Institutional Use of Information Technologies in City Planning Agencies: Implications From Turkish Metropolitan Municipalities

By

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ABSTRACT

This study argues the pivotal relationship between the computing technology and its organizational context. It focuses on nature of implementation in organizational settings that are becoming increasingly important. A further motivation point for this study is to reveal the different discourses (managerial/political/emotional etc.) in the cycle of implementation. The assumption behind this interest is that IT and other technologies are not value-neutral and these tools have the possibility of shaping the goals and agenda of the planning profession.

As a part of methodology of the thesis, a comprehensive literature survey was completed around the theoretical issues that constitutes the framework of IT/IS adoption in organizations with a particular reference to urban planning and management. The statements and research questions were tested in the planning departments of selected metropolitan municipalities (Ankara, Izmir, and Bursa) that are experiencing information technologies and systems in various implementation stages. The research strategy was based on a variety of qualitative approaches, including two different types of closed questionnaire-based surveys and semi-structured/unstructured interviews. To measure the success/failure degree of the planning technologies used in the case study organizations in the 'user' dimension of the study, DeLone and McLean's (1992) IS Success Model and Heeks'(1999) ITPOSMO model were used.

Case study research revealed the current stands of ICT implementation in urban planning departments of local governments. It was also evaluated planning practitioner's commitment and dependence towards computerized planning tools in working practice. In a more exploratory context, a progressive research agenda for ICT implementation in public planning agencies was developed based on the implications of empirical research and literature-based analysis.

ÖZ

Bu çalışma kent planlama alanındaki bilgisayar teknolojileri ile bu teknolojilerin kurumsal uygulama çerçevesini tartışmaktadır. Dolayısıyla uygulama sürecinin temeline ve kurumsal çevreye odaklanmaktadır. Bu çalışmayı yönlendiren önemli unsurlardan biri bilgi teknolojilerinin uygulanması sürecinde ortaya çıkan farklı yaklaşım ve uygulama tarzlarına ışık tutulmasıdır. Burada ortaya konulan yaklaşımın temelinde bilgi teknolojilerinin ve sistemlerinin bir araç olmanın ötesinde değerler taşıdığı ve bu nedenle planlama mesleğinin gündemini ve hedeflerini etkileyebileceği varsayımı yatmaktadır.

Çalışmanın metodolojisinin önemli bir bölümünü kent planlamayı temel alan ve bilgi teknolojileri ve sistemlerinin kurumsal adaptasyonu ve uygulaması üzerine yoğunlaşan kapsamlı bir literatür taraması oluşturmaktadır. Soru cümleleri ve varsayımlar bilgi teknolojileri uygulamaları bakımından farklı aşamalarda olan Ankara, İzmir ve Bursa Büyükşehir Belediyelerinin planlama bölümleri örneğinde test edilmiştir. Araştırma stratejisi, mülakat ve anket gibi çeşitli niteliksel araştırma teknikleri üzerinde kurgulanmıştır. Planlama teknolojilerinin kurumsal uygulamalarının etkinliğini ölçebilmek için ise DeLone ve McLean (1992)'in 'Bilgi Sistemleri Başarı Modeli' ile Heeks (1999)'in ITPOSMO modeli kullanılmıştır.

Sonuçta, örnek alan çalışması bugün itibariyle kent planlamada kullanılan bilgi teknolojileri ve sistemlerinin seçilen Büyükşehir Belediyeleri örneğindeki durumunu ortaya çıkarmıştır. Ayrıca, yerel yönetimlerde çalışan şehir plancılarının bilgi teknolojilerinin kurumsal utilizasyonu konusundaki düşünceleri, bu teknolojilere yaklaşımları ve çalışma pratikleri içindeki kapladıkları yer üzerine değerlendirmeler yapılmıştır. Araştırma sonuçları üzerindeki çıkarımlardan ve ilgili literatürden beslenen daha geniş bir çerçeve içinde de araştırmacılar ve uygulayıcılar için ileriki çalışmaların önceliklerini işaret eden bir araştırma gündemi oluşturulmuştur.

ABBREVIATIONS

BBS	Bulletin Board Systems
BUIS	Bursa Urban Information System
CAD	Computer Aided Design
CBO	Community Based Organization
DSS	Decision Support System
GIS	Geographical Information System
ICT	Information and Communication Technologies
IT	Information Technology
IS	Information System(s)
IT/IS	Information Technologies and Systems
LIS	Land Information System
MIS	Management Information System
PC	Personal Computer
PSS	Planning Support System
SDSS	Spatial Decision Support System
UIS	Urban Information System

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CHAPTER 1
INTRODUCTION

The world we live in is both urbanizing rapidly and more and more depending on new media and computer technologies. Information and communication technologies (ICTs) which have roots in very essence of modernity have accelerated their pace and improvement that affect all sectors of modern life, and with no exceptions in the area of urban development and planning.

Countries, regions, cities, citizens and organizations that are subject to city planning are influenced by rapid developments in the area of information and communication technologies in various degrees. We are witnessing a major challenge between countries to innovate, adopt and use new technologies efficiently to boost economic productivity, quality of life and so on. In new economy, cities are becoming more interconnected economically, culturally, and infrastructurally through the parallel development of global telecommunication and transportation networks. Many organizations and institutions, in both the public and private sectors, are involved with connectivity issues pertinent to the digital environment. Government offices, schools, universities, libraries are more and more linking together and some major city services becoming online. The information infrastructure also supports a wide range of new services which will empower citizens and provide better living conditions.

Besides its advantages, information technologies have also created new lines of divisions in both urban scene and urban life. Equal and easy access to technology (information poor/information rich, or information haves and have notes), personal privacy and work life (electronic surveillance), home centeredness (telematics), tension between local and global (space of flows- space of place), new forms of public space (electronic agora) and so on.

In today's world, although information technologies (IT) have significant impacts from innovation to reorganization of economic sectors, transportation to entertainment, education to urban management, media to social and cultural life, the area concerning ICTs-city/ city planning relationships has one of the least developed parts of urban studies and research. Salomon et al. (1999) suggested that there is a "*knowledge gap*" in our current understanding of what impacts information

technologies have on urban areas. They note that IT is relatively a young concept that is only partially understood, due to its complexity and novelty. Therefore, to reduce this gap, members of the research community should contribute more research on urban issues of new information and communications technologies (Salomon et al. 1999).

Such a research in urban studies may include wide variety of topics from urban economic development to newly emerged e-sectors, telecommunications infrastructure to telecommunications land-use plans, social and cultural impacts of information technologies to urban policy and civil rights to their physical impacts on built environment, micro-scale applications of IT tools in public and private organizations to broader technology transfer policies in both national and international level.

Understanding of the role and content of computerized tools in urban planning practice and debate is the domain of inquiry of this thesis. Further research questions and relevance of the research explain the context and conceptual structure of the inquiry. This chapter ends with some general notes about the methodological and structural aspects of the thesis.

1.1. The Context

"*The world has changed: Can planning change?"* (Castells 1991)

The rapid increase in the availability of information technologies and information systems (IT/IS) within planning agencies has brought important questions about the possible impacts of these technologies on the nature and outcomes of planning practice and debate (Campbell 1996). It is important that city planners understand the impacts and implications of information technologies and systems, and adjust their "attitudes" and "methods" accordingly. Today we are at a time that computer applications are exploding. This is a new challenge for the profession of city planning that needs to explore how planning practice and debate can best incorporate, modify and extend these new tools. These challenges can be gathered under two broad headings:

First, "**challenge to improve the intensity of urban planning and debate by using information technologies and systems**". New technologies like GIS/PSS, CAD programs and Internet are not value-neutral, they actively shaping the goals and agenda of the planning profession. In his brief essay "*Technology and Planning*" Stephen Wheeler indicates "*technology is a dynamic force that restructures both cities and the*

mindsets of city planning far more than we usually realize, and that we as planners must become better at stepping back from technology and putting it in its place" (Wheeler 2001, p.85). As Christine Boyer (1996) points out, "…*the computer affects the way we think, imagine, and organize information… Machines and now computers guide the way we model the world and grasp reality- and by analogy, the way we form or pattern the city*" (Boyer 1996, p.14). The challenge also arises to adopt computerized tools better to mainstream theory and ideology of the planning today. General trends toward "sustainability", "governance" or "democratization" in urban planning should be supported by computerized tools. For example, the important issues for GIS will no longer be obtaining the needed spatially-related data, but rather developing "flexible and sustainable" ways to structure and maintain these data to support the particular needs of planners. According to Batty, if the coming age is to be good for planning, "theory and technique", "ideology and practice" should closely be intertwined (Batty 1991).

Second, "**the challenges for integrating computerized tools into urban planning practice**". Planning methodology has changed in recent years through less modeling, more communication visualization; from mainframe to PC; from paper to computer screen; a wider array of interests and data sources parallel with the need for more sophisticated an online database, more data from more places and information sharing with the advent of new telecommunication systems that all relates to larger changes in urban planning. Being relatively cheap and easily available, computerized tools have opened up new opportunities for urban planners to improve their professional practice. As Yeh puts it out that in some computer-assisted planning activities like administration, planning analysis, ordinance-enforcement, and liaison, information technologies and systems have become the integral part of the work of urban planners (Yeh 1988). Computerized planning tools have allowed planners to conduct traditional planning tasks more effectively and efficiently. However, although these tools may serve the needs of planning professional better, planners' knowledge need to be improved and sophisticated more than ever.

IT-based changes in planning have not limited to the technical merits of tools themselves. Beyond this, successful implementation of these computerized tools into city planning agencies may be the most challenging issue for this debate. This dissertation argues the pivotal relationship between the computing technology and its

organizational context. Here "organizational context" refers that **information technologies and systems are more than mere machines and equipments and their implementation in organizations can only be understood as part of the broader social and environmental relationships**. The context of the study can be outlined in a four closely intertwined levels of relationships between environment, technology, agency and organizations (**Figure 1.1**).

In the Figure 1.1, at the most outer ring, we see broader environment (or external world) that includes both external institutions out of the organization (groups, markets, organizations) and influencing factors such as economy, politics, socio-cultural dimensions, technical and legal procedures. A highly unstable external environment is responsible to prevent the effective development and utilization of information technology-based systems.

Secondly, organizational context in terms of city planning agencies includes both public (local governments, central government agencies etc.) and private (private planning firms) planning agencies. Each group has different tasks they perform and internal organizational structure. Therefore, form of IT/IS implementation procedures varies along which application policies they choose to adopt. Planning agencies are mostly the parts of larger organizational structure and in many instances as planning departments within these organizations. Planning departments as individual units have very little control over technology implementation. Both external environmental and internal organizational factors are essential in the implementation process.

Thirdly, we may place information technologies and systems (IT/IS). Information technologies can simply be defined as "*the devices and systems designed to transfer information through telephone, fibre-optic lines or airwaves, the computer hardware that receives and stores the information transferred, and the computer software programs and data storage devices that facilitate such transfer and allow recipient to use and analyze data to create information for a specific purpose*" (Kellogg 1999, p.448). In a broader context, information technologies are the parts of information systems that are largely used by organizations. In this dissertation, information technologies and information systems are used more or less interchangeably with each other that refer to both large-scale information systems such as *geographical information systems* (GIS), or computer-aided *planning support systems* (PSS) as integrations of GIS, models, and visualization tools, and other technological

components: *software* (CAD, modeling, statistics, visualization tools), *hardware* (telecommunications infrastructure) and *networks* (Internet, Intranet).

In the inner ring and at the core of the study we see the implementation of IT/IS in planning departments of selected planning agency (local governments). Examining the nature implementation will be realized using both 'content' and 'process-oriented' approaches within a vicious circle that consists of pre-implementation, implementation, and post-implementation stages.

In sum, these four layers are closely interrelated with each other. Therefore, the major limitation on the use of information technologies and systems in urban planning today is not only a matter of technological context, but also the deliberation of larger environmental, organizational, and user dimensions.

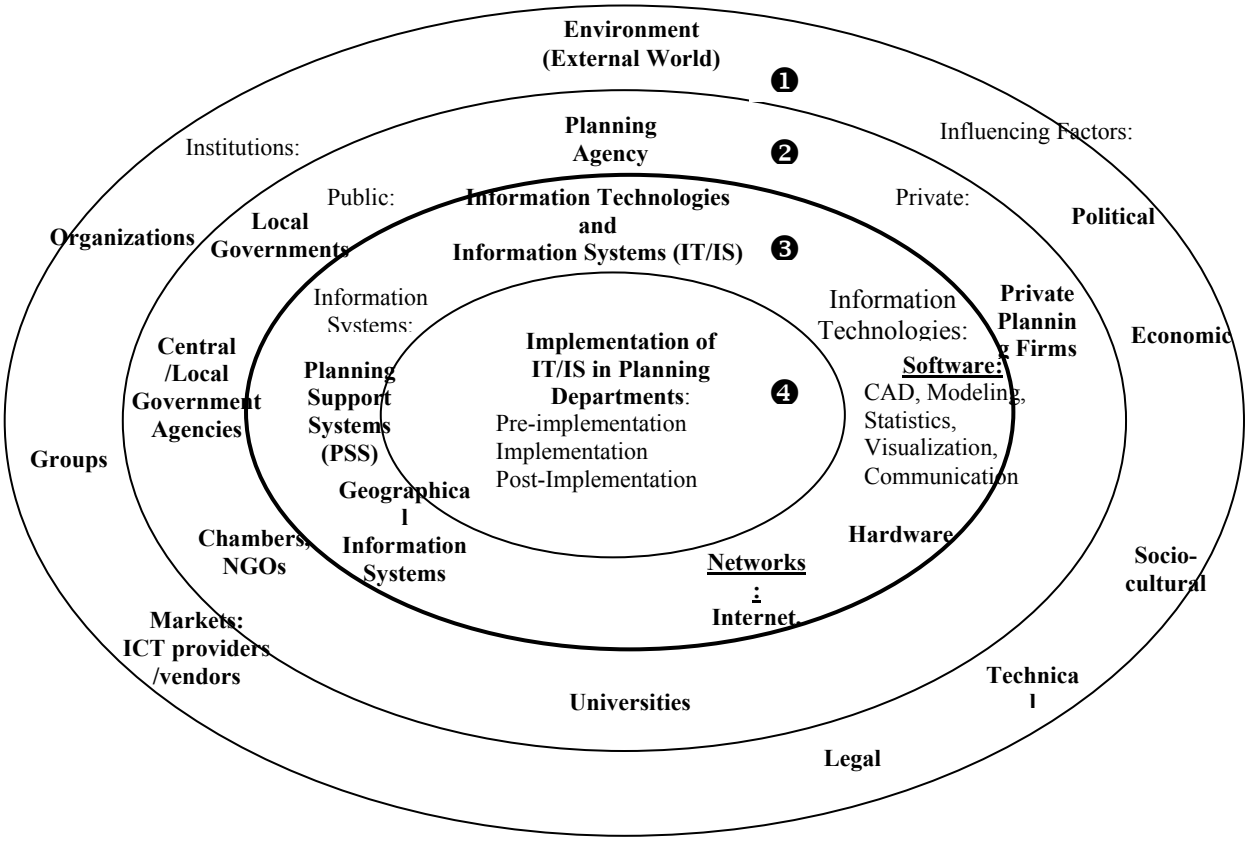

Figure 1.1 Summary of general context of the IT/IS and City Planning Relationships

1.2. Relevance of Research and Contributions to Field

As noted earlier, researchers in urban studies and planning have serious knowledge *gap* due to the level of complexity, uncertainty and novelty of the information technologies (Salomon et al. 1999). The obstacles made IT research difficult has fourfold:

First, innovations in information technologies (IT) are growing so dynamic and faster that this limits most of the efforts to forecast and measure the future implications of these technologies on social and institutional processes that work at a very different pace compared to the pace of technological advances.

Secondly, IT is largely invisible (Batty 1990); (Graham and Marvin 1996). Neither the technological elements, nor the traffic upon them can be seen. Given that, much of the information constituting the network traffic is private in nature and not measurable (Salomon et al. 1999). Restricted access is a feature of such private development that developing explicit research studies to explore the impact of these technologies is always problematic. Much of the data is in the hands of the private sector, and therefore not visible. The scarcity of institutional data and knowledge, and inconsistency in measurement tools and methods is another serious implication adding to invisibility effect: "*Cities are becoming invisible to us in certain important ways and it seems that this invisibility is increasing at a faster rate than our ability to adapt our research methods to these new circumstances*" (Batty 1990).

Thirdly, we have serious obstacles to understand and measure technological penetration and adoption due to the complex amalgamation of urban issues and new technologies. IT may involve many different facets of human life, like residential patterns, work patterns, learning, and leisure activities:

> ...contemporary cities can only be understood as parallel constructions within both urban place and electronic space. Without understanding both, and the many interactions points between them, we believe that we will never be able to approach or understand the totality of the current transformation underway in advanced capitalist cities (Graham and Marvin 1996, p.377).

Finally, urban studies and planning has remained blind to impact of new technologies on cities and city planning. Despite the recent efforts by urbanists and geographers, the field has been left open to other non-urban specialists that support

simplistic and utopian approaches (Graham and Marvin 1996). As a relatively young field of research, much of the writing about impacts of ICT on cities and urban planning tends to be *futuristic and speculative*, based on the experience of immature cases. Lack of empirical research in the field has become a serious obstacle in the development of more consistent results. As Castells states, "we have to produce analysis based on fact not fiction" (Blakely 1991).

This study focuses on nature of implementation in organizational settings that are becoming increasingly important. The findings of numerous studies suggest that the adoption and effective utilization of information technology is largely dependent on organizational rather than technical considerations (Masser and Campbell 1989). The knowledge base of the thesis, therefore, focused on three major areas of research:

First, studies in *organizational process and implementation of computerized systems in urban planning* that have largely concerned geographical information systems. This extensive body of research has documented the adoption and utilization of geographical information technologies for agencies and institutions. Questions examined include the human, organizational, and institutional aspects of GIS implementation (Croswell 1991, Azad 1993, Budic 1993, Budic and Godschalk 1994, Pinto and Azad 1994); the evaluation of GIS adoption and management by organizations (Obermeyer 1990, Onsrud and Pinto 1993, Pinto 1994, Campbell 1994, Budic 1994, Obermeyer and Pinto 1994); the diffusion of geographical information innovations (Onsrud and Pinto 1991, Masser and Onsrud 1993, Grimshaw1994) (Sheppard et al. 1999). Also the studies of informational/organizational systems researchers particularly on management information systems (MIS) have contributed valuable insights (Heeks 1999); (Danziger et al. 1982); (Heeks 2002) (DeLone and McLean 2003); (Laudon et al. 1994) ; (Rogers 1993).

Another important contribution to knowledge base of the study is *theoretical insights about the impacts of IT on planning theory and debate, planning practitioners* and as well as larger society. Challenges explored by the urbanists include theoretical approaches to the relations between cities and ICTs (Graham and Marvin 1996), technology and city planning relationships in the historical perspective (Wheeler 2001); (Pitkin 2001); changing context and debates in urban planning via new technologies (Klosterman 1997); (Harris 1989a); (Harris 1999); (Harris 1996); (Batty 1991); and the attitude of planners towards computerized tools and changing role of the planning

professional (Campbell 1996); (Innes and Simpson 1993);(Piracha and Kammeier 2002).

Lastly, the literature on *developing country implications of IT in public agencies* is explored (Masser and Campbell 1989); (Klosterman 1995); (Rondinelli et al. 1989); (Harris 1989b); (Ramasubramanian 1999).

Studies in ICTs have come into Turkish city and regional planning literature with master dissertations covering issues in geographical information systems (GIS) in early 1990s. Dissertations, documented by Higher Education Council's (YÖK) Dissertation Center so far, can be grouped under two main categories:

First group of theses mainly focuses on impacts of information and communication technologies on cities, and sectoral developments that are in some distance with major concerns of the current study.

Another group of theses mainly concerns ICTs as computerized planning tools. They can be distinguished by topics as geographical information systems and remote sensing, planning support systems, and computer-aided design. Among them, Erarslan's (1997) dissertation is remarkable in terms of its special emphasis on implementation process. The study examines the different problems of GIS use in municipal planning services in Turkey from the perspective of providers and users. Author accepts the argument that there are some major obstacles in the true exploitations of GIS for planning in Turkey and takes "data acquisition problem of GIS implementation" as a focal point for a detailed pilot study (Erarslan 1997). Also Saygın's study touches on the transfer of GIS technology to developing countries as a part of the larger study on GIS based urban policy development (Saygin 2003).

The brief survey on the Turkish urban planning literature indicates that little has been done in a structural way on evaluation of computerized planning tools in the real working practice. The common figure somewhat optimistically asserted in majority of these dissertations is that ICTs are simply tools that planners employ. Some authors accept the problems in diffusion and implementation for GIS in working practice (Erarslan 1997); (Yigitcanlar 2001), however, most of the study on the field employ these new technologies as supporting tools in analysis, modeling and visualizing phases of their works.

My contribution to the field will be based first of all in the descriptive context. An empirical case study research reveals the current stands of ICT implementation in

urban planning departments of local governments. It is also evaluate planning practitioner's commitment and dependence towards computerized planning tools in working practice. In a more exploratory context, a progressive research agenda for ICT implementation in public planning agencies is developed based on the implications of empirical research and literature-based analysis.

1.3. Aim of the Study

The influence of, and dependence on, information technology is growing increasingly in workplace in general and in city planning organizations in particular. The introduction of IT/IS in public planning agencies had some benefits, but particularly failures, especially in operating large information systems like GIS. Because there is no well-established tradition in doing evaluations in public organizations in developing countries, we have vast difficulties in measuring the real benefits and pitfalls of the information systems in Turkish urban planning case. Even such systems are very costly to operate an effective implementation procedure and management could not be established systematically. Thanks to being flexible in service and very easy and less costly in utilization, other IT tools like electronic spreadsheets, office programs, basic CAD software and Internet tools has rarely been explored as a part of IT adoption in city planning organizations. These computerized tools, like other large information systems, have become an important part of planning practitioners' working agenda. As Piracha and Kammeier suggest, unless planners have hands-on knowledge of such basic computer tools they will not able to build and operate large spatial and managerial information systems (Piracha and Kammeier 2002). Therefore it has received significant attention to examine a larger picture of all these computerized planning tools in planning agencies.

A further motivation point for this study is to reveal the different discourses (managerial/political/emotional etc.) in the cycle of implementation. The assumption behind this interest is that IT and other technologies are not value-neutral and these tools have the possibility of shaping the goals and agenda of the profession.

This study proposes an explanatory investigation of well-known evaluation frameworks in organizational research and GIS literature in selected public sector planning agencies and search for the possible future of how urban planning practice and

debate can best incorporate with these new tools from the users' (planning practitioners) perspective. This emergent form of evaluation will permit a new vigor to studies concerning the IT/IS implementation in city planning agencies, and may allow planning agencies to develop actions and to evaluate information technology implementation outcomes related to city management and planning.

1.4. Methodological Approach

This dissertation is a partly descriptive and partly evaluative study introduces an evaluation framework for various computerized planning tools implemented in selected planning departments of metropolitan municipalities. It employs a various evaluation frameworks for implementation by searching explicit and implicit structures behind the IT implementation process. In producing this thesis, it is hoped that it will be viewed not necessarily as a "handbook" to be followed specifically, nor a "recipe" for a successful IT implementation in planning agencies. Rather, it is intended more of an indicators of some part of our current practices and approaches to those technologies in Turkish planning practice.

The methodological approach of this study is largely based on the statements that constitute the general framework of the study. Each statement emphasizes the different stages (pre-implementation; implementation; post-implementation) of IT utilization in planning organizations.

The first statement is that "**the influence of, and dependence, on information technology is growing increasingly in workplace in general and in city planning organizations in particular"**.

This statement indicates the need of empirical study that seeks to explore what is actually done with ICTs in city planning agencies. It also questions the 'knowledge' and 'attitudes' that effect the implementation decision of those technologies systems using in planning organizations. In other words, it is suggested that the tools, processes and issues of city planning practice will be modified in the information age, and that the planning practitioner and planning agencies should need to adapt to an emerging new technologies. Thus, the diffusion of these technologies into planning organizations is a critical matter that should be monitored carefully.

Research questions related to this statement are as follows:

RQ1. What is the extent of diffusion of computerized tools among the planning agencies that have been explored?

This research question requires other sub-dimensions namely,

- What is the current level of IT/IS utilization in chosen organizations?

RQ2. How is IT/IS implementation decision taken in planning organizations?

This question requires further questions namely,

- What are the knowledge and attitudes toward those technologies and systems by interested parties before implementation decision has taken;
- What is the reason/tendency for adoption;
- What is the awareness/readiness level of planning organization towards new technologies and systems related to their field;

The second statement suggests that "**the organizational and user dimension of implementation factors more than technical ones, constitute the main obstacles to the improvement of information technologies and systems in city planning agencies**".

Different theoretical frameworks offer different implementation perspectives on the nature of the implementation process. For example, **technological determinist view** of technology has the assumptions that technologies are good and that the only factors limiting the realization of their potential are the extent of vision within the planning community and the ability of the technology to keep pace with users' demands. **Managerial Rationalism**, on the other hand, has the notion that implementation is linear, involving a series of logical stages based on strategy and preplanning. This perspective assumes that new technologies must be managed and controlled to yield their full potential. Another perspective, **social interactionism,** arises from analyses of how individual organizations work in practice rather than how they ought to work. This view offers the appropriate steps depend on the particular needs and capabilities of the individuals within a planning agency (Campbell 1996). The main argument developed here is that 'IT implementation' is not merely a technical issue but, like any other human activity, the action is influenced, shaped and constrained by theoretical frameworks for implementation. Therefore, I have adopted a theoretical framework which is similar to what social instructionist view of technology suggests, that is technology is not an autonomous force, rather it is an integral part of society, shaping and being shaped by various forces. The implementation environment incorporates not

just technological but also social and organizational factors. Role of user values and organizational environment is even more important in developing countries. Many researches in technology implementation in developing countries note that "*the critical role played by social (user) and organizational factors in the implementation of ICTs in developing countries*" (Heeks 2002, p.5). Consequently, it is expected that the assumption of organizational and user dimensions of technology implementation is more important than technical ones that are applicable for planning agencies chosen for the empirical part of the study.

Research questions related to this statement are as follows:

RQ1. What are the factors of IT/IS implementation in planning agencies?

This research question can be elaborated as,

- Which personal and situational factors are critical in the process of implementation?
- What is the style of implementation (corporate/departmental)?

RQ2. What are the constraints of implementation (e.g. technical, social)?

The third statement, that is based on the argument developed by Heeks (1999), is that, "**there are conception-reality gaps in implementation process of information technologies and systems (IT/IS) in organizations** (for this case, city planning departments in selected metropolitan municipalities)**. Successful adoption depends on the size of these gaps. The larger the gap, the greater the risk of failure"** (**Figure 1.2**). This statement has the idea that technology implementation in organizations is never linear and easy process. The soft realities of the organization and the hard application design of technological systems produce a "**conception-reality gap**" that influences the success and failure of the implementation (Heeks and Bhatnagar 1999). In other words, this gap is up to the amount of change between "where we are now" and "where the IT/IS-based systems and tools want to get us".

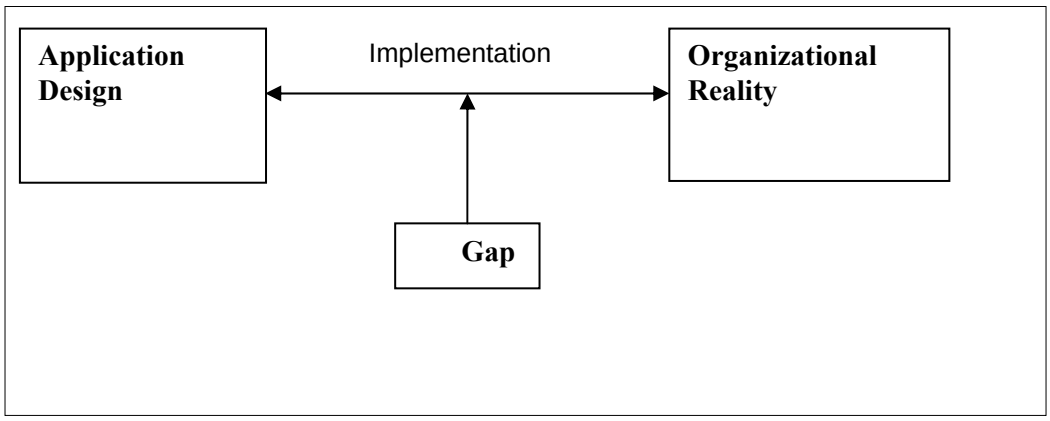

Figure 1.2 Conception-reality gap of IT implementation process in organizations

Research questions related to this statement are as follows:

RQ1. How to measure the assumed gap between technology's design and actualities of urban planning practice?

This research question has several sub-dimensions; these are:

- What are the dimensions of conception-reality gaps?
- How to measure those gaps?

RQ2. How to measure the effectiveness of IT/IS for chosen planning organizations?

This research question has several sub-dimensions; these are:

- What are the benefits of IT/IS use?
- IT/IS Effectiveness on the accomplishment of computer-assisted planning tasks
  What are the individual, organizational, and larger societal consequences of IT/IS use in organization?

As a part of methodology of the thesis, a comprehensive literature survey was completed around the theoretical issues that constitutes the framework of IT/IS adoption in organizations with a particular reference to urban planning and management. General theoretical framework of the dissertation was constructed as parallel with the statements and research questions mentioned above. Then, the statements and research questions were tested in the planning departments of selected metropolitan municipalities (Ankara, Izmir, and Bursa) that are experiencing information technologies and systems in various implementation stages. The selection criteria of cases as a major unit of analysis have fourfold: (1) Their readily awareness and operation of various IT/IS-based systems, (2) Existence of a planning department as a single, defined unit within an organization, (3) Availability of richer financial resources, larger size of planning staff,

and the targeted centers of new technologies, (4) The specialization of planning issues in different operational levels that creates more chance to observe intra/inter organizational context and variety of computer-assisted planning tasks.

IT/IS in urban planning transcend many areas of investigation that cover large variety of interests and academic fields. Most of the topics in the planning field correspond to the diffusion of information systems (basically GIS) within organizations requiring cross-organizational context, teamwork, and financial support that is beyond the scope of this study. On the other hand, more specific, in-depth study of cases may much more helpful in terms of conceiving implementation stages in a more holistic concept. In this sense, the research strategy was based on a variety of qualitative approaches, including two different types of closed questionnaire-based surveys and semi-structured/unstructured interviews. The analysis of cases addresses the main research questions raised in above and evaluation frameworks (discussed in chapter V) based on the literature in the field of information systems research.

1.5. Structure of the Thesis

The general structure of the dissertation comprises of three parts: Part I (Chapters 2 to 5) constitutes the knowledge base about the process of implementation of information technologies and systems (IT/IS) and their implications to urban planning practice and debate. Part II (Chapter 6) focuses on empirical study on selected public planning agencies. Part III (Chapter 7) evaluates the research findings and discusses broader implications of IT/IS in urban planning respectively.

Chapter one provides a general introduction to thesis comprising the domain of inquiry, general research questions, aim of the study and the methodological approach to the study.

Chapter two focuses on the clarification of the key terms “information”, “technology”, “information technology”, and “information system”. The key features and differences between those systems will be indicated briefly.

Chapter three explores the relationships between the “information technology”, and “city planning”. “How is discipline of urban planning approaching to these technologies?”; “Are there new challenges brought by them”; “What is the current trends in planning technologies in planning offices” are major questions of this section.

Chapter four describes the factors of effective utilization in organizations by exploring theoretical perspectives on the nature of the implementation process, major implementation factors, and various gaps in implementation process of ICTs in organizations. Chapter's content has direct input in the formation of empirical research.

In chapter five, two basic evaluation frameworks focusing on information systems success and failure is discussed. This section includes; indicators of information systems and organizational performance, and techniques to measure the implementation failures and success.

Chapter six is devoted to empirical investigation of IT/IS implementation in selected urban planning organizations and background of IT/IS development in urban planning and public sector organizations in a larger extent.

The final part of the thesis evaluates the case study research findings. This section ends with a general discussion on ICTs in public planning agencies and implications for further studies and research.

CHAPTER 2
INFORMATION TECHNOLOGY AND INFORMATION SYSTEM

The terms information technology (IT), new information and communication technologies (NICT) and information and communications technologies (ICT) are used correspondingly to indicate a critical step in the long history of technology. Around the multiplicity of labels like “atomic age” or “post-industrial age”, information age has become a standard term describing the era in which we live.

The increasing use of “information technology” and the rising value of “information systems” as parallel with the great importance of information highlight important trends that are shaping information age. Thus, this section discusses the issues that constitute the technical and intellectual context of these technologies and systems briefly.

2.1. Information

In many cases the word "information" has been severely overused; Information Technology, Information Age, and Information Systems. The Concise Oxford Dictionary provides the following definition:

> Information: n. Informing, telling; thing told, knowledge, (desired) items of knowledge, news; information retrieval, tracing of information stored in books, computers, etc.; information theory, quantitative study of transmission of information by signals etc.

The terms “data” and “information” is often used synonymously, however, there seems to be some consensus on a hierarchy of “types of information”, from data to information to knowledge. Some scholars, such as Klosterman, even add a fourth level of “intelligence” (Klosterman 2000) (**Figure 2.1**). In this context;

- **Data** would refer to raw facts, both quantitative and qualitative (Klosterman 2000). It is recognized upon its acquisition from one of many different sources in one of many different ways through events in the real world and the world of the mind (Harris and Batty 1992).

- **Information** would pertain to data manipulated and organized in a meaningful form (Klosterman 2000). Data is converted to information by various forms of filtering and processing which give it some form and coherence at a rather elementary level (Harris and Batty 1992).
- **Knowledge** relates to "understanding based on information, experience and study" (Klosterman 2000). Scientific processes of generalization and the investigation of cause and effect convert information into knowledge by imposing and testing a structure which is usually not inherent in the original data or the processed information (Harris and Batty 1992).
- **Intelligence** is sometimes considered "the ability to deal with novel situations and problems, to apply knowledge acquired from experience, and to use reasoning as a guide to behavior" (Harris and Batty 1992; Klosterman 2000). In this level, according to Klosterman, both computer and non-computer based tools and procedures are combined to support community dialogue and debate on how best to manage collective social concerns (Harris and Batty 1992; Klosterman 2000).

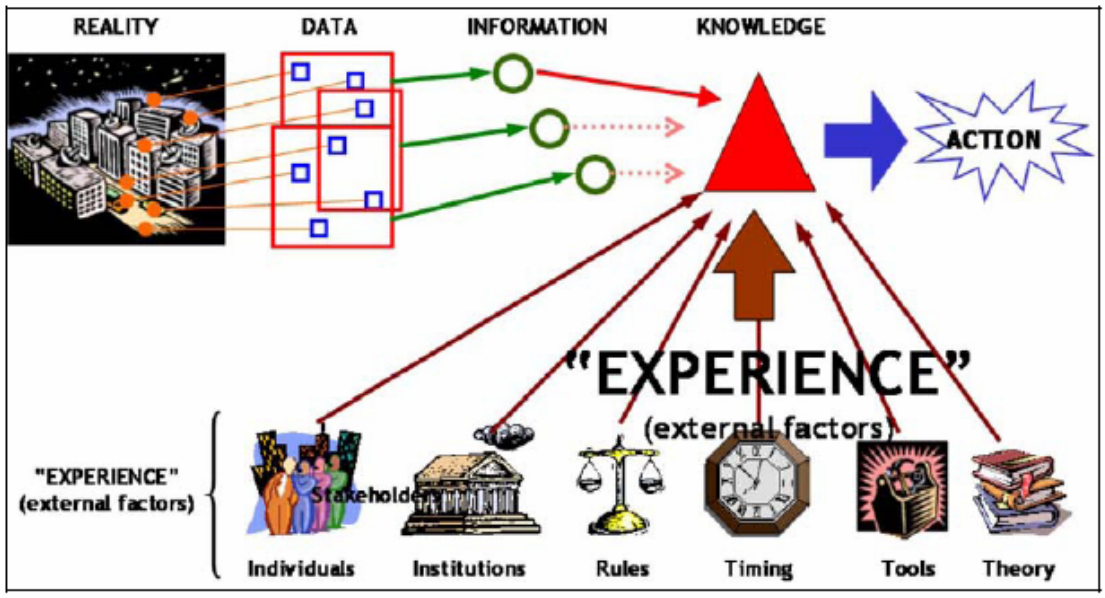

Figure 2.1 Data, Information, and Knowledge (source: Carrera 2002)

2.2. Information Technology (IT)

By information technology (IT), we technically mean "*a family of technologies used to process, store and disseminate information, facilitating the performance of information-related human activities, provided by, and serving both the public at-large as well us the institutional and business sectors*" (Salomon et al. 1999, p.5). However, in a broader context, definition of such complex systems refers to merging of technical, organizational, and human aspects altogether. We see this change in the concept of "technology" itself.

Technology has always associated with "progress" and considered improving standard of living and well being of the society as a whole. It is important to examine the ambiguities when we use the terms "technology", "technological systems", or "computer-based systems" that more or less interchangeably used with each other.

The English word "technology" is derived from the Greek *teckhne,* which means "art" or "craft". Before industrial age the term had been thought of as belonging to a special branch of "mechanical arts" (practical, useful, industrial, physical) as distinct from the "fine arts" (high, imaginative, creative, mental). The earliest English instance of the modern usage of term technology has cited in the Oxford English Dictionary in 1859 to refer to the "practical arts collectively". Alike from today's abstract noun "technology", it referred to the knowledge and the practice of the crafts. In the era when electrical and chemical power was being introduced and when these huge systems were replaced discrete artifacts, simple tools, or devices as the characteristics material form of the "mechanic arts", the latter term also was replaced by a new conception: "technology". As the first complex technological systems were assembled, the new concept of technology was constructed. In these large and complex new technological systems, the artifactual aspect remained relatively small compared to mechanical arts and the system tightly interlinked with the other components: conceptual, institutional and human (Marx 1994). According to Sproull and Goodman, it is possible to define three common elements of technology: namely "machines", "methods", and "knowledge". Their conception of technology is defined as knowledge of cause and effect relationships embedded in machines and methods. This definition emphasizes that the role and value of machines and methods does not exist in a vacuum but rather is shaped by existing knowledge. Therefore, any technology, like IT, is not an independent

entity and likely to vary according to personal, organizational, and cultural circumstances (Masser and Campbell 1995).

The pervasive use of "information technology" or "information and communications technologies" masks significant differences in what the various scholars actually mean by these terms. As "digital revolution", IT refers to a wave of socio-technical change, comparable to the earlier waves associated with electrification, industrial mass production, the telephone, and the automotive complex. This socio-technical economic system has transformed, and is likely to further transform, the economies and societies of nations. This definition has associated with futurist and utopian thinking of technology which will be mentioned soon. As "communication systems", IT refers to digital communications networks, which are seen as vehicles for dialogue between residents and public officials, or strengthening social bonds in communities of place. To understand the characteristics of these technologies we must look at their features in detail.

Basic Types of Information Technologies

Information technologies are collection of technologies and applications that enable the processing, storing and transfer of information to a wide variety of users or clients (Salomon et al. 1999). According to Laudon et al. (1994), there are very different kinds of information technologies available today, but they can be categorized as four basic types (Laudon et al. 1994):

a. Sensing Technologies: Sensing technologies gather information from the environment and translate into a machine-readable form that can be understood by a computer.

b. Communication Technologies: Communication technologies tie and communicate information between sensing, analyzing, and display technologies. Fax machines, cellular telephones, modems, local are networks (LAN) are the classic examples of this category.

c. Analyzing Technologies: Computer hardware (the physical equipment) and software (the programs) constitute the category of analyzing technologies. Computers take information from sensing and communication devices and then *store* and *process* the information.

d. Display Technologies: Display technologies provide the connection between sensing, communication, and analyzing technologies and the human user. Computer screens, printers and plotters are examples of these technologies.

Information technologies gain new significance when they work together as an **information system**. An information system, which is mentioned below, is composed of different information technologies working together within a system.

2.3. Information Systems (IS)

Information systems (IS) are defined as "*systems of human and technical components that accept, store, process, output and transmit information. They may be based on any combination of human endeavors, paper-based methods and IT*" (Heeks 1999, p.15).

1. Components of Information Systems

According to Laudon et al. (1994) a modern information system has four interrelated parts (Laudon et al. 1994):

a. Input: Information systems take data from the environment using sensing and communication technologies. Input is the raw data from the world around us. We use sensing devices to gather input and translate it into a form that can be understood by the computer.

b. Processing: Information systems analyze the data using computer-based hardware and software and convert raw data into a useful form of information.

c. Output: Information systems display the product as useful information. Output means displaying the processed information to users via computer screens, printers and other transmitting devices.

d. Feedback: Users of information systems have a goal in mind, some problem that they would like to solve. Feedback involves using the information that is output as a basis for acting on the data that was input.

Information systems today play a vital role in businesses, governments, and other organizations. Because information systems are so closely tied to organizations, it is necessary to understand the nature of organizations and their activities with these

systems. The connection between technology and organization is essential and will be mentioned in chapter IV in detail.

2. Differences between Information Systems and Information Technologies

According to Heeks (1999), there are three major differences between information technologies and information systems (Heeks 1999):

- Firstly, an information technology on its own does not do anything useful; in order to be able do anything, it must become part of an information system.
- Information systems do not necessarily involve computers and telecommunications equipment. It may be a collection of paper-based methods.
- Information systems are much more than just information technologies because they involve people and their action. Information systems (which Heeks called rationality-imposing applications) incorporate a significant set of rational structures, processes and even culture and strategies for the operation. Thus, they require changes in organizational context to operate rationally. On the other hand, information technologies (which Heeks called reality-supporting applications), like word processing, can work successfully in a wider variety of organizational environments due to its fewer requirements as pre-conditions to apply (Heeks 1999).

2.4. Information Technologies and Systems in Planning

This brief section reviews the most important technologies used by planners today: electronic spreadsheets, geographic information systems (GIS), Internet, and the hypermedia tools.

1. Electronic Spreadsheets and General Software Packages

An electronic spreadsheet is based on computer software in which numerical data are stored in two-dimensional tables that display the results of calculations performed on the data. Beginning with *Lotus 1-2-3* in 1981, a number of spreadsheets (VisiCalc, SuperCalc, Multiplan, Excel) came into to market and widely used by planners (Klosterman 2000). In these years electronic spreadsheets accepted as "God's gift to planners" offer three advantages to planners: First they are both easily accessible and highly useful. Second, they are adaptable, allowing users to customize, extend, and sharing databases. Third, spreadsheets are ideal for examining "what if" questions

which are essential to planning analysis. This means that by using a spreadsheet, a planner can quickly and easily determine the effects of different assumptions and alternative policy choices (Klosterman and Landis 1988) (Klosterman 2000).

Alongside electronic spreadsheets, many *general software packages* (such as word processing, database management, computation, graphics, and simulation) which have been developed mainly for business and wider applications has adapted for urban planning uses (Yeh 1988).

2. Geographic Information Systems (GIS) and Planning Support Systems (PSS)

GIS is a computer based system for the capture, storage, analysis, and display of spatial data. It combines

> (1) sophisticated mapping capabilities that allow attractive and informative maps to be prepared quickly and easily;
> (2) highly developed database management tools for storing, modifying, and manipulating 'attribute' data that describe the features displayed on a map;
> (3) topological data that explicitly describe the spatial relationships between the map features; and
> (4) extensive data on anything that can be displayed on a map: built or natural features, population and economic statistics, current and projected land uses, development controls, and so on (Klosterman 2000, p.50).

GIS is composed of hardware, software, and data. Among these components, the most important and extensive one is the availability of data. Obtaining and maintaining a spatially related data is still expensive and time-consuming. Thus, the diffusion of GIS has raised important institutional and political issues, including data sharing, access, and documentation (Klosterman 2000).

GIS technology for urban planning is most commonly used for comprehensive planning, zoning, land use inventories, site suitability assessments, and socio-demographic analysis, and is generally used for mapping purposes (Budic 1993, 1994, Harris and Elmes 1993, Warnecke et al. 1998). The value of maps in understanding and communicating planning issues is well recognized and appreciated. The more-sophisticated analytical applications, which contribute to other aspects of the planning process, are less developed (Nedovic-Budic 2000).

GIS technology is extremely useful for a wide range of public and private sector applications. However this broad applicability creates mismatches in order to meet specialized needs of planning tasks and activities. To reduce this problem, planners

began in the late 1990s to develop **planning support systems** (PSS) that combined GIS with other computer-based tools, such as spreadsheets, custom-written programs, and the Internet. According to Klosterman,

> the goal has been to create fully integrated, flexible, and user friendly systems that combine (1) spatially based GIS, textual, graphic, and visual information; (2) a broad range of computer-based models and methods for determining the implications of alternative assumptions and policy choices; and (3) a variety of visualization tools for presenting the results of the models in the form of charts, maps, and interactive video and sound displays (Klosterman 2000, p.51).

PSS is a novel concept in computer-aided planning context and in spatial planning is still in its early years. "What if?", "Index", "TRANUS", "CommunityViz", "QUEST", and "UrbanSim" are one of the major PSS programs using in the planning practice.

3. The Internet, Communication Technologies, and Hypermedia Tools

The internet is "*a 'network of networks' that connects millions of computer users around the world into a seamless web of electronic communication and information dissemination*" (Klosterman 2000, p.51).

The Internet has started with the American ARPANET, predecessor of the Internet, as a military strategy to enable communication networks to survive a nuclear attack. Communicability of networks through the invention of modems encouraged the development of "Bulletin Board Systems" (BBS), first in the United States, then worldwide. BBS did not need sophisticated computer networks: just PCs, modems, and the telephone line. Then they became the electronic notice boards of all kinds of interests and affinities. BBS created the "virtual communities" (Rhiengold 1998). In early 1990s business has realized the fruitful potential of the Internet. "The commercialization of Internet" grew at a fast rate. However the majority of communication process was still spontaneous, unorganized and diversified in purpose and membership. This led to general acceptance of a meta-language: HTML (hyper text) and WWW (network of networks). Within the general framework of the Internet institutions, businesses, associations, organizations and individuals began to create their own "web sites", and produced her/his/its "homepage" that made of a variable collage of text and images (**Figure 2.2**).

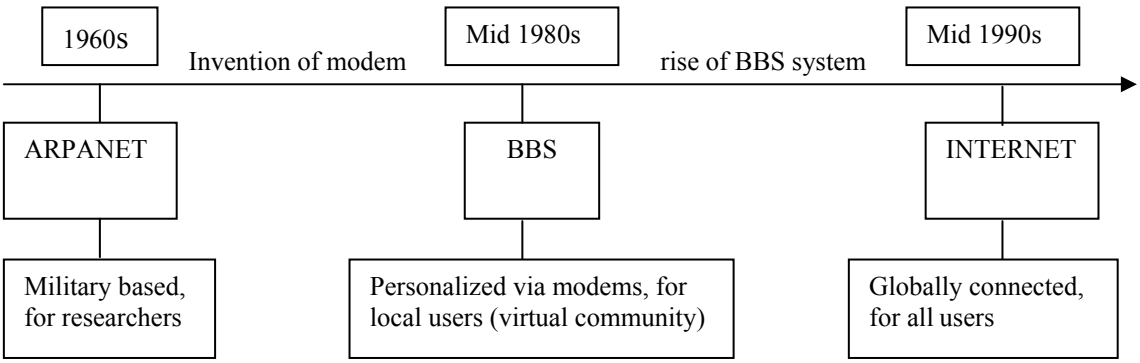

Figure 2.2 Evolution of the Internet

A wide variety of services are available over the Internet. Electronic mail, the file transfer protocol (ftp), the "telnet", newsgroups and public bulletin boards, list servers, and Internet-based chat software known as IRC, and the most importantly the World Wide Web (www) are the examples of these services.

Today, we see the trend of convergence of computerize planning tools with more mobile and interactive communication and media technologies. In terms of planning policy and management the Internet, alongside with other web-based computerized planning tools, may have great potential to foster public participation, and collaborative decision making: "*In planning, collaborative tools allow draft plans and proposals – including full-color, three-dimensional maps; supporting documents; and analytical models- to be posted on the Web for public review and comment*" (Klosterman 2001).

Another medium to increase collaborative design and decision making in planning is hypermedia. Hypermedia refers to the "*organized structuring of different forms of information expressed by different types of media, such as written documents, images and sounds, in an integrated, associative manner*" (Klosterman 2000, p.55). Hypermedia tools can help to promote public participation by rendering information more understandable, credible, and usable to different segments of the public, particularly those who have not had access to, or experience with, more traditional forms of information. Computer-based hypermedia and other visualization tools, such as maps and graphs, can thus help provide a richer understanding of complex urban conditions and contribute to more productive communication among planners, other professionals, elected officials, and, most important, the public (Klosterman 2000).

2.5. Summary

Planning organizations use both information technologies and information systems. **Geographical information systems** (GIS), or computer-aided **planning support systems** (PSS), and **spatial decision support systems** (SDSS) are the most known and applied types of urban information systems. Information technologies, such as **software** (CAD, modeling, statistics, visualization, office tools), **hardware** (PC, modem, telecommunications infrastructure) and **networks** (Internet, local area network-LAN) supports wide variety of planning tasks. Information has placed at the heart of these information technologies and systems (**Figure 2.3**).

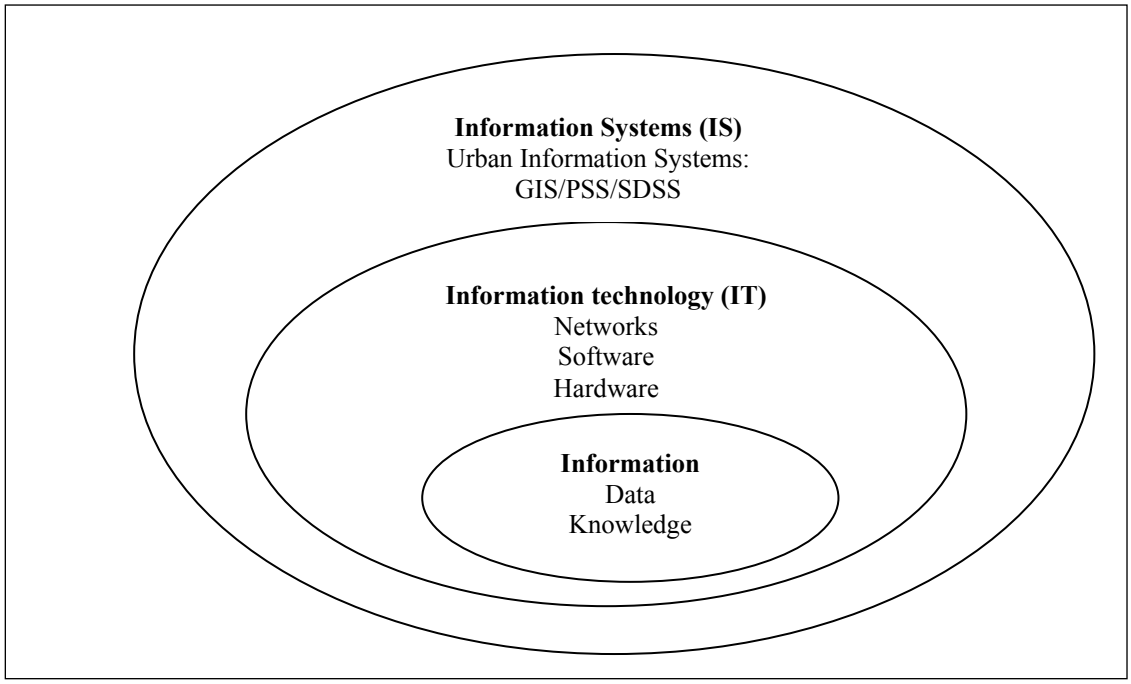

Figure 2.3 The connections between information, information technology, and information systems

CHAPTER 3
CITY PLANNING AND INFORMATION TECHNOLOGY

Chapter three explores the questions of "how planning profession approaches to these technologies? Are there new challenges brought by them"; "what the role of information technologies is in the planning process?" This chapter is organized around urban planning thought and its relations with new technologies, and urban planning organizations and their articulation with computerized planning tools through evolving historical context. Also, the role of planning technologies in the planning process is discussed.

3.1. Information Technologies in City Planning

Information technologies and systems, which have roots in very essence of modernity, have accelerated their pace and improvement that affect all sectors of modern life, and with no exceptions that in the area of urban development and planning. The diffused and complex interaction between these technologies and city planning is outlined by Paul Drewe and his colleagues in the TAN3 workshop in Berlin (1999) based on the distinction between real (physical) and virtual (cyber) spheres (Boelens 1999) (**Figure 3.1**):

In this conceptual scheme relation A refers to a *representation of the physical world* with the support of groups of software like CAD, GIS etc. It helps to understand existing and proposed new futures better or to present them in a better and more understandable way. Relation B implies *Online-Planning*. In respect to relation A, it goes one step further. Here, people in the physical world can participate and influence the proposed plans and planning decisions with the help of digital facilities. Relation C refers to the impact of information technologies on the choice of physical environment and therefore urban form. Lastly, relation D is the most speculative. It refers to the change in our mental maps and on our ways to look at our world and to perceive our surroundings. It indicates the impacts on the planners' ways of designing, the concepts, language and articulations collectively.

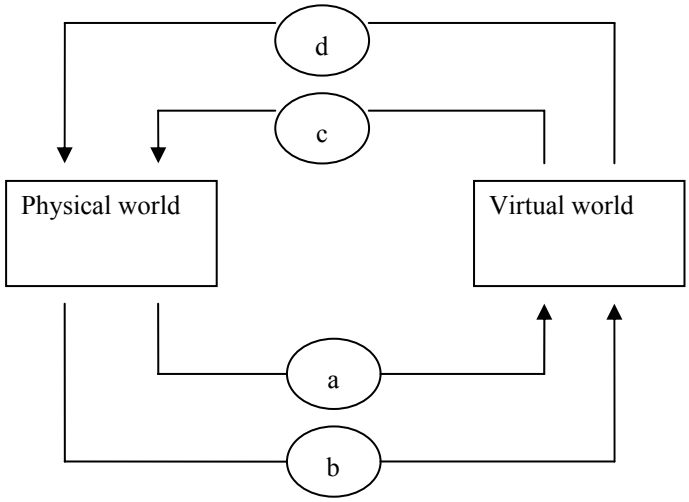

Figure 3.1 a conceptual scheme drawing on the interaction between information technologies and city planning

Another conceptual diagram developed by Shiode (2000) based on two major axes: hardware-software and real space/cyberspace (**Figure 3.2**). The vertical axis denotes the type of planning contexts. On one end is the physical investment and maintenance of hardware infrastructure, while on the other end lies event-oriented applications. The horizontal axis represents the nature of each space shifting from the solid, physical space of existing cities to a more flexible, metaphorical space within the information network (Shiode 2000).

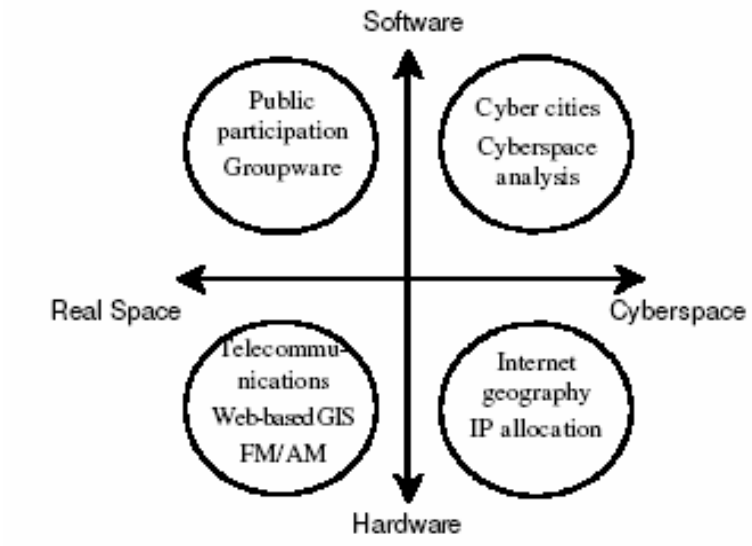

Figure 3.2 Summary of interactive factors between IT and urban planning (source: Shiode 2000)

In this chapter, the interaction between those technologies and city planning, will be examined in two distinct parts: Firstly, city planning and IT/IS interaction will be evaluated in a larger historical context with background information of planner's attitudes toward technology and changing debates and paradigms in both planning and technology studies. Secondly, the role of IT/IS in urban planning process and their relations with planning tasks and planners will be explored.

3.1.1. A Historical Outlook to relationships between City Planning and Technology

We may read the story of technology-planning relationship with many intertwined ways. The special emphasize here is that recognizing ICTs as planning tools in a larger historical perspective and following the paths that how these tools are "making and breaking" as parallel to changing debates in planning, technological systems, as well as planner's attitude toward technological systems.

As demonstrated in the **table 3.1**, Klosterman (1997) suggests that, there has already been a parallel progression over the past decades in terms of the planning profession's view of its own role and purpose and in terms of the evolving concerns of information technology (Klosterman 1997).

Table 3.1 Evolving views of planning and information technology
(Source: Klosterman 1997, 2001)

Decade	**Views of Planning**	**Concerns of Information Technologies (IT)**
1960s	**Planning as Applied science/ System optimization**: Information technology is viewed as providing the information needed for a value-neutral and politically-neutral process of "rational planning".	**Data:** "Observations which have been cleaned, coded, and stored in machine-readable form" Electronic data processing (EDP)
1970s	**Planning as Politics/Politics:** Information technology is seen as inherently political, reinforcing existing structures of influence, hiding fundamental political choices, and transforming the policy-making process.	**Information:** "Data which has been organized, analyzed, and summarized into a meaningful form" Management information systems (MIS)

Table 3.1 (cont.)

1980s	**Planning as communications/ Discourse:** Information technology and the content of planners' technical analyses are seen as often less important than the ways in which planners transmit this information to others.	**Knowledge:** "Understanding based on information, experience, and study" Decision support systems (DSS)
1990s	**Planning as reasoning together/Collective design** Information technology is seen as providing the information infrastructure that facilitates social interaction, interpersonal communication, and debate that attempts to achieve collective goals and deal with common concerns.	**Intelligence:** "Ability to deal with novel situations and new problems, to apply knowledge acquired from experience, and to use the power of reasoning effectively as a guide to behavior" Planning support systems (PSS)

Klosterman uses this historical timeline in the evolution of planning to specify the needs that planners have when using computer programs; each era in planning history represents a different definition of the main use of planning, and therefore, produces a different set of tasks and tools that are necessary to complete the planning process successfully. Following Klosterman's classifications, we can briefly examine this relationship within four interrelated periods by dividing into two major subparts namely conceptualization of computerized technologies within city planning and other technological approaches of the era, and reception of IT-based systems within planning organization which covers the main focus of the study.

3.1.1.1. Planning as Applied Science

a. IT and views of Planning

Computer use in planning began during the 1960s in an "*optimistic era*" of steadily increasing real incomes, investment, and consumption under the welfare state of the advanced western countries (Klosterman 1994). These material advances were gone parallel with a **'**general faith in modern science and technology' and, the 'search for a scientific paradigm of planning', separate from its earlier domination by the design professions, logically suggested the formulation of mathematical models of urban and regional development (Kammeier 1999). Hall called this paradigm shift as a "**systems revolution**" in which the subject was changed from a kind of craft into an apparently scientific activity, and in which cities and regions were viewed as complex systems.

And planning was seen as a continuous process of "**control and monitoring**" of these systems (Hall 1989). This view of planning is derived from the emergence of new academic fields such as operations research, urban economics, and regional science. These newly emerging academic fields stimulated an interest in using computer modeling in planning (Klosterman 2000).

This evolution from "planning as architecture" to "planning as an applied science" appeared mainly in the form of large-scale urban models. Models and computers became the fashion (Batty 1994). These computer-based models were used for allocating land uses, transportation, and related activities to the sub regions of a metropolitan area (Klosterman 1994). Large-scale metropolitan land-use and transportation models have implemented during 1960s by the emerging insights of regional science, linear programming, and operations research. The expenditure of millions of dollars during the 1960s on the development of extremely ambitious computer-based models for Pittsburgh, San Francisco and other American cities (Klosterman 1994). As Hall suggest, "…*for the first time, the engineering-based approach invaded the professional territory of the traditional land-use planning… This involved more than the knowledge of computer applications which seemed novel to the average planner of the 1960s*" (Hall 1989, p.328).

The most obvious example of this technocratic culture within planning is the ideal of the **"rational planner",** who serves as a "**technical expert**" outside the political sphere so that issues are "settled on their own merit". The ideal of rational planning fits neatly with ideas of social progress based on technology, as technocratic planners help advance the progress of society through rational plans (Pitkin 2001)

b. IT and Planning organization

As Harris notes, computer applications and operations of complex systems were in the hand of public sector in 1960s for two reasons. First, their prevailing social importance dictates that their planning, management, or control cannot be given to non-public bodies. Second, the decisions in complex systems such as urban land allotment, health care, education, national defense, energy supply, environmental management, transportation, housing, science and technology development must be taken jointly, and there is no automatic mechanism, market or something else, which will lead to find the optimum set (Harris 1996).

In this decade, the computer industry was concerned mainly with the handling of "*data*". Computer-based information systems (IS) were devoted almost exclusively to "*electronic data processing*" (EDP), the automation of existing manual procedures and the computerization of vast amount of routine data previously stored on paper. The goal was improving routine operations by facilitating efficient transaction processing, integrating data for related functions, and generating tabular summary reports useful for improving day to day operations (Klosterman 2001).

The advantages of computing were quickly seen in the industrial sector however, the service sector, such as local government, was slower to recognize the computer's value (Pitkin 2001). Mainframe computers were first introduced into public sector organizations in the 1960s and were initially used for financial and payroll functions, meaning that municipal finance departments became the home of data processing in cities. During the 1960s, this data processing function was distributed to other city departments, such as planning. Mainframe computers were operated centrally, in carefully controlled environments. Therefore computing tasks in organizations was subject to central administration and carried out mostly by specific computing departments as a service function. This inhibited the effective utilization of computers in most departments of organizations as well as city planning departments in central and local agencies (Masser and Campbell 1989).

3.1.1.2. Planning as Politics

a. IT and views of Planning

In the 1970s early enthusiasm in computer use in planning has left its place to harsh realities. Planners' faith in computer technology was severely tested. In the broader context, this failure can be summarized into three main headings:

1. Critiques of Modern Technology:

Intellectual critiques of technocratic thinking have come from three major camps of scholars:

First of all, writers in the **postmodernist** vein have reacted to the modernist characteristics of technocratic culture. Leo Marx called as the "*technological pessimism*" of postmodernism that found its roots in a spectacular series of disasters:

Hiroshima, the nuclear arms race, the American war in Vietnam, Chernobyl, the Exxon oil spill, acid rain, global warming, and ozone depletion. These unforeseen destructive social and ecological consequences of modern technology have created much of today's technological pessimism (Marx 1994). Modernist conceptions of knowledge and social progress were suspected by postmodernists, thus destabilizing the beliefs of technocratic culture (Pitkin 2001).

A second camp of thinkers that has questioned the technocratic spirit is that of **political economy**. Rather than objecting to technology on substantive or epistemological grounds, political economists tend to look empirically at the role of technological innovations in the political, economic and social relations of capitalism, rejecting the simple determinism of technocratic culture (Pitkin 2001).

A final camp of scholars that have challenged the assumptions of technocratic culture is that of **social constructivism**. Similar to political economists, scholars in the social constructivist camp dispute the autonomous nature of technology by pointing to empirical evidence that technological innovation is a matter of social processes and adaptation, rather than something that is determined by the power of the technology itself. In other words, "*people shape technology*", not the other way around, as technological determinists would have it. The social constructivists, however, differ with political economists by focusing on micro-scale impacts, rather than larger political and economic forces (Graham and Marvin 1996). Their message is clear: "*technology is social in much the same way as are institutions. It is neither neutral nor autonomous as many technologists and humanistic critics of technology have maintained*" (Feenberg 1999, p.11).

2. Politicizing of Technology and Planning:

Social movements of the 1960s and 1970s had created a context for the break with the very assumptions of technocratic determinism. The late 1960s and early 1970s has the turning point in terms of the politicizing of technology headed by two major social movements: the May Events of 1968, and environmental movement (Feenberg 1999). Anti-technocratic redefinition of the idea of progress played a central role in the May Events. As Feenberg suggests; "*without the struggles of those years in the background it is difficult to imagine the growth of client-centered professionalism, participatory management and design, communication applications of computers, and*

environmentally conscious technological advance" (Feenberg 1999, p.43). Technology-based ecological disasters and Oil Crisis of 1973 paved way to environmental movement that suggests modern technology should evolve in environmentally sound directions.

There is a vast heritage of technocratic culture in city planning. The technocratic spirit provided by the cultural modernism of the West in the early twentieth century was carried into urbanism by avant-garde practitioners. The credo of Italian Futurists; the vogue of geometric abstractionism exemplified by the work of Mondrian and the exponents of "Machine Art"; the celebration of technological functionalism in architecture by Le Corbusier, Mies Van der Rohe, and other exponents of the International style and so on exemplified the permeation of the culture of modernity by a kind of technocratic utopianism (Marx 1994, p.252). These utopians employed technological innovations to create social progress, and this way of thinking has continued throughout the history of planning (Pitkin 2001).

There have also been challenges to these assumptions throughout the history of planning. The most important challenge to technocratic planning came during the social turbulence of the 1960s and 1970s mentioned above, as Paul Davidoff's (1965) **Advocacy Planning** model rejected technical fixes to social problems. Instead, advocate planners looked to political lobbying and community organizing as tools for affecting social change, thus reflecting larger social movements of the era. Davidoff and some others, like social constructivist approaches in technology studies, saw technological innovation as the result of social processes rather than a predetermined outcome (Pitkin 2001).

While the limitations of computer technology became apparent to planners, planning itself was undergoing some fundamental changes. Planners began to recognize the political nature of their profession. The applied science model of planning was rigorously criticized during the 1970s with the emergence of a new conception of **planning as politics**. Instead of reinforcing the technocratic power of planners, reliance on computers actually weakened the position of planners because they tended to depend on the tool for solutions without recognizing a political context (Pitkin 2001).

3. Failure of Large-scale Urban Models:

The optimism in the application of the large-scale urban models in the 1960s was short-lived. Douglas B Lee's famous "Requiem for large-scale models" (1973) prominently marks the end of the optimistic first period of computer modeling in city planning. These sharp criticism had focused around the issue that "*...these applications were too ambitious, their theoretical base too simplistic, their implementation in practice too aggressive, and their almost complete inability either to anticipate more radical change or to relate closely to the questions planners needed answers to, a severe indictment of the entire experience*" (Batty,1991, p.136). Batty points two major factors cause for the failure of large-scale models: (1) the clash of two planning cultures, "science" and "design", in their search for real theory; (2) the transition in the Western world from economic boom, social welfare state to a decline which began in the 1970s and required different kinds of models (Batty 1994).

b. IT and Planning organization

In the 1970s the emphasis on information systems changed from "data" to "*information*". The primary concern shifted from the efficient processing of data for operational needs to "*management information systems*" (MIS), and the structuring and synthesis of data in forms that could serve better management needs. The major systems objective was the integration of electronic data processing (EDP) tasks with organizational function, the processing of information queries, and the generation of summary reports based on a comprehensive database (Klosterman 2001). These systems were designed to improve the information base that planners had been using to describe local market trends and evaluate the impacts of public policies (Klosterman 2000).

Public sector computer applications has widened through evolving microcomputers and included the development of "*urban information systems*" (UIS), "*geographic information systems*" (GIS), and "*land information systems*" (LIS). The combination of these large scale information systems provided the information required for management functions such as permit processing, code enforcement, infrastructure management, and transit operations (Klosterman 2001).

The question of how incorporating new computerized tools into existing planning processes and how organizations would have to change to embrace the new processes and technologies have become elucidated in the case of large-scale urban

models. Gary Brewer (1973) reported on the organizational limits to the development of large-scale urban models, in several case studies of agencies that had adopted them. He argued that it was not limits in the technology per se, the theory, the data, the computer resources available, or the technical expertise that were the undoing of this science, but rather the difficulties inherent in adapting the technology to organizations. Since then, with the rapid dissemination of computers into all work areas, the organizational problem has been revealed as the most important limit on the development of new technology. As Batty properly states, "*hardware and software are no longer the key problems, but that the development of appropriate organizational structures and processes--"orgware"--has now become the most important issue for information technology*" (Batty 1994, p.12).

3.1.1.3. Planning as Communications

a. IT and views of Planning

The realization that planning was political was enriched during the 1980s by a new generation of "ethnographic" studies of planning practice. These studies revealed that planning involves much more than the collection and provision of information that can improve the policy-making process. Planners of course prepare plans and do analyses. However, they also negotiate, explain, and argue about planning rules, changes, and permissions and administrative rules and regulations. Quantitative analysis and related information technologies play an important role in these activities. But so do giving advice, telling story, and the other metaphors and rhetorical devices planners use to communicate their ideas to others (Forester, 1980; Harris, 1989; Innes, 1990; Krieger, 1981; Mandelbaum, 1991). These studies suggest that planning cannot be merely a politically neutral instrumental means for achieved designated ends. Instead, it is an inherently political and social process of interaction, communication, and social design (Klosterman 1997).

This new **communication view of planning** suggests that it should not be viewed primarily as an abstract decision process attempting to optimize overall system goals such as community welfare. Instead, it must be seen as inclusion of an interactive, open, and ongoing process of inter-subjective communication and as a collective design

in which planners help the relevant community "make sense together while living differently" (Healey, 1992) (Klosterman 1997).

The emergence of the communications view in planning has challenged the narrow positivist view of reason based on scientifically constructed empirical knowledge to include all realms of discourse. On this view, rationality is based not on pure logic and the abstract evaluation of evidence but rather on an informed consensus formed by a community of individuals in a particular place and time (Klosterman 1997).

Communicative view of planning has emphasized the power of practice. Coupling with social constructionist view of technological systems, researches in the institutional issues of technological systems in real planning practice has gained significant importance. Following seminal works like Forester's "**Planning in the face of Power**" (1989) and Bijker et al.'s "**The Social Construction of Technological Systems**" (1990) the role of technological systems in planning practice and planning organization has concerned by various researchers focusing largely in the context of GIS in early 1990s. Among them, Innes and Simpson's "Implementing GIS for Planning" (1993) and Campbell's "A social Interactionist Perspective on Computer Implementation" (1996) are essential by their attention on problem of technology implementation in real planning practice based on the idea that "technology is socially constructed". Innes and Simpson (1993) has advised that researchers look more deeply the implications of technological systems for the organizations, politics, and norms of planning, and addressed Forester's (1989) work on planning practice that documents what planners do in their daily activities as a framework to investigate technology-planning relations using the language of practice rather than concepts primarily meaningful to computing experts (Innes and Simpson 1993). Similarly, Campbell (1996) examined the pivotal relationship between the computing technology and its organizational context by demonstration the different paradigms in implementation process. Deriving from the social constructionist view of technology Campbell warns us not to focus attention on the technology alone; "*the use and abuse of such systems will simply reflect the dominant beliefs of society and, at a more detailed level, of individual organizations. If we do not like what we see represented in the computing systems being adopted in planning, we should look carefully at the nature of planning practice and the choices we as individuals are making*"(Campbell 1996, p.105).

b. IT and Planning organization

Since the early 1980s computer applications in planning have changed dramatically in two respects. Firstly, the advent of microcomputers in late 1970s was a major break point in computer applications in urban planning. The expensive, fragile, and forbidding mainframe computers of the 1970s have been replaced by desktop computers, which provide planners with ready access to more information, greater computational speed, and dramatically better graphics than were available to anyone in the 1970s (Kammeier 1999). Coming of microcomputers has been celebrated by some authors doing studies on the role of computing in the practice of city planning: "the development of the microcomputer represents the democratization of computer power in society" (Brail 1987). Separation of tasks has been done previously done by computer experts has faced planners with a challenge to access computer technology for their tasks. As keepers of data and technical information, planning practitioners have become aware of the advantages of computers for increasing their own efficiency and productivity. For example, the computer could serve as a valuable time-saving tool for analysis. In a publication geared toward practicing planners, Devon Schneider (1979) highlighted how early Geographic Information System (GIS) applications helped make land-use decisions in a time-efficient manner. Moreover, planners realized that they were able to reduce costs in the areas of administrative support, service planning, and information processing by using the microcomputer, thus taking advantage of the most promising of all modern technologies for improving local government productivity.

However, the lack of microcomputer software for planning applications of these days has limited the exploitation of the true potential of microcomputers for changing planning practice. The microcomputer software was available for transportation planning and for city management, but not for other areas of planning practice (Klosterman 1998). During the 1980s, the emphasis on the computerized planning tools has shifted from "model-based," to "computer" exemplified the importance of "**efficient management**" rather than theories aiming to achieve the good society. This changing conception can be seen in the armory of 1980s software: from word-processing, database systems, and spreadsheets to more specific uses: GIS, expert- systems, computer-aided design, 3-D visualization and so on. As Batty indicates, Brail's (1987) book and Klosterman, Brail and Bossard's (1993) spreadsheet models are classic examples of this change (Batty 1994).

The second break, to organizations, is the introduction of higher-level information systems like management information systems (MIS), geographic information systems (GIS). GIS began to dominate the use of computers in spatial analysis, thus shifting the attention from the previous "nonroutine" or strategic models to much more routine computer operations such as spatial data storage, transformation, and presentation. Also the development of more "*user-friendly*", "*general purpose*" software such as electronic spreadsheets, interactive visualization and hypermedia tools has greatly increased the number of computer users in planning offices (Kammeier 1999). In the public sector organizations "*spatial decision support systems*" (SDDS) has begun to apply to support decision making related to complex spatial problems such as determining the optimal location of service centers like schools or fire stations. This system incorporated three major components of computer-based systems: (1) a database containing a variety of spatial and non-spatial data, (2) spatially related analytic and simulation models, (3) and a use interface that includes a GIS (Klosterman 2001).

The wider microcomputers' use in planning the more articles has been published to monitor computer utilization by planning practitioners and academics in organizational settings (Contant and Forkenbrock, 1986; Bardon, 1988; Klosterman and Landis, 1988; Masser and Campbell, 1989; Yeh, 1988; French and Wiggins, 1989). These studies have revealed that planners' use of microcomputers is not very broad but superficial. In other words, there are many planners using microcomputers comparing to old times, however, they primarily use only general-purpose word processing, spreadsheet modeling, and database management software to process documents and maintain administrative records. However, the microcomputers' potential for helping planning analysis and design, on the other hand, has not been truly exploited for the decade (Klosterman 1992).

3.1.1.4. Planning as Reasoning Together

a. IT and views of Planning

As Graham and Marvin (1996) suggest, the rapid development of information and communication technologies (ICTs) and telecommunications-based changes in cities demand a corresponding shift in the analysis and understanding of cities and the processes of urban development (Graham and Marvin 1996). The recent advances in

ICTs coupled with information networks begun to dramatically affect both the infrastructure of the city as well as those other forms of behavior which planners and urban analysts view as determining spatial and social structures (Batty 1995). These shifts require a redefinition of what we actually mean by "city", "urban" or "urbanity". Some urbanists have argued that "*cities and urban areas can be seen as fixed sites and places where the many separate and superimposed social, technological, institutional and economic networks which link them intimately into wider social, economic and cultural dynamics coalesce, cross and interact. It is the complex interaction betweens between cities as fixed places and networks that bring intense mobility (telecommunications, infrastructure, transport, the institutional networks of transnational corporations, media flows etc.) that now shapes urban life and development*" (Graham and Marvin 1996, p.71).

These changing notions of urbanity are encouraging a growing number of urbanists to develop a new range of concepts which address IT-based changes in today's cities **(Figure 3.3)**. Urban planners and decision-makers may agree or disagree on these varied visionary thoughts, but surely cannot ignore their potential impacts on the planning theory and practice as well as planning instruments and tools. This relationship can clearly be seen in the conception of computers in planning. As Batty indicates, "*...computer hardware and networks as well as software used traditionally to understand the city by professional researchers and planners are now being used by a variety of interests and agents whose concern is somewhat different, involving the very actions and behavior that we are usually see as composing the fabric and structures to be understood and planned for*". He states the radical change in our conceptualization of the meaning of technological systems in the case of computers "*computers which were once thought of as solely being instruments for a better understanding, for science, are rapidly becoming part of the infrastructure itself, controlling new infrastructure through their software, influencing the use of that infrastructure, and thus affecting space and location*" (Batty 1995). Consequently, the line between computers being used to aid our understanding of cities as a "tool" are blurred with the role that their being used to operate and control cities as a powerful policy "instrument" (Batty 1995). In other words, the idea of "**computers for planning**" suggesting computer as a tool for better understanding and analysis of cities are beginning to merge with "**planning for**

computers" that implies the ability to tackle with novel situations posed by information technologies upon the fabric of urban environment and life.

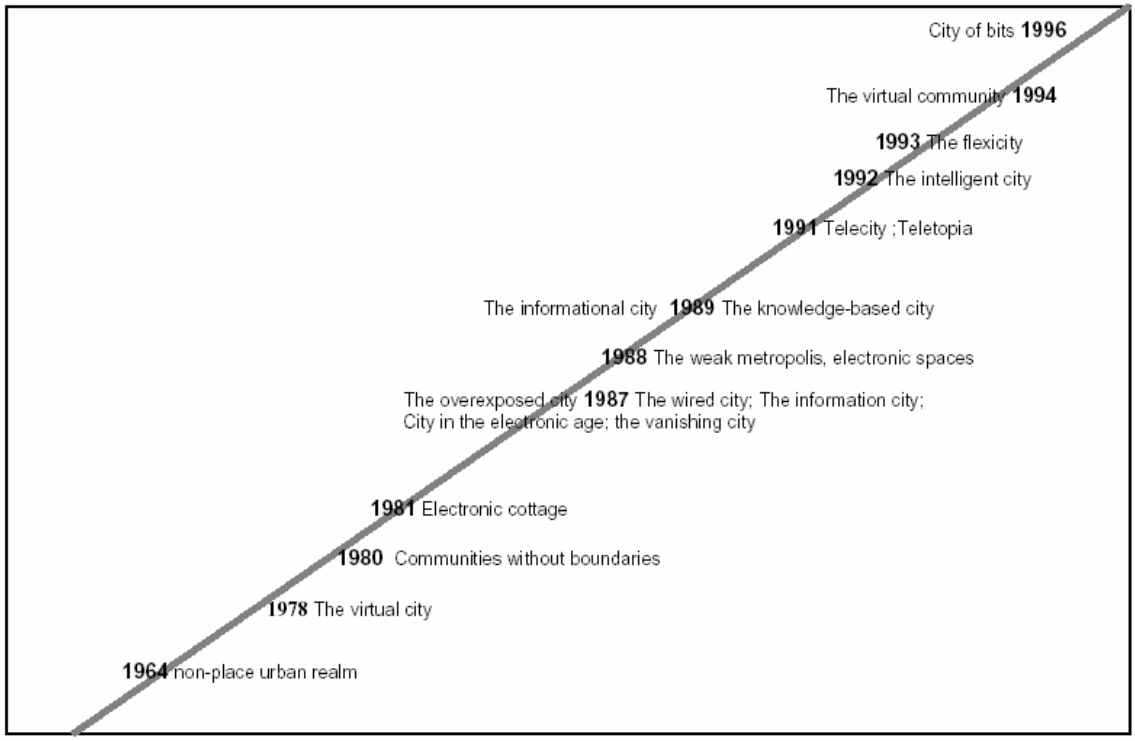

Figure 3.3 Metaphorical characterization of the contemporary city
(Source: Graham and Marvin 1996, p.9)

In this period, information technology is seen as providing the information infrastructure that facilitates social interaction, interpersonal communication, and debate that attempts to achieve collective goals and deal with common concerns (Klosterman 2001).

b. IT and Planning organization

Planners began to appreciate that computers would be useful in their work only as far as they were part of a social process as a tool. (Pitkin 2001) Implementing a toolbox of techniques became more important rather than operate a fully integrated system. This approach provides flexibility and adaptability that are essential attributes in a participatory planning process (Geertman 2001).

This conceptualization can be best exemplified in the transition **from "models" to "tools**". Modeling came back in 1990s in various different forms and closer to planning practice than it was thirty years ago. The somewhat modest term "tool" rather

than the more comprehensive term "model" is used. This is to emphasize the vision of a well-organized, composite desktop computing system, in which several tools are at hand to support the various tasks of urban planning and environmental management that are driven by the needs of political processes of problem-solving and decision-making (Kammeier 1999). According to Batty (1991), four distinct themes have emerged from these developments: the development of computer information systems for planning (particularly GIS and PSS), visualization with development of multimedia environments, expert systems, and forecasting (Batty 1991).

In the 1990s, planners expected information technology to "promote interaction, communication, and dialogue" (Klosterman 1995); (Kammeier 1999). In this decade, **computer mediated communication** opened up the possibilities of information sharing and transfer between organizations, integration of text, images, and sounds in the same system, and wider access and interactivity between stakeholders. Using information technologies and systems in a participatory context became one of the main themes of planning technologies.

The rapid development of information technology and computing software such as geographic information systems (GIS) also opened up tremendous opportunities for developing new analytical methods. Nevertheless, these new trends have not necessarily signified major progress in the development of planning methods and techniques over the last 20 years. Although GIS have become one of the most popular techniques used by planning authorities, much of their development has been technology-driven and has failed to inform policy making (Wong 1998).

On the other hand, planners have realized the limits of technologies in planning practice and debate. They accept that they have limitations and unintended consequences (Pitkin 2001). The importance of effective utilization of computer-based planning technologies into planning offices was gain significance due to the larger failure rates of implementation: "*An assessment of planning practice at the beginning of the 21st century suggests, rather depressingly, that the adoption and use of geo-technology tools (geographical information and spatial modeling systems) is far from widespread and far from being effectively integrated into the planning process*"(Geertman 2003, p.3).

In sum, changes in understanding and practicing information technologies and systems through various decades show us planners need to be wary of the hype

surrounding these new technologies. While these can be important tools for planners, they are not going to lead to better planning or better planned cities on their own (Pitkin 2001).

3.2. IT for Planning Process and Practice

The new information technologies and systems have opened up new possibilities for the better planning practice and debate. However, these are facing planners with fundamental challenges regarding much knowledge on IT, and the ways in which these new tools take place in planning practice. Here, the implications of information technologies and systems will be highlighted under the headings of planning process and planning profession.

3.2.1. IT in Planning Process

Urban and regional planners use the *planning process* as the core of their professional practice. They use the planning process to resolve a broad range of interrelated issues found in urban areas. Despite the heavy critics in recent decades, the rational model of planning process is the most widely used planning procedure. The planning process typically includes **problem identification**, **goal setting**, **design of alternative solutions**, **decision making**, and **implementation and monitoring**.

IT-based planning tools can be applied in the most aspects of the planning process including (1) data collection, storage, analysis and presentation, (2) plan making and/or policy making, (3) communication with the public and decision makers, (4) policy implementation and administration (Nedovic-Budic 2000).

GIS and other spatial technologies have long been used to data collection, storage, analysis, and presentation activities. On the other hand, the contributions of technological tools in decision support and management in the planning process remained relatively small. Most recently, however, positive developments both in geo-technology (through improved hardware and software) and in the planning field (through increased participation and communication) lead to a convergence of these two approaches and expand the demands made on them (Geertman 2002). Therefore, a fully integrated and interactive Planning Support Systems (PSS) and participatory, web-based GIS has come to support participatory planning process.

In **Figure 3.4**, Batty and Densham (1996) illustrates the relation of various information technologies and systems to support decision-making and management in different stages of planning process. As authors suggest "*the process takes place across many scales and is clearly `iterative' or `cyclic' in form. Processes may be nested within one another while the extent to which different professionals, managers and other decision-making interests are involved through the various stages, depends upon the nature of specific applications and their context*" (Batty and Densham 1996). Despite the comprehensiveness of the model, in real planning process only a few elements of it exist, often to the exclusion of others.

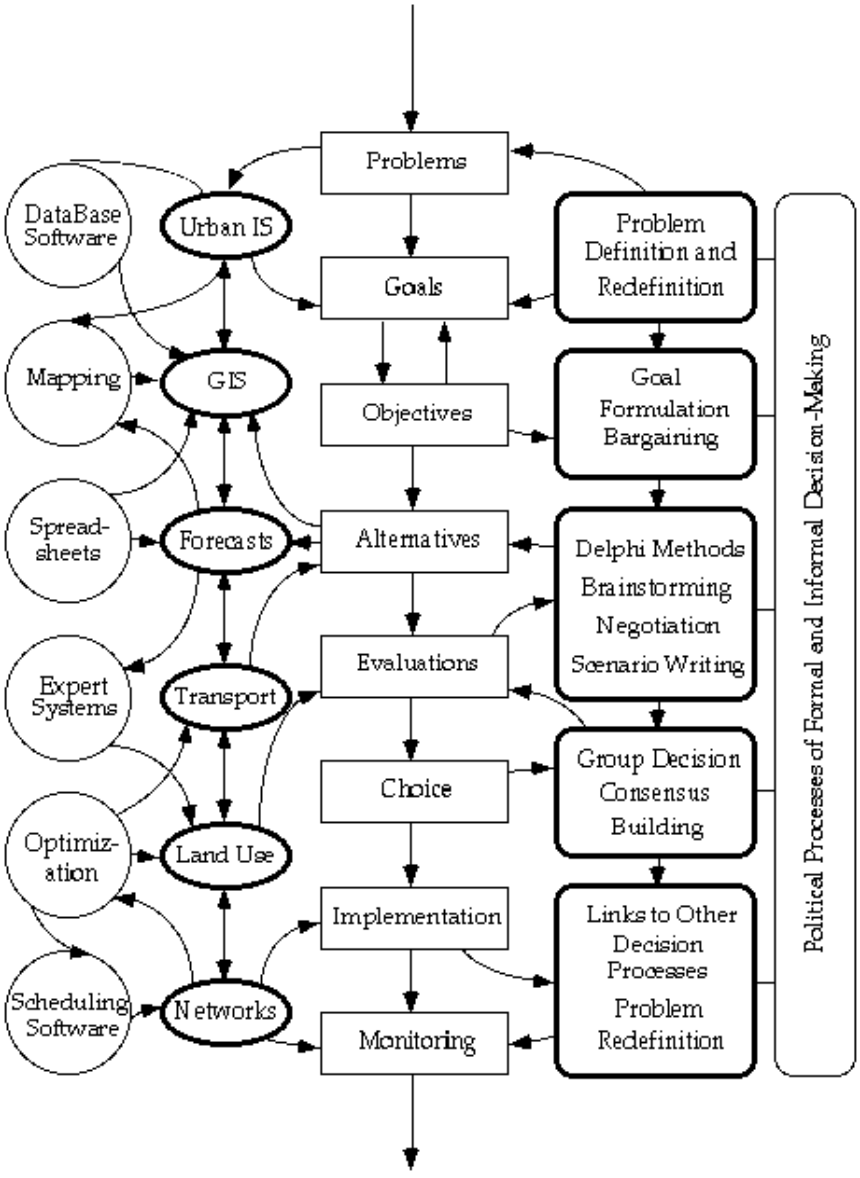

Figure 3.4 the planning process as a sequence of computable methods enabling decision support (source:Batty and Densham 1996)

3.2.2. IT and Planner Professional

The introduction of microcomputers into planning practice has improved the use of existing planning methods, making it much easier to produce high quality population projections, economic forecasts, fiscal impact studies, project evaluations, and the like. This rapid technological change indicates that there will be a growing need for planners with specialized expertise in computing technology and other computer applications (Catanese and Synder 1988). According to Piracha and Kammeier (2002) there are three possible levels of IT/IS knowledge for planners: "hands-on-use", "some knowledge", and "some additional knowledge", which is desirable and useful but not absolutely necessary (**Figure 3.5**). Authors suggest that unless planners have hands-on knowledge of important computer tools they will not able to build meaningful planning support systems (PSS) (Piracha and Kammeier 2002).

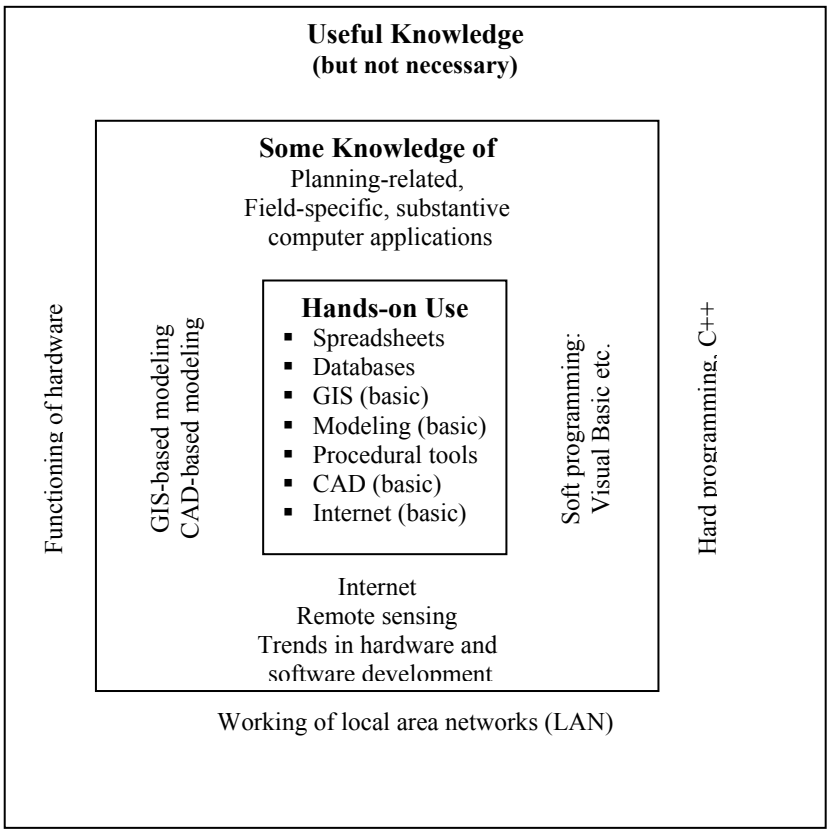

Figure 3.5 Planners' knowledge of computer tools
(source: Piracha and Kammeier 2002, p.219)

3.3. IT/IS in Planning Organizations

Urban and regional planning agencies are rich, dynamic arenas where many social problems and solutions are explored and addressed in a direct and tangible way. Examples of such problems are: urban growth; unemployment and economic revitalization; transportation; environmental degradation and protection; neighborhood decline and redevelopment; historic preservation; conservation of land and natural resources; and provision of open space, parks, and recreational facilities (Nedovic-Budic 2000). In previous section the current technologies in city planning were mentioned. Here the application areas of these technologies in planning offices will be highlighted.

There are two major debates on the function of computer-assisted tools in planning tasks and office works. The first one is about the function of computerized planning tools in doing planning tasks. This debate focuses on whether these technologies bring "**new ways of doing planning tasks**" or they are just "**new tools to perform old tasks**"? The latter suggests that the newly available microcomputer technology allowed practicing and academic planners to more easily perform tasks that previously could be done only by hand or with expensive "mainframe" computers of 1960s and 70s. However, they did not fundamentally change the ways in which planners operated. Instead, like word processing and electronic spreadsheets they allowed planners to conduct traditional planning tasks more effectively and efficiently (Klosterman 1998). But then, former view indicates that recent advancements in technology are so powerful that advanced information technologies may allow planners to do things they could not do before. For example, (1) "*expert systems*" that attempt to solve real-world problems by modeling the thinking process of human experts; (2)"*database management tools*" that structure planners' local data and combine it with shared institutional data to improve the quality and timeliness of their modeling, analysis, and design efforts; or (3) "*new modeling approaches*" like 'cellular automata', that can be used to develop complex models of the spatial organization of cities from simple rules describing local conditions. More recently, (4) "*hypermedia tools*" which are mainly for purposes of "visualizing data and communicating" have become much more important in producing traditional types of information such as reports, charts, and

maps to digitized form of information (graphic images, photographs, and video or audio clips) (Klosterman 1998).

The second debate is about limitations of supporting role of complex computer-based systems on the nature of planning practice. This view suggest that despite the amazing progress in hardware and software development over the last decade and the wide adoption of some computing functions in planning offices, "*it is a 'sine qua non' of planning that most of its tasks cannot be automated, and thus computation will always play a 'supporting role' in decision-making and design*" (Kammeier 1999). Another scholar Harris builds the distinction of 'science' and 'art' of planning to examine the ever changing context of planning technologies. He suggests that modern technology of 'information management', 'analysis', 'modeling', and 'presentation' contributes what he called the '**science of planning**' that is based on the rational view of planning. On the other hand, he emphasizes that the **artful side of planning** consist of making plans, negotiating ability, political wisdom etc. which cannot be considered as fully scientific. According to him, 'planning is contingent' on the resources available for making and executing plans, the goals of the society and polity for which plans are being made, and on many other forces and factors. Thus the method use for planning is contingent and on the technology in use to support making plan. The contingent nature of planning ensures that one must constantly make decisions about the choice of methods and their applications. Harris then implies that the **planning practice itself cannot be automated by the technological systems**: "*it is not impossible to imagine the planning practitioner operating like an unimaginative cook using a recipe or an inexperienced machine tool operator looking up each step in manual. If this were true, modern technology would permit the planner replaced by an expert system housed in a computer*" (Harris 1996).

A parallel debate associated with the first two, is the search for much more incorporated information technologies and systems to fit better the tasks of planning offices. To this view, the **constraints and limitations of the software** distort the true nature of planning. Much of the software adopted in planning offices today is not fully developed to perform planning functions competently. The recent effort to combine relevant information technologies and systems under the umbrella concept of "planning support systems" (PSS) promises that "*planning is a complicated process that requires different technologies that is not present in one integrated computer software program,*

so a range of computer-based methods and models into an integrated system that can support the planning function" (Klosterman 1997). Not surprisingly, to decide which technologies are the most appropriate within the planning context requires more importantly to know about the needs of planning that may derive from the planning practice and nature of planning tasks.

Computer-assisted Planning Tasks

Wide variety of computer functions (like word processing, database management, statistical analysis, modeling, digital mapping and geographic information systems, simulation, project management etc.) are applicable to planning offices depend mainly on the interaction between the hardware and software of computers and on the nature of the urban planning activities. Bardon's (1988) study of use of microcomputers on British local authority planning departments indicates four groups of computer-assisted planning activities:

1. **Administrative and managerial activities**: including personnel records, report-writing facilities, staff diary systems, and accounting and budgeting systems.
2. **Statutory functions** (Ordinance-enforcement activities): such as development control and building control systems. The information facilitated through these applications includes appraisal of staff work loads, analyses of development pressures, land-use change and land availability, and the completion of statistical returns.
3. **Analytical activities**: are needed for the formulation and monitoring of plans and include such tasks as data gathering and analysis, modeling and forecasting, report writing, and plan formulation.
4. **Liaison activities**: many of the systems concerned with statutory functions and analytical activities have enabled planning departments to provide a more effective information service to interested parties such as planning commissions, policymakers, developers and citizens (Bardon 1988, p.344-345) (**Table 3.2**).

Table 3.2 Main applications of computer functions in different areas of urban planning (source: Yeh 1988, p.246)

Computer Functions	**Urban Planning Activities**			
	Administration	Analytical Function	Ordinance enforcement	Liaison
Word processing	●	●	●	●
Database management	◉	○	○	○
Mathematical computation and programming		◉		
Statistical analysis		◉		
Modeling		◉		
Computer mapping		◉		
Geographic Information Systems (GIS)		○	○	
Digital image analysis		○		
Simulation		○		
Computer graphics	◉	◉	◉	◉
Project management	◉			

● most applicable ◉ applicable ○ may be applicable

Another preeminent scholar Harris (1989) indicates that planners engage in at least three different types of activities that involve the use of information technologies and systems in varying degrees:

- **Administration**: a large part of planning deals with the administration of rules and regulations, and the analysis of their impacts and possible changes in them. For example, the sequence of recording, processing, and acting on applications fro planning permissions (permit processing). In modern municipal management, administrative records such as fires, crimes, case of disease, real estate transactions, and licenses are often installed in computerized databases. In this context, it can be argued that information systems (like GIS) can allow planners to follow events in the development process. It has therefore multiple uses in the management and control of urban affairs.

- **Negotiation**: Planners negotiate, bargain, explain, and argue about planning rules, changes, and permissions. Such interpersonal activity is often supported by some form of information system, but this does not enter directly into the process. The planner may use such a system to prepare a position and to present facts to clients and the public, but only in rare cases can the public use the same system to prepare a basis for argumentation and negotiation.
- **Plan-making**: Planners make plans. These may be as vague as a set of guiding concepts, or as detailed as zoning ordinance. They may include taxes, budgets, capital improvements, and regulations. They may be comprehensive or limited to a few functions. The making of plans is mainly as art that can only be limited extent be supported by a computerized tools (Harris 1989, p.85-86).

Referring the work of Bardon (1988) in British planning agencies, Yeh (1988) reminds us computer applications may vary at different levels of urban planning as the nature of urban planning activities differs between different levels. For example, while country planning (regional) performs more analytical works and requires large and complex computer systems, district planning (local) requires less analytical work but more need for management-information systems (Yeh 1988).

3.4. Summary

Information technologies and systems support planning process and practice in a provocative new ways. In near future, these technologies seem to grow faster, and become more powerful, cheaper, and easier to use. For example, GIS will provide planners with deal detailed information on local land uses, infrastructure, and natural features which are not possible previously. Convergence of computerized planning tools with new media and communication technologies will allow planners to store, analyze, and share information collaboratively (**Figure 3.6**) Despite the dream-like settings provided by rapidly changing technologies, the real implications of these technological developments for planning practice and for planning offices are still less clear. Therefore, to understand diffusion of information technologies in an organizational context, to examine the process of implementation, and to analyze dimensions other than technological ones have great importance to use them more effectively in the

planning offices as well as public policy making and management. The next chapter discusses the institutional issues of technology implementation in detail.

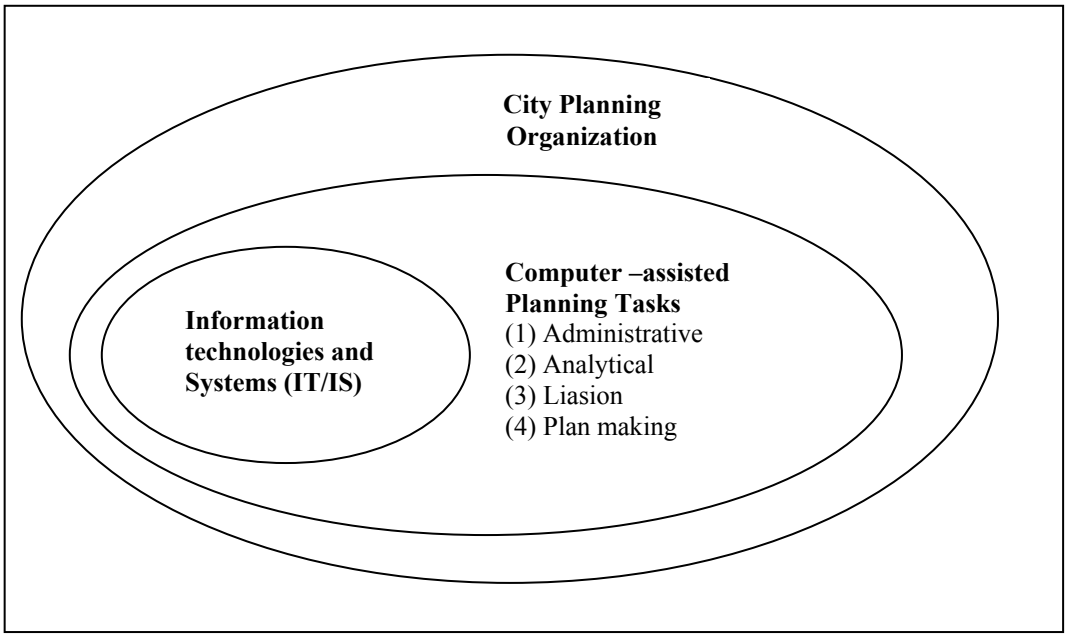

Figure 3.6 a conceptual scheme of IT-assisted planning tasks within planning organization

CHAPTER 4
DIFFUSION OF INFORMATION TECHNOLOGY IN ORGANIZATIONS

This chapter focuses on the nature of technological implementation process in organizations. It consists of three major sections: Firstly, definition and types of organizations are examined. Then the role of IT/IS in organizations is discussed. Secondly, diffusion of IT/IS in organizations is explored by following the Rogers's (1983) theory of diffusion of innovations. Lastly, the theoretical perspectives on the nature of implementation are discussed to understand the different approaches to information technologies and systems within organizations.

4.1. Technology and Organizations

Understanding information technology and systems is based on the environments in which they are located. This section will, therefore, explore the nature of organizations and the diffusion processes of these technologies in organizational context.

4.1.1. Nature of Organizations

Organizations are, as Handy puts it, "*first and foremost, fascinating collections of people*" (Masser and Campbell 1995, p.15). As Laudon et al. (1994) suggest, "*by coordinating and planning the work of many people through teamwork, organizations can accomplish much more than the same number of people working alone*" (Laudon et al. 1994, p.72). To achieve the vast majority of tasks and activities, organizations develop formal sets of rules as well as symbolic rituals to guide the actions of their constituent members. Therefore they are structured groupings rather than ad hoc collections of individuals.

Organizations are entities built to accomplish goals through the creation of products or services (Laudon et al. 1994). They have come to pervade all aspects of life.

The production and distribution of goods and services within the private, public and voluntary sectors are conducted through organizations.

There are diversity of approaches to interpret the nature of organizations and their operating structures. Morgan (1986) has well documented the extent to which our understanding of organizations and our general rules and precepts for managing firms and other groups of people are in fact drawn from the reigning metaphors of the day. He suggests that organizations can be understood by the eight metaphors, namely machines, organisms, brains, cultures, political systems, psychic prisons, flux and transformation and instruments of domination (Masser and Campbell 1995). Masser and Campbell's (1995) extensive literature survey on these metaphors can be grouped under four broad groups to associate their "style of working" and the "nature of decision making process" with the implementation of computer-based technological systems within these organizations (**Table 4.1**). Style of working refers to the norms and values of the organization which are reflected in. The nature of decision making implies formal and informal procedures for decision making and in particular the role of information in this process.

(1) The metaphor of "**organization as machines**" underlies the assumption that organizations have managed by set of rules that are designed to produce highly ordered and efficient work environments and is mostly linked to concept of 'scientific management' introduced by Taylor (1947). This approach represents an ideal of how organizations should operate in the absence of people and an ever changing context (Masser and Campbell 1995). Thus there is a tendency to accept all of the activities are uniform in an optimal style of organizational working. The task for the manager is to identify the appropriate strategies with the inherent logic of the approach, resulting in its inevitable implementation. It is implicit within such a conceptualization that there is shared understanding among all staff as to the goals of the organization. The style of decision making associated with this metaphor is assumed to be highly rational and orderly in nature. The actual ability to find an optimal solution is constrained by the skills of the individuals and the availability of appropriate information (Masser and Campbell 1995). In this line of thought, technological systems are seen as lessen the errors of the individuals and increasing access to proper information.

(2) Similar to machine metaphor formal and rationality based style of working in organizations associated with the concept of "**bureaucracy**" based on the works of

Weber (1947). According to Weber, rules and routine procedures are regarded as providing consistency and predictability and, by de-personalizing administration, the dependence on the charismatic qualities of a single individual become greater. The result is highly ordered hierarchical organizations with clearly specified goals (Masser and Campbell 1995). The conception of decision making as a formal-rational process suggests the most appropriate form to be a bureaucracy. To achieve the highest form of decision making comprehensive sets of rules and procedures are necessary to guide the process. In this context, technological systems have a significant contribution in reinforcing existing procedures and thereby taking better quality decisions (Masser and Campbell 1995).

(3) The approach that tend to see "**organizations as cultures**" suggests that "*every organization has its own way of doing things based on its own history and traditions as well as the manner in which external pressures and circumstances have been internalized*" (Masser and Campbell 1995, p.19). This view suggests that each organization should be regarded as a unique social system in which individual members are socialized in a particular set of norms, beliefs, and values. In most cases these values and norms are not specified but are just part of the procedures and rituals of the organization. The term culture with reference to organizations implies both **tangible** (i.e. financial resources, skills of the workforce, institutional arrangements etc.) and **intangible** factors (i.e. values, beliefs, motivations of individuals, ethics, privacy etc.). Decision making in this view is regarded as a process of negotiation and eventual decision is based on achieving consensus through a set of agreed values. In this sense both formal and informal information and other forms of knowledge such as experience, beliefs, values etc. are equally important. In this sense data provided by technological systems regarded as little different from information emanating from other sources (Masser and Campbell 1995).

(4) The notion of organizations as cultures also implies that "*rather than being simply social arenas, organizations are an institutional device for political as well social domination of the majority by the most powerful within society*" (Masser and Campbell 1995, p.19). This means that organizations are characterized by the interplay of power and politics in which the objectives of individuals or groups are conflicting. However, these groupings are not equally powerful and as a result it is argued that those in the most favorable positions use this advantage to increase their sphere of influence.

In terms of implementation of technological systems, it is considered that benefits of such systems are not equally distributed and the most powerful grouping within the organization gains the greatest benefit (Masser and Campbell 1995). This view of organizations also suggests that while conflict and bargaining typify decision-making as mentioned in cultural view of organizations, the outcome of this process will inevitably favor the most powerful individuals and groups. In this context, information derived from computers is regarded as equally subject to selectivity, distortion and manipulation by the dominant grouping. Computerization may even strengthen the position of dominant groups or assisting them in the process of generating information to support their interests (Masser and Campbell 1995).

The wide variations in the approaches outlined above have significant implications for the diffusion of information technologies and systems. The first two approaches ignore the social and political processes that have significant importance in technological diffusion and outcome of the technological implementation. However, the diffusion and implementation of information technologies and systems are highly problematic and subject heavily to organizational and user factors.

Table 4.1 Summary of key characteristics of selected theoretical approaches to decision-making in organizations (Source: Masser and Campbell 1995, p.20)

	Organizational metaphors			
Characteristics	**Machine**	**Bureaucracy**	**Culture**	**Instruments of domination**
Decision-making style	Rational Orderly Optimal	Procedural Rational Orderly	Disorderly Compromise Negotiation and bargaining	Confrontational Predetermined
Decision-making process	Problem→ Information→ Decision→	Problem→ Information → Decision, guided by rules and procedures	Ill-defined problem→ Search for information based on agreed values→ compromise	Decision → Propaganda → conformity
Role of information	Substantive	Substantive	Symbolic Ritualistic	Symbolic Political
Role of computer based data	Increases rationality	Increases rationality	No different to other sort of data	No different to other sort of data
Information and computational requirements	Extensive	Constrained by rules	Dependent on organizational norms and values	Information used and kept to maintain control

4.1.2. IT/IS in Public Sector Organizations

The potential benefits of IT cut across all sectors of the economy and all fields of human activities. It can improve the standard of living and enhance business operations as well as organizational efficiency. Information technologies and systems are seen as an essential component of public sector reform initiatives paralleling with the debates provided by the so-called information age. Scholars generally agree that information technologies and systems have driven organizational and institutional reform, replacing centralized, hierarchical forms of management and decision-making with more decentralized flows of information, power, and accountability.

Public sector organizations, like local government, voluntary organizations, government agencies, have still been the single largest collector, user, holder and producer of information. The work of these organizations is thus very information-intensive and according to Heeks (1999) four main types of formal information are identifiable:

1. **Information to support internal management**: includes information about staff for personnel management, and information about budgets and accounts for financial management.
2. **Information to support public administration and regulation**: includes information that records the details of the main entities like business enterprises, buildings, land etc. It is used for a variety of purposes such as legal, judicial, and fiscal.
3. **Information to support public services**: differs according to type of the service (transport, education, public utilities etc.).
4. **Information made publicly available**: includes dissemination of press releases, consultation papers, laws and regulations etc.; dissemination of collected materials such as demographic or economic statistics; or information about internal management available for the requests from citizens, politicians etc (Heeks 1999, p.16).

These crucial needs of processing information from day-to-day operational implementation to long-term policy analysis and planning make information technologies and systems vital for public sector organizations and their reform

objectives. Information technologies and systems therefore bring three basic changes of potential in the context of public sector reform:

1. **Supplant**: automate existing human-executed processes, which involve accepting, storing, processing, outputting or transmitting information.
2. **Support**: assist existing human-executed processes. For example, assisting existing processes of decision making, communication, and decision implementation.
3. **Innovate**: create new IT-executed processes or support new human executed processes. For example, creating new methods of public service delivery (Heeks 1999, p.17).

Heeks (1999) summarizes the 'direct and objective' benefits of information technologies and systems in public sector organizations in five main headings:

- **Cheaper**: producing the same outputs at lower total cost.
- **More**: producing more outputs at the same total cost.
- **Quicker**: producing the same outputs at the same total cost in less time.
- **Better**: producing the same outputs at the same total cost in the same time, but a higher quality standard.
- **For the first time**: producing new outputs.

Heeks (1999) also distinguishes some 'potential' benefits of information technologies and systems in public sector organizations by obtaining different examples from all around the world:

- **Increased efficiency**: IT can reduce the cost and/or time required for organizational activities and therefore increases process productivity;
- **Decentralization**: IT can provide support for more efficient and effective decision making at decentralized locations and create new information flows that incorporate those locations;
- **Increased accountability**: IT can create new accountability information and can deliver accountability information to new recipients, providing for more efficient or effective accountability;

- **Improved resource management**: IT can create new performance information and deliver it to decision makers, providing more effective managerial control over government resources (Heeks 1999, p.17).

Problems /pitfalls

Changing context of new information economy has required public and private organizations to invest new information technologies and systems continuously. Therefore, organizations make great amount of financial investment for these technologies. However, they don't estimate the consequences of these instruments consciously. Alongside some benefits, surely some pitfalls may be brought about by execution of information technologies and systems. Some are;

- **Privatization trends of public service provision**: Through information technologies it becomes possible and viable for the private sector to reappropriate and recapitalize what had become public goods (Graham and Marvin 1996).
- **Commodification of urban government services**: Some local government agencies view electronic service delivery as an opportunity to recover cost or actually generate net revenues for services that were previously free (Graham and Marvin 1996).
- **Digital Divide**: As with shifts in banking and retailing, these processes may advance the interests of socially privileged, mobile, and technologically literate groups while compounding the many disadvantages already faced by marginal groups of "information have nots." Huge demand for information with disadvantaged areas of cities often unmet, a problem that can be compounded by regressive shifts in urban public support services. Besides this, the large numbers of failures in the implementation of IT-based systems keep developing countries on the wrong side of the digital divide, turning IT into a technology of global inequality.

4.2. Diffusion of IT/IS in Organizations

The term 'diffusion' is widely used to describe the process of implementation particularly in GIS implementation literature (Masser and Campbell 1995); (Pinto and Onsrud 1993); (Masser and Onsrud 1993). According to Masser and Campbell (1995) diffusion is "*the fundamental process that is responsible for the transfer innovations from the workshops of their inventors to becoming a daily part of the lives of a large section of society*" (Masser and Campbell 1995). Roger's (1983) theory of "Diffusion of Innovations" is highly influential in the area that is noticed by most of the practitioners in the field. In his seminal work Rogers defines diffusion as "*the process by which (1) an innovation (2) which is communicated through certain channels, (3) over time (4) among members of a social system*"(Rogers 1993).

In this definition 'innovation' refers to an idea, practice, or an object perceived as new by an individual or other unit of adoption. There are five major attributes of an innovation:

- **Relative advantage** (the degree to which the innovation is perceived as better than the idea it supersedes);
- **Compatibility** (the degree to which the innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters);
- **Complexity** (the degree to which the innovation is perceived as difficult to understand and use);
- **Trialability** (the degree to which the innovation may be experimented with on a limited basis);
- **Observability** (the degree to which the results of the innovation are visible to others) (Rogers 1993). An innovation, for this study, refers to information technologies, and information systems that are adopted by planning offices.

A communication channel is the means by which messages get from one individual to another. These channels include both the mass media and opinion of peers, particular what are termed 'opinion leaders'.

Time is involved in diffusion in (1) the innovation-diffusion process, (2) innovativeness, the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than are other members of a social system, and (3) an innovation's rate of adoption. The innovation decision process is the mental process through which an individual or other decision making unit passes through five different stages: *knowledge*, *persuasion*, *decision*, *implementation*, and *confirmation* (**Figure 4.1**). Different activities and different communication channels are more effective at different stages in the innovation decision process.

A social system is a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The units in a system may be individuals, firms, or families (Rogers 1993). The speed and extent of the diffusion of an innovation is linked to social and political processes rather than simply the inherent technical worth of the product (Masser and Campbell 1995).

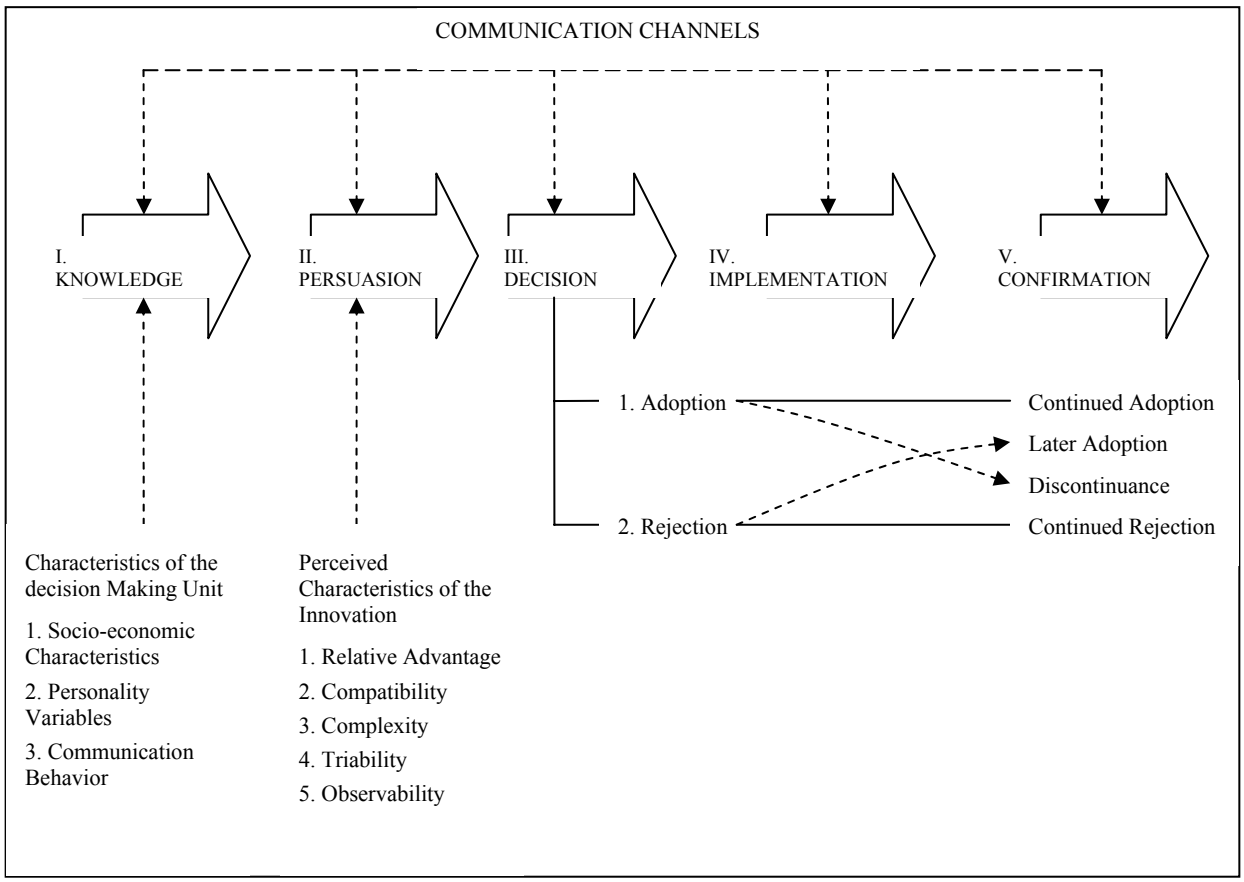

Figure 4.1 Stages in the innovation-decision process (source: Rogers 1993, p.17)

The ambiguity of the term "diffusion" indicates the difficulty in practice to separate the different processes which are part of diffusion, such as 'implementation', and 'use'. Influenced by Roger's work, Campbell and Masser (1995) use diffusion as an umbrella concept which the term encapsulates the processes of "awareness raising", "adoption", "implementation", "routinization", "utilization", and "outcomes"(Masser and Campbell 1995) (**Figure 4.2**). According to Masser and Campbell, while all these elements are regarded as inherent part of diffusion, the overall process cannot be considered to be 'linear' in nature. It is a complex and problematic process in which aspects of implementation may well precede adoption (i.e. while one section of an organization may be routinely utilizing a technology, another may be unaware of its existence) (Masser and Campbell 1995, p.5).

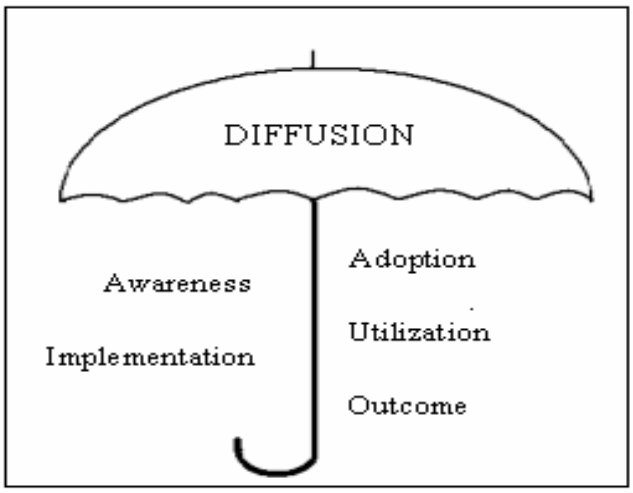

Figure 4.2 A Conceptualization of Information technology Diffusion
(Source: Masser and Campbell 1995, p.6)

The novelty of the information technology and systems in planning offices indicates the implementation issues are more central to an empirical study in accordance with the point of adoption. The stress on implementation is even more important in developing countries. As Ramasubramanian (1999) summarizes in the case of GIS implementation studies, the discussions in developed countries tend to emphasize on the complexities associated with "**use**" (such as ethics, socio-political context, empowerment, participation), rather than remaining focused entirely on "**implementation**". Developing countries are still dealing with implementation rather than utilization issues (Ramasubramanian 1999). Here, because the focus of empirical research will be based on planning departments of local governments in a developing

country context, it is regarded more relevant to group the stages of diffusion in a three sub-sets that implies the centrality of implementation in a cyclical process: (1) pre-implementation, (2) implementation, (3) post-implementation.

4.2.1. Pre-Implementation (Inception/awareness/readiness)

Pre-implementation covers measures that make potential users more knowledgeable about available technologies, their possible applications, and their benefits and costs. Pre-implementation, in this sense, refers the first three steps of Rogers's stages of the innovation-decision process: (1) knowledge, (2) persuasion, and (3) decision (Rogers 1993).

Knowledge occurs when an individual (or other decision-making unit) is exposed to the innovation's existence and gains some understanding of how it functions.

Persuasion occurs when an individual (or other decision-making unit) forms a favorable or unfavorable attitude toward the innovation.

Decision occurs when an individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation.

As mentioned previously 'communication channels' have great importance in this process. According to Rogers, mass media channels are usually more effective in creating awareness-raising of innovations. On the other hand, interpersonal channels are more effective in forming, and in changing, attitudes toward a new idea, and therefore indirectly influencing the decision to adopt or reject a new idea. Media and interpersonal communications channels are much more effective in the decision of adopting an innovation rather than technical reports or expert opinions (Rogers 1993).

Despite the subjectivity of the process some qualitative methods gain relative importance to guide more effective decision making in the implementation decision of an innovation. "**Benchmarking**" and "**SWOT analysis**" may use to assess the organization's pre-requisite conditions for implementation. Other methods include checklists or guides indicating necessary pre-conditions for an effective implementation. "**E-readiness**" assessment is a good example using to determine an organization's (or country) ability to take advantage of the innovation. In the case of e-government, e-readiness must be built in terms of (1) data system, (2) legal infrastructure, (3) institutional infrastructure, (4) human infrastructure, (5) technical infrastructure, and (6) leadership and strategic thinking. Lack of e-readiness contributes

to both lack of and failure of an innovation's implementation (Heeks 2001). Another example is from GIS implementation into community based organizations (CBOs). Here, Kellogg (1999) indicates the importance of the meeting the pre-requisite conditions before implementation:

> …we expect that presence or absence of a constellation of technological, organizational and personal prerequisite conditions will affect the degree to which CBOs, as organizations with unique contextual conditions and cultures, can successfully adopt Internet and GIS technologies. To the extent that these prerequisites are satisfied, the organization will more easily adopt a new technology. Successful adoption may also depend on a constellation of transactions, defined as changes in or to the organization initiated from within or from its environment, that will satisfy the prerequisite conditions (Kellogg 1999, p.450)

Pre-implementation implies the adoption decision as indicated in Rogers's stages of the innovation-decision process. However, while the adoption decision clearly effects implementation, it is composed of different processes and is analytically distinct from implementation (Goodman 1993).

4.2.2. Implementation

Implementation determines whether the introduced technologies and systems are utilized or not. In a more traditional definition, "*implementation has been envisaged as one phase within a linear progression from initial awareness about an innovation through a routine use*" (Masser and Campbell 1995). According to Onsrud and Pinto (1993) implementation is defined as "*activities necessary to put the innovation into practice and incorporate it into existing and developing operations*" (Pinto and Onsrud 1993). As Goodman (1993) states, implementation refers to a "*process*": "*undertaken to translate a tool, technique, method, or other object into some from of utilization*" (Goodman 1993). Implementation also refers to fourth stage (see fig.x.) of Rogers' innovation decision process that indicates the **use of innovation** in organization (Rogers 1993). Thus, in Rogers' model, implementation occurs when an organization actually tries to put an innovation into use. This is a complex phase of the innovation decision process because as he clearly observed: "*Until the implementation stage, the innovation*

decision process has been strictly mental exercise. But implementation involves overt behavior change, as the new idea is actually put into practice. It is often one thing for an individual (or organization) to decide to adopt a new idea but quite a different thing to put the innovation into use" (Rogers 1995).

The introduction of an innovation into an organization necessarily implies "**change**". Implementation is a means through which such adaptations are transmitted to the often wary members of the organizations. Interpretations about this process may also wary according to different theoretical perspectives and world views like **technological determinism**, or **social interactionism** that are indicated briefly in the next section. As a result, scope of benefits from new technologies, and attitudes toward change are to be evaluated in different organizational and personal perspectives.

Although implementation involves a considerable degree of technical issues such as installation of hardware and software, it is a much more complicated process that organizational and user issues have greater significance.

4.2.3. Post-Implementation (Adoption/utilization/Outcome)

Post-implementation can be regarded similarly with the concept of '*institutionalization*' that focuses on the continuity of utilization rate of the technology over time: "*the distinction about when implementation stops and institutionalization starts may be a bit arbitrary. Institutionalization assumes the new technology has been introduced and has reached some level of utilization*" (Goodman 1993, p.46). Utilization or adoption of an innovation is

> generally a complex, iterative, and often messy process where one or more of the following happens: the organization clarifies the potential of the innovation for its purpose and operation; the use of the technology is redesigned by organization members to accommodate the organization's needs and structure more closely (reinvention or appropriation); the organization routinizes the innovation's use into the functional activities of the organization; and the organization itself changes to accommodate the new technology (Kellogg 1999, p.449).

Institutionalization requires '**reinvention**' or '**appropriation**' of innovation in organizations. Reinvention emphasizes the modifications in the adoption of technology

in different organizational settings. For example, "*two organizations may purchase exactly the same items of equipment but their understanding as to the nature of what they have acquired is likely to be entirely different…. Similar discrepancies may be found between the views and expectations of individuals within the same organization*" (Masser and Campbell 1995, p.23). Therefore each individual's or organization's interaction with in an innovation (for this study, information technology and information utilized in planning offices) will become subject to a process of continual appropriation and reinvention. Adoption, as Inness and Simpson (1993) indicate, is only complete when the participants develop consensus on the meaning of the technology and no longer regard as new (Innes and Simpson 1993).

The decision of adoption or institutionalization, according to Rogers's innovation decision model, has given in "**confirmation**" stage (see Figure 4.1) which denotes continued adoption or discontinuance and rejection (termination) (Rogers 1993).

4.3. Theoretical Perspectives on IT Implementation in Organizations

There are numerous theoretical perspectives on how organizations adopt an innovation (technology) in various organizational contexts. Coyne et al.'s (1996) study on the role of information technology in architectural practice indicates the three major models exploring the implications of IT in these organizations (Coyne et al. 1996).

First, there is the "**rational decision making model**" of organizations. Here the emphasis is on detached principled decision making. Technology is regarded as a variable in a matrix of variables to be taken into account in making "rational" decisions about the future. Rational decision making does not rule out the possibility of other kinds of decision making (such as intuitive decision making), but it seeks to be clear about the distinction and the priority of each.

Second, there is the model of "**technological determinism**", of technology as determining the changes that confront practice. Technology is regarded as a prime cause above anything else-social factors, work practices, etc. These two models seem to be privileged in technical and managerial theory, though not necessarily amongst practitioners themselves.

Third, there is the "**praxis model**" in which technology is regarded instrumentally as equipment that we use to get things done in some specific work context. The emphasis is on human action in a context, and how technology impinges. On this view the introduction of a new technology, such as advanced IT, will *affect* and be *affected* by customary ways of doing and thinking about things (Coyne et al. 1996).

Another scholar Campbell (1995, 1996, 1999) has given a similar classification on the perspectives on technological implementation in the case of GIS (Campbell 1996); (Masser and Campbell 1995); (Campbell 1999) **(Table 4.2)**.

Table 4.2 Conception of technology implementation perspectives by various scholars

Campbell, 1996 Perspectives on Technological Implementation	Coyne, 1996 Models for exploring the implications of IT
Technological Determinism	Technological Determinism
Managerial Rationalism	Rational Decision-making
Social Interactionism	Praxis model

First, **technological determinism** based on a utopian view of technical developments. These assumptions suggest that the process of adoption and implementation is guided by the inherent value of the technological innovation and is a rational response on the part of the participants within an organization. The aim of the implementation is to improve organizational effectiveness and efficiency. According to Masser and Campbell (1995), such analyses suggest that the advantages of computer-based innovations are so transparent that implementation is just a technical process. Therefore, technological implementation in organizational context regarded as unproblematic, the most important quality is technical competence (Masser and Campbell 1995). Implicit in this perspective are the assumptions that technologies are good and that the only factors limiting the realization of their potential are the extent of vision within the planning community and the ability of the technology to keep pace with users' demands (Campbell 1996).

Second, there is a **managerial rationalism** perspective that sees effective implementation as a combination of good 'rational management' and technical competence. Managerial rationalism based on the assumption that individuals within

organizations act rationally and will follow the lead taken by senior staff. Like technological determinism, personal goals are regarded as secondary to achieving the objectives of the organization (Masser and Campbell 1995). Implicit in managerial rationalism is the notion that implementation is linear, involving a series of logical stages based on strategy and preplanning. This perspective assumes that new technologies must be managed and controlled to yield their full potential. It also implies that once the optimal plan for technology implementation is designed, it can be implemented easily. According to Campbell, such an approach is sometimes called the 'cookbook method' of system implementation. In this literature, *recipes* (or prescriptions) *for success* are given that offers universal remedies to the problems of system implementation (Campbell 1996).

Third, there is a **social interactionist approach** to technological implementation that arises from analyses of *how individual organizations work* in practice rather than *how they ought to work* (Campbell 1996). Similar to Coyne et al.'s (1996) praxis model, social interactionism perceives technologies are not neutral configurations of equipment; rather they are *socially constructed* within each organizational context and likely to be continuously reinvented by their users. Another important element of the social interactionist perspective is its view of organizations as *unique* social systems or cultures that socializes individuals in a particular set of norms, beliefs and values (Campbell 1996). The summary of these methods and their conceptions of technology implementation were given in the **Table 4.3**.

Table 4.3 Main characteristics of various perspectives on technological implementation
Source: (Campbell 1996); (Campbell 1999)

Characteristic	**Technological Determinism**	**Managerial Rationalism**	**Social Interactionism**
Propensity for Adoption	Inevitable if a good technology	Inevitable if a good technology and rational management	Uncertain, depend on trends in society
Reason for Adoption	To solve an operational problem that has been identified	To solve an operational problem that has been identified	To enhance symbolic status of power
Style of Implementation	Technical process	Guided by a rational management strategy	An organizational process that is problematic and uncertain
Constrains of Implementation	Technical worth of the innovation and stupidity of users	Poor management and the technical worth of the implementation	Social and political processes
Likely outcome of Implementation (Institutional consequences)	Positive, greater efficiency and more rational decision-making	Positive, greater efficiency and/or more rational decision-making	Uncertain, reflection of organizational practices and values
Perception of Organizations	Machine, organism	System	Cultures
Decision making style	Rational/ Comprehensive/ Optimizing	Procedural/rational/ orderly	Fluid/confrontational/ Entailing negotiation and compromise

Implications of Theoretical Perspectives of Implementation

The models outlined above imply that implementation of innovations are likely to vary according to line of assumptions and thoughts about these systems. Each perspective undoubtedly contributes to the totality of understanding, be that in terms of technical know-how, strategy formulation, or the social and political nature of the implementation process. Despite the widespread emphasis in the current literature on the technological determinist and managerial rationalist approaches grown number of authors (Inness and Simpson, 1993; Campbell, 1996; Coyne,1996) in planning and architecture field indicate the value of the power of practice and reality of organizations deriving from the **social constructionist view of technology** (SCOT approach) and postmodernist reflection of technology.

4.4. Summary

As indicated previously, there is no 'quick fixes' or 'cookbook recipe' that guarantee the success of technological implementation. As Innes and Simpson (1993) suggest, for those interested in information technologies and systems should look carefully the real working practice, and everyday use of sound technological systems: "*The research will be most effective in resolving the difficult problem of achieving compatibility between GIS (also other planning technologies) and planning if it can use the language of practice*" (Innes and Simpson 1993, p.234). Therefore it is important to sketch planners' attitude to those technologies and systems in planning organizations. This chapter summarized diffusion of technological systems into organizations (**Figure 4.3**) and pointed different perspectives on the process of implementation. The following chapter is examined the evaluation frameworks to understand the practice in detail.

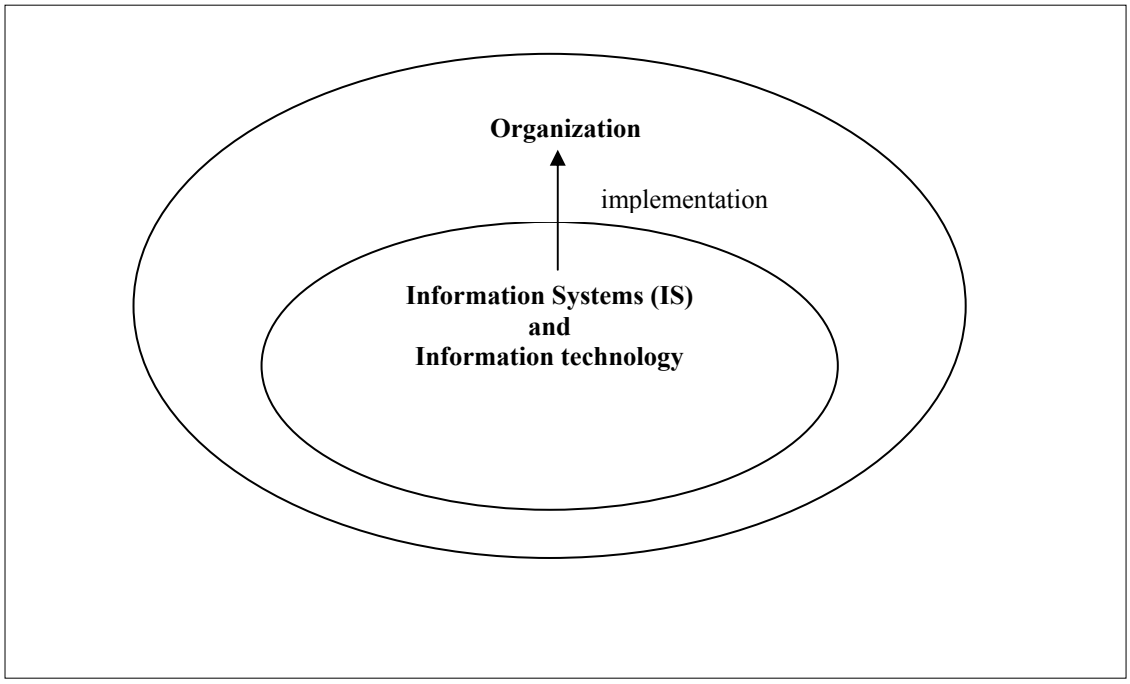

Figure 4.3 Implementation of information technologies and systems in organizations

CHAPTER 5

EVALUATION OF INFORMATION TECHNOLOGY IN ORGANIZATIONS

In chapter five, major points in evaluation of organizations, and information technologies and systems are discussed. This chapter has three sections. In the first part, key concepts and terms are given in relevance to measuring information systems performance. Secondly, review of different information system evaluation frameworks will be discussed under the guidance of organizational studies, information systems research, and GIS and planning literature. In the final section, a general summary of theoretical framework will be elaborated to give conceptual basis for the empirical part of the study.

5.1. Key Concepts in the Evaluation of IT/IS

From the perspective of organizational studies, the primary reference of any effect is organizational performance. Organizational performance and information systems performance are different concepts and may be required different methods and measurements. This section briefly clarifies the complications between these terms and concepts.

5.1.1. Performance Measurement: Effectiveness/Efficiency/Productivity/Quality

The introduction of new methods and systems (i.e. information systems) are often measured with the terms "**effectiveness**", "**efficiency**", "**efficacy**", "**productivity**", and "**quality**" (**Table 5.1**). These concepts are within the literature of Performance measurement (PM) framework that was recognized after late 1980s. PM researchers argue that an organization's success depends not only on the achievement of financial measures, but also on how well the organization adapts to the external environment within which it exists. Success, they stress, is a multi-dimensional concept, and the aspects relating to that success change both over time and between an individual

or a group in an organization and another (Ballantine and Cunningham 1999). Among PM researchers, Checkland et al. (1999) conceptualized performance measure by using the concept of a system and the measures necessary for it to remain stable over time. Their researches over the thirty year period suggest the recognition of three levels of performance that used to monitor a system's performance (Checkland and Scholes 1999):

- *Effectiveness*: is the right thing being done?
- *Efficacy*: do means work?
- *Efficiency*: is resource usage minimum?

Another scholar Roebeke (1990) confirmed the importance of effectiveness, efficacy, and efficiency in performance measurement and suggests that these three criteria constitute a hierarchy, within which measures of effectiveness are more important than the other two (Ballantine and Cunningham 1999).

Table 5.1 Performance measurement concepts by various scholars

Performance Measurement Concepts	**Organization**	**Information Systems**
Effectiveness (ability to accomplish a purpose)	1. The degree to which the organization achieves a stated objective. 2. the ability of an organization to fulfill its mission through a blend of sound management, strong governance and a persistent rededication to achieving results	1. The degree to an information system achieves its objectives. These objectives can be information relevance, quality, and timeliness, system availability and reliability, user satisfaction, etc. 2. The probability that the system can successfully meet an operational demand within a given time when operated under specified conditions.
Efficiency / Productivity (The ratio of the 'output' - product or service- to the 'input' –resources: time, money, people- of any system)	Capacity of an organization, institution, or business to produce the desired results with a minimum expenditure of energy, time, money, and human and material resources.	Efficiency of an information system provides the maximum amount of service given its level of resources.
Quality	Organizational quality means meeting the customer's requirements.	Information system quality can be measured by information quality, system quality, and service quality (DeLone and McLean, 2003)

Productivity is another criterion that is frequently used to measure organizational performance. It can be defined as the ratio of outputs to inputs. According to Danziger (1979) productivity that provided by the introduction of an information system into public sector organizations can be measured fourfold: (1) a reduction in staff and costs, (2) an increase in the volume of work, (3) an increase in new information, (4) and an improvement in the effectiveness of service to the public (Nedovic-Budic 1999, p.290). However, public sector organizations have different structural aspects and context that focusing only upon productivity may ignore other aspects such as the quality of output, the treatment of employees, and other externalities (Nedovic-Budic 1998).

5.1.2. Success and Failure

The notion of success and failure is one of the widely used terms in IT/IS implementation studies. However there is a great deal of ambiguity in the use of these terms in relation to information technology. In the case of implementation of information systems into organizations, failure is more widespread than the success. The rate of failure is even more significant in developing country context. Lyytinen and Hirschheim (1987) identify four categories of failure:

(1) **Correspondence failure**: It is concerned with the extent to which a system meets the objectives specified at the outset of the project. Such an approach very much reflects the rationality inherent within much management science, as it assumes that clear, unambiguous goals were se at the start of the project and that the environment can be controlled to such an extent that they remain relevant.

(2) **Process failure**: It refers to a situation where an operational system cannot be produced within the initial budget guidelines. Overspending is therefore viewed as a failure in the implementation process, more particularly the predictive capacities of management science. In the management science tradition cost-benefit analysis is often used to asses this kind of success and failure in terms of quantitative, monetary terms. Thus, it ignores the intangible and qualitative benefits.

(3) **Interaction failure**: It focuses on the extent to which a new system is used. '*Use*' in this case tends to be associated with '*user satisfaction*' and increased organizational performance.

(4) **Expectation failure**: This category encapsulates the previous three, and is based on whether or not the system fulfills expectations. The key issues in this case are deciding whose perceptions should be principal and judging the relative differences between the expectations of the individuals concerned (Masser and Campbell 1995, p.49).

Heeks et al.'s (1999) study on success and failure in Health Care Information Systems indicate four major groups of implementation failure in organizations:

(1) **Total Failure**: It denotes a system that never implemented or in which a new system is implemented but immediately abandoned. Such an outcome can be defined relatively objectively.

(2) **Partial Failure**: of an initiative in which major goals are unattained or in which there are significant undesirable outcomes. Here the 'goals unattained' indicates expected outcomes that someone wanted to happen but which didn't. 'Undesirable outcomes' implies unexpected outcomes that someone did not want to happen but which did happen. This category also includes the 'zero-sum failure' of an initiative that succeeds for one stakeholder group but fails for another.

(3) **Sustainability Failure**: of an initiative that succeeds initially but then fails after a year or so. It is a special type of partial failure.

(4) **Replication Failure**: of an initiative that succeeds in its pilot location but cannot be repeated elsewhere (Heeks et al. 1999).

Finally, one may see the "**success**" of an initiative in which most stakeholder groups attain their major goals and do not experience significant undesirable outcomes (Heeks 2002b).

According to Heeks (2002), any success/failure categorization runs into some immediate difficulties: The first difficulty is the **subjectivity of evaluation**. Thus, the introduction of any technology into an organization brings both benefits and problems and therefore winners and losers. The actors in the process of implementation recognize success and failure differently according to their areas of interest (Masser and Campbell 1995). This subjectivity even further increasing when combining with the subjectivity of the case study writers themselves. The second difficulty is the **timing of evaluation**. This perspective suggests that success in today's information system (IS) may be failure in tomorrow's IS, and vice versa (Heeks 2002b).

5.2. Review of Different IT/IS Evaluation Models

Information systems and information technologies affect organization's output (service, product etc.), quality, and competition. The crisis in using these systems and technologies within an organization is that organizations have serious difficulties in assessing the performance of those systems and their applicability within an organization's structure.

Experience of GIS within planning organizations about last thirty years suggest that the success or failure of GIS implementations owes more to organizational than to technical issues. The impact of information technologies, and their convergence with other information systems using in city planning offices are relatively new phenomena and need to be explored. In this context, this section reviews some IT/IS evaluation models using in both 'information systems' and 'GIS and city planning' literature.

5.2.1. Richard Heeks' Theory of 'Conception-Reality Gap' and 'ITPOSMO Model'

The first model from IS literature is Heeks' theory of conception-reality gaps which helps illuminate the causes of an implementation outcome. A '**conception-reality gap**' is the gap that exists in an organization between the conceptions and public sector realities that determine success or failure in the information age reform. The conception-reality gap helps explain success and failure of information technology related innovations (Heeks 1999). According to Heeks, success and failure of information reform depends on the extent of the mismatch between the conceptions and world-views of stakeholders involved in the development of the information system and public sector realities. An implementation effort that tends to match its environment in relation to technical, social and organizational factors will have greater possibilities of success (Kouroubali 2002).

5.2.1.1. ITPOSMO dimensions of IT/IS success and failure

Heeks argues that the success or failure of information age reform is dependent on the degree of mismatch between the conceptions of that reform and the realities into which it is introduced. After a review of a number of case studies, he concludes that

mismatches between conceptions and reality can be classified into seven categories summarized by the ITPOSMO acronym (Heeks 1999) (**Figure 5.1**). These categories are:

- *Information*: Information provided by the system versus actual information needs, and the extent to which the organization can access the information.
- *Technology*: Technological capacity required for participation and actual technology capacity of target organizations.
- *Process*: technology features in relation to existing processes.
- *Objectives and values*: the accordance of objectives and values incorporated in the system in relation to objectives and values of users.
- *Staffing and skills*: how well the system fits with human capability requirements.
- *Management and structures*: how well the system fits within existing organizational structures.
- *Other resources*: How available resources such as time and money match with required ones (Heeks 2001, p.21).

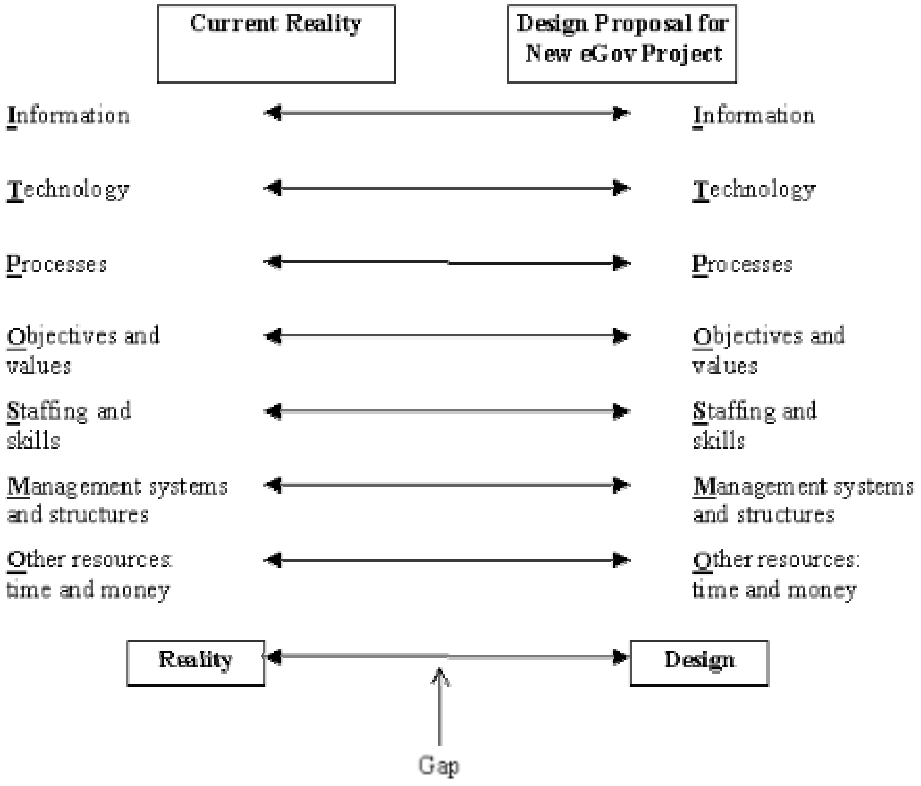

Figure 5.1 ITPOSMO dimensions of conception-reality gap

Heeks et al.'s (1999) conception-reality gap theory of IS implementation in public sector organizations executed in the ITPOSMO model has some parallels with soft system methodology developed by Checkland and Scholes (1990). Under the guidance of their Health Care Information Systems (HCIS) experience they notice:

> …There is no straightforward method for analysing the gap between current reality and the conceptions assumed within a proposed new health care information system. One approach – arising from Checkland's Soft Systems Methodology (1990)…Soft systems methods often advocate recognition of gaps as potential changes, which can then be discussed in participative fora to identify those which are desirable and feasible. Where gaps are identified by participating stakeholder groups as both desirable and feasible changes to current reality, it may well be that they will be successfully implemented(Heeks et al. 1999, p.17).

The identification of gaps in this model has great value. Success or failure of the IS in organizations are depends on the size of those gaps. As Heeks and Bhatnagar (1999) propose "*The smaller the gap, the greater the chance of success. Conversely, the larger the gap, the greater the risk of failure*"(Heeks and Bhatnagar 1999, p.59). The authors also underline the three major points in the evaluation of conception-reality gaps:

Gaps are not necessarily bad. They may influence the implementation process in favorable or unfavorable ways. An initiative involving no gap between conception and reality will be a hundred percent successful. But no gap means that nothing changes in the organization. If something will change, it must require some kind of conception-reality gap. Consequently implementation of these systems may bring some risk but that risk being proportionate to the size of the gap.

Gaps bring both risks and benefits. Larger conception-reality gaps may bring greater risks of failure, but they may also bring greater organizational benefits. If the implementation becomes successful it may then improve organizational efficiency and effectiveness (Heeks and Bhatnagar 1999).

5.2.1.2. Three basic archetypes of conception-reality gaps

Based on health care information systems (HCIS) and public sector case studies on IS all over the world, Heeks identifies three archetypes of conception-reality gap:

1. Rationality (hard) – Reality (soft) Gap: According to Heeks, information systems are designed according to models of rationality. Technology is conceived as an objective and rational entity, not as something that incorporates particular political and cultural values. The tendency towards rationality in IS design is reinforced by the rationality of the modernization and western rationalism. Derived from the popular conception of a technically-rational and technologically-determinist agenda information technologies and systems are often conceived in terms of machinery and engineering, rationality and objectivity (Heeks 2001) (**Table 5.2**). Thus, many of these systems are designed according to these conceptions. The trouble is that many government and civil society organizations do not adhere to these 'hard' ideas. In reality, they are dominated by 'soft' factors: people, politics, emotions and culture. When a hard IT design meets a soft reality, there is a large gap and a strong likelihood of failure (Heeks 2002b 74).

Table 5.2 Differences between hard and soft models

ITPOSMO Dimension	**'Hard' Rational Design**	**'Soft' Political Reality**
Information	Emphasis on standardized, formal, quantitative information	Emphasis on contingent, informal, qualitative information
Technology	A simple enabling mechanism	A complex, value-laden entity: status symbol for some, tool of oppression for others
Processes	Stable, straightforward and formal; decision outcomes as optimal solutions based on logical criteria	Flexible, complex, constrained and often informal; decision outcomes as compromises based on 'power games'
Objectives and Values	Formal organizational objectives	Multiple, informal, personal objectives
Staffing and Skills	Staff viewed as rational beings	Staff viewed as political beings
Management System and Structures	Emphasis on formal, objective processes and structures	Emphasis on informal, subjective processes and structures
Other Resources (time, money etc.)	Used to achieve organizational objectives	Used to achieve personal objectives

Heeks also notices those hard-soft gaps are sharper when an information system implemented in developing countries in which cultural and organizational values are quite different: "*For instance, geographic information systems (GIS) are seen to incorporate a number of assumptions and requirements that derive from Western rationalism. Introduction of GIS in developing countries has therefore been problematic*" (Heeks 2002a).

2. Private-Public Gap: The public sector is fundamentally different from the private sector. However this seems to be forgotten by too many IT/IS vendors, donors and consultants. They may pick up IT/IS designed for the private sector that is not match with public sector reality. According to Heeks and Bhatnagar (1999), public and private sector organizations are largely different that is indicated in the **Table 5.3**. Information systems developed for private sector do not match public sector realities and therefore likelihood of failure (Heeks 2002a). IT/IS based public services have generally lagged behind private services. But these gaps are beginning to narrow through the introduction of e-government initiatives in public organizations. With e-government, a widening range of electronic information services is being introduced into central and local governments. Government computing services are also being contracted out to private agencies. Another important point for private-public gaps is that public sector's requirements for large and complex information systems and technologies are greater in accordance with private sector initiatives. In developing countries this role is even more important and therefore public sector organizations in developing countries are the target for many information system projects (Heeks 2002a).

Table 5.3 ITPOSMO dimensions of public sector organizations (Source: Heeks 1999)

ITPOSMO Dimension	Public Sector Organizations (PSOs)
Information	- Less use of strategic information and less emphasis on financial cost information - information need on virtually every aspect of a person's life (i.e. location, health, education, finances, criminal record etc.)

Table 5.3. (cont.)

Technology	-having generally a more limited and older technological infrastructure - negative conception of technology (innovation brings high risks and costs)
Processes	- processes that are largely different than private sector (i.e. policy-making, socio-political consultation etc.) - constant discontinuous changes in legislation, policy initiatives, and political parties
Objectives and Values	- Broader objectives covering social and political and economic factors
Staffing and Skills	- less labor flexibility -traditional skill areas - greater recruitment and retention problems
Management System and Structures	- public sector organizations (PSOs) are largely the service sector organizations thus they do not have sales, marketing and production segments involving IT/IS solutions
Other Resources (time, money etc.)	- more limited resources (less money) and more limited pressures of competition on performance (more time)

Country context gap: As Heeks (2001) suggests that information systems or technologies developed in the context of a particular country will incorporate common assumptions of that context. Thus, "*there is often a large design—reality gap when trying to introduce in country X an e-governance system designed for country Y. The frequent result is failure*" (Heeks 2001, p.22). Country context gap addresses problems in transfer of IT/IS between industrialized countries, especially more problematic with developing countries. Designers, consultants, ICT vendors or aid donors that dominate the IS/IT design process in a developing country often bring with them the mentality; "If it works for us, it'll work for you". They also bring their context with them and then impose a design derived from that context that mismatches developing country realities (Heeks 2002a) (**Table 5.4**).

Table 5.4 ITPOSMO dimension of stereotypical IT/IS implementation for developing countries (source: Heeks 2002a)

ITPOSMO Dimension	Developing countries
Information	formal, quantitative information stored outside the human mind is valued less in developing countries
Technology	the technological infrastructure (telecommunications, networks, electricity) is more limited and/or older in developing countries
Processes	work processes are more contingent in developing countries because of the more politicised and inconstant environment
Objectives and Values	developing countries are reportedly more likely to have cultures that value kin loyalty, authority, holism, secrecy, and risk aversion
Staffing and Skills	- limited local skills (i.e. IS/IT skills of systems analysis and design, implementation skills, and operation-related skills including computer literacy and familiarity with the western languages) - lack of broader skills covering the planning, implementation and management of IS initiatives
Management System and Structures	more hierarchical and more centralized organizational structure
Other Resources (time, money etc.)	less money and high cost of ICTs and IS systems in relevance to industrialized countries -low cost of labor

Some further types of gaps: Beyond these three major types as Heeks highlighted it may contribute to some additional gaps related to information technology and systems implementation in terms of different initiatives and stakeholders. They can be grouped under two major categories:

1. Gaps associated with citizen users: This category may include *access gap* (unequal access to technology); *age gap* and *gender gap* (uneven distribution of ICT users among places); *spatial gap* (there is a substantial gap exists between the prosperous core and the poorer periphery in the provision of information infrastructure); and applications *gap* (mismatches to provide local-user sensitive applications for the different local needs in different places).

2. Gaps associated with stakeholders in organizations: This category may consists of *knowledge gap* (limited understanding of phenomena due to its complexity and uncertainty, or mismatch between our ability to fully understand the entity that is labeled "reality" and "data" (Salomon et al. 1999)); *communications gap* (relates to that part of the knowledge gap which can be attributed to miscommunications between the parties involved (Salomon et al. 1999) i.e. citizens who attend planning meetings often experience difficulty understanding the spatial relationships portrayed on maps, plans, or projection screens. This occurs regardless of the media -paper or digital- employed. The resulting frustration leads to miscommunication and mistrust amongst all stakeholders including citizens, developers, planners and politicians); *skill gap* (the gap between requirements of design conceptions and reality of availability and expertise of the staff); *mindset gap* (general resistance to change, lack of customer orientation, resistance to data sharing etc.); and *tribal gap* ("two tribes" mentality: IT designers understand technology but not realities of governance, officials and politicians understand the realities of governance but not the technology) (Heeks 2001).

5.2.1.3. Assessment of Gaps: Gap Closure Techniques

It is an important question whether and how the gaps can be reduced to increase the likelihood of successful accomplishments. Heeks (2003) proposes a simple but effective technique to assess the failure of IS/IT implementation in the case of e-government projects: Design-Reality Gap Assessment (Heeks 2003). This technique is qualitative and subjective based on opinion and experience.

Design reality gap assessment is based on the conception-reality gaps along a set of seven 'ITPOSMO' dimensions. Using each of the seven ITPOSMO dimensions in turn, analyze two things: First, the organizational reality relating to that dimension that exists right now at the time of analysis. Second, the conceptions/requirements within the design of the IT/IS project. This technique rates the size of assumed gap by using ITPOSMO model from 0 for 'no change between current reality and design proposal' to 10 for 'complete and radical change' (Heeks 1999). The scores for each individual dimension can be presented using a table or a diagram arranged to show the gaps in size order from the largest to the smallest. The dimensions that show the largest gap are the most likely causes of project failure (Heeks 2003).

Heeks (2003) also offers some variations on the basic technique. These may include:

Different factor weights: The basic technique makes a questionable assumption that all dimensional gaps are equally important. However some factors can be more crucial assessing the success and failure of IT/IS implementation according to other ones. Thus, a more complex variation can be used in the ranking and weight of chosen dimensions;

Additional sub-dimensions: The basic technique uses ITPOSMO dimensions that consist of seven rating scales. A more sophisticated but more time-consuming approach can be used by breaking each main dimension down into a series of sub-dimensions. Each sub-dimension is then allocated for its own rating scale. For example: the 'technology' dimension could easily be considered as three sub-dimensions namely as software, hardware and networks. On the other hand, according to Heeks, one can develop his/her own particular dimensions and sub-dimensions that are seen to be relevant to the specific context (Heeks 2003).

5.2.1.4. Critics of Heeks's Conception-reality Gap Assessment

1. Conception-reality gap assessment is a simple but effective management tool for those involved in the development of information systems in developing countries.

2. ITPOSMO model has the value to examine 'why' introducing an information system project in similar organizational settings results in a varied degree of change.

3. Heek's model has the capacity to assess the implementation stages of information technologies and systems for the public sector organizations in the developing country context. Therefore, it represents a more holistic framework for the case study research. A knowledge base drawn on ITPOSMO dimensions also creates opportunity to share and communicate the reasons of success and failure of different cases systematically.

4. Heeks's model recognized that 'social and organizational factors' are not just a question of relatively objective realities, but also of relatively subjective perceptions and values. In this sense, it creates a suitable platform to observe the implications of theoretical perspectives on IT implementation which was mentioned in the Chpt.4.

5.2.2. DeLone and McLean's IS Success model

The second evaluation model is DeLone and McLean's IS Success model (1992) which derives from authors' recognition of the multi-dimensional nature of IS success after documenting the IS literature from the period 1981-1988. In their influential article, DeLone and McLean (1992) classified the vast range of IS success measures and synthesized a six factor taxonomy, namely, "system quality", "information quality", "use", "user satisfaction", "individual impact" and "organizational impact" (**Figure 5.2**) (**Table 5.5**).

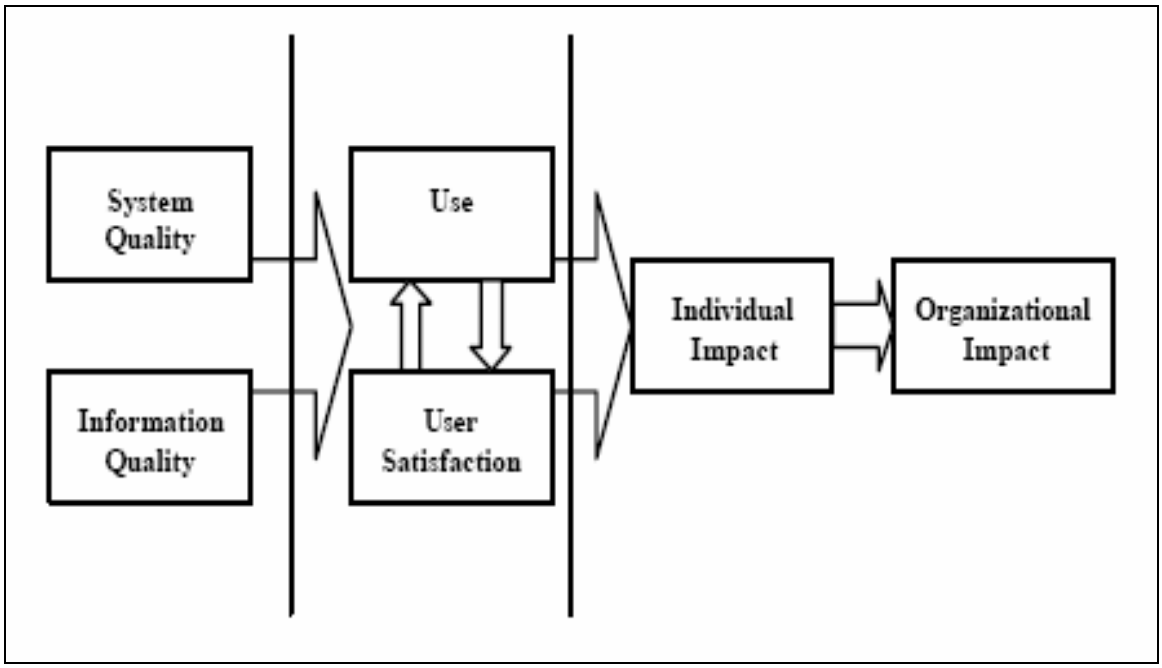

Figure 5.2 DeLone and McLean's (1992) model of IS Success

System quality: relates to system performance such as response time and ease of use (Landrum and Prybutok 2003). It concerns the engineering aspects of computerized information systems and their performance characteristics with respect to hardware, software, database management, and data manipulation functionality (Nedovic-Budic 1998). System reliability, functionality, flexibility, efficiency, and response time are examples of components that define system quality (Nedovic-Budic 1999).

Information quality: refers to quality of the information product, such as accuracy, currency, relevance, and completeness (Landrum and Prybutok 2003).

Information quality is usually determined from the user's perspective and is therefore subjective and closely related to the user information-satisfaction dimension. However, some of the indicators of quality, such as accuracy, completeness, and currency, can be measured objectively (Nedovic-Budic 1999).

System Use: refers to how frequently an information system is used (Landrum and Prybutok 2003).It can be evaluated through a variety of objective measures, such as functions performed, records processed, or charges for system use, as well as through perceptions of use (Nedovic-Budic 1998). As Nedovic-Budic (1999) indicates "*questions about who uses the system, levels of use, motivations for and voluntariness of use, and the purpose and nature of system use are also relevant. Measuring the effect of an information system in terms of information use assumes that the effect of the technology is proportionate to its use in support of organizational functions, tasks, and projects*" (Nedovic-Budic 1999, p.287).

User satisfaction: deals with recipients' response to the information generated as output from an information system. As exemplified from city planning process, the recipients of the system are the professional planning staff, decision-makers, and interested groups and citizens involved (Nedovic-Budic 1998). User satisfaction has been used as one of the most prominent measures of system success and effectiveness. It is predominantly employed as a measure in the management information system field. User satisfaction affects information system goal achievement, employee quality of work life, and system use. In measuring user satisfaction it is important whose satisfaction is observed and measured. This dimension includes many players (such as system designers, implementers) and cognitive differences (cognitive gap) in these groups may affect the success of a system's implementation (Nedovic-Budic 1999).

Individual impact: refers to effect of information on behavior. This dimension based on the assumption that information has value only if it is used and influences decisions. Information systems may influence the behavior of the individuals who rely on these systems for information, expertise, and decisions. According to DeLone and Mclean, a good system may improve individual performance by facilitating a better understanding of the decision context and by increasing decision-makers' productivity and confidence. A good system may also affect the course of action taken by decision-makers and ultimately change their perceptions about the value of a particular information system (Nedovic-Budic 1999).

Table 5.5 Summary of MIS success measures by category
(source: Delone and McLean (1992), adapted from (Nedovic-Budic,1998, p.684-685)

System Quality (18)	**Information Quality (23)**	**(Information) Use (23)**
Data accuracy Data currency Database contents Ease of use Ease of learning Convenience of access Human factors Realization of user requirements Usefulness of system features and functions System accuracy System flexibility System reliability System sophistication Integration of systems System efficiency Resource utilization Response time Turnaround time	Importance Relevance Usefulness Informativeness Usableness Understandability Readability Clarity Format Appearance Content Accuracy Precision Conciseness Sufficiency Completeness Reliability Currency Timeliness Uniqueness Comparability Quantitativeness Freedom from bias	Amount of use and/or duration of use: - number of inquiries - amount of connect time - number of functions used - number of records accessed - frequency of access - frequency of report requests -number of reports generated - charges from system use - regularity of use Use by whom? - direct versus chauffeured Binary use: - use versus nonuse - actual versus reported use Nature of use: - use for intended purpose - appropriate use - type of information use - purpose of use Levels of use: - general versus specific Recurring use Institutionalization (routinization) of use Report acceptance Percentage used versus opportunity for use Voluntariness of use Motivation to use
User Satisfaction (9)	**Individual Impact (21)**	**Organizational Impact (18)**
Satisfaction with specifics Overall satisfaction Single-item measure Multi-item measure Information satisfaction: - difference between information needed and received Enjoyment Software satisfaction Decision-making satisfaction	Information understanding Learning Accurate interpretation Information awareness Information recall Problem identification Decision effectiveness: - decision quality - improved decision analysis - correctness of decision - time to make decision - confidence in decision - decision making in participation Improved individual productivity Change in decision Causes management action Task performance Quality of plans Individual power or influence Personal valuation of IS	Application portfolio: - range and scope application - number of critical applications Operating cost reductions Staff reduction Overall productivity gains Increased revenues Increased sales Increased market share Increased profits Return on investment Ratio of net income to operating expenses Cost-benefit ratio Stock price Increased work volume Product quality Contribution to achieving goals Service effectiveness

Organizational impact: can be evaluated with the effect of information system on organizational performance that refers to efficiency and effectiveness criteria. Efficiency can be expressed as cost savings, cost avoidance, or productivity gains. Efficiency may also result in the generation of revenue. System effectiveness involves generating a product of better quality or accomplishing an intended purpose. Organizational impact has been evaluated frequently with cost-benefit analysis. Cost-effectiveness, conjoint (value) analysis, and measures of organizational goal achievement and productivity are among the alternatives to traditional cost-benefit analysis (Nedovic-Budic 1999).

In the scheme (see Figure 5.2), DeLone and McLean (1992) indicate relationships between these six categories with an interdependent IS success model that implies a causal relation from system and information quality to individual and organizational impacts: "*system quality and information quality singularly and jointly affect both use and user satisfaction. Additionally, the amount of use can affect the degree of user satisfaction - positively or negatively - as well as the reverse being true. Use and user satisfaction are direct antecedents of individual impact; and lastly, this impact on individual performance should eventually have some organizational impact*" (Seddon et al. 1999, p.53). They also argue that when measuring IS success, researchers should "systematically combine" measures from their six IS success categories (Seddon et al. 1999).

Like Heeks (1999), DeLone and McLean (1992) put information as the output of an information system or the message in a communication system and noted that it can be measured at different levels. These levels include the 'technical level', the 'semantic level', and the 'effectiveness level' that is based on the communications research of Shannon and Weaver (1949):

- *Technical level* of communications as the accuracy and efficiency of the communication system that produces information.
- The *semantic level* is the success of the information in conveying the intended meaning.
- The *effectiveness level* is the effect of the information on the receiver (DeLone and McLean 2003, p.3).

In the DeLone and McLean's model, systems quality measures technical success; information quality measures semantic success; and use, user satisfaction, individual impacts, and organizational impacts measure effectiveness success (DeLone and McLean 2003).

5.2.2.1. Critics of DeLone and McLean's Model of IS Success

As Seddon et al. (1999) state DeLone and McLean's (1992) paper is an important contribution to the literature on IS success measurement because it was the first study that tried to impose some order on IS researchers' choices of success measures (Seddon et al. 1999). A decade after a DeLone and McLean's (1992) original model has been published, many academic contributions have been made to (1992) model to apply, validate, challenge, and propose their enhancements. Other researchers (Wilkin, 1999, 2003; Seddon, 1996, 1997, 1999; Rai et al., 2002) have taken DeLone and McLean's challenge of investigating multiple dimensions and multiple variables. Some (Seddon, 1997; Rai et al., 2002; Wilkin, 1999, 2003) have offered worthy debate in their discussion of DeLone and McLean's (1992) IS Success Model, pointing to other categories, dependant variables or factors that determine IS success. Rai et al.'s (2002) work compares both DeLone and McLean's and Seddon's IS Success Models, and concludes that each has merits for testing IS Success, albeit both models still do not completely explain the complexity of information systems (Boon et al. 2003). As a result, DeLone and McLean (2003) revised and updated their original model. Based on their evaluation of those contributions, they propose minor refinements to the original model and propose an "Updated DeLone and McLean IS Success Model" (DeLone and McLean 2003). This model, shown in the Figure 5.3, includes "Information Quality", "System Quality", "Service Quality", "Intention to Use", "Use", "User Satisfaction", and "Net Benefits" (**Figure 5.3**).

As an extension to previous model (1992) DeLone and McLean (2003) include '*service quality*' as new dependent variable, and 'net benefit' as meta-variable. They suggest that measuring the success of a single system, information quality or system quality may be the most important quality component. However, for measuring the overall success of the IS department, service quality may become the most important

variable. This dimension takes into consideration variables such as: reliability, responsiveness, assurance and empathy (DeLone and McLean 2003).

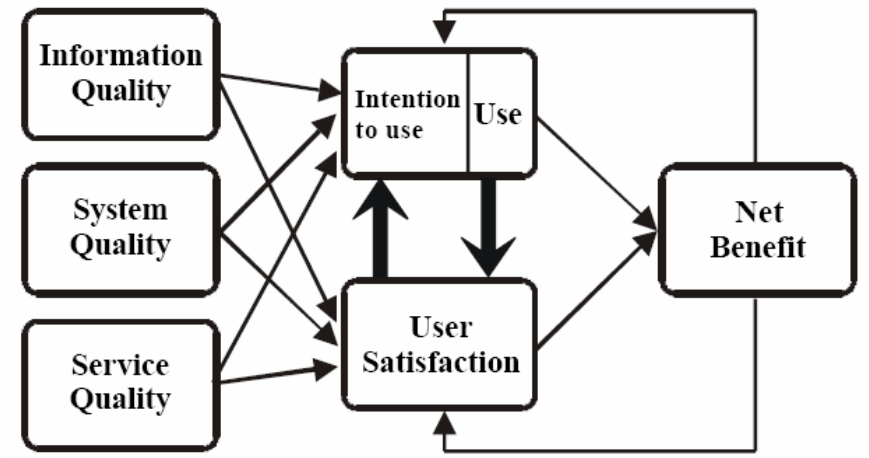

Figure 5.3 Updated DeLone and McLean IS Success Model (2003), source: (DeLone and McLean 2003, p.22)

DeLone and McLean have updated the 'impacts' of IS as '*net benefits*' that previously differentiated as 'individual impacts' and 'organizational impacts'. They use net benefits as an umbrella concept to group wide variety of impacts such as workgroup impacts, inter-organizational and industry impacts, consumer impacts, and societal impacts that derived from IS activity: "*the choice of where the impacts should be measured will depend on the system or systems being evaluated and their purposes. Rather than complicate the model with more success measures, we prefer to move in the opposite direction and group all the impact measures into a single impact or benefit category called net benefits*"(DeLone and McLean 2003). Authors indicate three key points in the recognition of 'net benefits' in their model:

First, they explain why they use the term 'benefit' instead of 'impact' that they previously emphasized: "*we have come to prefer the term net benefits ourselves because the original term impacts may be positive or negative, thus leading to a possible confusion as to whether the results are good or bad. Also, the inclusion of "net" in net benefits is important because no outcome is wholly positive, without any negative consequences. Thus "net benefits" is probably the most accurate descriptor of the final success variable*" (DeLone and McLean 2003).

Second, they point the term 'net benefit' with a caution that three issues that must be taken into account: what qualifies as a "benefit"? For whom? (the designer, the sponsor, the user, or others) and at what level of analysis? Authors further recognized 'net benefit' dimension as broad and context dependent category: "*our model may be useful to both Microsoft and the user community, but each may have a very different definition of what constitutes net benefits and thus IS success*" (DeLone and McLean 2003).

Thirdly, they indicate the importance of the level of analysis. Despite their tendency for using 'net benefit' as an umbrella concept, the problem of which benefits to be measured (individual, group, organization, industry, or nation) is still valid for researchers working in the field: "*the challenge for the researcher is to define clearly and carefully the stakeholders and context in which net benefits are to be measured*" (DeLone and McLean 2003).

5.2.2.2. DeLone and McLean's IS Success Model for GIS and City Planning

DeLone and McLean (1992) offer a comprehensive review and typology of various measures of information system success. Thus, their model has been tested in a variety of fields such as management information systems (MIS), e-commerce, enterprise resource planning (ERP), costumer relations management (CRM) and so on. Adaptation of DeLone and Mclean's (1992) model into planning literature has begun with GIS implementation studies. Although some of DeLone and McLean's measures have been applied in evaluations of GIS success only a few has been applied in the context of planning (Nedovic-Budic 1999).

Based on the study on "*The impact of GIS technology*" Nedovic-Budic (1998) has proposed "*societal impact*" dimension as a further variable to the lists of six DeLone and McLean's IS success dimensions: "*societal impact is important to consider in the evaluation of GIS, because the ultimate goal of all technologies introduced in public sector agencies is to benefit society*" (Nedovic-Budic 1998).

In the review article of "*Evaluating the Effects of GIS Technology: Review of Methods*" Nedovic-Budic (1999) further proposes a framework to adjust DeLone and McLean's model (1992) into GIS and as well as planning context (Nedovic-Budic 1999) (**Table 5.6**).

Table 5.6. Summary of Evaluation Criteria and Relevance in the Planning Context, source: (Nedovic-Budic 1999, p.291)

Dimensions	**Geographic Information System (GIS) Evaluation Criteria**	**Planning Context for GIS Evaluation**
System quality	Database contents, system integration, functionality, ease of use, ease of learning, reliability, response time, human factor	Diversity and comprehensiveness of planning the GIS database, integration with other information systems, suitability for planning analysis, modeling, simulation, user-friendliness
Information quality	Relevance, usefulness, clarity, format, accuracy, appearance, sufficiency, completeness, reliability, currency, and timeliness	Urban development management and monitoring, planning data collection and analysis, geographical and attribute data
Information use	Amount and duration of use, application areas, nature of use (type of information, purposes), levels of use (general vs. specific), direct versus indirect use, voluntariness and motivation of use	Specialization areas (e.g., land use, environ- mental), tasks in the planning process (e.g., generating alternatives, plan making, presentations), planning methods aided (e.g., suitability analysis, impact assessment)
User effects		
Individual effects	Overall satisfaction, information satisfaction, enjoyment, decision-making satisfaction, quality of work	Planners: improved job performance, efficiency, and effectiveness; administrators: management of resources; decisionmakers: enhanced decision-making process; public: access to information, input into plans and policies
Organizational effects	Understanding, learning, awareness, problem identification, decision effectiveness (quality, time, correctness, confidence, explicitness), change in decision, individual productivity, power of influence, quality of plans	Planning decisions at all levels (staff, administrative, decisionmakers, and public)
Societal effects	Operating cost reduction, staff reduction, overall productivity gains, increased revenues, increased sales, return on investment, increased work volume, product quality, goal achievement, service effectiveness	Efficient management and administration of urban development (review of development proposals, zoning, building permits), efficient handling of information, increased productivity, public service, quality of plans and policies, quality of urban and economic environment
	Equity	Community development, capacity building, empowerment, public participation, access to information, healthy and prospering communities

When we look at the planning literature we find that most of the evaluation models produced by planners are about GIS and more recently PSS (**Table 5.7**).

Nedovic-Budic (1999) reviews GIS evaluation studies and found that "*comprehensive conceptual frameworks adapted or developed for the evaluation of GISs are scarce, and are not well grounded in previous research and theory on how technology affects public and private organizations*" ((Nedovic-Budic 1998);(Nedovic-Budic 1999)).

Table 5.7 Summary of Evaluation frameworks
adapted from Nedovic-Budic (1998, 1999)

Evaluation Frameworks	Context
Clapp et al (1989) on land information systems	Based on four levels of assessment: (1) operational efficiency, which examines operational output such as interactive cartographic capabilities and products; (2) operational effectiveness, which considers program outputs that include information availability and public and private understanding; (3) program effectiveness, which focuses on program effects such as enhanced decision making and timely problem recognition; (4) contribution to well-being, which assesses societal benefits and costs, including integrity, justice, wealth, and fulfillment.
Antenucci et al (1991) on GIS	Based on five types of distinct GIS benefits: (1) quantifiable efficiencies and improvements in existing practices, (2) quantifiable expanded or added capabilities, (3) quantifiable unpredictable events, (4) intangible benefits and advantages, and (5) quantifiable sales of information and resulting service benefits.
Calkins and Obermeyer (1991) on GIS	Based on taxonomy of use and value of geographic information: (1) questions about the use of geographical information, (2) the effectiveness and benefits of geographic (3) information use, (4) the measurement of benefits associated with information use, (5) the characteristics of geographical data and spatial analysis, and (6) the characteristics of the organization
Tulloch et al (1996) on multipurpose land information systems (MPLISs)	Based on the benefits derived from use of the system: (1) Efficiency benefits occur within a single agency. (2) Effectiveness benefits accrue across local other government agencies using the system (3) Equity is achieved during the democratization stage, when the benefits from the system are distributed throughout the community.

5.3. Summary

In this section, a summary of general theoretical framework is presented as the basis of empirical study that will be examined in the following chapter. This framework mentioned so far is constituted three main parts:

Firstly, the features of information technologies, information systems, computer-assisted planning tasks, and conception of IT/IS in planning process and practice was given (Chapter 2, Chapter 3) briefly to understand the relationship between IT/IS and city planning. The rationale behind the planning organization's and planners' attitude toward IT/IS use was highlighted. Secondly, the organizational context of IT/IS use was examined regarding to nature of organizations, and various implementation perspectives. Then, diffusion of IT/IS within an organization was explained through Rogers's innovation diffusion theory, and categorized with stages namely as pre-implementation, implementation, and post-implementation (Chapter 4). Lastly, different IT/IS evaluation frameworks within organizations was reviewed under the guidance of information systems, business management, and GIS/city planning literature (Chapter 5). Review in the planning and GIS literature indicated the need of more methodological developments. Here, there is no intention to suggest that one method is superior to the others. Instead, different methodological approaches are presented as complementary and somewhat overlapping. On the other hand, review on the IS research and organizational research opened up the new methods of evaluation that may more suited to scope of the empirical study.

CHAPTER 6
A CASE STUDY IN SELECTED PLANNING DEPARTMENTS OF TURKISH METROPOLITAN MUNICIPALITIES

This chapter provides a link between the general theoretical framework of the thesis (Chapter 2 to 5) and the findings of empirical research that have examined what is actually happening in organizational settings of city planning practice deriving from the use of information technology and systems. The chapter has three major sections: The first part of the section elaborates the general background of research. Second part, the research objectives and methods are mentioned. The final part of the chapter is devoted to the major findings of the empirical research.

6.1. Research Background

The preceding discussion on the general theoretical framework of the thesis has elaborated the nature of implementation, computer-assisted urban planning, and various evaluation frameworks to measure the individual (planning practitioner), organizational (planning department of selected local governments), and societal (various stakeholders outside the department) consequences of information technologies and systems. Empirical part of the thesis, which is attached with the theoretical framework, is based upon the statements and research questions mentioned previously.

Brief history of ICT, structure and internal organizations of municipalities, e-municipality efforts within e-government concept, development of spatial information systems, and city planning context and its connections with new technologies will be explored as a background.

6.1.1. Brief History of ICT in Turkey

The first digital computer was installed in Turkey in 1960 by the State Directorate of Highways. In 1976, there were only 111 mainframe computers and almost 70 data processing centers in the country. Mainframe computers were so costly that they were just preferred by big private corporations and public institutions (Kuleyin

2000). At the end of 1970s, there were 300 data processing centers in Turkey (Kirlidog 1996).

Economic liberalization policies of Turkish government after 1980s triggered substantial improvements in Turkish telecommunications system. Opening up to foreign markets gave Turkey an opportunity to expand and refine its IT infrastructure during the 1980s (Kirlidog 1996). The austerity program crafted by Turgut Özal and later implemented by his administration during the 1980s placed a high value on expansion of telecommunications services. In this period Turkish government saw the quality telecommunications infrastructure as a vital part of the open economy (Wolcott and Goodman 2000). During this time the network size was being tripled to cover all parts of the country with high quality telephone lines. In the country, number of items of data processing equipment increased sharply during the 1980s. This trend was accompanied by the fast spread of personal computing throughout the world in the early 1980s (Kirlidog 1996).

Reforms and investments on telecommunications initiated in the previous decade have been slowed down due to the high political instability and economic crisis of mid 1990s. However, two important developments have come about in telecommunications sector in 1993. Firstly, Turkey chose in 1990 the Global Standard for Mobile Communications (GSM) as its mobile phone standard, and licensed two consortia, TurkCell and TelSim, to offer services. Since then, GSM service became available in 1993 (Wolcott and Çağıltay 2001). Current indicators suggest that the GSM market in Turkey keeps on growing, and the number of GSM subscribers has exceeded the number of PSTN subscribers in 2002 (25 million as of March 2003)(SPO 2004). Secondly, the international connection to the Internet was first established by the Middle East Technical University in April 1993 (Kirlidog 1996). Before that, in a more modest scale, a BITNET connection was established between Ege University in Izmir and the European Academic and Research Network (EARN) in 1986 (Wolcott and Goodman 2000). By the latter half of the 1990s, the number of users began to grow rapidly. In 1995, the number of hosts had grown to nearly 3,000, and the total number of daily users was estimated to be 10,000–15,000 (Wolcott and Çağıltay 2001). Today, there are approximately 4,300,000 Internet users in Turkey.

Though the government is an important investor in computerization, the private sector accounts for the larger slice of the IT market pie. Within this group, banks are the

major players. Banking sector is the most computerized sector in Turkey. This could perhaps be explained by the fierce competition in the sector. Banking is followed by the other financial institutions, the travel industry, and the automotive and other industrial concerns (Kirlidog 1996).

6.1.2. Public Administration and ICT in Turkey

Guaranteeing the right to have access to information and securing a change in the tradition of secrecy in public administration will be significant factors in creating a culture of openness, transparency and accountability in the administration. Since the mid 1990s, there have been some improvements in Turkey on that account. The development taking place in the application of electronic innovations to public administration is referred to as "e-government", “e-local government” or “e-municipality”. Before determining the extent of e-local government and e-municipality administration structure of local governments will be examined.

6.1.2.1. Structure of Turkish Local Government

Public administration in Turkey is divided between the central and local administrations. As field administration units, Turkey is divided into provinces, which are subdivided into districts, which are divided into villages. Currently, there are 80 provinces, 873 districts and around 35,000 villages. Provinces and districts are both administrative units of central government and territorial units of local government. On the one hand representatives of central government, governors for provinces and sub-governors for districts, on the other hand, local government bodies, provincial local governments and municipalities, work in the same areas, but carry out different duties (Sagbas 2003).

There are three main local administrative tiers in Turkey. These are the ‘special provincial administrations’, ‘municipalities’, and ‘village administrations’. The Turkish Constitution (1982) defines local governments in its article 127: “*Local administrative bodies are public corporate entities created to meet the common needs of the citizens of provinces, municipal districts and villages, whose decision making organs are elected by the electorate described in law, and whose principles of structure are also*

determined by law" (Sagbas 2003, p.2). Central administration has the power of administrative trusteeship over the local governments in the framework of principles and procedures set forth by law (Altintas et al. 2002).

There are 3,214 municipalities in Turkey consisting of three types of municipalities: (1)"metropolitan municipality", (2)"metropolitan-district municipality"; (3)"non-metropolitan municipality". The status of municipalities is explicated by the Law of 1580 on Municipalities dated 1930, and by various other codes, statutes, and, regulations enacted since then (Altintas et al. 2002).

In 1984, "metropolitan municipalities" were established according to the Metropolitan Municipalities Law of 3030. They were first set up in three biggest cities of Turkey: Istanbul, Ankara and Izmir. The numbers of these have later been extended to a total of 16. Because city planning departments of metropolitan municipalities selected as unit of analysis the structure of the metropolitan municipalities is to be mentioned in detail.

General Structure of metropolitan municipalities

Metropolitan municipalities have a two tier system. In addition to the metropolitan municipality, a number of district municipalities, as a lower tier of the metropolitan municipality, are set up. The central government can establish a metropolitan municipality in any larger city. There are no specific population limits to be eligible (Altintas et al. 2002).

The metropolitan municipality is governed by a mayor, a metropolitan executive committee and a metropolitan council. A metropolitan council consists of district mayors and one-fifth of the members of the municipal council of the districts, belonging to the metropolitan municipality. The metropolitan executive committee consists of a metropolitan mayor, a secretary-general of the metropolitan municipality, and the directors of some metropolitan municipality departments, such as finance and public works (Sagbas 2003).

Duties of Metropolitan Municipalities

Municipal responsibilities and areas of action are divided between metropolitan municipalities and district municipalities. The responsibilities of metropolitan municipalities can be summarized as follows (Sagbas 2003, p.2):

- public safety (fire protection)
- cleaning (solid waste disposal)
- public transportation, traffic management
- water supply and sanitation
- public works (e.g. major roads maintenance, roads 14m width and more)
- preparation of master urban plans
- approval of the application plans of master plan drawn up by district municipalities and supervising the implementation of them
- city-wide co-ordination of investment plans
- agricultural services (parks with 30.000 square meters area and over, veterinary services)

Metropolitan municipalities coordinate and control the activities of the district municipalities within its boundaries. They have responsibilities to settle the conflicts among the municipalities within their own boundaries.

Recent Developments in Metropolitan Municipalities

In Turkey, 32% of the population lives in 16 cities with metropolitan municipality organizations, and 22 million people live in municipal palaces which comprise of 41% of the country's population. The model of metropolitan municipality, which has been under trail for 20 years, has been tried to be re-organized in recent years with a new draft Law of 3030. Among the items taking place in the new draft are:

- County municipalities becoming first-tier municipalities and being put under the wardship of metropolitan municipality.
- Extending of the borders of metropolitan municipality.
- A provision of law saying systems of “geographic and city information systems” should be set up for inter-municipality tasks.

Although such provisions as setting up GIS and extending the borders are positive, it has been the source of new problems, for nearly 10 years, for the metropolitan municipalities experiencing GIS and urban information system (UIS). As the related literature put it and empirical studies claims, setting up a GIS and running it is affected by many factors such as human resources, organizational structure, and

social structure rather than being a technical process. In this sense, it is necessary that the content of the regulation to be brought be defined clearly.

6.1.2.2. ICT for Governance

Good governance simply means a form of government responsive to citizen demands, which acknowledges its citizens as stakeholders and allows their participation in the decision-making process that can also be held accountable, and functions efficiently. To achieve good governance at the local government level, municipalities and other forms of local administrations must conduct their decision-making, implementation, and auditing activities in a participatory process whereby the population living under their jurisdiction is equally represented (Tüzün and Sezer 2002). "Stakeholder participation", "transparency", "accountability" and "political participation" are some of the attributes of good governance that also constitute the agenda of 'e-government'. In this respect, Turkey has realized a comprehensive e-transformation program through e-Turkey. This program has been rapidly progressed after Turkey has participated in '*eEurope+*' initiative with other European Union (EU) candidate countries in June 2001. The main goal is to implement the activities required in the concept of eEurope initiative which major goals are: (1) a cheaper, faster, secure Internet; (2) investing in people and skills; and (3) stimulate the use of the Internet in the European region (4) acceleration in forming the foundations of an information society (Tüzün and Sezer 2002).

In conjunction with eEurope+ initiative, Turkish government has declared "*e-Transformation Turkey Project*" in 2002. e-Transformation Turkey Project aims to foster the evolution and to coordinate information society activities with a coordination of State Planning Organization (SPO), which is affiliated to the Prime Ministry. Prime Ministry, NGOs, and all public institutions are identified as affiliated organizations for this project. The structure of this action plan covers eight major sections including strategy, e-Education and Human Resources, e-Health, e-Commerce, standardization, infrastructure and information security, legislation, and e-Government (SPO 2004). The objectives of e-Transformation Project concerning public administration are as follows:

- Mechanisms that facilitate participation of citizens to decision-making process in the public domain by using ICT will be developed.

- Transparency and accountability for public management will be enhanced.
- Good governance principles will be put in place in government services through increased usage of ICT.
- Public IT projects will be coordinated, monitored, evaluated and consolidated if necessary in order to avoid duplicating or overlapping investments (SPO 2003, p.4).

"Government On-Line" or "e-Government" lies at the heart of e-Transformation Turkey Project. It is seen as an essential part of government reform and restructuring (SPO 2003). The 'e-Government' project has been launched with the objective of providing convenience to citizens in services provided in daily life and increasing the welfare of individuals. Within this framework, restructuring of the state, raising the level of education and health of the society, strengthening scientific and technological capability, development of new technologies and improvement of physical infrastructure are critical. The objectives of e-government as follows:

- *Transparency*: Providing public access to all kind of information through the Internet media will reinforce the 'transparent government' concept.
- *Service for 7 days a week 24 hours a day*: Apart from improved service quality, governmental service will be only a 'click' away for 7 days a week 24 hours a day.
- *Increased participation*: the main idea is that the more availability given to the public, the more an interactive government is generated.
- *Easy, quick, and convenient access*: As Internet technology use is carried into the provision of public services, "government office" will turn into "government portal". Since everyone will benefit from the ease afforded by this new technology, equal service quality will be available nation-wide.
- *Service quality*: As services begin to be provided on the Internet, the public will benefit from high quality, standardized services.
- *Monitoring red-tape*: Operations previously carried out on paper such as; voting, health, taxes, public registration, customs procedures and municipality services will all be transported to electronic media together with the establishment of the e-government notion, making them available for all kinds of analysis.

- *Reducing expenditure*: The burden of yearly government expenditure will be drastically reduced by the adoption of the e-government system (TUSIAD 2001, p.135-136).

Today, most of the public institutions in Turkey have web sites and some portion of them can offer interaction between the user and the government. Currently 3054 web sites are operated by public institutions and state organizations. Roughly, out of 200 public institutions 30 of them have the ability to interact with the users. Most of the rest are able to provide information only (SPO 2004).

There are about 200, big or small, e-Government projects underway. Within Turkish e-government framework, some ICT projects have been developed in conjunction with municipalities and public sector organizations concerning local governments. "YerelNet Project" and various state-supported e-municipality initiatives developed by larger metropolitan municipalities such as Istanbul, Ankara, İzmir and Yalova are the major projects in progress.

YerelNet (LocalNet) Project

"YerelNet" is a web portal and web-enabled communication platform for local governments in Turkey (Yildiz 2002). It was launched by the Ministry of Interior in cooperation with Public Administration Institute for Turkey and the Middle East (TODAIE) in 2001. The main objective of the project is to build a network of local administrations over the Internet in order to improve the cooperation among local authorities and to share information. YerelNet is a state e-portal is being created to build state e-agencies that will provide effective, transparent, secure, fast and uninterrupted service. This would also guide the state and citizens to use the electronic medium (Güler 2001).

Currently, YerelNet hosts information on 3,216 municipalities, nearly 35,000 villages and more than 1,000 local government associations. It is a very accessible and democratic website, with no password or fees. Samples of information available on YerelNet include: (1) Lists of local governments (2) Lists of government bids and tenders (3) Publications and press coverage of Turkish local governments (4) Local elections results since 1963 (5) Important international developments (6) Basic information on fiscal, personnel and infrastructure issues (7) Interactive local government library and public forums (Yildiz 2002). Despite its great premises it is too

early to provide objective evidence on whether or not program's objectives have been achieved.

Rise of e- Municipality in e-Government

The terms "e-municipality" or "e-local government" are used more or less interchangeably with each other to indicate municipal services on-line. Municipalities have lagged behind central government organizations in the context of on-line public services. Aside from some major metropolitan municipalities they do not have the knowledge, technology and financial capacity required for the establishment of these services. Derived from the survey results of YerelBilgi Project provided by YerelNet in 2001, the extent of ICT diffusion into municipalities can be grouped under five main headings:

1. Rate of Computerization: The data provided by YerelBilgi Project (2001) indicate that 69% (2100/3064) of total municipalities have computers (Güler 2001).

2. Automation of Municipal Services: In the survey, the term "*automation"* is used to indicate a digital environment that some municipal services such as accounting, budgeting, personnel, and infrastructure management are operated by using relevant computer software package (**Table 6.1**). The findings indicated in Table 6.1 suggest that most of the municipalities use software packages usually just for accounting purposes (TBD 2004).

According to survey results only 30% of municipalities (903 of 3064) have automated municipal services. Among them, 12% of municipalities (381 of 3064) have in-house data processing centers. Almost half of the municipalities surveyed are provided computer services from private IT firms (Güler 2001).

Table 6.1 Computer usage of Municipalities according to some basic municipal services, (Source: TBD 2004)

Municipal Services	**Rate of Computer Usage (%)**
Accounting	70
Budgeting	67
Personnel	54
Infrastructure Management (Water, Waste disposal etc.)	43
City Planning	12

3. Internet Connection: According to 2001 survey results, only 15% (467 of 3064) of total municipalities of Turkey have established dial-up Internet connection (Güler 2001). Since then, the Internet connection rate of municipalities has risen rapidly (currently 75% of total municipalities have Internet access according to data provided by TBD e-municipality report) (TBD 2004). The results of YerelBilgi Project survey (2001) also indicate that according to the type of municipal administration larger metropolitan municipalities are at the top in all categories except Private IT Firm support. On the other hand, to provide IT support from a private firm is quite high in smaller non-metropolitan county municipalities (**Table 6.2**).

Table 6.2 Computerization rate according to type of municipal administration (source: (Güler 2001))

Type of Municipal Administration	Existence of Computer (%)		Internet Connection (%)		In-house data processing center (%)		Private IT Firm Support (%)		Automation of Municipal Services (%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Metropolitan	100	0	80	20	80	20	60	40	40	40
Metropolitan –district	97	3	51	49	78	22	88	12	69	69
Province	98	2	50	50	77	23	77	23	58	58
County	79	21	24	76	23	77	79	21	46	46
Non- metropolitan	63	37	18	82	9	91	72	28	40	40
TÜRKİYE	69	31	22	78	18	82	75	25	43	43

4. Establishing Web Sites: As of October 2001, there were approximately 150 municipality web sites in Turkey (Güler 2001). Today municipal web sites in Turkey are estimated nearly as 390 (12% of total municipalities) (TBD 2004). According to Yıldız (1999) it is possible to group these municipal web pages into three categories:

The first group can be defined as pamphlets on the web. Most of the web sites fall into this category. They are prepared for depicting the historical and natural beauties of the region and thus for promoting internal, and especially external tourism activity.

A second and a smaller group of municipalities use their web sites as a platform for political discussion and promotion. In these sites, there is detailed information about

the mayor, his activities, and the political party that he belongs. These web sites are also status symbols for the mayors and their parties.

The third and the smallest group are the ones that provide administrative information and feedback channels to its visitors. The most developed web sites belong to large municipalities such as Ankara, Istanbul, Izmir, and Bursa. These big cities enjoy relatively adequate expert personnel and information technology infrastructure, together with a constituency that regularly use the Internet and demand the municipality to be on the web in a professional way (Yildiz 1999, p.11-12).

5. Adoption of high order Information Systems (GIS/MIS): Management and operation of various information systems and information technologies are constituted cutting edge of the IT-based municipal organizations. Municipalities are responsible to provide the basic urban services (i.e. infrastructure development, fire department operations, garbage collection, planning services etc.) to the public that requires collecting accurate information about their environment and efficient use of this data to perform their tasks. Municipalities collect and manage both *spatial data* (i.e. master plan and application plans, land-use maps, cadastre maps) and *non-spatial data* (i.e. water system revenues, environmental taxation, building permits) in their operations. Almost 80% of total data exploited by municipalities are "spatial data". Thanks to advancing technology municipalities are increasingly using geographic information systems (GIS), decision support systems (DSS), management information systems (MIS), and Internet to carry out administrative, auditing, and planning tasks more efficiently. Among these technologies, GIS is very essential for municipal operations with their enormous strength to process spatial data (Sanal Gazete 1999). Before discussing current municipal implications of GIS and other information systems it will helpful to mention the diffusion of GIS in Turkey briefly.

6.1.2.3. Development of GIS in Turkey

Since the end of 1980's different sectors have implemented GIS in Turkey. Karakurum and Biter's (1997) study on GIS market in Turkey - according to the ranks assigned by vendors to the sectors to which they have sold GIS packages - illustrates the primary sectors using GIS, being municipal services with mean ranks of (10.67%), then

Urban Planning (8.79%) and Cartography (8.13%) (Erarslan 1997). The results of this survey indicate that municipalities are the primary customers for the GIS market. Before examining the implementation process of UIS for selected municipal organizations diffusion process of GIS will briefly be discussed under four major stages:

At the **First Stage** (1980-1989): firstly hardware demand of users was met by GIS vendors (Ucuzal 1999). The hardware needed to run a GIS and workstation-based GIS products were very expensive. The software market was not as developed as today. In this period, the adoption of GIS in the world was nearly universal, but GIS adoption in Turkey was embryonic at best. According to Gülersoy (1999), one of the earliest GIS projects in Turkey began with the production of digital maps covering the boundaries of Istanbul Metropolitan Municipality in 1987 (Gülersoy and Yigiter 1999).

At the **Second Stage** (1990-1993): the hardware demands of GIS users were still very important. Aside from hardware demands, the new developments in the software market increased client's choice to select from larger spectrum of GIS products. However, in most cases, software preferences of the clients were not based on full-awareness and knowledge in system's capabilities, and not derived from the realization of information systems they need. Most of these systems are not functional today. During the second stage, most of the GIS projects were in a partial basis covering basically infrastructure services or environmental projects that are supported by international donors or the distributors of the major foreign GIS companies in Turkey. Of the earliest examples of these actions, one was a training program on GIS organized in the framework of 'Coastal Area Management Program' for 'The Bay of Izmir' by 'United Nations Environment Program' in 1993. (UNEP 1993). As Gülersoy (1999) suggest, 1990-1993 period witnessed the widespread diffusion of GIS especially in universities and large public sector organizations. Since 1994, a rapid development process has occurred respectively (Gülersoy and Yigiter 1999).

At the **Third Stage** (1994-1996): the clients recognized the importance of software functioning, independent from the hardware. Almost all GIS vendors have provided the client organizations such as municipalities and universities with many demo versions of their software package as free of charge for promotion. Until 1994, clients still purchased very expensive workstation-based GIS products. The complexity of standard software packages without local language support and training provision caused serious difficulties in operating these systems by users (Sanal_Gazete 1999).

Then, the emergence of high-capacity PCs with lower costs obligated the vendors to convert their software packages appropriate for desktop PC environments. Workstations began to be used as main systems, or servers were established via networks to connect every different branch of user organizations. Alongside the partial GIS projects, city-wide pilot projects (Aydın Municipality in 1996) and international donor-aid urban information system projects (Bursa Metropolitan Municipality) were initiated.

At the **Fourth Stage** (from 1997 up till today): according to Ucuzal (1999), finally after 1996, GIS adoption in Turkey reached its fourth stage. Institutional users of GIS finally recognized the three major points related to the effective GIS adoption: (1) *determination of GIS objectives* related to basic software functions, use and user type, and data sources; (2) *application development* according to their needs, and the graphic and non-graphic database design relevant with applications; (3) arrangement of *continuous training provision and service support* (Ucuzal 1999). On the providers' side, all GIS vendors changed their marketing strategies to provide application developments depending on specialized demands of various GIS users. They recognized that 'pilot project approach' in marketing was enough only for the promotion of their product, but as the municipalities have got limited technical and human resources for the completion of the project, most of the systems became useless. Therefore, vendors started to increase their technical support and training provision correspondingly (Erarslan 1997).

The devastating earthquake in Marmara region in 1999 affected the progress of GIS projects in Turkey. Especially after a disaster, people suffer from the lack of vitally important information, because such information never existed or was never kept in a systematic way. The importance of accumulation of up-to-date and accurate data distributed among city-wide organizations was recognized. In Sakarya, The GIS Center was established by the Sakarya Governorship, which was responsible for the coordination of all public organizations in the city (Tecim 2001). Another major reason was rapid development of Internet in Turkey in recent years, triggering the need for intra/inter-organizational GIS. With the advance of new ICTs, integration of GIS and Internet has become possible. Especially metropolitan municipalities in Turkey have started to distribute some GIS data via Internet. Providing interactive city maps by major Turkish metropolitan Municipalities (Istanbul, Izmir, Bursa, Kocaeli etc.) is just

among recent efforts, and needs to be improved in terms of both content and accessibility (Karas 2001).

Major GIS Users in Turkey

Geographical Information Systems are considered as appropriate tools for the preservation and the management of spatial information. Since the end of 1980's different sectors implemented GIS, in Turkey. Karakurum and Biter's (1997) study on GIS market in Turkey according to the ranks assigned by vendors to the sectors to which they have sold GIS packages illustrate the primary sectors using GIS are as follows: Municipal Services with a mean rank of (10.67%), then City and Regional Planning with a mean rank of (8.79%) and Cartography with a mean rank of (8.13%). Other sectors are Education (6.29%), Electricity, Water and Gas Authorities, Ministry and other Public Associations, Defense, Petroleum Companies, Mining Engineering, Communications, Agriculture and Civil Engineering (Erarslan 1997). The results of this survey indicate that local authorities are the primary customers for the GIS market in Turkey.

According to Ucuzal (1999), there are three different types of institutional GIS users in Turkey (Ucuzal 1999):

1. Central Government: Central government institutions usually operate with small scale applications and they have good capacity of human resources, better working conditions and financial resources. In most of these institutions (i.e. Ministry of Public Affairs, The Bank of Provinces, Land Office, State Institute of Statistics) there are at least a demo version of GIS software and hardware in any of their administrative branches. In the majority of central government institutions that made investment to GIS technologies there has not been constituted as a proper GIS utilization. The ambiguity in the clarification of organizational needs forced these institutions to obtain standard software modules that were not suitable for organization's objectives, and lack of getting technical support in the implementation and customization of the products.

2. Private Sector: Private sector organizations invest in GIS technologies to obtain net profits or using these technologies as a tool to determine the feasibility of their investments. In this context, they use GIS to analyze the spatial urban structure. The dilemma for the private sector is that the cost of GIS remains very small in accordance with the cost of data required.

3. Local Government: The capability of plan making, programming and decision making of the municipalities are largely dependent on the collection, storing, preservation and the management of the spatial information and the information related with the use of the space. Therefore, public works (engineering)-city planning applications are the major concerns of most of the Municipal GIS operations (Ucuzal 1999). In Turkish case, there has not been a municipality which wholly completed establishing a comprehensive urban spatial information system so far. Ankara, Istanbul, and Bursa are the cities, in which implementation process of GIS projects is still continuing (Celik 2002). Because municipalities are the primary customers for the GIS market in Turkey the term urban information system (UIS) has become more popular in Turkish GIS literature in recent years (Tecim 2001); (Baz 1999); (Tokman 1999). By combining many of the municipal services into Municipal GIS or in the scope of the so-called UIS information system, it is aimed that many municipal services will be combined. Thus the system will be shared with other related local governments and central public organizations in the city, and thus service unity will be obtained. Becoming widespread in recent years, this tendency, which is called "corporate approach", encompasses a strategy that aims to increase sharing of information both within and among institutions (Masser and Campbell 1995). But compared with types of "departmental" and "individual" system implementation, this approach that necessitates accumulation of knowledge means local governments should cope with more problems within the current structure. Problems in running and using UIS in municipalities can be summarized under three main headings:

- *Software:* When we look into the current state of Municipal IT/IS applications, it is seen that IT/IS investments are primarily based on CAD-based systems. The most important factor here is thought to be those that complexity of the GIS packages and that they require predisposition for language, programming and computer, and the level of accumulation of knowledge GIS requires literacy come to the fore.
- *Staffing and Management Structures*: other important factors are that there are sort of bottlenecks in human resources, and the regulations currently in effect render standard IT/IS packages unusable in municipalities. It is for this reason that GIS implementations that were brought from abroad and put into use without any adaptation faces with failure. Because of these problems, many

municipalities turned to CAD-base programs instead of costly GIS investments. These programs involve some advanced level functions and methods of analysis compared to GIS modules (Ucuzal 1999).

- *Data Issues*: Digitalization efforts for spatial urban information systems and GIS are in infant stages, and lacking. For this reason, the concept of GIS in Turkey is frequently taken for the subject of digital map production. Since the system is based on use of spatial and non-spatial data together, the problem of digital map production should be solved first (Gülersoy and Yigiter 1999). In terms of information sharing, Internet and telecommunications infrastructure of municipalities are so neglected that cannot realized to interact with the public and public initiatives capably on-line (TUSIAD 2001).

In this section, problems were dealt with in general. Problems related with various implementations and their examination of these starting with the sample of city planning departments will be obtained through the evaluation of the results of empirical research.

6.1.3. City Planning Context

Computerized planning tools namely as basic office automation software, GIS and CAD software have entered the planning departments of Metropolitan Municipalities of Turkey in early 1990s. Among them, GIS are considered as appropriate tools for the preservation and the management of spatial information. Since the beginning of 1990s different sectors implemented GIS in Turkey. When searching for the institutional use of GIS in Turkey it is observed that GIS has been utilized in universities, central government institutions and municipalities predominantly in the field of surveying and city planning (Gülersoy and Yigiter 1999).

IT/IS in Turkish City Planning Literature and Education

First studies conducted using information systems in planning fall into early 1990s. Taking priority among these are the studies describing spatial changes in cities with the help of GIS. Güvenç's doctorate thesis determining industrial distribution in Istanbul using Q programming language (1992), again Güvenç's and Işık's studies (1996-1997) determining social change in Istanbul are important in this (Tekeli 1998).

A very important part of the literature related with information systems and technologies in city planning is constituted by the studies conducted by universities. Publication realized by practitioners and software companies began gain prevalence only towards the end of 1990s: In the newspaper published in 1995 by Autocad software company Sayısal Grafik Ltd., section involving the use information technologies in urban planning began to take place.

As an example of first GIS studies conducted by universities, we can mention a study realized by İ.T.Ü. titled, “Planning of urban system in terms of conserving and sustaining the ecological balance”. “Istanbul Historical Peninsula Project" conducted in 1995 by Yıldız Technical University, Faculty of Architecture is another pioneering study was put forward for the purpose of establishing A Model of City Information Model to provide data for projects of planning, urban design and architectural design to be realized in cites with historical features (Gülersoy and Yigiter). On the other hand, studies of thesis conducted at universities have become one of the most important tools in accumulating data for using information technologies and information systems.

According to the results of the scanning conducted in 2003 through the documentation archive in Higher Education Council (YÖK), it can be said that around twenty post graduate studies and doctorate thesis were produced in city planning departments. Among these studies, among the first group studies there are those with sectoral base, and that emphasize on ‘urban space’ such as the effect of information technologies on urban space (Artar 1999); (Oztep 2000), spatial place choosing in communication and electronic sectors (Dede, 1994).

In other group gives emphasis to the use of information technologies as a tool in planning practice. This group can be divided into three sub-groups:

(1) Using information technologies and systems in the process of city planning: i.e. use of information technologies in city designs (Elliiki, 1996), expert system in planning, and planning support systems (Dikçınar 2000), GIS-based city planning implications during the process of participation (Yigitcanlar 2001);

(2) Using information technology within the basic expert areas in city planning: i.e. using information systems in preservation planning (Yigiter 1998), using GIS in choosing place for housing areas (Saygin 1992);

(3) Institutional use of information systems: i.e. 'data acquisition problem of GIS implementation’ special to various municipalities in metropoles, (Erarslan 1997). As

mentioned in the introduction section, it is difficult to say sufficient studies were conducted on this sub-group. Information systems entering Turkey late and diffusion being limited also reflected itself to quantitative studies conducted.

As information studies, nearly all of the above-mentioned studies of thesis emphasize on GIS. Considering the fact that GIS has got a widespread area of use, and there exist a number of disciplines in the area of information systems, especially in 'geodesy and photogrammetry engineering', and 'public administration'.

IT-based planning tools (i.e. GIS, CAD, electronic spreadsheet, basic office automation software, Internet) has become an increasingly important tool for students in planning programs around the world, thus providing a growing number of planning professionals who come to the work world with a working knowledge of these computerized tools.

First computer applications lectures given in planning schools in Turkey were on developing algorithm and programming languages. The software and hardware was primitive and interest amongst students and faculty members was limited. The general consensus was that computers were better to be left to the experts. But especially after the second half of 1990s, subjects related to basic computer applications, and the use package programs such as CAD and GIS began to take place in the planning curriculums. With the advent of the Internet, and a rise in general level of awareness, interest and demand began to form toward advanced-level applications. Despite all these developments, computer literate man power, as it is throughout the world, is also defined as an important problem in planning practice in Turkey (Gülersoy and Yigiter 1999). Universities being in the front, IS vendors and professional chambers all undertake this task.

IT/IS in Turkish City Planning Practice

Turkey was first confronted with computer in the early 1960s. In the same years, a planning period was given a start and, within this process, the concept of city planning gained prevalence and found the opportunity to scientifically base itself. After the second half of 1960s, land use models and transportation models were devised using contemporary planning techniques in 'Metropolitan Planning Offices' set up in Istanbul, Ankara and Izmir (Tekeli 1998). But considering the fact that there were only around 100 mainframe computers in the country, and they were highly costly and run only by

computer experts, it can be said that scientific methods for city planning, and systems approach were adopted in line with the world. But computer-based models could not find true place in the practice of city planning in this period.

1980s witnessed technological transformation as much as it did economic and political changes. Parallel to the liberal economic policies implemented, and with the developments in telecommunications sector, renewing the technical infrastructure, liberalizing the import, microcomputers (PCs) entered fast the Turkish market, bringing vigor to the informatics in the country. That local governments began to gain financial and administrative autonomy, and that authority related with endorsing reconstruction plans delegated to them after 1985 (with the Reconstruction Law No:3194) gave way to important development in the professional practice. Metropolitan municipalities being set up by the Law 3030, in 1984, first application were realized in the area of information systems in planning in the direction of the desire making use of technological developments in areas audited by metropolitan municipalities. During the period in which Istanbul Metropolitan Municipality opened tender for the digital maps covering the responsibility areas of Istanbul Metropolitan Municipality, many local governments began to turn to institutional GIS systems.

In recent years, information systems in planning areas, especially of GIS, have been talked of frequently but it is not known yet clearly in what areas and how this system will be used (Gülersoy and Yigiter 1999). In the metropolitan municipalities of our big cities such as Istanbul, Ankara, İzmir and Bursa, and in some metropolitan-district municipalities (i.e. Kadıköy-İstanbul, Nilüfer-Bursa), especially GIS has been in use. But some problems arose because, as needs grew, these were not defined clearly and introduced into the software programs as a result, the systems installed already have not been utilized actively and systems and programs have been changed continuously.

Despite a number of opportunities such as designing, visualizing, participating, changing policies, modeling provided by information technologies and systems, very few of the have been used in planning institutions. Considering the nearly 35 year experience of IT in Turkey there is no fully utilized spatial urban information systems in Turkish case. In Turkish planning practice, local government institutions are the major adopters of these systems and have gained some achievements in the automation of basic IT services. However, no innovative use of various IT technologies such as remote sensing, spatial modeling, simulation and forecasting etc. in the institutional practice of

urban planning and management has been observed so far (Akbulut 1999). In planning organizations, beginning from pre-implementation phase, there exist problems in all stages. Determining these problems and creating assessment opportunities form the basic subjects for the empirical research to be explained in the next section.

6.2. Research Strategy

It is decided to choose the case study research as the main research strategy. This technique is often used to study implementation of planning technologies (generally for GIS) in public sector planning organizations by significant urban researchers (Campbell 1987); Onsrud et al. 1992; (Pinto and Onsrud 1993); (Masser and Campbell 1995); (Nedovic-Budic 1998). Case study research proposed for the study is exploratory since the fieldwork and data collection may be undertaken prior to definition of the research questions and assumptions mentioned previously. Although selecting cases is a difficult process it is recommended that the selection offers the opportunity to maximize what can be learned, knowing that time is limited (Yin 1993).

The research strategy on which the empirical investigations were based combines a variety of approaches, including two different types of closed questionnaire-based surveys and semi-structured/unstructured interviews in the planning departments of selected metropolitan municipalities. The analysis of cases addresses the main research questions raised in the preceding chapters.

Preliminary surveys and observations in metropolitan-district municipalities of Izmir (Konak, Bornova, Balçova) implied that planning departments in smaller municipalities have lack of resources, expertise, and operation of large-scale technological systems that is questionable for the testing of assumptions and research questions. Therefore, to exemplify the organizational context of IT/IS use, city planning departments of Turkish Metropolitan Municipalities are selected as major unit of analysis with four general reasons:

- Their readily wider acceptance of operation of various IT/IS-based systems,
- Existence of a planning department as a single, defined unit within an organization,
- Availability of richer financial resources, larger size of planning staff, and the targeted centers of new information technologies and systems that provides ease of evaluation for the research,

- The greater variety of planning topics and levels they have to concerned that increase the need of inter/intra organizational coordination, and the greater chance of observing computer-assisted special planning tasks.

In this context, planning departments of Ankara, Izmir, and Bursa Metropolitan Municipality were selected which represented about 1/5 of the total number of systems present within Turkish Metropolitan Municipalities with three specific reasons:

- Because the headquarters of many firms developing and distributing information systems are in Ankara due to the position of this city in the administrative mechanism, this situation could form a positive for Ankara in terms of pursuing and utilizing in planning units,
- The fact that 23rd Universeade Olympic Games are going to be held in Izmir in 2005 will encourage the use of information systems both in- and inter-institutions because Izmir Metropolitan Municipality initiated, within its urban vision, the project "e-İzmir", which would raise its life quality.
- Bursa's urban information system (UIS) model, which has come into being with feasibility studies and international loan, and basic data to be obtained from the pursuit of this plan specially on the city planning model have been basic determiners in choosing these examples.

As a result of preliminary site visits, a number of previous attempts the other two, except Bursa, for setting up information systems, despite the above mentioned projects, have not been yet able come, despite all efforts, to a position to integrate the city planning division into the system. For example, in Izmir, priority was given on systems that generally require non-spatial data such as setting up telecommunication infrastructure (İzmirnet), İZSU automation, document recording, cemetery automation, purchasing and inventory, pursuing document, and vehicle pursuit system. Although the examination of Ankara and Izmir samples provided important information in pre-implementation and implementation stages, it has been observed that the most consistent results can be dealt with in the case of Bursa Metropolitan Municipality.

In concrete terms, the research strategy and associated research methods planned to use in the case study has integrated three parts (**Fig 6.1**):

The **first part** of the empirical research focuses on the procedures and attitudes. The aim is to clarify (1) the extent of IT/IS diffusion within planning department and

larger organizational context; (2) the reason/tendency for adoption in the perspective of different stakeholders; (3) and general awareness/readiness level within the organization. The appropriate research method for this analysis is 'semi-structured interviews' by the interested technical and political bodies through the guidance of Rogers's (1993) diffusion of innovations model (see chapter 4). Also a 'checklist' of measuring e-readiness level is applied to understand the current level of IT/IS use within organization. Both interviews and e-readiness checklist assist to understand the first assumption of the study that "*the influence of, and dependence on, information technology is growing increasingly in workplace in general and in city planning organizations in particular*".

The **second part** of the research illustrates the nature of implementation process in selected planning organizations. The pre-determined personal and organizational implementation factors adjusting from the relevant information systems (IS) and GIS literature are tested through a 'general survey' with IT/IS users in the department. Then, to determine major obstacles and benefits derived from implementation process and to assess which implementation dimensions are prevailing (technical, social-organizational, user) for chosen organizations are formed based on the semi-structured interviews. These techniques assisted to test the second assumptions of the study that "*the organizational and user dimension of implementation factors more than technical ones, constitute the main obstacles to the improvement of information technologies and systems in city planning agencies*".

The **final part** of the empirical research is devoted to evaluate (1) IT/IS effectiveness on computer-assisted planning tasks; (2) success and failure of IT/IS applications; and (3) individual, organizational and social consequences of IT/IS use. This part covers post-implementation stages of information technologies and systems within chosen organizations and opens to the most of the discussion about the consequences of these technologies. Therefore, widely recognized IS/IT success models (DeLone and McLean's IS success model, Heeks's Conception-Reality Gap assessment), were used (see chapter V).

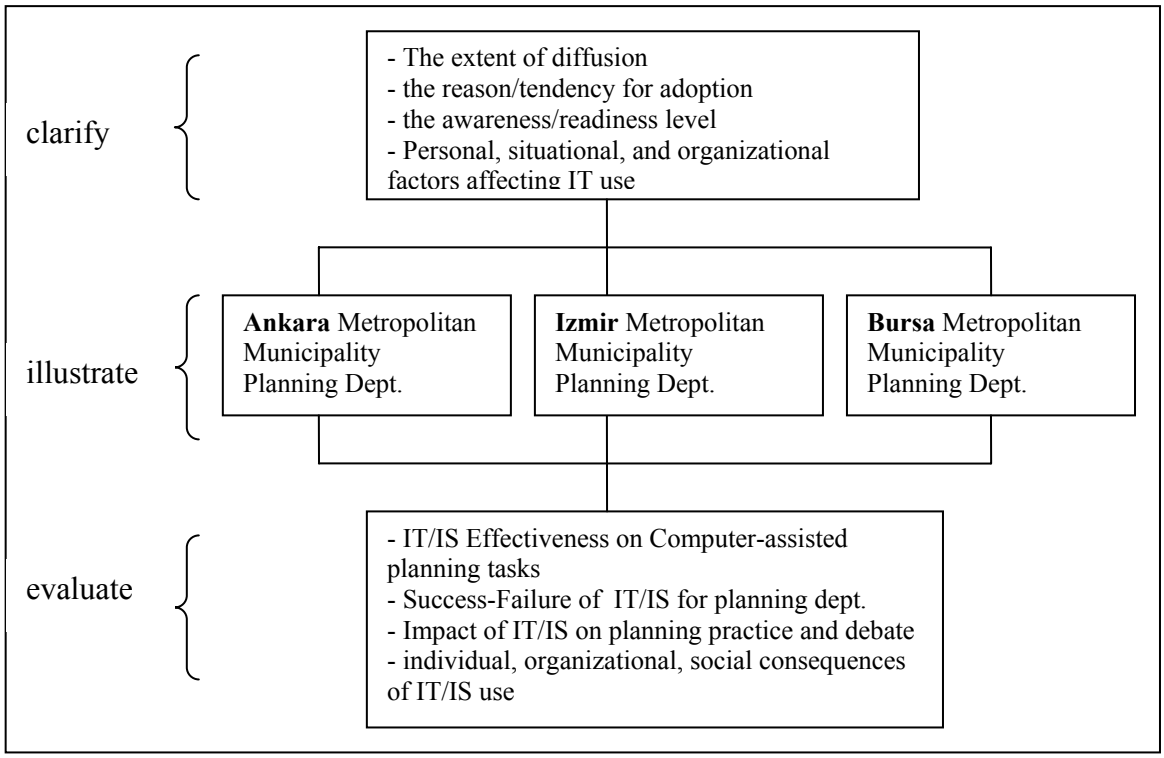

Figure 6.1 The general structure of research strategy

Research Approach:

Because case studies were directed towards planning departments in local governments and that a substantial part of these researches has been conducted in GIS area, approaches presented by these studies were effective in choosing the research approach. In short, these approaches can be collected in two groups (Ramasubramanian 1999):

Content or Factors approach: identifies factors that enable or impede technology implementation in particular organizational settings. This approach is considered very useful identifying new research questions. It can be used to identify the benefits and constraints associated with adoption of particular technologies. However this approach is criticized firstly its static view of adoption, and secondly the absence of contextual information to identify why certain decisions regarding implementation were made at certain points of time.

Process approach: examines the dynamic nature of technology adoption by indicating the key stages or decisions that are made during implementation. It distinguishes the decisions in different implementation stages. This model may be proved useful because it assist in identifying the critical steps in the adoption of technological innovation into organizations. However, the process approach ignores

overarching factors that caused particular decisions to be made (Ramasubramanian 1999).

In this framework, cases have been examined in this study with the help of both the "factors" and "process-oriented approaches". The base of the study is constituted especially by human factor. So while looking for the effect of " personal and situational characteristics of "factors approach" during the process of implementation, decisions that affect the applications in city planning departments will be dealt with the help of "process approach" within a vicious circle that consists of pre-implementation, implementation, and post-implementation (**Table 6.3**).

Table 6.3 Appropriate techniques to use adjusted to stages of implementation

Implementation stages	What to measure	Method to use
Pre-implementation	- The extent of diffusion	**Interview** with IS Managers, Chief Planning Executives , and other computer literate staff **Direct observation** and **Documentation**
	- the reason/tendency for adoption using framework of Rogers's diffusion of innovations model (1993)	**Interview** with IS Manager, and Chief Planning Executives,
	- the awareness/readiness level	e-readiness **Checklist**
Implementation	- Personal, situational, and organizational factors affecting IT use - Impact of IT/IS on planning practice and debate	**General user Survey** with IT/IS users in the department
Post-implementation	- IT/IS Effectiveness on the accomplishment of Computer-assisted tasks (system perf.) - individual, organizational, social consequences of IT/IS use	**Specialized user Survey** based on DeLone and McLean's IS Success Model (1992)
	- Success-Failure of IT/IS for planning dept.	Heeks's (1999) Design-reality gap assessment based on **ITPOSMO model** **Factor rating**

6.3. Case Study Research

In the context of case study research survey questionnaires and interviews were conducted in March and April 2004. The general framework of surveys and interview were given in the below.

1. Interviews

Interviews were conducted with managers and other staff who have no difficulty in using IT in the metropolitan municipalities of Ankara, Izmir and Bursa. The research consisted of 6 structured qualitative interviews and 10 complementary interviews with other responsible interviewees in and out of selected departments (**Table 6.4**).

Table 6.4 Distribution of interviewees according to selected metropolitan municipalities

Municipality	**Number of Interviewees**	
	Managers	Other Staff (Clerical, professional)
Ankara Metropolitan Municipality	2	2
Izmir Metropolitan Municipality	2	5
Bursa Metropolitan Municipality	2	3

There are two main objectives of these interviews: firstly, to learn great deal about IT/IS implementation process through revealing the key points in all stages, and secondly, to determine the attitudes and support of managers as major 'gatekeepers' in the implementation of new innovations.

The interviewees for structured interviews were selected on the basis of the following inclusion criteria:

- Interviewee's influence on the development of IT/IS systems in the department
- Interviewee's professional reputation –preferably a chief executive of the department
- Other interviewees were selected from the planning officers who responded the specialized user survey.

All interviews were transcribed. Each interview lasted between 45 and 90 minutes, with an average length of 60 minutes. The essence of the opinions was condensed from the transcribed interviews to make the material suitable for analysis.

The process involved reducing the interviewee's statements to shorter sentences, structured in accordance with the issues in the interview guide. All interviews were carried out at the interviewee's place of work. The interviews followed a structured interview guide developed from issues originating from the ITPOSMO dimensions of Richard Heeks' conception-reality gap theory, and Rogers's (1983) innovation diffusion theory (**Table 6.5**). To verify and supplement the interview data complementary documentary materials were used later on.

Table 6.5 Structure of the interview

Structure of the Interview	
First Section: Pre-implementation stage	- The reason/tendency for adoption - e-readiness level
Second Section: Implementation stage	- obstacles and benefits derived from the implementation of IT/IS in the department - strengths and weakness of the organization in order to overcome the implementation problems
Third Section: Post-implementation stage	- evaluation of IT/IS implementation in the department based on Heeks's seven ITPOSMO dimensions

2. Surveys

Two different structured questionnaires were applied in planning departments of selected Metropolitan Municipalities (Ankara, İzmir, Bursa):

a. General user survey was widely applied to all the staff in the department. The participants were asked to fill out all the 17 structured questions within three major parts even if they were not familiar with the computerized planning tools. General user survey focused on profile of a city planning practitioner in detail to understand the city planning- information technology relationships better. This survey carried three aims: (1) to draw a profile of planning practitioners working in selected municipalities (e.g. age, sex, education, computer literacy, job title, duration of work), (2) degree of their knowledge on planning technologies and their perception of implementation of information technologies and systems in the department (3) to identify their attitude toward new technologies and their future role in planning practice and debate. The

variables that were used in this survey are listed in **Figure 6.2**. This survey was carried out with the widely used statistical software package of SPSS.

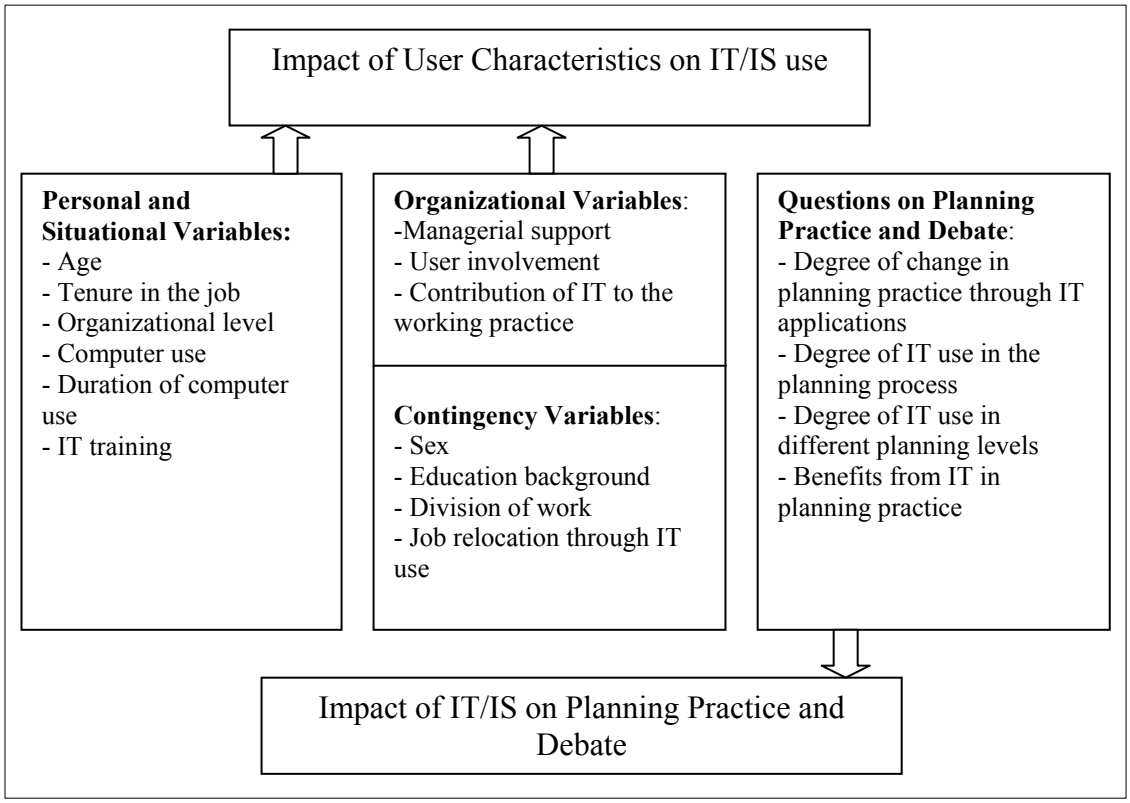

Figure 6.2 The variables and questions of general user survey and their relationships with the objectives of the survey

b. Specialized user survey was simply applied to city planning staff in the department that uses computerized planning tools as an integral part of their daily working practice. A questionnaire built from the reviewed theoretical model of DeLone and McLean's (1992; 2003) 'Model of IS Success' (see chapter V) to explore (1) technical aspects of current planning software (system quality, data quality); (2) their performance in working practice (information use, user satisfaction) and (3) several consequences originated from the implementation in the department (individual impact, organizational impact, and social impact). The participants' perceptions were asked on each set of meta-variables about the information system he or she operates. The questions were ranked on a Likert-type five-point scale. The 31 variables used in this survey were selected according to their applicability with planning tasks among over 100 variables from DeLone and McLean's (1992) model of IS Success measures. Nedovic-Budic's (1998) suggestion of 'societal impact' was also added as an extra dimension to the

original list of variables that are listed in **Table 6.6**. This survey was also carried out with the SPSS.

Table 6.6 The selected measures for specialized survey
source: adapted from (Nedovic-Budic 1998)

System Quality (5)	**Information Quality (5)**	**System Use(5)**
- system integration - ease of use -ease of learning - usefulness of system features and functions - realization of user requirements	- relevance -usefulness/ sufficiency - accuracy - completeness - currency	- amount and duration of use - application areas - use for intended purpose - routinization - voluntariness of use/ motivation to use
User Satisfaction(4)	**Individual Impact (6)**	**Organizational & Social Impact (6)**
- overall satisfaction - information satisfaction - decision making satisfaction - quality of work	- learning - problem identification/ accurate interpretation - decision effectiveness - improved individual productivity - individual power of influence - quality of plans	- operating cost reduction - increased revenues - product quality - contribution to achieving institutional goals - service effectiveness - public participation/ information access

Content: The impacts of information technologies and systems on city planning departments of selected Metropolitan Municipalities were therefore measured in relative terms, and the reports were based on respondent's perceptions. The decision to rely on the survey respondent's perceptions was based on the two basic considerations:
(1) High order planning technologies like GIS are recent phenomenon among municipalities in Turkey. Therefore, it is important to measure users' realities and satisfaction to systematize the design and implementation efforts of these technologies.
(2) It is suggested that the influence and dependence of information technology applications are growing increasingly in city planning organizations. So, it is important to determine the extent of computerization in planning workspace and future role of these technologies in planning office from the experience of planning practitioners.

Population and Sampling: The distribution of the sample (**Table 6.7**) shows that responses from three selected Metropolitan Municipalities (Ankara, İzmir, Bursa) were

analyzed. Jurisdictions of all municipalities had populations over 1,000,000 people. Respondents of the two questionnaires were given below.

Table 6.7 Distribution of the respondents according to Municipalities

Metropolitan Municipality/ Number of Respondents	Ankara	İzmir	Bursa	Total
General user survey	17	18	12	47
Specialized user survey	4	7	10	21
Total	21	25	22	68

6.3.1. Pre-Implementation

Pre-implementation, as mentioned in chapter IV, covers measures that ensure potential users to have more knowledge on the available technologies, their possible applications, and their benefits and costs. The findings were organized as (1) general information about the organization and the planning staff, (2) the reason/tendency for information technology adoption, and (3) e-Readiness Level of respected organizations.

1. General Information

City planning departments are mostly the parts of a larger organizational structure and embedded as an individual division within their organizations. City planners in these departments are generally gathered under the roof of detailed planning and metropolitan planning units. These units are organized as branch directorates under the Directorate of Research Project and Coordination and the Directorate of Reconstitution and Planning. Apart from these units, city planners work in Directorate of public Works and Directorate of Transportation. The city planners in the units interviews were held are given in **table 6.8**.

Table 6.8 Distribution of respondents according to division of work

Division of work:	Freq.	Percent.
Application planning	16	34,04
Metropolitan Planning	27	57,45
Other (Urban Information Systems Division, Urban Design Division, Directorate of Transportation)	4	8,51

When the relationship between in-house information system units and city planning departments is considered, there is only the Division of Urban Information Systems of the Directorate of Reconstitution and Planning in Bursa Metropolitan Municipality that carry on its activities as an organization. Other samples consist of Data Processing Centers of directorates of reconstruction and planning. Information Technology and Cartography Directorates as well as the Division of Urban Information Systems as in Bursa Municipality provide planning units with technical support and digitized spatial maps such as land-use maps or base maps.

2. The reason/tendency for adoption

The stages that would affect the decision for applying the "innovation", which is defined as 'innovation diffusion process' by Rogers, are indicated as knowledge, persuasion and decision. (Rogers 1993). During the interviews held with IT managers and planning department heads, questions related to the stages defined by Rogers were asked, and the answers given these questions are as follows:

knowledge and persuasion: It is clear that managers are aware of the existence of the technologies used and improved in the field of urban planning. When the resources from which information on technologies that are defined as "communication channels" by Rogers are looked into, effects of (1) IT fairs (2) promotions and seminars held by software vendors (3) views from in-house IT departments[1]. (4) views from other units and organizations that apply the sound systems (5) personnel whose relevant IT experience and knowledge is reliable[2]. (6) Internet were clearly seen. Internet was said to be particularly effective in terms of following up the recent developments and prices of hardware[3].

decision: Planning departments are not usually independent in their choice of IT as they act in accordance with the conditions of the organizations they are part of. There are two ways for new technologies to enter such organizations: (1) through donation or a bank loan: relevant software and hardware are donated by the vendors or demo versions are given free of charge or, as in Bursa Metropolitan Municipality, they are

[1]. Interview with head of Metropolitan Planning Division of Directorate of Reconstitution and Planning in Ankara Metropolitan Municipality (March,2004)
[2]. Interview with head of Directorate of Reconstitution and Planning in Izmir Metropolitan Municipality (April, 2004)
[3]. Interview with the head of Urban Information Systems Division of Directorate of Reconstitution and Planning in Bursa Metropolitan Municipality (April, 2004)

allowed to the organization at the end of a process of choosing a software company through a loan obtained from the World Bank and a bidding system. In a similar way, GIS software, hardware and training were received through UN at the end of a UNEP programme in which İzmir Metropolitan Municipality participated in 1993. (2) Through in-house IT Departments: The software and hardware used at Ankara Metropolitan Municipality are said to have been obtained through the in-house IT departments. Except for Bursa Metropolitan Municipality, appropriate software and computer configurations were first obtained through these departments. Then, as the use and duration of IT increased during work, planning departments started to demand IT/IS appropriate for their needs.

In the process of deciding on the investments for IT, the technical language used and personal relationships also play an important role. It is said that decision-makers at the top positions usually are not very familiar with IT terminology, and they act within economic and political conditions when determining the priorities for IT investments. As aforementioned, IT inappropriate to organizational objectives and to works done is the foundations of the problems encountered during implementation. In order to avoid such problems, study on "feasibility" and "benchmarking" should be done during the pre-implementation stage, and organizations should act accordingly. Even though Bursa Metropolitan Municipality started investments on IT/IS following a feasibility study within an organizational scale realized by an international consultant firm (1995), other organizations seem to have started their practice on IT after spending significant amount of time and money through a trail-error stage. The research report prepared by Gülersoy (1999) confirms this process:

> It appears that there are more than one software packages in many organizations and firms that are in connection with urban planning. The reason for this is that either most practices are at their trial or pilot stages or software packages that exist in the market are tried out in different areas and organizations are under political influences during their decision-making phase (Gülersoy and Yigiter 1999, p.299).

3. e-Readiness Level:

All cases surveyed have had an increasing interest on IT/IS investments since 1990s. Despite the fact that implementation stage has started, it is difficult to claim that practices and studies are carried out in compliance with specific objectives and an IT

strategic plan. The level of readiness for organizations to use IT is determined quantitatively through benchmarking and feasibility studies. However, in order to determine the current readiness level of planning departments in a general framework, e-readiness framework defined by Heeks (2001) has been referred to and it has been studied under six subgroups(Heeks 2001):

(a) data system infrastructure: There is an absolute need for data in the heart of all information technologies and systems. It is important to digitize spatial and non-spatial data (or attribute data) in order to create an Urban Information System. In all the organizations surveyed within this framework, digitization is being carried on. The interviewees claim that in their units they will have completed the digitization process in a few years. Digitization of spatial data is carried out by controlled cartography directorates and in-house IT departments. Only in Bursa Metropolitan Municipality (BMM), digitization of detailed plan and activities to control were started in the planning department in BMM and then digitization was assigned to metropolitan-district municipalities while controlling is carried out in BMM. Connecting attribute data to spatial data was realized only in BMM between the years 1997-1999. However, there are still problems with updating the attribute data. In other cases surveyed, although collecting attribute data is continuing, connecting this to spatial data is still at its premature stage. Moreover, it is rather difficult to collect specialized data that would meet the needs of urban planning due to economic and bureaucratic reasons. In this respect, work volume of city planning departments supported by IT gets smaller and most of the opportunities that the system brings out are not used. Therefore, especially in İzmir and Ankara Metropolitan Municipalities preferred to use CAD-based software packages rather than expensive GIS investments.

(b) legal infrastructure: Despite the delays on legislations related to electronic data transfer and transmission in Turkey, there has been considerable improvement recently. The legislation concerning the right to have 'digital signature' and to collect information was put into practice only at the beginning of the year 2004. However, since regulations were recent and not put into practice, their likely influence on the metropolitan municipalities was not obvious. There are problems encountered in carrying out some tasks that Metropolitan Municipalities legislation (issue no.3030) requires with the support of urban information systems in compliance with the current legislation system. "*Since urban Information systems prepared with software products*

of various companies mostly meet the requirements of Municipalities legislation no. 1580, and Construction legislation no. 3194 , they have not managed to transfer the tasks and authority defined at metropolitan municipalities that were established in compliance with the legislation no. 3194 to a computer environment" (BUIS, 2003)

(c) institutional infrastructure: Among the organizations surveyed, only Bursa Metropolitan Municipality (BMM) has intended to establish an urban information system and managed to make up relevant units and coordination functions. BMM has also restructured municipality units in relation with 'Total Quality Management' activities. In this respect, a technical support unit for IT was established in the planning department. Although specialized units related to IT support were formed in other organizations, organizational infrastructure of such units was not formed.

(d) human infrastructure: All the organizations interviewed pointed out the importance of the human factor. Having knowledge on IT and being able to use them are important criteria of recruiting people objectively, except for political manipulations in these organizations. It was also pointed out that when a new employee has the capability of using IT-based systems, work process speeds up and correct decisions are more likely to be given[4]. City planners who started working after 1996 in the organizations interviewed were said to have more competency at information technologies and systems[5]. In the next five or ten years, people who have no competency at using IT and have no command of a foreign language will not have much chance to get a job[6]. It was also claimed that while existing staff has been encouraged to use IT and its importance has become more significant in personal records in the organization[7], in-house IT training has not been realized efficiently apart from BMM. The results of the general survey shows that significant number (89,4 %) of city planners working in planning departments feel the need to use IT software. This proves that readiness level of human infrastructure within the organizations interviewed is rather high.

(e) technological infrastructure: Most developing countries are a long way short of the computing and telecommunications infrastructure. Since in Turkey Turkish Telecom has not been privatized and the telecommunications market has not been open to

[4] Interview with head of Directorate of Reconstitution and Planning, Izmir
[5] Interview with head of Metropolitan Planning Division, Ankara
[6] Interview with the head of Research Project and Coordination Directorate of Bursa Metropolitan Municipality (April,2004)
[7] Interview with head of Metropolitan Planning Division, Ankara

competitions, transferring and sharing data have not been realized at the required speed and cost. According to the" 2nd Turkish IT Council e-municipality interim report" of Turkish IT Association (TBD) dated 2004, of the municipalities that own computers, 74% of them have an access to Internet almost all of which are provided with "dial up" (TBD 2004). Technical infrastructure investments among the urban development units have been completed within the organizations surveyed. However, some problems are experienced in terms of transferring data between departments and organizations as units of metropolitan municipalities are located in different campuses and buildings in the city. While Bursa Metropolitan Municipality has an investment plan on the issue, İzmir Metropolitan Municipality is going through a bidding process for VAN (value added network) connection, namely "İzmirnet", that would connect all municipality units and relevant public organizations to each other.

(f) leadership and strategic thinking: Leadership and vision are said to be the major pre-conditions in order to implement successful IT (Heeks 2001). All of the managers of the organizations in which the interviews were held claim to have an important role in implementing and using information technologies in their own units. In terms of readiness for IT, political changes within the organizations[8], cultural structure of the country, the pace of technological changes and quality of people are believed to be important[9]. Since 2002, adopting the idea of "e-municipality" and "e-government" around the 'e-Europe+ program' as state policy has had positive impacts on metropolitan municipalities surveyed and its reflections on the political leaders' programmes. For example, in İzmir Metropolitan Municipality, the mayor and the local council are said to support technological developments and accept all expenses and changes in the IT field as priority in order to have a democratic and modern municipality structure. The steps taken for "e-izmir" vision by İzmir Metropolitan Municipality seems to a clear proof for this.

[8] Interview with the head of Urban Information Systems Department, Bursa
[9] Interview with the head of Directorate of Reconstitution and Planning, Izmir

6.3.2. Implementation

The findings related to implementation process were given under two major headings: (1) the results of general user survey covering personal and situational factors affecting IT use, and possible impact of IT upon planning practice and debate from the perspective of planning practitioners; (2) the results of interview covering the problems of implementation and organizations capability to tackle with these problems in general.

6.3.2.1. Results of General User Survey

Results of general user survey can be discussed under three main categories: (1) impact of user characteristics upon IT/IS use; (2) impact of IT/IS on Planning Practice derived from user's attitude towards new technologies in city planning practice and debate.

1. Impact of User Characteristics on IT/IS use

Personal and situational characteristics may influence one's perception of information and the way one processes such information. Individuals with distinct characteristics and backgrounds are expected to have unique ways of interacting with information systems and, consequently, have different attitudes and behavior toward such systems (Khalil and Elkordy 2001). In this context, first section of the survey investigated the relationship of user's age, sex, education background, division of work, tenure in the job, organizational level, IT training and duration of system use on planners' knowledge of IT use and their attitudes toward new technologies in planning practice and debate (**Table 6.9**) (**Table 6.10**).

Table 6.9 Frequency distribution of Personal and Situational Variables

	Frequencies	**Percent**
Age:		
(1) 20-25	2	4,3
(2) 26-31	15	31,9
(3) 32-37	17	36,2
(4) 38-43	9	19,1
(5) 44-49	3	6,4
(6) 50+	1	2,1

Table 6.9. (cont.)

Sex:		
Female	31	66
Male	16	34
Education background:		
Undergraduate Degree	40	85,1
Master Degree	7	14,9
Tenure in the job:		
(1) Less than one year	1	2,1
(2) 1-2 years	2	4,3
(3) 3-5 years	5	10,6
(4) 6-10 years	18	38,3
(5) 11-15 years	14	29,8
(6) 16 years or more	7	14,9
Organizational Level:		
(1) City planner and Other Staff	37 (+7)	93,6
(2) Department manager	2	4,3
(3) Division Manager	1	2,1
Computer Training:		
(1) Formal Computer Training	26	55,3
(2) Informal or no computer training	21	44,7

Table 6.10 Mean rankings of users

	Mean (years)	**S.D.**
Age	2,98 (32-37)	1,07
Tenure in the job	4,34 (6-10)	1,12
Duration of computer use	5,11	2,88

Correlations between User-Organizational Characteristic and IT/IS use

In this part of the study selected variables of personal and situational characteristics are compared with the uses of information technologies and systems expressed by the staff in selected planning organizations. All possible IT/IS software in city planning was grouped according to Piracha and Kammeier's (2002) classification of planners' knowledge namely, "hands-on use" and "advanced level use" (see Chpt. 3):

- Hands-on use software covered basic CAD, basic GIS, Office Programs and Internet-based tools.
- Advanced level applications that required some additional knowledge were included PSS, MIS and Project management tools, Statistical and Modeling programs, and knowledge of computer programming (**Table 6.11**).

Table 6.11 Frequency Distribution of Planners' knowledge on IT/IS (n=47)

	IT Knowledge on Planning Technologies							
	Don't know (1)		Heard of/read about (2)		Worked with (3)		Mean	S.D.
Hands-on Software	Freq.	%	Freq.	%	Freq.	%		
CAD	5	10,6	13	27,7	29	61,7	2,51	,69
GIS	9	19,1	23	48,9	15	31,9	2,13	,71
Office	1	2,1	8	17,0	38	80,9	**2,79**	,46
Internet	2	4,3	6	12,8	39	83,0	**2,79**	,50
Advance Level Software Applications								
Programming Tools	24	51,1	21	44,7	2	4,3	1,53	,58
PSS	40	85,1	7	14,9	0	0	**1,15**	,36
MIS/ PM	32	68,1	15	31,9	0	0	1,32	,47
Spreadsheet	28	59,6	16	34,0	3	6,4	1,47	,62

The level of interest of user groups in hands-on software has been examined in terms of age, tenure group, organizational level, computer use, duration of computer use and training of the 'personal and situational characteristics' shown in the frequency distribution table and the results below have been obtained:

*Age***:** A person's willingness to accept a new technology or a change may differ with the person's age. Since younger users generally display a more positive attitude toward the information system, they are more ready to accept the change (Khalil and Elkordy 2001). A negative correlation between hands-on software use and age($r=-0.39$, $p<0.01$) has been found. This proves the expectation summarized above on the samples investigated.

Tenure in the Job: User attitude and behavior toward information systems are expected to vary with the user's work experience, measured as tenure in the industry, organization, or job (Khalil and Elkordy 2001). There is also a negative correlation found between 'hands-on software use' and 'tenure in the job' ($r=-0.53$, $p<0.01$) on sampling.

Organizational Level: The organizational level of the user's job determines his/ her responsibilities and decisions and, consequently, his/her informational needs (Khalil

and Elkordy 2001). Therefore, computer use may vary at different managerial levels. There is a negative correlation found between hands-on software use and organizational level ($r=-0.33$, $p<0.05$). This indicates that people at the managerial positions do not need to improve their knowledge in terms of hands-on software use. Besides, when the tenure in the job of this group is considered, it also supports the results in the "tenure in the job" category. However, since the proportion of the people at managerial position is low (6.4%) and the study does not focus directly on the use of IT by managers, it may be difficult to reach a generalization from these results.

Computer use: Of the people working in the planning departments surveyed, 72% of them (37/47) use computers on their daily work. All the ones who do not use computers do not use any type of IT software either.

Duration of Computer use: Lengthy use of an information system may strengthen the user's belief in its usefulness, which, consequently, may increase his/her use of the system (Khalil and Elkordy 2001). In the research, the positive correlation between hands-on software use and duration of computer use ($r=0.41$, $p<0.01$) supports this statement. Lengthy use of IT by staff members (mean= 5.11years) has had a positive impact on hands-on software use.

Computer Training: was found to have no correlation with hands-on software use. That although 55,3% of the people (26/47) has received formal IT training, they do not use IT software related to their everyday tasks at work in practice may be one of the likely explanations for this inconsistency. Another explanation is that even though 44,7% of the people (21/47) has not received formal IT training, they may be able to use software packages in practice with the help of the knowledge gained during informal processes (**Table 6.12**).

Table 6.12 Crosstabulation between hands-on software use and computer training (n=47)

Count

		Formal Computer training		
		no	yes	Total
Hands-on Software use	don't know	8	9	17
	work with	13	17	30
Total		21	26	47

Other Findings:

- Education background, gender, and division of work were found to have no effect on users' attitudes toward hands-on software use.
- No correlation between software requiring advance level knowledge (i.e. planning support systems, electronic spreadsheet, or hypermedia tools) and tested personal and situational variables has been encountered. That such software has not yet been utilized in the organizations surveyed and the knowledge the respondents have related to them is very limited is the main reason for that. There is a positive correlation encountered, although small, between "software requiring advance knowledge" and "duration of computer use" in terms of programming ($r=0.35$, $p<0.05$) and electronic spreadsheet ($r=0.29$, $p<00.5$) software. On the other hand, that ratio of hands-on software use is high (63.8%) within the organizations surveyed provides an opportunity in terms of awareness raising for advance level IT software.
- Another set of variables affecting IT/IS use are organizational variables namely "user involvement" and "management support". 'User involvement' is defined as a psychological state, which refers to the importance and personal relevance of a system to its users. 'Management support' is defined as the extent to which the upper managerial levels provide an appropriate amount of support for IT/IS (Seliem et al. 2003). It is expected that both user involvement and management support lead to an increase in the system usage. When hands-on software usage was looked into no significant relationship was encountered in terms of management support and user involvement. However, management support seems to have positive influence on user involvement ($r=0.35$, $p<0.05$). 66% of the respondents (31/47) say that they are encouraged to use IT within their organizations. 89.4% of the respondents also need to use IT in terms of the tasks they performed. While the ratio of computer use is 72.4% and of hands-on software use 63.8%, the need to use IT is far above these ratios. This situation shows respondents' positive attitude towards IT usage without being influenced by the organizational environment. As a matter of fact, 93.7% of the respondents found IT useful in their daily work. Another result obtained, in terms of organizational determiners, is that respondents' being able to use IT software has no positive impact on their organizational levels. Although the managers said capability to use IT software was one of the important criteria to be

considered during a recruitment process, it is obvious that using IT software does not play an important role in personal carrier development when working.

Regression Analysis

Following the results of correlation analysis the total numbers of independent variables were condensed into four personal-situational dimensions and two organizational dimensions respectively. A stepwise regression analysis was performed on the data set. The objective was to use the several independent variables whose values are known to predict the single dependent value (Pinto and Onsrud 1993). This technique was repeated until it was determined that all significant predictor variables have been included (**Figure 6.3**). The given three models have predicted the independent variable (Hands-on Software use) in various degrees (**Table 6.13**).

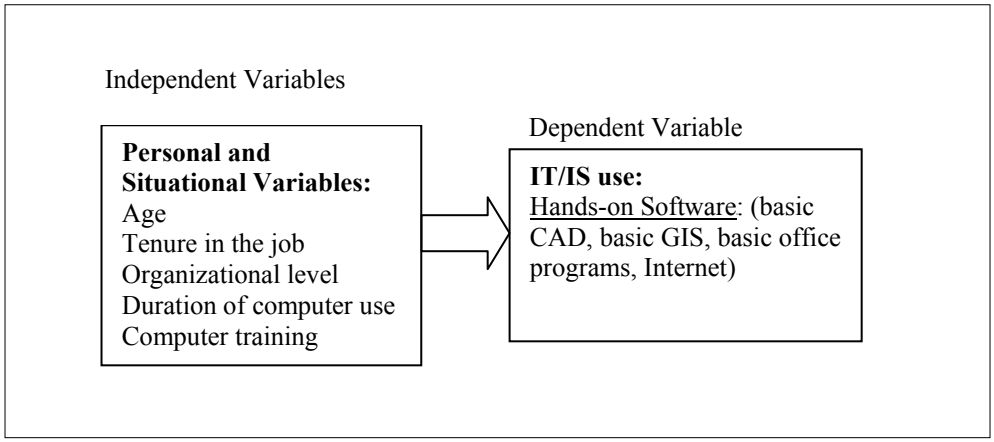

Figure 6.3 Independent variables and dependent variable calculated in stepwise regression analysis

Table 6.13 Stepwise regression: (n=37)

(1) Dependent Variable: Hands-on Software use

Model	R	R Square	Adj. R Square	Std. Error of the Estimate	F
1	,442 [a]	,196	,173	,380	8,51
2	,608 [b]	,370	,332	,341	9,96
3	,675 [c]	,456	,407	,321	9,22

a. Predictors: tenure in the job
b. Predictors: tenure in the job, duration of computer use
c. Predictors: tenure in the job, duration of computer use, computer training

2. Impact of IT/IS on Planning Practice

Second segment of the survey is devoted to planning practitioners' perception of new technologies on city planning practice and debate. The results of this section are as follows;

- *Would widespread use of IT make significant changes in city planning practice*? 80% (38/47) of the planners who answered this question thinks that using new technologies will have significant transforming impact on city planning practice. This underlines the fact that technological developments have a stronger impact on the respondents than the view of "new tools to perform old tasks".
- *At what stage of planning process is IT used mostly?* Respondents were asked to rank the frequency of using IT during city planning process from "the most" to "the least" on a 5-point scale. As a result, data collecting, issuing and evaluating features of IT were pointed as "the most important" (mean=1.58) whereas ICT's influence as an enabler on the "participation" process in planning was evaluated as "the least important" (mean=4.17) (**Figure 6.4**). ICT not being evaluated as a new participation means by the respondents as well as the idea that IT may support technical-rational side of planning more may have an impact on the result.
- *At what planning level could IT be used more effectively?* Respondents were asked to show at what level of planning IT is used most effectively on a 4-point scale from ranking it from the "the most" to "the least". IT was said to be used the most frequently at the 'urban design' and 'detailed planning' levels. Considering that software packages used in city planning practice is CAD-based and is mostly effective on architectural scale, one may find the results reasonable. On the other hand, the results indicate the need for establishing an urban information system that would be appropriate for effective IT usage at planning levels such as regional or master planning (**Figure 6.5**).
- *What is the most important benefit that would be obtained from IT/IS usage in city planning*? Respondents were asked to rank the benefits of using IT during city planning process from "the most" to "the least" on a 5-point scale. They gave importance to some benefits such as data collecting and processing (mean=1.36) and having the role as supplant in routine planning tasks (mean=2.38). Here, too, functions such as decision-support and participation–

data-sharing capability of IT/IS are seemed to have been neglected by respondents (**Figure 6.6**). It would be possible to have improvement in these areas if a complete urban information system with all its functions working efficiently was established and advanced software knowledge and skills to use it were improved.

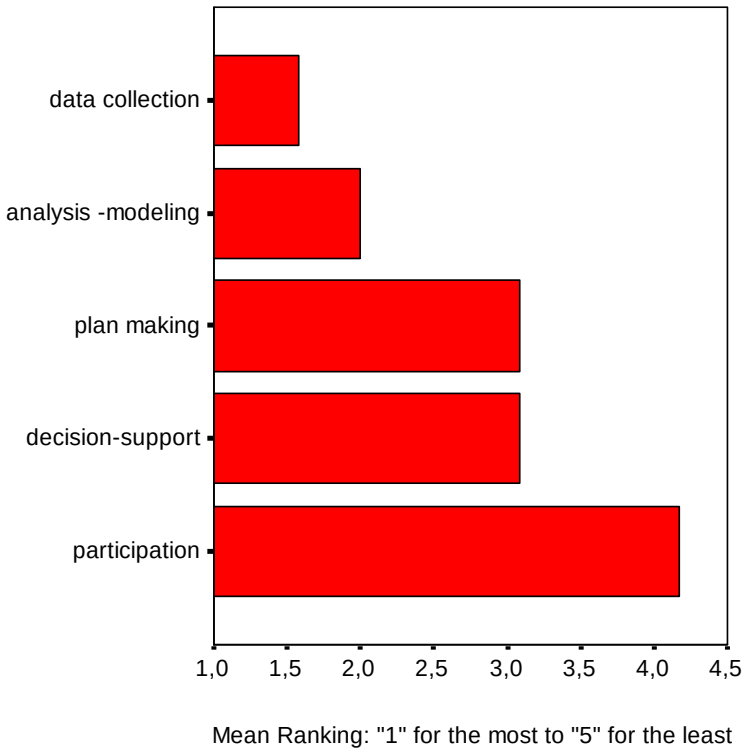

Figure 6.4 *At what stage of planning process is IT used mostly?*

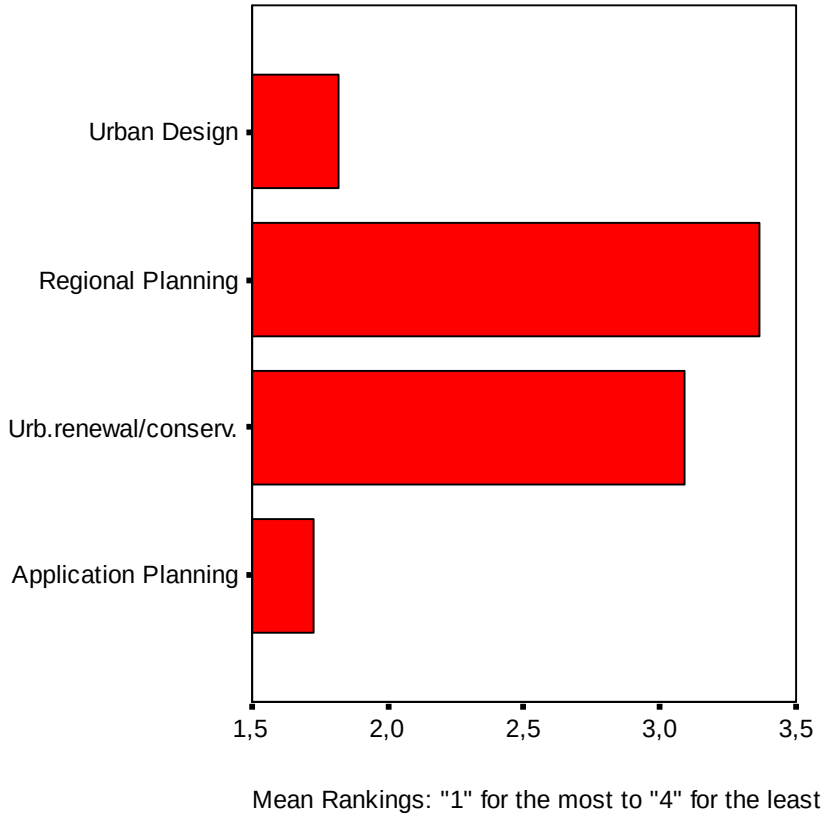

Figure 6.5 *At what planning level could IT be used more effectively?*

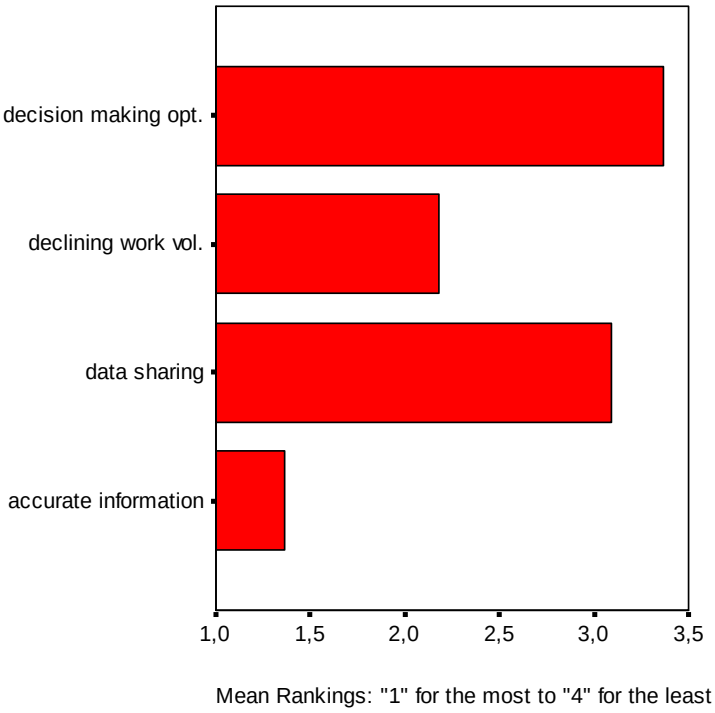

Figure 6.6 *What is the most important benefit that would be obtained from IT/IS usage in city planning?*

6.3.2.2. Obstacles and Benefits derived from IT Implementation

It is obvious that despite increasing use of information technologies and systems in planning departments, it will take some time to realize the benefits of their implementation. In fact, even though the planning departments of three metropolitan municipalities surveyed may have more advantages in particular areas compared to the ones in other municipalities, these selected organizations have a very short history of implementation. Therefore, while the obstacles were mentioned in detail by the interviewees, the benefits derived from implementation remained relatively peripheral for them. Besides, since the interviewees were planning heads or professional staff members, views of elected officials, other decision-making bodies, and citizens on obstacles and benefits from IT implementation were reflected only indirectly. In order to form a systematic framework to summarize implementation obstacles, criteria developed to determine the obstacles for planning support systems (PSS) by Guido Vonk (2003) in a similar way as were GIS success criteria (hardware, software, orgware, finware, ecoware) (Douwen et al. 1993) introduced by Douwen et al (1993) (**Table 6.14**).

Table 6.14 Major Obstacles derived from IT implementation process

OBSTACLES	
Software-Hardware	▪ Software inefficient to give 3D visualizations, and to promote the product and inadequate for current planning practices ▪ Not using software improved in terms of presentation and liaison as well as in compliance with planning methods and legislations
Humanware	▪ Personnel who do not follow up technological innovations (quality) ▪ Short of personnel who are open to IT-based work processes (quantity)
Dataware	▪ Insufficient and unreliable supply of base maps, cadastre maps and other planning data that would be essential for urban planning functions ▪ Problem of updating digital data periodically ▪ Insufficient information on urban planning issues conveyed to the public by metropolitan municipalities ▪ Digital data repetitions due to miscommunication between organizations and losses in terms of time and money due to reasons such as incompatible and non-updated data

Table 6.14. (cont.)

Orgware	▪ Existing ICT technologies which do not match the idea of e-municipality, ▪ Canceling investments on information technologies and systems as a result of changes in the managerial levels, ▪ Authorities to approve technical reports not having full comprehension of them and limited support given.
Planning Task & work process	▪ A need to form teams that would work on contemporary planning of good quality rather than on the quantity of plan production, using software professionally. ▪ Even though work volume has increased and working hours have become shorter, missing the details that are taken into consideration in the traditional planning process, such as knowing and understanding the area studied especially during master planning stage and revising the decisions made, and as a consequence, alienation from work ▪ Still doing most of the analysis essential for urban planning through traditional methods and working in 2D, although IT-based environment has been established. ▪ Having digital data (both spatial and attribute data) production problem adjusted to needs of urban planning, and also due to political and economic reasons, narrowing the context and volume of those data intended to be collected. ▪ Considerable waste of time during auditing and approval processes as a result of not having office automation and digital archive that consists of information such as planning decisions and planning dates.
External world: Legal rules, politics, macro economy etc.	▪ Digitally-produced plans of no legislative validity ▪ It is not possible to encourage the personnel to use information technologies within the existing legislation ▪ Not being able to form legal procedures related to selling, sharing and copywriting of plans created in a digital environment by municipalities and lack of organizational bodies that would deal with such problems.

As Budic (1994) puts it, "*the assessment of benefits is used as an indirect measure of the success of implementing GIS*" (Budic 1994, p.245). Possible benefits derived from implementation of information technologies and systems can be both tangible and intangible. The tangible benefits (quantitative), as Budic states, often identified with increased efficiency, can easily be submitted to cost-benefit analysis (Budic 1994). Less tangible or qualitative benefits could be better monitored by using qualitative techniques such as in-depth interviews. Abundance and diversity in potential benefits of information technologies and systems do not mean that such technologies will be very useful for city planning. In order to evaluate the benefits of information technologies in city planning, their usage should be monitored within the organizations in which such planning is implemented in *practice*. With this objective, a summary related to the results obtained from the interviews is presented in two main categories

(**Table 6.15**). Increase in the possible benefits derived from implementation depends on the elements such as diversification in areas of use, reorganization of work process and increase in duration of utilization.

Table 6.15 Benefits derived from IT implementation process

BENEFITS	
Improvement in Decision-making	▪ Accuracy in technical information collected through IT also directing decision makers towards ratio-technical accuracy ▪ Carrying planning tasks into a digital environment provides an opportunity for a planning unit to communicate with the other units and politicians more easily and to convey the problems to them more quickly and accurately, and consequently to gain more prestige professionally ▪ During quantitative plan audits the risk derived from IT use to make a mistake and to waste time gets smaller and the process of decision making and finalizing gets easier
Improvement in Work process	▪ Saving time through use of software that is in compliance with plan-making procedure and technique and consequently the improvement in daily routine tasks. ▪ Ease of accomplishing planning audits derived from IT usage and having an increase in the production of recently planned areas ▪ Making fewer mistakes in routine planning tasks, having an increasing rate in accuracy. ▪ Facilitating the control among the planning scales and having an opportunity for designs and presentation at any required scale. ▪ Having studies of analysis and synthesis more easily and faster since various data used in planning analysis may be superimposed easily in a computerized environment. ▪ Shortening the periods of works otherwise would last much longer with traditional methods.

SWOT Analysis

SWOT analysis in the selected organizations may be a useful starting point to identify the long term impact of information technologies and systems as well as the contingencies and opportunities of new technology within a specific formative context. The SWOT analysis has been traditionally used in the marketing or economics areas of the business. An analysis is performed on the various areas of the organisation to identify current or potential strengths and weaknesses when compared with other competitive forces. From this analysis, the organisation identifies actual or potential opportunities to gain strategic advantage or threats to the organisation's well being (Burgess and Schauder 2003). Being a highly subjective technique, SWOT may be more helpful in guidance rather than prescriptions.

Tracking implementation process by SWOT we can provide valuable information about significant threats which may cause the failure of IT projects within the respected organizations (Huxhold and Levinsohn 1995). This technique is also very useful in the preparation of IT staretegic plans and developing organizational policies. Therefore, a SWOT analysis was structured according to opinions of interviewes given in the **Table 6.16** below.

Table 6.16 SWOT Analysis

SWOT Analysis	
Strengths	▪ staff quality ▪ independency in technological and staff choices ▪ power of information technologies and systems in accuracy and speed of working process
Weaknesses	▪ lack of office automation ▪ budget cut-offs in the new IT investment and maintenance ▪ incompatibility of working procedures with IT ▪ lack of top-managerial support ▪ lack of funding for maintenance of database ▪ no clear vision for the sustainability of technological investments ▪ Data access to the public is not easy, most of the on-line services are just made for increasing revenues
Opportunities	▪ possibility of ease of data sharing between central administration directorates and municipalities with the new draft law of local governments ▪ the more chance of conducting IT strategic plans through rising e-government and e-municipality initiatives in public sector organizations (PSOs) ▪ cost reduction in office communication and validity of digital services through the impacts of digital signature law
Threats	▪ work process in PSOs are so ineffective that they lag behind to operate and invest new technological innovations ▪ the widening of boundaries of metropolitan municipalities, mentioned in new draft law Metropolitan Municipalities, may reduce the readiness level in digital data collection and processing ▪ data pricing policy: applications of central administration directorates based on the law of 4736 create high costs of purchasing digitized spatial data ▪ lack of inter-organizational coordination between public sector organizations ▪ lack of awareness-readiness level of citizens that demands high quality on-line municipal services ▪ shrinking opportunity to find international/national donors for new projects due to the high rates of failure in preceding IT/IS projects ▪ incompatibility between metropolitan-district municipalities and metropolitan municipality in terms of different service provision, software choice, and operating systems ▪ absence of national geographic information infrastructure, and insufficiency in collecting attribute data due to the low level computerization of PSOs ▪ inefficient national telecommunications infrastructure

6.3.3. Post-Implementation

Post-implementation is the term used to indicate certain maturity reached by the application of an innovation, and benefits and effects attained in this situation. This complex process also encompasses the process of evaluating the results of implementation, and institutionalization of the system or termination of the project.

It is difficult to say that the process of implementing IT/IS applications has been conducted by rational and technical methods in public institutions in Turkey. Many technological innovations are terminated before they reach the level of maturity during application period due to political reasons or personnel problems.

Any attempt to assess an information technology reminds us the performance criteria mentioned in Chapter 5 (quality, efficiency, effectiveness, productivity, etc.). In order to assess the success or failure of IT in this direction, first, DeLone and McLean's IS success model was used to measure the performance of information technologies and systems (IT/IS), and their effects on individuals and institutions. Secondly, Heeks' conception-reality gaps typology was used that is more qualitative and interpretive, compared to DeLone and McLean's model. Opportunities both models present give us opportunity of looking through a broader window in to the evaluation of the success of IT system.

This section will focus on the assessment of the models summarized above in two parts. The assessment will be conducted by evaluating the samples chosen from the models.

6.3.3.1. Results of Specialized User Survey

DeLone and McLean's (1992) model proposes that "*system quality and information quality singularly and jointly affect both use and user satisfaction. Additionally, the amount of use can affect the degree of user satisfaction as well as the reverse being true. Use and user satisfaction are direct antecedents of individual impact; and lastly, this impact on individual performance should eventually have some organizational impact*" (Roldan and Leal 2003, p.68) (see chapter V). In the survey, information system success measures developed by DeLone and McLean (1992) were conducted with slight changes to the 21 respondents from the respected authorities. The

intent of the survey was to assess the degree of satisfaction with information quality, system quality, system use, user satisfaction with the system, and to learn much about the importance level of the individual, organizational and social impacts of information technologies and systems using the five-point Likert scale. Exploring correlations between success measures and validation test of DeLone and McLean's original model was out of the scope of this survey. The general evaluation of results indicated that mean values of each success measures not exceeds the 3.19. This suggests that respondents generally satisfied with their system features and their impacts especially on individual level. The detailed discussions of each category were given under four major headings mentioned below.

1. Satisfaction with the System Quality and Information Quality

Success measures grouped under 'system quality' and 'information quality' dimensions have exclusively indicated the technical and engineering aspects of the information technologies and systems. The results of system quality measures indicated that respondents generally satisfied the learning and the use of the software and it usefulness and effectiveness to fulfill their requirements (**Table 6.17**). In terms of 'ease of use' and 'use of learning' of software respondents found Netcad more satisfied in accordance with Microstation. The possible reasons of this result is with that Netcad is based on Turkish Language, and its underlying logic is based on the most popular CAD programs such as Autocad, and probably the higher chance to get training provision and system feedback. Except general purpose software Autocad, other programs used by respondents are adjusted to planning tasks and working procedures (significantly for plan-making) and therefore 'usefulness of system features' and 'realization of user requirements' was found satisfactory. On the other hand, 'system integration' measure was found marginally satisfied by their users due to the inefficiencies in the connection and sharing with the larger inter/intra organizational context.

Table 6.17 System quality (n=21) (Mean ranking: 1=very satisfied, 5=very dissatisfied)

System Quality measures	Mean	S.D.
ease of use	2,00	,707
ease of learning	2,05	,590
usefulness of system features&functions	2,29	,561
realization of user requirements	2,38	,805
system integration	3,00	,949

Since programs are CAD-based and particularly performed for plan-making the satisfaction level with the systems quality was found significantly higher. However, this trend may be reversed if the IT-assisted planning tasks are diversified (i.e. planning analysis, modeling, simulation) and richer in terms of content.

The obstacles in data content, sharing and provision were discussed in preceding sections. 'Information quality' here largely refers the spatial (graphical) data (e.g. base maps, development plans) that CAD-based applications exploited. E-readiness level of respected organizations in graphical data production and exploitation are significantly higher then respondents was found satisfied with information quality measures (relevance, accuracy, usefulness) correspondingly (**Table 6.18**). On the other hand, except Bursa Metropolitan Municipality, selected planning departments are weaker in the use and production of attribute data. It is a largely accepted view that an information system becomes useless unless up-to-date data sustained. In this context, respondents were the least satisfied with the 'currency' measure that addresses the problems in the maintenance and sustainability of data infrastructure. This also indicates the depressing effect on the exploitation of IT/IS for other significant planning tasks such as urban development management and monitoring, planning data collection and analysis.

Table 6.18 Information quality (n=21) (Mean rank:1=very satisfied,5=very dissatisfied)

Information Quality measures	Mean	S.D.
relevance	1,76	,625
accuracy	2,33	,577
usefulness- sufficiency	2,33	,730
completeness	2,60	,821
currency	2,86	,655

2. System Usage and User Satisfaction with the System

System usage is commonly operationalized in four ways in the literature: frequency of use, variety of applications used, and variety of tasks performed (Morris et al. 2002). This study employs five of the system usage measures which originally defined in DeLone and McLean's (1992) model. Results of system usage indicated that respondents are very satisfied with the use of programs to perform planning tasks and a time period that the system is used. Because planning software operated in the selected planning departments particularly adjusted to perform 'plan making' and 'presentations' tasks respondents' satisfaction with its application areas is particularly higher as well as their motivation of use toward these systems (**Table 6.19**). Although 'amount and duration of system usage' has positive impact on levels of use, 'routinization' (or institutionalization, see chapter IV) are still particularly low which probably indicates the lack of proper IT-policy toward computerization of the work place and re-organization of working process. Routinization also becomes a challenging issue in the ever-changing implementation of different systems.

Table 6.19 System use (n=21) (Mean ranking: 1=very satisfied, 5=very dissatisfied)

System use Measures	Mean	S.D.
use for intended purpose	2,05	,669
amount and duration of use	2,15	,587
application areas	2,43	,978
voluntariness and motivation of use	2,43	,507
levels of use: routinization	2,52	,602

User satisfaction is the degree to which the individual feels that the information system meets his or her information needs (Morris et al. 2002). It is the most widely used measure of computing success. The most striking results of user satisfaction category implies that 'information satisfaction' and 'decision-making satisfaction' are relatively low comparing with overall satisfaction level of respondents (**Table 6.20**). This probably was derived from the obstacles in the provision of up-to-date data (currency) and production of accurate planning data supporting variety of planning actions. Another underlying reason may the excessive use of general purpose or CAD-based software that poorly supports the variety of planning tasks and planning process

in a comprehensive manner. For example, long-term applications (i.e. planning analysis, forecasting, and modeling) are rarely automated in a comprehensive GIS/UIS environment; 'decision-making satisfaction' remains peripheral for both planning practitioners and concerning decision-making bodies.

Table 6.20 User satisfaction (n=21) (Mean ranking: 1=very satisfied)

User Satisfaction Measures	Mean	S.D.
overall satisfaction	2,29	,561
quality of work	2,48	,873
information satisfaction	2,62	,590
decision-making satisfaction	2,85	,875

3. Individual Impact

Both 'system usage' and 'user satisfaction' are direct antecedents of 'individual impact' in the DeLone and McLean's (1992) model of IS success. The results of the survey indicated that higher satisfaction level with the system usage and users' commitment to the system has significant positive impact on individual's abilities, productivity, and quality of their works (**Table 6.21**). It is expected that a good information system may improve individual performance by facilitating a better understanding of the decision context (Nedovic-Budic 1999). Although 'decision effectiveness' score selected as important it was not rated as 'very important' by the respondents. This finding implied a variety of points which roots may found in the obstacles mentioned in preceding dimensions and other methods of evaluation. For example, information technologies and systems operated in the respected departments have found somewhat positive by the majority of respondents there are still wide communications gap with the other parties such as elected officials and the public. Another point is that, the measure of 'individual power of influence' has the lowest mean value which merely refers to the public sector realities. For many PSOs computer literacy is neither an entry requirement nor an instrument for a better rank.

Table 6.21 Individual impact (Mean ranking: 1=very important, 5=not very important)

Individual Impact Measures	Mean	S.D.
learning	1,81	,512
quality of plans	1,90	,539
improved individual productivity	2,10	,625
problem identification-accurate interpretation	2,10	,641
decision effectiveness	2,19	,750
individual power of influence	2,33	,856

4. Organizational and Social Impact

Organizational impact refers to the efficient management and administration of urban development, efficient handling of information, increased productivity, public service, quality of plans and policies, and quality of urban and economic environment (Nedovic-Budic 1999). Survey results emphasize the importance of IT-driven product quality, service effectiveness and organizational effectiveness (**Table 6.22**). The findings of the survey also confirms the importance of economic side of implementation that there is no significant improvements in the operating costs, and revenues derived from IT usage despite the larger amounts of technological investments. This result, however, is open to discussion that may be well determined after conducting a cost-benefit analysis or a benchmarking study.

A social impact of an information system, according to Nedovic-Budic (1999), indicates the improvement in the public participation, access to information, and contribution to healthy and prospering communities. Social impact dimension has the lowest mean value among the overall categories. This result strongly emphasizes that there are no significant social benefits derived from IT/IS use in planning organizations. This is perhaps due to many underlying reasons. One is that, planning departments of metropolitan municipalities has no direct daily contact with the public. Secondly, output of information technologies and systems are not transmitted and sharing effectively even in the departmental level due to the technical and informational obstacles mentioned previously. Thirdly, public administration is not adjusted to principles of governance and e-government. Lastly, but the most importantly, our city planning tradition are highly based on technical-rational view of planning that overlooks the value of ICTs as enabler of participative mechanisms.

Table 6.22 Organizational and Social impact (n=21) (Mean ranking: 1=very important, 5=not very important)

Organizational and Social Impact	Mean	S.D.
product quality	1,86	,478
Service effectiveness	2,10	,625
contribution to achieving goals	2,10	,539
operating cost reduction	2,67	,796
increased revenues	2,71	,784
public participation/ information access	3,19	1,030

6.3.3.2. Heeks' Model of ITPOSMO Dimensions on IT/IS Success in PSOs

Conception-reality gaps indicated in Chapter 5 makes up of the foundation of this section. According to Heeks (1999) the gap between the conceptions of technology and organizational reality is one of the major elements that affect the implementation success directly. Heeks points out three archetypes (private-public gaps, country context gaps, rationality-reality gaps) related to conception reality gaps and seven ITPOSMO dimensions that would measure them. In this section, there are points which will indicate the success/failure of the IT/IS implementation on the samples investigated in compliance with the methods mentioned above.

1. Private-Public Gaps

Private organizations in Turkey follow up the innovations in information and communications technologies and adapt the systems used in Europe and America to their own structures. The private sector makes efficient use of opportunities IT provides in their business activities and R&D activities. On the other hand, the public sector cannot present their activities efficiently, and decisions are not made promptly and accurately as they do not benefit from IT sufficiently. Therefore, it seems that efficiency and productivity concepts are not developed in public sector and a clear need for a reform has risen (Tecim 2001). Tecim (2001) evaluates the reasons for public sector's failure in using IT/IS efficiently in four main groups: (1) lack or short of qualified technical staff using IT in most public organizations, (2) preventing creativity with a civil servant mentality, (3) not providing enough financial support for any

scientific technological and creative projects, (4) lack of managerial authority that would implement IT projects (Tecim 2001, p.3).

IT projects implemented in the public sector tend to be larger and more complex compared to the ones in the private sector (Heeks and Bhatnagar 1999). Almost all municipalities in Turkey which started with large-scaled GIS and UIS projects failed. As they have tried number of software packages and systems and had the aforementioned problems derived from implementation, municipalities have started using basic-level information technologies which are appropriate to their structures. GIS and CAD-based software packages are used in the planning units of several municipalities in Turkey. As Erarslan (1997) points out *"future market is dependent on the preferences of planning authorities between the design oriented software and analysis oriented software*" (Erarslan 1997, pp.76). Considering the fact that plan-making is the most important planning task of city planning units of municipalities, we may say that CAD-based software will still be effective in short term as it provides low-cost and opportunity to work independently.

One of the basic deficiencies in the large-scaled projects implemented in municipalities is that, unlike private sector, they do not make any investments without determining basic necessities appropriate to work process and doing feasibility and benchmarking studies beforehand. Also high-price policy of companies that provide GIS/UIS software and their failure, due to their lack of experience, at the consultancy, installation and service stages of the projects they bear have their impact on this picture (Tecim 2001). It is usually not possible for city planning units to choose a system that would meet their needs as they do not have the initiative in purchasing service and IT investment.

2. Country context Gaps

Transferring information systems from industrialized countries to developing ones indicates important problems as well. It is assumed that countries information systems imported from have the same level of technological infrastructure, local skills base and contextual stability as the country they are imported to(Heeks and Bhatnagar 1999).However, unless after-sales service and professional consultancy support are not provided, the chance for failing will show an increasing rate. The software and hardware vendors in Turkey are generally the distributors of foreign GIS companies.

Initially, standard modules were imported in order to market GIS packages in Turkey, but they were not successful as they did not meet the needs and conditions of municipalities. Then, they were altered and modified to be in compliance with the needs and work process of local users. The importance of local conditions became obvious in the example of Planet Module which was launched in 1995 by NETCAD Company whose products were widely used in city planning units of municipalities. NETCAD reached, as Yılmazer and Ertaş (2001) stated, a 85% -market share, producing a package according to the urban physical planning technical drawing procedure which was in Turkish and appropriate for desktop PC use (Yilmazer and Ertas 2001). Nevertheless, re-producing legal and traditional city planning mentality in a digital environment identically stands in the way of IT and prevents innovations and creativity in terms of work process. In the public sector, unless a IT-based reform is done and conditions, such as providing after-sale service and consultancy, adaptation to local conditions and providing continuous training, are realized, it seems rather difficult to have successful implementation of large-scaled information systems that are used in city planning and several other areas.

3. Rationality-reality gaps

Heeks (1999) emphasizes the contradiction between the conception of hard-rational design of information system and soft political realities of organizations (Heeks and Bhatnagar 1999). This allows observing the major obstacles in the implementation of the project and giving a chance to a better management by identifying the size of a gap for each dimension. As mentioned in Chapter 4, the nature of organizations and the style of implementation have direct impact on the expectations and benefits derived from the implementation of information systems. Alongside the management style, rationality-reality gaps are even sharper when an information system implemented in developing countries. Since metropolitan municipalities, the key unit of analysis in the case study, are public sector initiatives (dominated by 'soft' factors: people, politics, emotions and culture) in a developing country context, it is expected that rationality-reality gaps becomes greater.

In this respect, Bursa Metropolitan Municipality (BMM) seems to be the most appropriate example for investigating the matter in detail. There are three main motives for this: firstly, as indicated at the pre-implementation and implementation stages, city

planning departments in İzmir and Ankara Metropolitan Municipalities do not have enough time to evaluate the results of the implementation due to frequent and continuous system changes in these organizations. Secondly, unlike the 'departmental style' IT implementation in the Ankara and İzmir examples, the 'corporate style' IT implementation which is widespread on municipality scale exists in BMM. Finally, the fact that the large-scaled information system implementation in BMM has been obtained through an international donation-loan, professional consultancy and feasibility study is a significant aspect for a detailed investigation.

BURSA URBAN INFORMATION SYSTEM (BUIS)

With automotive and major textile plants, and foodstuff industry, Bursa is one of the prime industrial centers in Turkey. With its current 1.6-million population, the city is the fifth largest in Turkey. In 1987, Bursa was granted the status of a "metropolitan municipality", encompassing 3 district municipalities under its jurisdiction. Bursa Metropolitan Municipality (BMM) has developed many civic projects regarding to developing its social capital and enhancing better service provision such as various community projects in the context of Local Agenda-21 initiative, Total Quality Management within Local Government in Bursa, and World Health Organization's Healthy Cities Project. BUIS is an active part of these projects that has supported many city-wide applications such as 'Disaster Data Bank', 'City Natural Hazards Risk Map', 'Bursa Interactive City Map', 'Air Pollution Maps', 'inventory of registered historical buildings' etc (BUIS 2003). BUIS is one of the few working examples of city-wide GIS in Turkey and needs to be examined in detail.

Development of BUIS Project

Bursa Metropolitan Municipality wanted to use urban information systems for the planning and management of this rapidly flourishing city. In such a motivation, they began BUIS project with a GIS feasibility study conducted by US-based firm 'Psomas and Associates' between 1994 -1996. Funding for the feasibility study was through 'Trade and Development Agency' (TDA), an arm of the United States Department of State. The study had four major steps: needs assessment, study tour, pilot project and feasibility Study/Implementation Plan (Henstridge, 1999). Meanwhile, an international fund provided Bursa Metropolitan Municipality with a loan from the World Bank for

the planning, reconstructing, improving and managing the water and sewerage system of the city. After the completion of feasibility study, Intergraph won the bidding to design and begin implementing Phase-1 of the project in 1996. In order to provide an interactive system management, Intergraph established a branch in Bursa for the implementation process. Permanent staff members from the Metropolitan municipality and district municipalities of Bursa were assigned for the control of the implementation process from 1996 to 1998. Aside from Intergraph, three different companies that are specialized in different categories of data collection and processing signed a contract within the same period. Since 1999, BUIS has been fully operated by local 'urban information system division', which is responsible for operating the system, supporting other departments in the organization, and coordinating inter-organizational data sharing among respected local organizations.

ITPOSMO DIMENSIONS OF BUIS

Based on the results of field study, interviews, and corresponding materials, Richard Heeks's ITPOSMO model was examined in the case of BUIS.

Information

As a rapidly urbanizing metropolitan region, Bursa is undergoing tremendous infrastructure expansion, land titling, land registration and environmental projects. In the implementation phase-1 (1996-1998), information need of BUIS was projected and four different firms were commissioned to produce spatial data (i.e. base maps, cadastre maps etc.) and attribute data (i.e. building details, household data) through surveys and digitization of maps. Then, an inter-organizational network was established. Covering three metropolitan-district municipalities in Bursa, The Cadastre and Title Deed Office, Turkish Telecom, Bursa Natural Gas Company, the BUIS implementation succeeded in the coordination of data management (BUIS, 2003). It also provided a software application developed for 182 'muhtars' (selected headmen of the villages), connecting them to the main system by wide-area network.

The conception reality gaps for are as follows: (1) there is an absolute need for accurate and up-to-date data in the heart of all information systems. There are some serious problems in the currency of the data that threats the sustainability of the project: e.g., since the international funding options were not available after 1999 the heavy

costs of information maintenance (46% of total BUIS expenditures) became more prone to the political choices of decision-makers; (2) there are serious inefficiencies in the provision of attribute data by respected local bodies: e.g., muhtars were expected to update the database once in a week. In reality, only 20% of them succeeded in operating properly (Erarslan, 1997); (3) information systems require clear information management strategy to fulfill the organizational needs and objectives rationally. Yet, the fact that needs assessment could not be determined by each municipal unit means that features of information systems largely fail to address to the needs and objectives of the organization.

Technology

The hardware and associated GIS software has been provided in the implementation phase of the project with the support of international donors. Both software and hardware are currently operational to perform municipal tasks and services. There is also a fiber-optic network connection between all municipal divisions and corresponding district municipalities.

The conception reality gap is relatively low for technology dimension but some issues still need to be improved: Coordination of municipal tasks and inter-organizational communication between local bodies, and better provision of municipal services are the major aims of the BUIS. The telecommunications infrastructure in Turkey, however, is somewhat limited, therefore there are some problems occurring in the provision of web-based services. There is not a fully established network system in and between local public sector organizations and this makes the sharing of data more challenging.

Processes

As proposed in the feasibility study, 'Urban Information System Division' was founded under the Directorate of Public Works to support functioning of municipal services, in-house production and maintenance of information. Many municipal units adjusted their working processes according to BUIS. For example, citizens' demand for fixing and maintaining of infrastructure system via telephone service was converted into a 'task sheet' by local system operator and transmitted to maintenance crews working in the field.

Conception-reality gap is also low for this dimension. Yet, the absence of office automation reduces the opportunity of fully integrated work process that BUIS may offer.

Objectives and Values

The feasibility report assumes objectives of greater efficiency through increased revenue generated from property tax collection, effective provision of utility services, control of urban development, and delivery of emergency health, safety and police services with BUIS project.

Some of the system objectives mentioned above were achieved so far. On the other hand, there are some problems increasing the size of this gap: (1) an urban information system is a costly investment and may only be profitable in the long run. It requires a strong political and individual commitment to fulfill the objectives of the organization. In this respect, such factors as the international consultants, project contractors leaving at the end of the phase-1 of the project with the expiration of their contracts, international donors drawing their support, and the mayor, the founder of the BUIS, not being re-elected, reduce the chance of wide spread adoption of the system; (2) In terms of values, there is a 'communications gap' between politicians and BUIS administrators in the determination of current and future needs of BUIS.

Staffing and Skills

Feasibility study paid great attention to training of the staff for the successful system implementation. In this context, consultants provided a comprehensive training program included hardware, software, and training of system administrators, chief managers and system operators.

Staffing and skill gap is not important for the BUIS. Sufficient attention is given to continuous training of the staff in information technology. But innovative use of software packages and reinventing them for specific operations remains relatively small. This is largely because of the problem of public sector employment policy that neither computer skills nor individual productivity is encouraged and rewarded by the administrative system.

Management System and Structures

The design of BUIS proposed strategy to develop an appropriate structure aiming to increase the effectiveness of the organization and its service to its clients or public.

Since BUIS has a city-wide basis, some obstacles were encountered in the sharing and production of the data originating from the country's legal and administrative system: (1) the majority of applications in the GIS market have been insufficient to fully perform the responsibilities and coordinating role of Metropolitan Municipalities to the digital environment (BUIS, 2003); (2) there is an ongoing challenge between local bodies of central administration and Metropolitan Municipality in the sharing of information. As vital source of BUIS, for instance, cadastre maps are not available free of charge for Municipal organizations; (3) there is also a conflict between Metropolitan Municipality and associated district municipalities in conjunction with their political stances. In some cases, district municipalities may establish completely different software packages or operating systems that interrupt the city-wide coordination efforts and cause economic loss due to the incompatible data production and exchange. BUIS suffers largely from these issues and the gap is higher.

Other Resources

For the BUIS case, donor-aid made the money available for the feasibility studies and phase-1 of the project. The time schedule for training and implementation of basic features of the system worked for the first stage as envisaged in feasibility study. Also, some revenues were gained through the marketing of spatial data and digital maps prepared by the BUIS staff (BUIS, 2003).

But significant budget cut-offs were experienced in the second phase due to the lack of political support and wider economic recession in the country. Therefore the conception-reality gap was gradually increased.

6.4. Summary

This chapter revealed the most important issues in IT/IS implementation in case study organizations in terms of both 'content' and the 'process'. Firstly, the background conditions of macro scale determinants of IT implementation in Turkey were discussed in the guidance of 'metropolitan municipalities as organizations', 'e-government', 'IT and particularly GIS diffusion', and 'urban planning connection' of sound planning technologies. Secondly, the general survey revealed a high level of IT awareness amongst planning officers, and the interviews were indicated main barriers influencing wider implementation of information technologies and systems within their respective authorities. Thirdly, the two major IS evaluation frameworks (Delone and McLean 1992; Heeks 1999) were adopted to elaborate the general statements on IT implementation mentioned previously. The larger implications of the results of case study will be mentioned in the concluding chapter.

CHAPTER 7
CONCLUSION

The final part of the thesis is devoted to evaluate the assumptions developed in the preceding chapters under the guidance of case study research findings and wider context in IT/IS implementation in city planning practice and research. This section ends with a general discussion on ICTs in public planning agencies and city planning discipline in general, and proposal of a new research agenda that guides further studies on the nature of planning technologies.

7.1. General Discussions on the Research Findings

In the introduction part of the thesis, subjects to be dwelled upon in the study were pointed out, and the statements upon which the study would be based and the relating research questions were put forward. Findings about these statements were supported by the results of a case study presented in Chapter six.

The first statement was that "**the influence of, and dependence on, information technology is growing increasingly in workplace in general and in city planning organizations in particular"**.

Despite its generality, this statement points to the so called information era in which we live bring forth the expectation that information technologies would have an important role to play, and that this would cause certain effects and changes on urban planning. Considering the fact that individuals in information society are educated and more sensitive to information technologies, and that private companies and public sector organizations have increasingly turned to the Internet and other technology-based services, it can be accepted that these expectations are not without reason.

Yet, it is out of the scope of this study to speculate on the reflections of these wide-scaled effects on the planning, and to discuss which technologies would affect planning practice and the debate in the future. On the contrary, within today's practice, it aims to take a cross section on IT-supported planning practice in Turkey. The reason for this stems from the fact that the study adopts an approach that accepts 'technological

innovations as socially structured phenomena' rather than a deterministic and futuristic assumption. For this reason, the main thrust of the thesis is that technologies used in urban planning could be best exemplified in process of implementation.

Testing of the first statement requires a 'diffusion' study. Given the studies conducted on this subject in Turkey, a comprehensive survey conducted by TODAIE in 2001 which encompasses 95% of the municipalities country-wide within the YerelNet project on the nature of Internet usage in local governments. But evaluation data about large-scale information systems like GIS/MIS were not collected throughout that study. In Eraslan's master thesis in 1997, a survey was conducted on 15 municipalities with different populations in relation with the providers and suppliers of GIS, and the survey concentrated basically on the problem of "data acquisition".

Given the small number of previous studies, and financial, organizational and time-related costs required by comprehensive diffusion studies, it cannot be expected that the results obtained from this study are the ones that can extend to generalized results in the sense to explain diffusion process. On the contrary, the results obtained from this study attempt to achieve detailed data directed at the assessment of diffusion "process", the "content" of implementation problems, and the criteria of assessment in this process. Thus, within the process which is systemized as pre-implementation, implementation and post-implementation, each stage was dealt with in detailed following different methods. For example, Rogers' 'innovation diffusion theory', which constitutes mainstream of diffusion studies, has been an important means of reading the nature of pre-implementation stage.

In relation with this supposition, the pre-implementation stage, which is considered to be the first phase of this study, indicates the following results:

- The politics of computing are at least as important as technical considerations in investment process.
- In the choice of costly systems such as GIS, it is necessary that institutional objectives and **needs assessment** should be determined beforehand. For this reason, it is a requisite that professional consultancy should be provided and '**feasibility**' studies should be conducted. Analysis of feasibility for IT systems is divided into three areas: (1) financial feasibility, (2) technical feasibility, and (3) institutional feasibility. The first two follow standard methods of evaluation. On the other hand, **institutional feasibility** refers to the capability of the institution to support an

information system project. GIS, for instance, requires specialized human workers, with sufficient knowledge to carry out a GIS project (Pick 2004, p.68).

- It seems necessary that planning departments should turn to software and hardware suitable for their organizational objectives and act together with decision makers in the choice of these systems. Until recently most Turkish planning departments had not considered producing a strategy aimed at managing the use and development of computer facilities. There were no plans for major organizational re-design and re-consideration of how planning functions could or should be carried out. Therefore adequate time and resources should be devoted to 'needs assessment' process by planning departments. Otherwise, an inadequate needs assessment would create a number of problems at the 'implementation stage'.
- When looked at it in terms of the e-readiness level, it has been observed that case study organizations have problems in terms of **data infrastructure**, **legal infrastructure** and **institutional infrastructure**. On the other hand, case study organizations in terms of human infrastructure, technical infrastructure and leadership have showed levels of being ready over than expected. The basic problem here is the deficiency in how technological innovations, especially large-scale information systems, will be dealt with within the institutional structure. The adaptation of the low-cost technologies, such as "word processing", not leading to any change on the present institutional processes and procedure do not pose any problems, while high-cost technologies, like GIS, and those that require institutional re-organization and utilization of the systems from which the results could be obtain in a long term require that the level of e-readiness should be high almost in every field. For this reason, it seems difficult to get desired results from investments of large-scale systems before the level of e-readiness reaches higher levels at institutional and departmental basis and also country-wide.

The second statement suggested that "**the organizational and user dimension of implementation factors more than technical ones, constitute the main obstacles to the improvement of information technologies and systems in city planning agencies**".

As Ramasubramanian (1999) puts it, "*all but most naive users will acknowledge that success and failures of GIS implementation are influenced by a wide range of factors that have little or nothing to do with technical considerations*"

(Ramasubramanian 1999, p.360). The result of this study confirms this observation. Especially the organizational aspect of high order information systems faces us as the biggest barrier in the implementation process. Issues in the implementation process have been dealt with in two dimensions:

First: aims obtaining information about the **user dimension** of information technologies in planning through the general user survey. '**Personal and situational characteristics**' of the users, and determining expectations and estimations directed toward IT entering into work processes are considered to be important elements. Information thus obtained is exploratory in obtaining clues for planning practitioner's attitude towards new technologies as well as their conceptions of IT-supported planning practice. Thus it could be possible to direct the focus of the subject from diffusion of technological innovations toward urban planning. Also, levels of satisfaction especially toward the use of information systems were tried to be determined through a survey conducted with planners with IT competency. Results of this survey indicated the system performance, and individual and organizational impact of planning technologies from the view of planning practitioner as end-user.

Second: is the determination of the benefits and obstacles about the implementation process through the result of interviews. The results obtained are in conformity with general literature and the results of the studies conducted in Turkey. Discussions on the results reached at case study organizations can be summed up as follows:

- Rise in the benefits expected from IT/IS implementation is closely related with such elements as the diversification of the areas of use, re-organization of the work process, and the extension of the implementation period.
- It necessary to undertake studies on the measurement of tangible and intangible benefits. For example, cost-benefit analysis on **tangible benefits** can be used as an effective tool. **Intangible benefits** (e.g. better working morale, better communication within the organization, responsibility, organizational effectiveness) bear great importance in the implementation of information systems and utilization despite measurement difficulties. So techniques such as 'stakeholders analysis' and '**SWOT analysis**' could provide important clues for institutions to be aware of their own characteristics and device strategies to overcome implementation problems. Applied in this study, "SWOT" analysis provides a point of view and a simple but

effective method for a better detection of institutional implementation problems and external threats or opportunities.

- In case study organizations, obstacles to implementation process were grouped in six main categories namely 'software-hardware', 'humanware', 'dataware', 'orgware', 'planning task & work process', and 'external world'. Among these categories, it has been seen that the most important factors that could affect the functioning of planning technologies are **orgware** and **dataware**. One of the interesting results is that humanware does not constitute an important obstacle for implementation. In the process interviews conducted, staff quality was defined by the head of planning departments as one of the most important strengths of the institution. The fact that the mean age of the planners in these institutions is relatively low (mean=2.98 equivalent of 32-37) and that duration of computer use is high (mean=5.11 years), and users involvement is quite high (90% of total respondents) is effective.
- Another important point is that environmental instability and change. It is also known that the effect of external macro factors is highly important during the process of implementation especially in developing countries (Campbell 1987); (Masser and Campbell 1989). In this context, variety of macro issues (i.e. public public sector realities, technology transfer, political instability) on IT implementation process for Turkey has been examined in Chapter 6 following the idea of 'conception reality gap' assessment defined by Heeks.

The third statement, that is based on the argument developed by Heeks (1999), was that, "**there are conception-reality gaps in implementation process of information technologies and systems (IT/IS) in organizations like city planning agencies. Successful adoption depends on the size of these gaps. The larger the gap, the greater the risk of failure"**

Third statement points out the gap between technical-rational features in the design of information systems and soft politics and human reality matters encountered in application. Before all else, it is necessary that these gaps in the success of an information system should be detected and then strategies should be devised in order to decrease the number of these problems. The best aspect of dealing with the gaps is that the dimension of technical and organizational/user is displayed. This approach suggested by Heeks (1999) makes easier for us to look at the cases systematically,

making our explanatory view sharper on the one hand, and provides opportunities for us in finding clues through the gaps assess the IT project on the other.

It has been learned that technologies used in urban planning are not saviors and they will not be panacea for all planning problems, and that these technologies are unfortunately learned with difficulty by the institutions that experience them(Pitkin 2001). Every IT/IS implementation faces failure unless it takes into consideration the '**organizational reality**'. The results of the conception reality gap assessment in the case of Bursa metropolitan Municipality indicated several ITPOSMO dimensions namely "information", "objectives and values", and "management structures and systems" seem critical and may lead to 'sustainability failure' for Bursa Urban Information System (BUIS). Broadly, 15-year urban information systems (UIS) experience in Turkish Municipalities has confirmed that UIS implementation was neither based on a well-designed development plans to fulfill the objectives of the organizations nor fully-utilized due to the ever-changing political context.

Although 'conception-reality gap assessment' is a subjective technique, it may provide great benefit in terms of detecting the gaps stemming from the IT implementation of the organizations and devising strategies to lessen these gaps. Also, it may be helpful in forming an atmosphere in which the categorized and comparable experiences are shared. Thus a case study pool of planning technologies can be established. The importance of this sort of methods is that they form an atmosphere that will encourage internal dialogue and help employees come together in a workshop mentality.

Planning technologies examined in the current thesis can be distinguished within two groups on the framework drawn by Heeks&Bhatnagar (1999) (**Figure 7.1**). Information technologies such as Internet, basic office tools, visualization tools support organizational reality, while large-scale information systems such as GIS/PSS require or impose organizational rationality. Implementation problems mention in the previous section is valid for these second group technologies. This '**rationality imposing applications**' generally incorporates a significant set of rational structures, process and even culture and professional strategies and involvement for their operations. The implementation of these technologies in public sector organizations as municipalities brings the need for an IT-based reform. For this reason, almost all of the implementations realized without these pre-requisite conditions face failure. Among the

case study organizations, it has been observed that only Bursa Metropolitan Municipality took into consideration these necessary pre-conditions and the need for institutional re-organization. But, even in that case, there is high possibility of 'sustainable failure' which underlying reasons discussed elsewhere.

Figure 7.1 Continuum of computer applications,
source:(Heeks and Bhatnagar 1999, p.65)

On the other hand, such programs as word-processing that we mentioned in the first group are '**reality supporting applications**' and they incorporate few hard rationalities and by comparison with the rationality-imposing applications. Consequently, since there is less need for pre-conditions, its internal utilization is relatively easy. Its rate of success is higher and requires few changes in institutional structure. For this reason, shift GIS systems to CAD-based reality supporting applications have been observed in the case study organizations of Ankara and İzmir. As Erarslan (1997) suggests, municipalities shifted to CAD-based programs because they were cheaper but in fact these programs are not capable of automating all municipal applications. It seems inevitable that data problems will be encountered when re-shift is realized to GIS programs in the long run (Erarslan 1997). Implications for system development and utilization, and implementation approaches will be discussed later.

7.2. General Discussion on IT/IS implementation in Urban Planning

In this section, going from the results of the case study towards more generalized discussions, the role of the technology in urban planning was developed in three headings: (1) Implications for planning practice, (2) implications for planners, (3) and implications for public sector planning agencies.

7.2.1. Implications for Planning Practice

The rapid pace of technological developments and development of more powerful and less costly planning technologies are leaving planners face to face with fundamental challenges regarding technology and the ways in which planning takes place (Catanese and Synder 1988, p.134). Some tasks are eliminated by the introduction of the computer; others remained unchanged; yet others are created (Farthing 1989). The lessons derived from case study organizations suggest that planners are primarily using this new technology to make plans and to support some routine tasks such as zoning review. However, the lack of office automation on routine tasks creates some organization efficiency and productivity problems in these organizations.

An important part of the planners responding in general user survey the question of "*What is the most important benefit that would be obtained from planning technologies*?" stated the **supplant role** of IT/IS as the second most important benefit. But, as it was stated in the interviews, archiving and finding the up-to-date and accurate information is still the most time consuming activity in planning offices. '**Cookbook planning tasks**' such as collecting data, organizing it, and presenting it according to stated rules are rarely organized into digital forms. This situation draws attention to importance and necessity of the tools of IT related with the administrative tasks and office automation of planning agencies. In this sense, office automation will be helpful in the reduction of time-consuming and repetitive tasks.

As Farthing points out "*planners tended to fall into the category of information consumers, where the computer system generated information useful to their work*"(Farthing 1989, p.524). They often explore available data and extracting and transforming those data. Therefore benefit from digital data is up to its accuracy and up-to-datedness. Unfortunately, planning departments frequently pay too little attention to data issues, and they regularly fall foul of **garbage in, garbage out** data quality problems. The computer cannot add weight or give value to inaccurate and incomplete data. This may well point to the need for supporting data sensitization of existing digital data production efforts.

Exploratory analysis and design, identifying emerging problems, discovering solutions, are '**non-routine planning tasks**' and requires more skilful and innovative computer usage. In this context, information technologies and systems (IT/IS) have

support role. Because of organizational reliance on "standard operating procedures" on the one hand, and professional training and socialization on the other, public organizations tend to favor the status quo. For this reason, innovative actions, as in many public organizations, are not seen in the case study organizations. Also it cannot be said that IT/IS are benefited sufficiently for the tasks of 'decision making' and 'liaison'. Consequently, effective utilization of non-routine planning tasks in planning units seems to be the most challenging issue in the next period.

When we look at IT/IS use in terms of planning levels, basic computer programs (i.e. word processing, CAD software) are widely and effectively used in district-level planning studies while master planning studies demand the use of high-order information systems, such as geographic information system (GIS) or land information system (LIS).

Especially IT/IS support for "**what if**" type questions is significantly important in the development of planning scenarios at the master planning level, and scenario-based modeling is a worthy policy-making tool for planners, and other policy-makers. For instance, although master-planning studies required for urban information system (UIS) in Bursa metropolitan municipality should be in active position for the current working practice, it has not been possible to initiate these studies. The reasons for this: (1) 'attribute data' were not updated since 1999, (2) digitization of the maps (base maps, cadastre maps, development plan maps) required for master planning studies couldn't be finished, and (3) most important of all the lags in master plan studies due to the cancellation of the current master plan. Since planning departments do not exercise responsibility master-planning studies the way it should be, analytical, forecasting and decision making tasks supported by high-order systems like GIS have not been not used. For this reason, CAD-based systems in the current practice have become forefront preferences due to the reasons: (1) low investment cost, (2) a visualization tool for the finished products of urban design and district planning, (3) an internal communication tool intended to facilitate feedback (4) a fast and flexible sketch design tool, and (5) congeniality with legal procedure especially in district planning studies.

Computer software supports for most of the traditional planning analysis functions such as projecting population, preparing maps and drawings, statistical analysis and forecasting, analyzing regional economic impacts, managing projects, and urban transportation planning. As aforementioned, there are two views on the role of

these technologies in urban planning summarized by Klosterman (1998) (see chapter 3). The first one is '**New Tools for Old Tasks**' that computer-based tools (i.e. word processing, electronic spreadsheets) allowed planners to perform traditional tasks more easily and effectively that could be done only by hand before. However, they did not fundamentally change the ways in which planners operated. The second one is '**Doing New Things**' that "advanced information technologies (i.e. expert systems, planning support systems, database management tools, and advanced modelling such as cellular automata) allowed planners to do things they could not do before" (Klosterman 1998).

Technologies mention in the first viewpoint is '**reality supporting applications**', the ones mentioned in the second viewpoint are '**rationality imposing applications**'. When we make an assessment on the examples studied, level of IT knowledge, current working practice of the planning practitioners, and organizational realities seem to support this view. On the other hand, many things should be ready and trouble-free from the viewpoints of planners' being able to do new things, their training and their attitude towards technological innovations to the IT strategy of planning agencies during the implementation process. Discussion on this subject will be dealt with in detail in the next two sections.

7.2.2. Implications for Planning Practitioner

Like many things in the information age, it seems inevitable that there must be some changes in the role and subject of planners. In this section, some challenging issues will be dealt towards a perspective wider than research results in two headings: (1) personal and situational characteristics of planners as end-users, (2) Attitude of planners toward planning technologies.

1. Personal and Situational Characteristics of Planners as end-users

The results of the research show that the planners working in surveyed planning units are young (70% between 26-37), have high job tenures (6-10 years), more than half took formal computer training (55.3%). More than half (78%) of the practitioners have experience of 5 years in computer use. The three variables namely "tenure on the job", "duration of computer use", and "computer training" were able to account for approximately 40% of the total causes of 'hands on IT usage'.

As mentioned elsewhere, ‘IT and other technologies are not value-neutral and these tools have the possibility to shape the goals and the agenda of the profession’. In the case study organizations, an important part of the urban planners (80%) think that applying new technologies into planning practice would have important transforming impacts. Even IT/IS haven't replaced most of the routine planning tasks, planners interviewed, with great majority (93%) find IT/IS as an important contribution to their working practice.

Farthing’s study (1989) puts forward a few reasons to explain this situation: Firstly, because the planning technologies in use are peripheral to planners’ main job; they do not have a big impact on planners’ experience of work, and any limitations of the system are not central to them. Secondly, as *information consumers* planners tended to receive infrequent outputs from the system. They are generally ‘voluntary’ users of the system in the sense that they have alternative ways of obtaining the information necessary for their jobs from more traditional methods and sources. Thirdly, because planners’ jobs mostly cover other than non-routine tasks, unlike clerical staff, they are feared about their job satisfaction in a lesser extent (Farthing 1989, p.524). Moreover, using computer doesn't constitute justification for job ranks within the organization. But being equipped with high level of computer competency gave ample opportunity for autonomy, variety and feedback in work experience, and also raise job boundary issues with other non-planner professional such as computer experts. But further case study is needed on the causes of this situation.

2. Future role of planners in the information age

From urban design at turn of the century to transportation planning, systems approach, social advocacy, and political economy, the focus of planning have continually shifted. Planners' role has also been debated under the changing economic and social conditions in the information age.

Debate 1: Reactive or proactive:

Modern urban planner has been created through the industrial age, and thus is a by-product of it. The planning profession began as an urban problem solver in an industrial era (Muir 1998) (Osiowy 1997). In many ways, planners are products of a dynamic and complex system, yet generally respond through a reactive approach (Muir

1998). During a time of transition such as our present state of economic and social turbulence the planning profession must once again re-think its values, theories and processes. This time, however, on a much pursued as planners take a 'pro-active' stance in their urban environments. The immense tasks of planners grow with the changes brought by information age combined with the previous tasks of industrial society (Osiowy 1997). At this stage, IT/IS would be one of the important support tools for planners in their being able to cope with urban problems proactively and produce urban development scenarios.

A dynamic and fast-changing social and economic condition rely on innovative and quick solutions to planning problems that requires package of analytical and decision-making skills that planning should offer (Muir 1998). In this context, it is necessary that planners should develop IT/IS competency and use creatively analytical, modeling, simulating and forecasting features provided by computerized planning tools.

Debate 2: Expert or Communicator

Respondents of the question "*At what stage of planning process is IT used mostly?*" appearing in general user survey pointed out that data collecting, issuing and evaluating features of IT is 'the most important'. In this sense, IT/IS is seen as a robust data collecting and processing tool. The responses given by planning practitioners emphasize the 'scientific' aspect of the planning. On the other hand, contribution of IT/IS as a support tool of 'policy making' and 'communication/participation' is expressed to be at a lower rank.

In undertaking certain bureaucratic tasks in relation to land-use development, planners' expert role is prevalent in local government context. When examining the role of planners in bureaucratic mechanism as fulltime officials, secure a certain amount of power through their ability to devote time and energy to land-use planning issues (Osiowy 1997). In fact, 'the positivist conception of planners saw them as technical experts' (Allmendinger 2002). As a result, what is expected from IT/IS is generally directed to functions that support rationality and reinforce "expert role". But experience achieved from case study organizations suggest that the even the 'expert role' is limitedly supported by the technologies used. The most important reason for this is the obstacles experienced during the implementation process and that there is no clear strategy for 'information management'.

As Krouk et al. (2000) points out, urban planners, acting differently from other areas of expertise, should inform the policy making authority and serve as a link between local government and residents. Public involvement in planning can be promoted by inventing mechanism that takes advantage of the evolving technology. In recent period, (1) technologies (i.e. Internet, networking) that encourage the communication efforts in/outside the organizations as well as the public, (2) transition from government to governance, (3) initiatives supporting e-municipality and e-government, and (4) in parallel to the paradigm of communicative action that constitutes the new mainstream of planning, almost all the technologies used in planning are engaged in supporting participative processes. But the development of technological tools in this direction shows that it won't take a direct, active role in participative processes. To be able to develop the social-effect dimensions of planning technologies:

At the organization base, the following are necessary; (1) moving from desktop to network computing environments to strengthen the communicative and collaborative aspects of planning (2) making use of reality-supporting information technology such as Internet and e-mail (Heeks 1999a) (3) informatization and then interaction (i.e. web-based surveys, role-playing games, hypermedia) of planning documents and ideas with the public via city-service web sites.

At the required skills of planners, the following are necessary; (1) having the ability to possess, understand, process and use information effectively (Muir 1998) (2) competency in basic computer programs (Alexander 2001) (3) competency in computerized visualization tools (i.e. GIS mapping, 3D Modeling, urban simulators, Internet) alongside with traditional tools and methods (i.e. paper maps, photographs, physical models) (Al-Kodmany 2001) (4) or advanced knowledge of fully integrated information systems like Planning Support systems (PSS) that combine the data collection, presentation, analysis of information and alternatives in the planning process, as well as providing the means to increase public participation (Cackowski 2002). Planners, as information workers, already possess many of the skills mentioned above, communications and problem-solving skill among them. But they should pay enough attention to increase their level of competency with those planning technologies.

Alongside with above mentioned factors IT-supported public participation in planning process must also provide three prerequisite conditions: "*First, the public must have equal access to appropriate information [elimination of digital divide]. Second,*

the information must be presented in a way that is easily comprehended and must make sense. Third, participants in the process must interact with each other repeatedly over time to ensure satisfactory exchange of information and help build trust" (Budthimedhee et al. 2002, p.229).

7.2.3. Implications for Public sector Planning Agencies

We mentioned, in Chapter 4, about theoretical frameworks of IT implementation categorized by Coyne (1996) and the diffusion of technological innovations within the organization Campbell (1996). Results derived from case study organizations suggest that frameworks of technological determinism and managerial rationalism are not valid in the nuts and bolts of implementation process. As Campbell (1996) put it, especially the findings obtained from interviews show that applications of by 'social interactionist' framework or 'Praxis model', envisaged by Coyne, can provide an important contributions in explaining the theoretical framework. Although this subject forms a separate framework of study, it can be summed up in the view of data obtained from case research as follows:

(1) Managerial rationalism: As aforementioned, information systems (GIS/UIS/PSS/MIS etc.) demand being taken in a rationality imposing framework, and, in this sense, in a framework that supports 'managerial rationalism' and 'rational decision-making'. But institutional soft realities make it difficult to pursuit this process. Among the case study organizations, it has been observed that there exists political instability and change, and that rationalism principles do not work in practice because there is no strategy and pre-planning during the process of realization of the re-organization of work processes, purchasing of technologies and implementation and utilization.

(2) The attractiveness of the technological determinist discourse is its promise in the direction that implementation will be trouble-free and technological facilities will increase organizational efficiency and effectiveness. This situation, as a marketing strategy, is widely used by IT vendors. They are induced managers to purchase unnecessarily costly and large-scale information systems. In this framework, this has mostly been observed at top management level with elected officials whose knowledge of IT is restricted and level of awareness is low. But it can be said that this approach is

not valid for the personnel and mid-level managers who have already experienced this technology. The large number and diversity of the problems expressed documents this situation.

(3) In the social interactionist perspective, however, following the idea that technology is socially constructed, monitoring of the practice is of great value in understanding the state of implementation. In the process of implementation, the re-invention of technological innovation in the work process is seen as the most important tool in utilization. In this sense, choosing the software that will mostly support the work practice, and user-defined extensions (i.e. Application of 18th Regulation, The Analysis of the Arrangement of The Dissolution of The Partnership, The Applications of Allotment and Unification) used on standard software packages points to the importance of re-invention process in the case study organizations. Apart from the approaches of technological determinism and managerial rationalism, social interactionism suggests that 'reason for adoption' does not always match the 'needs of organizational structures' and the purpose of 'solving operational problems'. The aim of many urban information systems (UIS) implementation is to get prestige. Municipalities tend to favor large, complex UIS projects supported by generous funding. But continually changing political context brings an end to the projects, which have been started as a factor of prestige, through ways that don't support organizational rationality.

Implications for System Development and Utilization

In organizations, implementation of large-scale information system such as UIS generally ends up with failure because systems of this kind require lots of more changes on ITPOSMO dimensions than determined before. Freezing some of the dimensions, getting them smaller and simpler and finding solutions by bringing them closer to organizational realities may open the way leading to a more successful implementation.

The thing that is tried to be explained by such slogans as "**KISS: Keep It Small and Simple**" (Heeks 1999b), "**Small is Beautiful**", "**one step at a time**" (Masser and Campbell 1989, p.452-453) is the necessity of a flexible and manageable design. Bigger projects are problematic because they require more change along more dimensions of change than smaller projects.

'**Small is beautiful**' implies the need to avoid over-ambitious plans, which carry high risks of failure. This approach recommends organizations to concentrate on limited

applications, which directly meet perceived organizational needs. Such an approach is less vulnerable to organizational and environmental changes and political instability. According to Masser and Campbell (1989), the small is a beautiful approach to effective computer utilization in urban planning agencies. Developing countries have been given more chance to succeed with the advent of less-costly more powerful PC-based systems, reduced costs of the hardware, and a wide range of user-friendly software packages (Masser and Campbell 1989). Type of implementation labeled as 'departmental' or 'individual' can easily use this strategy. Therefore, rather than wasting resources on unachievable measures of organizational objectives planning agencies may at least manage its internal affairs efficiently, beginning with the technology and knowledge available right know. Among the case study organizations, it has been seen that this kind of a method has been followed by planning departments of Metropolitan municipalities of İzmir and Ankara.

There are some approaches to be followed in large-scale projects that require inter-institutional organizations such as BUIS (Bursa Urban Information System). According to Heeks (1999), the success rate of the system can be increased by detailed determination of the ITPOSMO dimensions and using some gap reduction strategies. For example, 'freezing one dimension' or 'freezing several dimensions' can make information system (IS) implementation more manageable and more successful. Also 'freezing all dimensions except simple automation' can be used as another element that raises the success of implementation (Heeks 1999a). Especially in municipalities that commence IT/IS implementation recently and have restricted financial resources and personnel, following this strategy and turning to IS that support organizational reality can be useful. In the case of planning departments, automation of the routine planning functions can be realized by utilizing from administrative and statutory functions that are labeled as 'cook-book planning tasks'. Such functions as plan-making, analytical functions, and liaison activities can be added according to the results obtained from implementation and after pre-requisite conditions for IT/IS have been realized.

Apart from these strategies, the approach of **incrementalism** can be seen in IT/IS implementations. Incrementalism implies that "*when a major set of changes is planned as part of IT/IS implementation, breaking these down and introducing them only slowly and in an incremental manner will help to reduce the extent of any given change*" (Heeks 1999a, p.104). This can mean selecting a slow and incremental method

of system installation. "**Piloting**" or "**one step at a time**" strategies are typical of incremental installations (**Figure 7.2**). Gaining experience from modest scale system implementations may enhance the awareness level of organizations in terms of the potential costs and benefits of further developments. Such an approach, as Masser and Campbell highlight, assists exploiting opportunities and coping with threats imposed by larger organizational and environmental change (Masser and Campbell 1989).

Although the methods mentioned above are known and widely used in private sector, in public sector organizations like municipalities, it has not been always possible to get successful results. In local administrations in Turkey, when the subject is looked upon in terms of GIS/UIS implementation, 'piloting' has been started by the vendors as an implementation strategy but this stage could not be overpassed due to the fact that necessary training, consultancy, and institutional support could not be achieved (Tecim 2001).

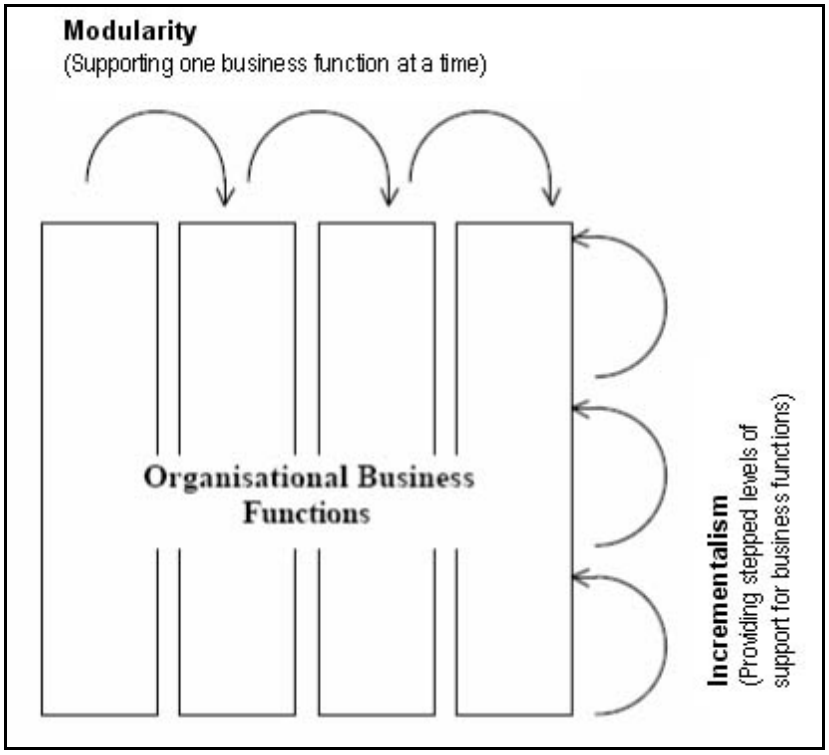

Figure 7.2 Modularity and Incrementalism for increasing success rates in IS Projects (source: (Heeks 2002))

In fact, in this situation, as the social interactionist framework suggests, shows that there is no recipe for generic success that could be advised to institutions. 'Stakeholders perspective' and 'organizational culture' is of great importance beyond

the objective criteria in successful implementation of IT. On the other hand, any institutionalization of IT/IS requires time. Also, the utilization of systems by the individuals required to operate and use the technology. But it has been seen in other case study organizations and in various examples that many technological systems have tried in very short periods, and the choice and running of these systems are quitted without establishing necessary conditions. To increase the success of the IT/IS implementations, it is necessary that these technologies must be followed by the managers/consultants of those particular organizations starting from the pre-implementation stage to institutionalization, and it is necessary that IT strategies must be developed, and opportunities for learning should be developed from experience.

7.3. Directions for Future research

Studies of Obermeyer ve Pinto (1994) bring forth a pyramid-in-shape 'body of literature' that draws attention to different stages of scientific research (**Figure 7.3**). To them, IT research "*would follow a pattern that begins with technological problems, proceeds through financial aspects, continues with institutional issues, and finally culminate in examinations of the effect of the technology on society*" (Obermeyer and Pinto 1994, p.viii).

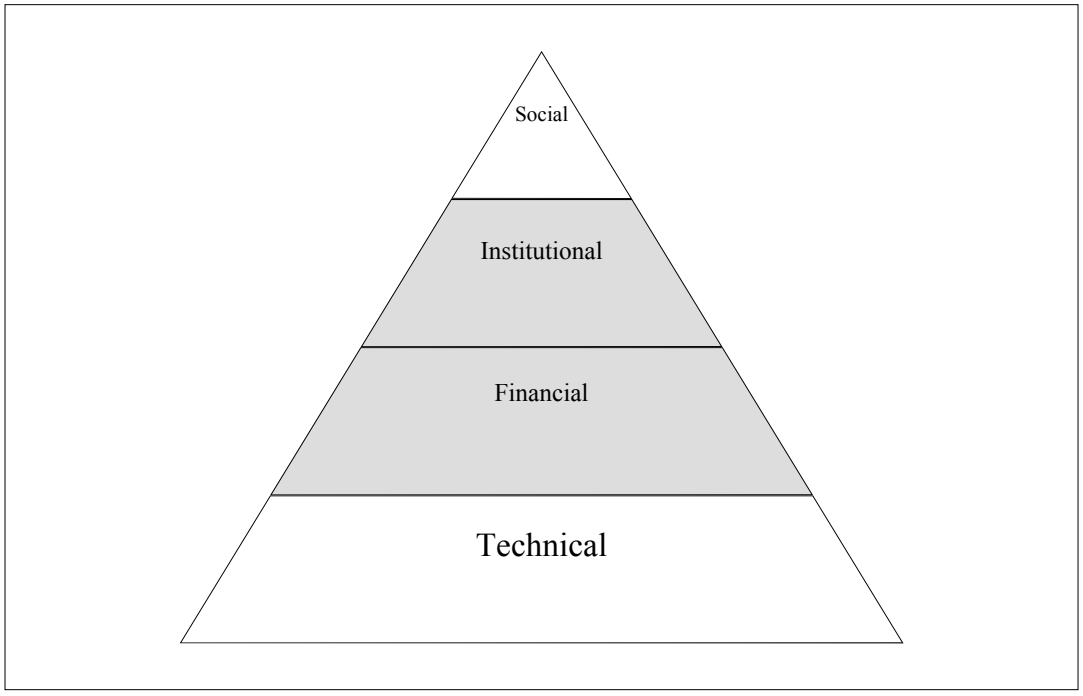

Figure 7.3 Pyramid of research on technology (source: (Obermeyer and Pinto 1994))

Given these research stages, this study depends mostly on those which focus on institutional issues, rather than financial or technical issues. In the planning literature in Turkey related with technological issues, although we come across with studies focusing on such issues as 'participation' and 'decision support' within the framework of developing strategies used especially in planning, there no study focusing on the financial aspects of these technologies. Although financial dimension, as in this study, is discussed in studies which dealt with 'institutional' subjects, a separate field of study is needed to develop it. In an atmosphere in which technological systems change swiftly and new developments appear, the costs and benefits planning technologies bring to organizations bear great importance especially in terms of the utilization of large-scale information technologies. Considerable declines in the price of technologies used in recent period and the increased capacities of technological innovations in supporting urban planning functions have increased the importance of 'institutional' studies. As Ramasubramanian (1999) suggest, implementation problems especially in developing countries have become first and foremost issue. Although considerable resources were allocated for large-scale information systems, especially in public sector, due to the lack of required interest during the implementation process, a great deal of 'implementation failures' are experienced. For this reason, except for Erarslan's study (1999), this thesis has become an exploratory study trying a systematic approach to implementation problems of technologies used in planning. This thesis also presented an approach that deals, for the first time, with the user dimension such as 'personal and situational characteristics' and 'user satisfaction'. Thus, as the user of these technologies, effort was given for an expansion from the technological dimension of the subject toward the dimension of planner and planning dimension.

Studies aimed at social dimension of the technology, which Obermeyer and Pinto (1994) suggested as fourth dimension, are highly new subjects for the planning literature of Turkey facing only recently this kind of problems. To gain advancement in this subject, it is necessary that planning technologies should be utilized for a long time in the organizations, and the benefits to be obtained from these implementations should be shared with the public. Ramasubramanian also suggests, "…*concerns [for developed countries] related to ethics of representation, socio-political implications of technology use, use of IT/IS to empower the lives of ordinary citizens*" (Ramasubramanian 1999, p.360). It is not seen possible in the short run that studies focusing on technologies used

in planning in Turkey concentrate on social dimension of these technologies. Still, it might be a more appropriated step for a start to establish an extension towards this social effect over the reality supporting applications like the Internet. But in every condition, priority should be given to institutional subjects in the future studies.

Limitations to the methodology

IT implementation studies on 'institutional issues' which are based on diffusion research have methodological limitations. In the absence of longitudinal studies diffusion research data are frequently gathered from surveys and questionnaires. This method, as Ramasubramanian states, freezes the diffusion process and researchers rely on respondents in reconstructing the process of adoption and diffusion (Ramasubramanian 1999). The limitations here were avoided by conducting in-depth case study research and choosing the examples from different stages of the implementation process.

Another limitation for the study was that the lack of literature in IS implementation for urban planning in local context. The attention of writers has been focused elsewhere. Also, including the current study, few studies focusing on the institutional dimension of the technology comprise of single case studies. Therefore, these provide no basis for estimation of overall failure/success rates for both public sector and private sector urban planning agencies.

To measure the success/failure degree of the planning technologies used in the case study organizations in the 'user' dimension of the study, DeLone and McLean's (1992) IS Success Model and Heeks'(1999) ITPOSMO model were used. The first one of these models is one of the most accepted models in the field of IS research. It was also discussed by Budic (1999) in the field of urban planning. The other is a simple but effective management tool for those involved in the development of information systems in developing countries. Both models were carried from the field of IS research and organizational studies to the field of urban planning. Thus it was aimed that a more systematic reading of IT/IS implementation process and content should be established. DeLone and McLean's model presents a defined framework at what dimension and usefulness the technologies applied in planning are used. But since many elements in this model take into consideration private sector realities, this model was used by reducing its content in the direction of Budic's critics and by focusing on the dimensions

which could be important in urban planning. Heek's model on the other hand, as it is in the former model, discusses the success of information systems not over the success criteria previously defined and within causal relation, but over technical and functional rationality, and soft organizational/political reality. Separately, with different techniques it presents at the stages of pre-implementation (e-readiness assessment), implementation (definition conception reality gaps), and post-implementation (gap closure techniques), Heek's model bring forward a more holistic framework for the solution of the problems determined. Despite the sophistication of the success/failure perspective used, it is necessary that both the number of urban planning units that apply planning technologies and the utilization period of technological systems should be extended so that the data obtained would be developed and reliability would be increased.

As a result, the evidence obtained from case study research could be suitably extended and updated. This study will hopefully lead to further studies which address the management and utilization of information technologies and systems in different planning agencies. Research frameworks of technological, financial, institutional, and social dimensions of technical innovations have been debated in IS research, organizational research, and many other related literature. What is important for urban planning is that, as, Innes and Simpson (1993) put it, as a basis for the research on technologies used in planning, planning practice should be followed before all else. In this sense, it would be appropriate that studies to be conducted in the future should overflow the academic framework and be addressed with a joint effort in which planning practitioners involved.

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