Rock – Paper – Scissors

The influence of government on ICT use, a focus on information intensive organizations and Tehran

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Tilburg University

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Final thesis

Gert-Jan van der Panne

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g.vdrpanne@uvt.nl

Student nr.: 647918

Policy- and Organization Sciences
Tilburg University

Supervisor Tilburg University: Prof. Dr. P. Kenis
Second reader Tilburg University: Dr. T. Gößling
Supervisor Triarii Consultancy The Hague: Ir. R. van der Lande

Preface

As I am writing my last words in this thesis, which are presumably the first you are reading, the windows of my room are open, the sun shines in, and the music of Ennio Morricone plays on the background:

> *"The last and final moment is yours,*
> *that agony is your triumph"*

It is perhaps needless to say that I indeed feel both triumph as agony with finishing this thesis and thus my years as a student. The years have been great and I am looking forward to taking them with me to the years that are coming.

As with everything I do, this thesis would not be written without the help and guidance of other people. Thanks to Robert van der Lande and the rest at Triarii for giving me this opportunity and making it an educational one. Thanks also to Patrick Kenis and everyone at my thesis circle for useful advice. Thanks to Tobias Gößling for final helpful suggestions. Further thanks to people and organizations that were very helpful in setting up my research; the Dutch embassy in Tehran, Asef Bayat from ISIM, Mansour Abader from EVD, and Erwin Boon from NIBA.

Apart from these thanks I also thank the people that have been there for me during this period, and in fact always: My family, who kept me motivated, for example by continuously asking when I would finally graduate. My friends from ToBra, Tabuk, and het Vergif van deze Tijd, who kept me motivated, for example by continuously asking when I would come out and play. My other friends, who kept me motivated, for example by continuously asking when I would join them in the life above the rivers.

This thesis concludes my study Policy and Organization Science and is the result of fifteen months of work. These fifteen months have been an experience beyond borders in many ways. I have learned new things about the world, people, and even myself. Even if reading this thesis provides just a fragment of the experiences it has given me while writing it, I consider it a success.

Gert-Jan van der Panne,

Tilburg,

August, 2006

Summary

This thesis presents the research on the influence of government on the use of ICT in information intensive organizations, with a focus on Tehran. In the different sections of this thesis, respectively literature and managers from information intensive organizations in Tehran are consulted to answer the following research questions:

> What is the influence of government on the use of information and communication technology in information intensive organizations according to literature?
>
> To what extent is the influence of government on the use of ICT found in information intensive organizations in Tehran?

The first research question is approached in the first part of this thesis by means of a literature research, in which various literature resources are consulted to compose a model. This model, in short, provides four different options for government to influence ICT use in information intensive organizations:

- Provide an ICT infrastructure;
- Develop ICT skills;
- Compose ICT regulations and institutions;
- Financial support.

To answer the second research question, this model is evaluated in the situation of information intensive organizations in Tehran. By means of semi-structured interviews, managers of information intensive organizations in Tehran give their view of the situation in their Tehran-based information intensive organization. The answer to the second research question is, in short; the influence of government on ICT use in information intensive organizations in Tehran is substantial and decisive. This is the model, evaluated in the situation in information intensive organizations:

- The government provides a controlled, but adequate ICT infrastructure, which allows for a moderately satisfying use of ICT;
- The government invests effectively, both directly as indirectly, in the development of ICT skills, which enables and stimulates the use of ICT;

- The government stimulates ICT use by composing ICT regulations and institutions that facilitate certain ICT developments, but limits ICT use, to some extent unintentionally, by its slow, unpredictable, and bureaucratic attitude;
- The government stimulates ICT use by financially supporting specific projects and developments and encouraging public-private partnerships.

In conclusion, in the third part of this thesis, both parts of the research are combined to answer the research questions more completely and extensively. In the third part, the complete research presented in this thesis is discussed.

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List of abbreviations

EU	European Union
EVD	Economische Voorlichtings Dienst (Agency for International Business and Cooperation)
G7	The Group of Seven
G8	The Group of Eight (including Russia)
ICT	Information and Communication Technology
ICTs	Plural of ICT
ILO	International Labour Office
IRICA	Iran Informatics Companies Association
ISIM	International Institute for the Study of Islam in the Modern World
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunications Union
NIBA	Netherlands-Iranian Business Association
NICTA	National Information and Communication Technology Agenda
OECD	Organization for Economic Co-operation and Development
PC	Personal Computer
R&D	Research and Development
SME	Small and Medium Enterprises
TAKFA	This is a Farsi-based abbreviation, expressed in Western alphabet. See NICTA.
UNCITRAL	United Nations Commission on International Trade Law
WIPO	World Intellectual Property Organization
WSIS	World Summit on the Information Society
WTO	World Trade Organization

1 Introduction

Modern societies, organizations, and individuals deal with Information and Communication Technology (ICT) every day [1]. ICT powers the third industrial revolution as steam power did the first and electricity the second. In this light, modern societies are often referred to as knowledge societies, information societies[2], or network societies. Networks of people and organizations are becoming more important than old and current hierarchical networks [3]. The emergence of the knowledge society, building on the pervasive influence of modern information and communication technologies, is bringing about a fundamental reshaping of the global economy. Its significance goes well beyond the hyping of the Internet or the dramatic declines in the dot.com sector. What is underway is a transformation of economy and society[4].

Simultaneously, organizations experience a trend of increasing dynamism and openness. Their borders are porous, through which materials, energy, and information continuously flow. Their eyes are always fixed on the external environment, watching markets shift from day to day, industries push to reconfigure themselves, technological innovations intrude at a constant pace, and government policies constrain or create options. It is argued that the survival and growth of an organization is ultimately conditioned by their capacity to learn and adapt to a changing environment[5].

To an organization, the government is an environmental force that has to be taken into account in many phases of decision making. Given that ICT is a development that can have both positive (e.g. increase of productivity[6]) and negative (e.g. the 'digital divide'[7]) effects on virtually every aspect of society, governments are eager

[1] Batenburg, 2002, p. 17

[2] Macionis and Plummer, 2005, p. 617-623

[3] Castells, 1996

[4] ISC, 2002

[5] Choo, 1995, p. 1-2, Boonstra, 2002, p. 137

[6] Ester, 2003

[7] Dijk, 2003

to play a part in the development of ICT. This research focuses on this relationship in the context of ICT use in information intensive organizations.

In 2005, a Dutch team of consultants started cooperating in a project for the government of the Islamic Republic of Iran. This project is called TAKFA-II. Its main purpose is to design and outline the ICT policy of Iran. The function of the team of Dutch consultants is to give direction to the ICT policy of Iran. I am a member of this team as an intern and my function is of a supportive nature. This is also a function of this thesis.

1.1 Research problem

National and international governments have always played an important role in the development of ICT. Designing and outlining an ICT policy for any government is directed at paying attention to the application of ICT on social, economic, and educational areas[8].

In literature, ICT is mostly researched as an independent variable. The effects of ICT on e.g. quality of work, effectivity, and efficiency are well-documented and widely researched. The use of ICT is the dependent variable in this research. Literature on the influence of government on the use of ICT is available, but fragmented. More often than not, data are presented as part of a research that focuses on ICT in a broader context. Therefore, an overview and analysis of this literature is needed to reach relevant outcomes on this subject.

This literature research allows for a focus on a specific situation; ICT use in information intensive organizations in Tehran and the influence of government. Especially in a country as Iran, where the government plays a profound role in every aspect of society[9], this is interesting to research. Information on this specific situation that is available, is primarily from government sources. This research takes another point of view by exploring the views and experiences of managers in

[8] WRR, 2002, p. 65

[9] www.evd.nl

information intensive organizations in Tehran that are interviewed as experienced experts on this subject.

1.2 Research goal and question

The first goal of this research is to provide insight in the influence of government on the use of ICT in information intensive organizations. This insight is the theoretical framework from which the second research goal is approached.
The second goal is to provide insight in how and to what extent the influence of government found in literature applies to the situation in information intensive organizations in Tehran.

To reach these goals, the following central research questions are used:

> What is the influence of government on the use of information and communication technology in information intensive organizations according to literature?

> To what extent is the influence of government on the use of ICT found in information intensive organizations in Tehran?

1.3 Research outline

This descriptive, deductive, and qualitative research is set up in three parts. The parts are all in the context of the thesis, and are not to be seen as independent. The thesis is split up in three parts to make it more readable and surveyable. The following paragraphs give a general idea of the research outline by briefly describing the goals of each part. In figure 1-1 this is displayed visually, to increase the surveyability of the research outline.

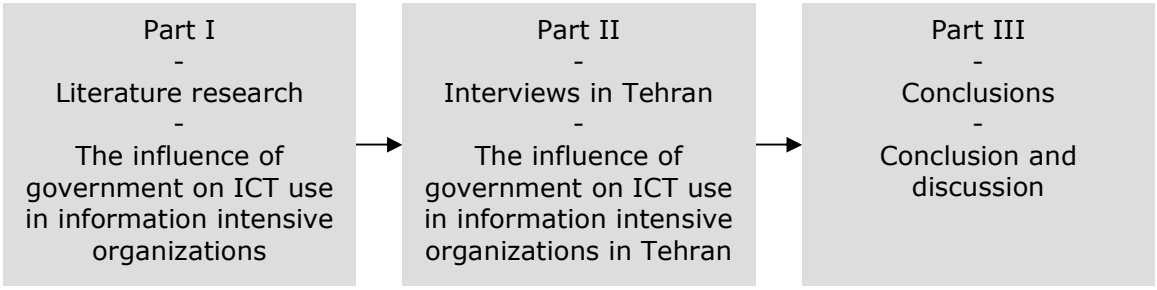
The first part is a literature research designed to answer the first research question. It presents a theoretical framework of the research field to support the empirical

second part of this thesis. The literature research results in a model summarizing the influence of government on ICT use in information intensive organizations. This model is the basis for the second part of the thesis.

The second part builds on the aspects of the model that are explored in the first part, with Tehran as the research location. It provides an answer to the second research question. The second part is based on the model that is composed in the first part. The model is evaluated with the use of semi-structured interviews of managers and directors in information intensive organizations in Tehran.

The third part draws conclusions based on the first and second part. In the third part, both research questions are answered to give a complete overview of the research findings. To conclude the research, a discussion of the research and recommendations for future research are given.

Figure 1-1 Research outline.



1.4 Relevance

This thesis is written to serve both scientific as practical purposes. These are discussed in the following paragraphs.

1.4.1 Scientific relevance

Scientific literature is analyzed to give insight in the influence of government on the use of ICT in organizations. The continuous development of ICT is having a growing

impact on organizations. Therefore, an analysis of the influence of government is a useful theoretical foundation for present and future scientific activity on this subject. The first part of the research is an addition to the scientific literature on ICT use in organizations in general; the second part is focused on the situation in Tehran. By analyzing semi-structured interviews from managers in Tehran a rather unique view of the situation is provided.

1.4.2 Practical relevance

The outcomes of this research are directly useful to the team of Dutch consultants. The literature research is relevant as described above. In the second part of this research, the influence of government on the use of ICT in information intensive organizations is researched in the situation in information intensive organizations in Tehran. This provides an indication of what are main issues in government policy with respect to ICT use in information intensive organizations in Tehran. The view of managers that work in information intensive organizations in Tehran is a valuable addition to the information that is made available through government channels.

1.5 Research quality indicators

Various steps are taken to increase the quality of this research. These steps concern internal validity, external validity, and reliability.

1.5.1 Internal validity

The validity of the literature research is enhanced by consulting multiple sources. This is not only to improve on the richness and quality of the literature analyses, but also adds to the validity. The data that is used in the literature research is from sources approved by scientists

The validity of the semi-structured interviews is taken into account by preparing for the interviews by reading the literature written on semi-structured interviews[10]. Also

[10] Kvale, 1996, p. 29-36 (in Baker, 1999); Rubin and Rubin, 1995 (in Baker, 1999);

the interviews are prepared by consulting experienced experts who are familiar with life and organizations in Tehran. The advice from the literature is used in constructing the list of questions and during the entire interview process. The interviews are written out to prevent subjective interpretation.

1.5.2 External validity

The external validity is especially important to the first part of the research. The generalizability of the literature research is improved by analyzing literature from multiple, scientific sources. The goal of the first part of the research is to provide a theoretical framework from which the second research question, that focuses on Tehran, is approached. The first part of the research can also function as the basis for a research that focuses on another city, country, or region.

By preparing for, careful documenting, and analyzing the interviews, the second part of the research aims to draw conclusions that are of value to the situation in information intensive organizations in Tehran. However, the limited amount of interviews restricts the generalizability.

1.5.3 Reliability

The reliability in the literature research is taken into account by describing in detail the steps of how the research is done. The concepts that are used to search literature and the way in which literature is selected and analyzed are indicated. Every step of the literature research is described to eliminate bias of subjectivity of the researcher. The process of data collection, selection, and analysis are described in the beginning of the literature research, to make this part of the research more replicable.

With respect to the interviews, the reliability is enhanced by using semi-structured interviews. The basic structure of these interviews can be replicated by anyone and

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Powney and Watts, 1987, p. 139 (in Arksey and Knight, 1999); Brenner et al., 1985 (in Arksey and Knight, 1999)

generates answers on the same subjects. Furthermore, the answers from all interviews can be compared to each other. However, because these interviews are close to a conversation, it is hard to achieve 'reliable' analysis of open-ended questions[11]. Three relevant concepts are applied to maximize reliability in interviews; consistency, truth value and neutrality[12]. The full interview transcripts are available, but not included in the research to protect the respondents' identity.

[11] Arksey and Knight, 1999, p. 8-9

[12] Arksey and Knight, 1999, p. 54-55

Part I – Literature research

2 Methodology

This part of the thesis provides insight in the influence of government on ICT use in information intensive organizations according to literature. This insight is the basis of the thesis and provides a theoretical starting point for the second part of this thesis; the focus on Tehran. This literature research part of the thesis is designed as descriptive, deductive, and qualitative, as described by Baker[13].
First, the central concepts of this research are explored with the use of literature. The literature on government, ICT use, information intensive organizations and the influence of government on ICT use in information intensive organizations is the unit of analysis. This literature is also the unit of observation in this part of the research.

2.1 Data collection

The literature is from sources available at the library of the Tilburg University. Books and articles are searched using the search engine of the Tilburg University library website. The sources are:

- Tilburg University catalogue;
- ABI/Inform;
- JSTOR;
- Others (when referred to, e.g. Blackwell Synergy, ScienceDirect, Wiley InterScience, Scholar Google, a.o.).

Multiple search methods are used to find literature; the search engine of the Tilburg University as described above, browsing through the library of the Tilburg University in which literature is placed together by subject, checking interesting quotes, and checking the source of interesting articles in the media. The literature is searched using the concepts described above. In some cases, literature uses the abbreviation IT (Information Technology) instead of ICT. This literature is only consulted and analyzed if the description of the concept of IT is similar to ICT used in this research.

[13] Baker, 1999, p. 40

2.2 Data selection

Only literature in English and Dutch is used. The literature research is planned carefully to improve credibility and quality. Literature is seen as relevant and thus included in the analysis when the context fits the context of this thesis and the main concepts are similar to those of this thesis. The main concepts government, information intensive organizations, and ICT use are described in chapter 3. To improve reliability a maximum variety in types of literature is used in this research; books, reports, articles, researches, etc.

Findings from literature are supported by or compared with findings from different authors. Literature is selected when it is relevant to the goals and questions of this research. The references in relevant literature are used in a second search to reveal literature that is also relevant. Literature with full text is used; when only an abstract is available, it is excluded. The list of references is used again from the new literature when it appears relevant. Also, the opposite method is used. That is, when literature is seen as relevant, the authors that refer to that literature are checked. This method is supported by applications that show a list of authors that refer to certain literature (e.g. Web of Science, Scholar Google).

This method is also used to assess the importance of literature; literature that is referred to by many other authors is preferred. The amount of literature that is included in the analysis becomes clear during the research. The use of lists of reference and Web of Science and Scholar Google can increase this amount during the research.

2.3 Data analysis

The relevant texts in the selected literature are summarized, labelled, and coded by category to improve on surveyability and intelligibility for the researcher. The goal of this analysis is not to produce figures on any of the central concepts, but to provide insight in the influence of government on ICT use in information intensive organizations. This insight is to be reached by analyzing the meaning of the texts and providing an overview. The method of data analysis is best described as content

analysis. The meanings of relevant matters in literature, as intended by its authors, are central in the analysis of the literature. The content and findings of literature is labelled and put in the context of this thesis. Then, the labels are used to create a clear and surveyable overview of the literature for the researcher. Concluding the data analysis, the literature is used to get insight in the influence of government on ICT use in information intensive organizations.

3 Theoretical background

Using the methodology outlined above, the central concepts of this research are explored to provide a theoretical starting point. The central concepts are government, information intensive organizations, and ICT use.

3.1 Government

This paragraph provides an overview of how government is seen in this thesis. In literature, even in government publications, there are various descriptions of government. Also, government is often referred to by means of related concepts such as the state, the collective sector, etc[14]. This paragraph explores the concept of government and gives a definition of how government is seen in this thesis.

It is difficult to imagine present-day societies, with its sophisticated economic and social network, without government[15]. The government is described in 1919 by Weber[16] as *"a political community that successfully claims the monopoly of legitimate physical force within a given geographical area"*. In modern societies, this means that government is able to exercise effective authority and its policies can be imposed on others. Macionis and Plummer simply describe government as *"the whole of formal organizations that direct the political life of a society"*[17]. Somers and Sinderen define the government as an *"institution that has the highest authority in a country. The army and the police are available to the government, as it is the only institution that has the legitimate right to use violence. From this position of authority, the government can prescribe certain rules to the citizens of a country"*[18].

[14] Somers and Sinderen, 1996, p. 72

[15] Heertje in Stiglitz, 1989, Somers and Sinderen, 1996, etc.

[16] in Schram et al., 1997

[17] Macionis and Plummer, 1997, p. 692

[18] 1996, p. 72

The main tasks of the government are to provide collective goods (e.g. defense, health care, justice, etc.), influence market tendencies, stimulate long term developments, and promote acceptable division of income[19].

The role of the government is a focus of discussion today as it has been for centuries and probably will be in the future. For example Plato and Aristotle, who had a polemic on the question if the state should be governed technocratically (Plato) or democratically (Aristotle)[20]. To an organization, the government is an environmental force that has to be taken into account in many phases of decision making. It is in this stage irrelevant to compare government to private organizations on all imaginable aspects. It is, however, relevant to point out the 'powers' the governments in general have that private organizations don't have[21]:

- The power to tax; the government can tax in several ways (e.g. proportional, progressive, and regressive), on several occasions (e.g. value added taxes, property taxes, inheritance taxes, etc.), and on specific goods (excises such as on alcohol, tobacco, and pornography).
- The power to proscribe; the government can prohibit certain activities, e.g. to protect markets, stimulate innovations, etc. These government initiatives are, in principle, to improve welfare.
- The power to punish; the government can exercise a range of punishments (e.g. for pollution) far more severe than could be arrived at by private contractual arrangements[22].

These powers that governments are different in e.g. pervasiveness and intensity between different countries.

Keeping these definitions and descriptions in mind, the following is how government is defined in this research: The government the highest authority in a society and

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[19] Duijm, 1992, p.187

[20] Somers and Sinderen, 1996, p. 16

[21] based on Stiglitz, 1989, p. 42-44

[22] In Stiglitz, 1989, these powers are complemented with transactions costs as an advantage in correcting market failures. The goal of this part is to point out what distinguishes government from private organizations. Therefore, transactions costs are left out of this list.

can impose its policies and powers to tax, proscribe, and punish on people and organizations within that society[23].

3.2 Information intensive organizations

Information is increasingly becoming one of the most important, if not the most important, basic resource for organizations. It is different from 'conventional' resources because it can be passed on, e.g. by selling it, without losing it. In fact, the value of information increases when more people have it. This is reason to rethink how organizations and societies work[24]. As mentioned in the introduction, modern societies are often referred to as information societies[25]. In these information societies, technology is developing rapidly, which necessitates changes in national economies as well as in individual organizations[26]. The challenge is to restructure national economies and organizations so that they can take better advantage of the opportunities presented by an information intensive world[27].

Information intensive organizations are organizations that develop a product or service which has a high information content. The main business processes of this kind of organization concern information processing. Information is the most important resource; it is used, shared, and integrated into routines to achieve a common vision or goal. Examples of information intensive organizations are banks, insurance companies, taxation offices, etc.[28].

The focus in this thesis is on this type of organization, because they have chosen to rely on ICT in every part of their organization. Therefore, developments in both government policies related to ICT as ICT itself are closely followed. Information intensive organizations are organizations that are, in comparison to other organizations in a society, ahead on the use of ICT in its business processes. The

[23] Based on definitions and descriptions by authors above.

[24] Drücker, 2001, p. 85

[25] Moore, 1997

[26] Drücker, 1994

[27] Moore, 1997, p. 281

[28] Dur, 1992; Proper, 2005; Glazer, 1993; Jones, 1994

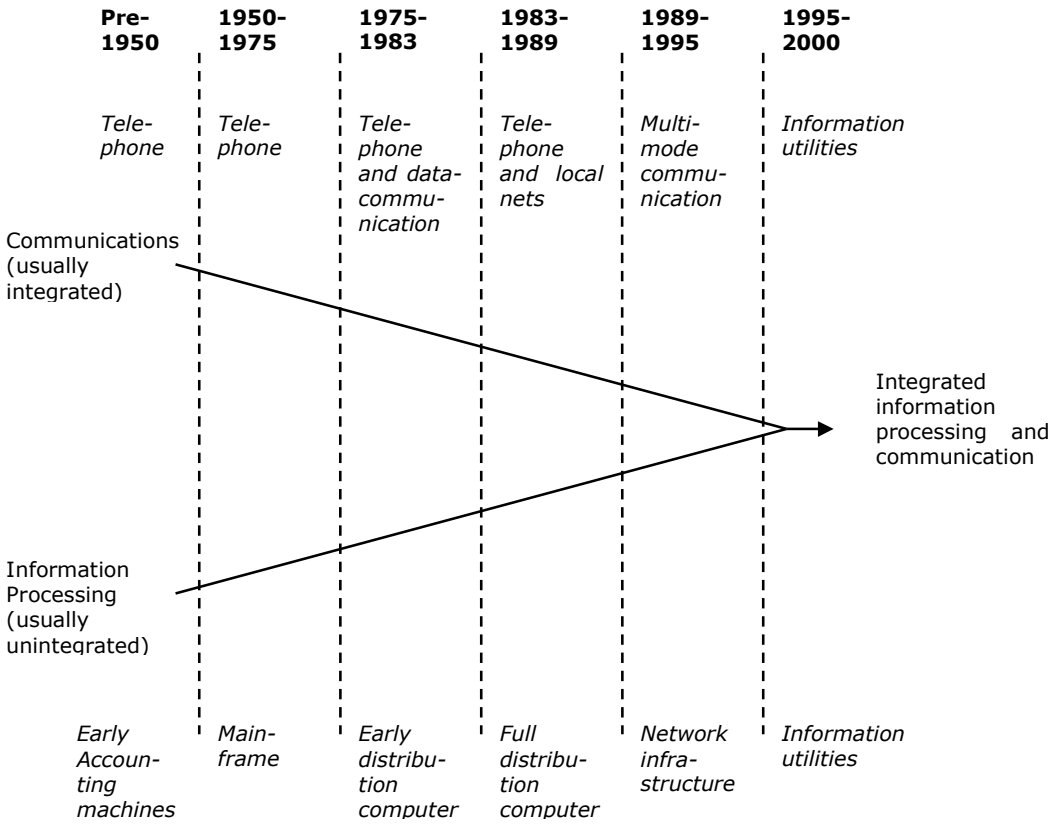
way in which these organizations deal with decisions and policies from government can be seen as an indicator of how less information intensive organization might deal with these developments later. Managers from information intensive organizations can be expected to be experts on the relationship between government and ICT use in their situation.

3.3 ICT use

ICT use is a central concept of this thesis. The goal of this research is to provide insight in the influence of government on ICT use. It is therefore not the intention at this point to give a complete and in-depth overview of ICT and all its possible and diverse applications. The concept of ICT and its use is described here in a simple manner with little technological jargon.

ICT is the convergence of communication technologies with information processing technologies. These to have always relied on each other to some extent; each has depended on the other to some degree. In the past decennia, the technologies converged significantly, although they were part of different developments. These developments have not taken place simultaneously throughout the world. The following figure (3-1) gives a general idea of the convergence.

Figure 3-1 Convergence of communications and information processing[29].



Information and Communication Technology (ICT) refers to all technologies that enable information processing and communication. Examples of this are personal computers, mobile telephones, the Internet, chip cards and interactive television. Also the necessary context is part of ICT; data processing, ICT-procedures, software, hardware and people involved[30].

ICT is in this thesis approached from a socio-technical perspective. In this perspective, the goal of ICT is not to replace, but to support employees. ICT is not a

[29] King and Kraemer, 1995; this article can be consulted for an in-depth description of the convergence of communications and information processing.

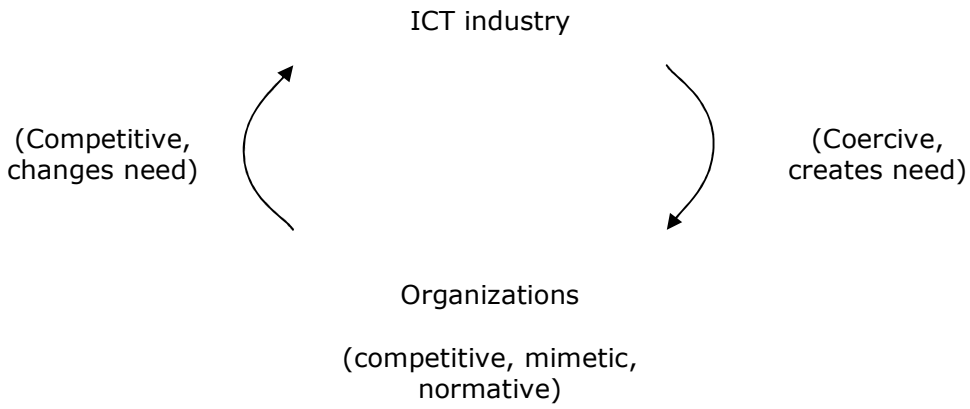
[30] Boonstra, 2002

goal in itself, but a means to reach the goals of an organization more effectively and efficiently[31].

ICT use in this thesis is simply the use of ICT as it is described above. The focus is on the use of ICT by information intensive organizations. ICTs are becoming more and more integrated in organizations in a wide variety of ways. The traditional applications, such as storage and processing of data, are increased to an extent that they facilitate the exchange of information beyond borders. Examples of ICT use are easy access to information, supporting various business processes, and connecting people and organizations all over the world[32].

ICT use in organizations is closely related to developments in ICT. The ICT industry develops new hardware and software, which organizations adopt and implement to remain competitive and also because they copy one another. These changes within the organization create a demand for new ICTs and thus organizations put pressure on the ICT industry. The ICT industry responds by developing even newer hardware and software, and the cycle starts again[33], which is illustrated in figure 3-2.

Figure 3-2 ICT use in organizations as a response to both external competition and institutional influence[34].



[31] Boonstra, 2002; Simons, 2004; etc.

[32] Simons, 2004.

[33] Hall, 2005, p. 167

[34] Based on Hall, 2005, p. 167

4 The influence of government on ICT use in information intensive organizations according to literature

4.1 Introduction

"Today, just about every country of significance has produced some form of information policy or is making an attempt to position itself as an information society. Across the world, the goals of these information policies are surprisingly consistent. What differ are the mechanisms that have been selected to achieve the goals"[35].
This statement by Moore indicates that countries around the world are engaged in at least some kind of effort to be or become part of the information society. It also indicates that government action, in the form of information policy, is important to reach this goal; government and ICT are in it together.

In this thesis society and technology are seen from a socio-technical view that sees the development and use of technology and societal change as interlinked and together the result of a wider societal-cultural process[36]. Smit and Oost[37] illustrate this by referring to two technologies, the clock and the telephone, that have influenced society profoundly, and have been influenced by society.
The development of the mechanical clock in the thirteenth century was the start of regulated and structured life. However, the influence of the development of the clock on society was not one-way traffic; societal needs influenced this technology. An example of this is the alarm clock. This function was developed to answer the need of monks in medieval monasteries to arrange nightly praying sessions.
The development of the telephone was at first a coincidence that occurred in an attempt to improve the telegraph. The first period after the invention of the telephone is characterized by searching functions for it. The first function of the telephone was the broadcasting of music, church lectures, important speeches, etc. Then, different voices in society (e.g. from corporations and citizens) demanded development of the two-way communication function of the telephone. This led to

[35] Moore, 1997, p. 276

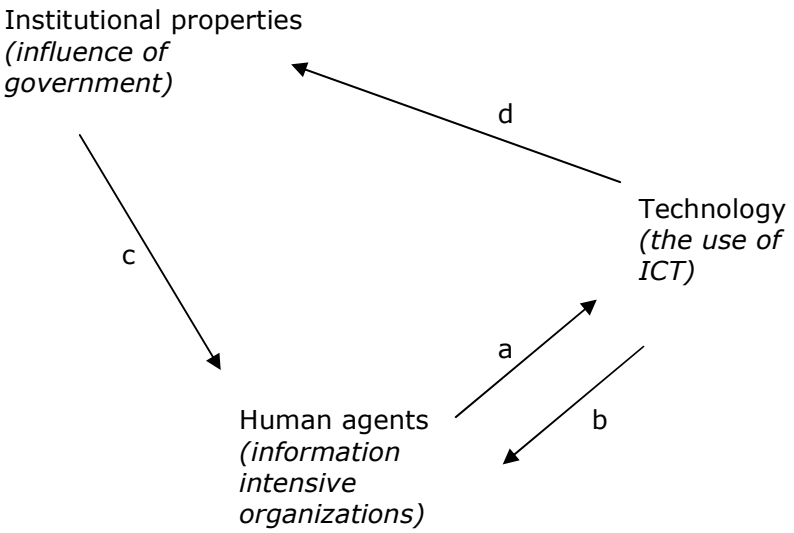
[36] Smit and Oost, 1999, p. 91; Batenburg et al., 2002

[37] 1999

streamlining and later automation of the telephone technology, which caused the telephone to develop into a technology and service we cannot imagine to be without[38].

This approach to technology in society and in organizations is the basis of a model by Orlikowski, in which this 'duality of technology' is explored. Technology and its use in organizations in this model have a dual nature as objective reality and as socially constructed product. The model is called 'the structurational model of technology' and is shown in figure 4-1. Within the model, the different concepts are followed by a cursive, which indicates what they represent in this research.

Figure 4-1 The structurational model of technology[39].



This model is related and important to this thesis to show that the research questions are only relevant within a greater context of technology, government, and organizations. As Orlikowski mentions in her conclusion: *"Even though causal associations may be postulated and researched, the premises of the structurational*

[38] Chapter two of Smit and Oost (1999, p. 25-53) provides an interesting and story on the development of the clock and especially the telephone as technologies that changed society and were changed by society.

[39] Orlikowksi, 1991, edited; additions from researcher in cursive

model caution us against undue determinism."[40] This is how this research is positioned; it explores the influence of government on ICT use in information intensive organizations, but doesn't place this relationship outside or above the greater context.

Three concepts are the center of the model. Human agents are technology designers, users, and decision-makers. The concept of human agents is translated to this research in the form of information intensive organizations. Technology is in this model the material artifacts that mediate task execution in the workplace. In this research the focus is on the use of ICT, which is a form of material artifacts that mediate task execution in the workplace in a variety of ways. Institutional properties of organizations represent a range of organizational dimensions (e.g. organizational strategies, ideologies, culture, etc.) as well as environmental pressures (e.g. governmental policy, competitive forces, state of knowledge about technology, socio-economic conditions, etc.). The focus in this research is on the government and the influence of its policies and decisions regarding ICT use in information intensive organizations.

The basis of the model lies in the different meanings of the relationships represented by the arrows in figure 4-1:

- *Arrow a:* As a human artifact, technology only exists through human action, and it continues to exist by human action through the ongoing maintenance and adaptation of technology. An interesting remark by Orlikowski on this relationship: *"Human action constitutes technology by using it."*[41];
- *Arrow b: "Technology is the medium of human action because technology, when used, mediates their activities."*[42] Technology has the power to both facilitate and constrain activities within organizations;
- *Arrow c:* Institutional properties, in this research the influence of government, influence people in organizations in their interaction with, and use of technology;

[40] Orlikowski, 1991, p. 34

[41] Orlikowski, 1991, p. 16

[42] Orlikowski, 1996, p. 18

- *Arrow d:* The interaction with technology has an effect on the institutional properties of an organization, either by reinforcing or by transforming the structures of signification, domination, and legitimation.

Because technology development and the use of technology are societal activities, they can be influenced, which can be seen in the model above. Rip et al. state in this context: *"Technologies are conceived, developed, and diffused by means of long and costly investments that are realized under economic and societal constraints. Accordingly, technology policies should be directed at guiding and stimulating the integration of technology in society."*[43] These technology policies are seen as part of a national strategy for achieving goals of wealth, sustainability, safety, etc.[44]. This requires an organized effort[45]. On a national level, this organized effort is often the result of national strategic management. In this thesis the focus is on its influence on ICT use. Strategic management directed at developing and stimulating or restraining the use of ICT is as important at the national level is it is at the organizational level. It is characterized by intense global competition, fast technological change, complementarities and links, and uncertainties. These characteristics require exact timing for market entry, anticipation of core capabilities, continuous technology learning, and development of supporting institutions and infrastructures. As a technology and an infrastructure, ICT also demands experimentation, new skills, and managerial practices, coordination, and support institutions.

Although it is not the focus of this thesis it is at this point relevant to note the importance for organizations to be open to government initiatives and information. Openness to government information, and for that matter any external information sources, and initiatives on the field of ICT is strongly positively associated with the level and intensity of ICT use. This, in turn, has been found to have a positive impact on firm-level financial performance[46]. However, low usage of government information sources is not uncommon. Most organizations gather external information on

[43] Rip et al., 1995, p. 16

[44] Rip et al., 1995, p. 16

[45] Smit and Oost, 1999, p. 56

[46] Forth and Mason, 2003, p. 21

subjects as ICT use not only from government, but also from technology suppliers and specialist consultants[47].

The considerations mentioned above give rise to new strategic behavior, policy instruments, and competencies[48]. In a study of the East Asian 'miracle' by Hanna et al.[49], it is argued that the strategic and selective response support to ICT led to the transition of East Asian countries from labour-intensive to knowledge-intensive structure. The strategic management of the East Asian countries has five aspects[50]:

- *Developing shared vision.* National visions anticipated the key role of ICT as an industry, technology, and infrastructure. National visions create awareness of possibilities, build long-term development orientation, and generate consensus on reforms. They are translated into corporate behavior through incentives, training, cooperative research, institutional support, and directed credit. Directed credit functions as a signal of the government's commitment to promising segments and technologies. Developing a foresight is important at national as well as organizational level.
- *Maintaining outward orientation.* It is virtually impossible to develop a realistic national view on ICT without orientating beyond borders. An international view is important within a national view. There is a variety of instruments available to develop and support this external orientation. Examples are the creation of a technology watch, market intelligence capabilities through specialized R&D institutes, export incentives and institutions, and general trading companies. A focus on export markets helps to achieve an economy of scale and leads to dynamic learning. Promoting the international view of a country to its organizations motivates organizations to meet quality and responsiveness of foreign markets, but also develops information channels on international best practices and technology trends.
- *Building core competencies.* A national strategic intent is to develop technological capabilities and nurture core competencies. Guided by the shared vision mentioned above, "*governments used policy instruments such*

[47] HI Europe, 2000 in Forth and Mason, 2003

[48] Hanna et al., 1996, p. 186

[49] 1996

[50] Hanna et al., 1996, p. 186-194

as trade, credit, foreign investment, specialized education, and technology support to complement firm efforts to develop core competencies."[51] The process of developing core competencies is based on previous market and industry achievements of a country's organizations. From several approaches to the national competencies, the core competencies are chosen and a strategic vision is compiled. This strategic intent sustains the efforts of organizations and leads to cumulative learning and higher value-added production. It is important to anticipate on the comparative advantage of a country or organizations in this way to *"allow for lead time for learning, lumpy investments, the building of support infrastructures, and training or recruitment of a critical mass of engineers."*[52]

- *Promoting strategic planning and learning at all levels.* Developing a national strategy requires cooperation between levels of government and between governmental and private organizations. In strategic planning the government acts as a *"coach, catalyst, coordinator, and regulator."*[53] The experience of the East Asian countries is that the use and diffusion of ICT must be constrained to some extent by national strategies. Research on all levels identifies ICT needs, which is the starting point for directing funds, policies, and services to support bottom-up actions and pilot projects. In conclusion; strategies are formed by both visions from the top as by local best practices.
- *Focusing and coordinating public-private efforts.* This aspect of strategic management by the East Asian countries flows logically from the aspect above. *"Mutually reinforcing plans were made possible by national visions, external orientation, incentives for learning and collaboration, and a rich array of institutions promoting government-business cooperation."*[54] The directed coordination of public and private initiatives is important to maximize the competitive advantage, accelerating learning, promoting the use and diffusion of ICT, building networks, and making the most of links and relations.

This overview of national strategic management is given to illustrate what kind of

[51] Hanna et al., 1996, p. 192

[52] Hanna et al., 1996, p. 191

[53] Hanna et al., 1996, p. 192

[54] Hanna et al., 1996, p. 194

considerations of governments are the reasons for initiatives to influence the use of ICT. Their options to do this, are diverse and numerous.

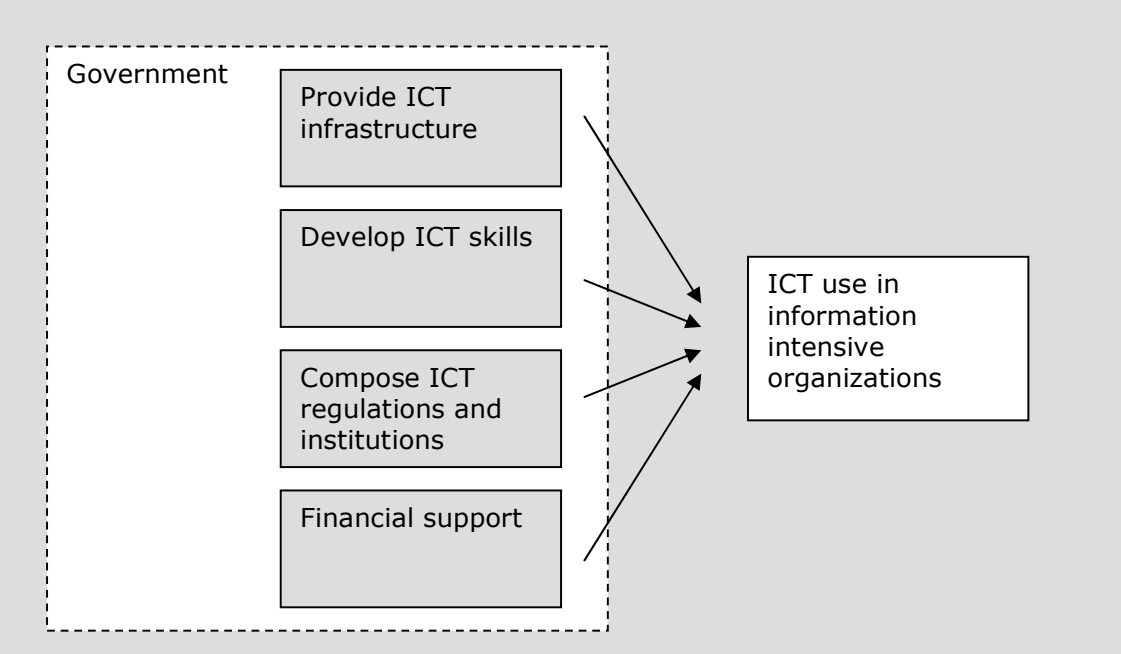
The focus is on national governments in general and its policies with regard to ICT use in information intensive organizations. Important in this focus is what options are available to a government to stimulate or limit integration and use of a technology. Several models of government influence on technology are consulted in order to come to a complete and clear model. The model presented in figure 4-2 is used as a guide throughout the research. The four different government instruments are the paragraph headings of this chapter, which in turn reappear in the second part of the research.

The following instruments are available to governments in order to influence the use of ICT[55]:

- Provide an ICT infrastructure;
- Develop ICT skills;
- Compose ICT regulations and institutions;
- Financial support.

[55] based on Smit and Oost, 1999, p. 57 and Stiglitz, 2000, p. 342-349

Figure 4-2 Influence of government on ICT use in information intensive organizations[56].



In figure 4-2, the government is in a square bordered by a dashed line to illustrate that it is not a static concept, but a dynamic one. Its border is porous, and materials, energy, and information flow in and out. The focus, however, is on what flows out of the government with a specific intention, to influence the ICT use in information intensive organizations.

It can be expected that some of these influences will also influence each other, or have some kind of relationship. However, they are first separately explored and described. Each paragraph begins with its part of the model and ends with the same part of the model, but with the relationship as it is found in the literature research. In the conclusion of this literature research, the complete model is presented.

In the following paragraphs these channels available to a government are explored to provide a clear view of the influence of government on the use of ICT in information intensive organizations according to literature. The four following paragraphs each start with an outtake of the model in figure 4-2, which applies to

[56] based on Smit and Oost, 1999, p. 57 and Stiglitz, 2000, p. 342-349

the subject of that particular paragraph. At the end of each paragraph the outtake is presented again, with modifications if necessary based on the researched literature.

4.2 ICT infrastructure

Cheap and efficient ICT infrastructure is essential for a country and its organizations and people. It enables individuals and organizations to communicate with one another. Initially the need is to extend the reach of these networks so that there is universal service. Moore stressed the importance of such an infrastructure by stating that *"an efficient telecommunications network is the single most important element in a successful information society."*[57] Tassey agrees with this and emphasizes the role of government in this by stating that the growth of nations is, in part *"the result of an effective complementary role for government in providing the domestic economy with an adequate technology base as well as broad and rapid utilization of this base."*[58] Hanna et al. emphasize the role and function of government in the following way: *"Government develops the national information infrastructure. It sets policies and standards, pools resources, guides demonstrations, invests in telecommunications infrastructure and regulates it services, and builds public networks and databases."*[59]

First, it must be made clear what is meant by ICT infrastructure. A dictionary describes infrastructure as *"the whole of immobile facilities such as roads, bridges, airfields, docks, etc."*[60] Another dictionary uses the definition *"An underlying base or foundation especially for an organization or system."*[61] Infrastructure means a base or a foundation. Thus, ICT infrastructure can be seen as the basis for ICT use. An interesting and usable definition that is appropriate in this research is that ICT infrastructure is *"a system of generic and relatively permanent basic facilities for collecting, storing, processing, and transporting data and knowledge, that is the*

[57] Moore, 1997, p. 276

[58] Tassey, 1990, p. 345

[59] Hanna et al. 1996, p. 203-204

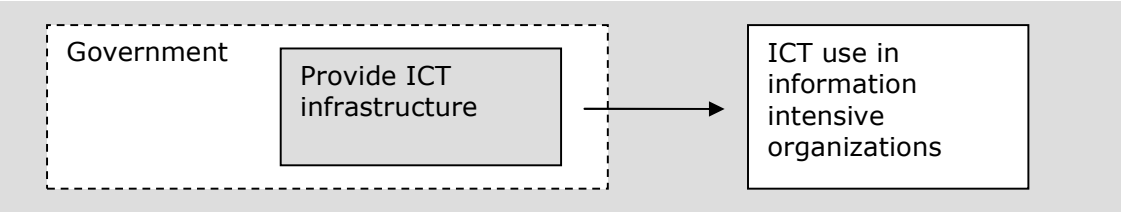
[60] Van Dale, 2006 via www.vandale.nl

[61] Houghton Mifflin, 2000 via www.dictionary.com

foundation for further development and use of specific information systems."[62] It can be argued that people and organizations are part of an infrastructure. In this research however, the definition of ICT infrastructure is narrower and focuses on facilities that allow data treatment as described in the definition above. It is, to a certain extent, focused on technology.

Providing an ICT infrastructure is essential for any government that intends to influence ICT use in organizations in its society. Without an infrastructure, there is no use. This is the part of the model that focuses on providing an ICT infrastructure:

Figure 4-3 Influence of government on ICT use by providing ICT infrastructure[63].



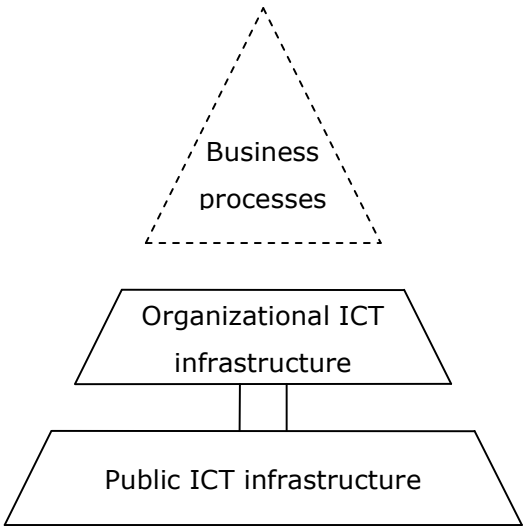
In comparison to the conventional infrastructure of e.g. roads and airfields, ICT infrastructure is sometimes called *"the new infrastructure"*[64]. This new infrastructure is equally important for enabling business processes as the conventional infrastructure. In fact, the availability of an ICT infrastructure is key, or as said before, fundamental for an information intensive organization. This is seen in figure 4-4, where ICT infrastructure is depicted as the base of an organization.

[62] Matthijsse, 1998

[63] Part of figure 4-2

[64] Weill and Broadbent, 1998, p. 6

Figure 4-4 ICT infrastructure as a foundation of an organization[65].



In figure 4-4 two different kinds of ICT infrastructure are identified; public and organizational. The influence of government on ICT use in information intensive organizations by means of providing an ICT infrastructure deals with public ICT infrastructure. Examples of this are the Internet, telecommunications networks, industry networks, etc. The lines between the two infrastructures signify that it is essential for the two to be connected. In this pyramid-display of an information intensive organization, the business processes are mainly knowledge management, financial management, and order processing, for which ICT use is important. The business processes are bordered by a dashed line, because there are more influences on it from concepts beyond this model. It is the combination of the two infrastructures that enables the business processes. The government is responsible for the public ICT infrastructure and its quality and effectiveness.

With regard to ICT infrastructure in an information intensive environment, there have been developments that differ from the conventional ICT infrastructure. First, ICT infrastructure is managed more holistically. Whereas the conventional ICT infrastructure was rooted in uncertainty and opportunism, the ICT infrastructure in an information intensive environment is approached in the *"concept of life-cycle*

[65] Weill and Broadbent, 1998, p. 7

funding"[66]. This means that ICT infrastructure needs both one-time costs as costs of operation and maintenance. The technologies that make up an ICT infrastructure are renewed or even replaced. Information intensive organizations rely more than ever on ICT infrastructure, therefore this cannot be neglected. Second, ICT infrastructure in an information intensive environment is designed to take advantage of economies of scale and scope. Government expenditures on ICT infrastructure are aligned with standards-setting activities and other strategic investments. An important goal of this is to prevent unnecessary heterogeneity, which is a cause for capital costs and expensive and scarce workforce skills[67].
A more holistic management of ICT infrastructure is also the basis of a development which refers to this infrastructure as information infrastructure.

Recent literature on ICT infrastructure is often a starting point or a part of literature on information infrastructure. Therefore, the concept is briefly included in this paragraph on ICT infrastructure, to point out what it means and how it relates to ICT infrastructure.

The role of ICT infrastructure goes beyond that of simply enabling ICT activities. The role is more often than not to get the full benefits of ICT deployment. Investments in ICT infrastructure are often seen as investments in information infrastructure. Information infrastructure is ICT infrastructure in a broader sense, putting the emphasis on the coordinating and strategic function of such an infrastructure. Investments in ICT infrastructure provide the telecommunications-based 'information super highway' and both build and maintain information infrastructure[68]. The users (organizations, persons, etc.) of an information infrastructure have access to a great and diverse pool of ICT based services. Renkema indicates the importance of information infrastructure; *"The information infrastructure has emerged as a focal point of national or even international IT policies."*[69]

[66] Katz, 2002, p. 54

[67] Katz, 2002; Tassey, 1990

[68] Renkema, 1998

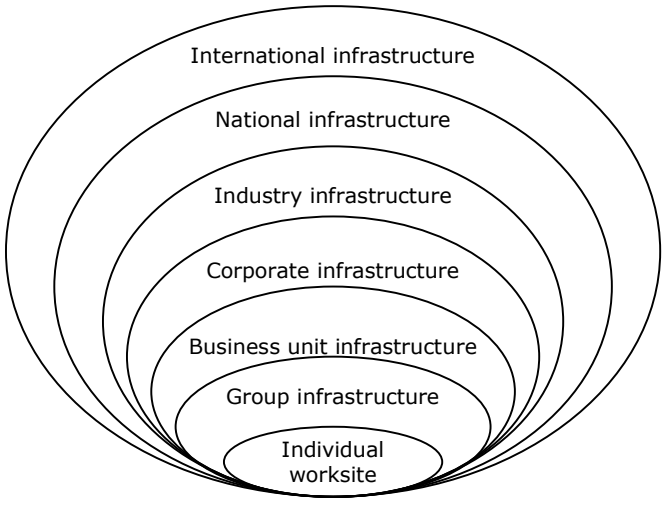
[69] Renkema, 1998, p. 182

There are three characteristics of information infrastructure that can be seen as goals for any ICT infrastructure[70]:

- *Virtualized.* An information infrastructure allows a collection of distributed information resources to be shared and managed as if they were a single information store, although they may in fact remain fully distributed.
- *Autonomic.* It ensures that the interconnected information systems can be managed effectively and efficiently through self-management just like the human autonomic nervous system.
- *Open.* It utilizes open interfaces and agreed-upon standards to enable highly interoperable systems and processes.

An important aspect of using ICT is that it is, at least to some extent, borderless. Therefore ideas such as e.g. 'the organization' or 'the country' could be argued to be meaningless. However, there will always remain some kind of borders. This is also true for information infrastructure. Just as an organization is part of an environment, infrastructure is part of an environment. This is shown in figure 4-5.

Figure 4-5 The layered nature of information infrastructure[71].



[70] Bourbonnais, 2004, p. 665; Frissen in Koops, 2006, p. 5

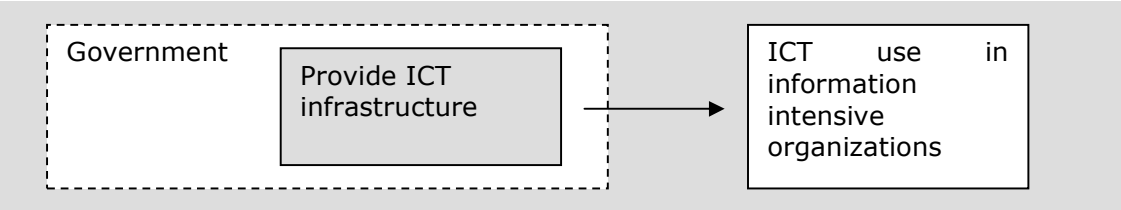
[71] Renkema, 1998, p. 183

This picture of the layered nature of information infrastructure is also an image of different levels and functions of ICT infrastructure.

4.2.1 ICT infrastructure in the model

Keeping the above in mind, it is clear that government does not only influence ICT use by providing an ICT infrastructure. Governments design policies to build and develop the information infrastructure, which has a profound influence on ICT use in information intensive organizations. However, the concept of information infrastructure includes some characteristics that are in this thesis discussed in a different paragraph. For example, an information infrastructure involves regulations and institutions, which is a separate paragraph. Therefore, for this part of the research the government influences ICT use in information intensive organizations by providing an ICT infrastructure (figure 4-6).

Figure 4-6 Influence of government on ICT use in information intensive organizations by providing an ICT infrastructure[72].



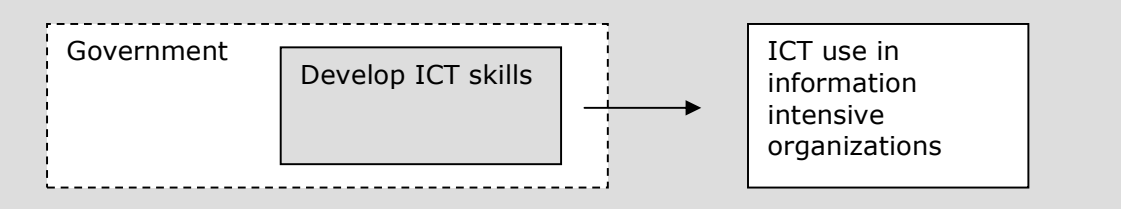
4.3 ICT skills

In the previous paragraph, the importance of an infrastructure to ICT use in organizations and the role of government in its development are detailed. This paragraph focuses on a subject that is assumed to be equally or even more important to ICT use in organizations; ICT skills. The importance of the development of ICT skills to ICT use in organizations is sometimes emphasized by referring to ICT

[72] Similar to figure 4-3.

skills as the 'knowledge infrastructure'. This emphasizes that ICT skills are seen as a factor with the same enabling and stimulating effect on ICT use in organizations as ICT infrastructure.

Figure 4-7 Influence of government on ICT use in information intensive organizations by the development of ICT skills[73].



As explained above, national governments can both stimulate or limit the use of a technology, in this research ICT. One goal of a country that wants to be or become an information society is to improve industrial and commercial competitiveness and productivity by making organizations use information as a resource. This improved competitiveness and productivity of organizations and the overall economy allows for a fundamental shift in the nature of the economy by moving into more information intensive operation. A prerequisite for this is a skilled workforce, or, more properly, an educated workforce. All citizens must have basic information and technology skills, which is achieved by education and training. Many need to develop these skills to a high level so that they can meet the needs of the information intensive organizations[74]. Learning ICT skills is even essential, because with any newfound knowledge it is vital to manage the use of technology to ensure you don't get consumed by the technology itself[75].

To understand, produce, and most of all use the new information and communication technology, there is a widespread need to posses a range of ICT competences. Developing ICT skills is sometimes referred to as achieving ICT fitness of people in an organization and it has certain critical success factors such as *"becoming more professional, more creative in using a PC, saving time, or having more information at*

[73] Part of figure 4-2

[74] Moore, 1997, p. 276, Smit and Oost, 1999, p. 57

[75] Jory, 2001

hand"[76]. This increases the importance of providing higher education, vocational education and training as well as tailored offers for continuing vocational education and training and lifelong learning[77]. This need for lifelong education is replacing the classical learning period between 18 and 23 and new technologies call for new learning models[78]. To dig deeper in the concept of life long learning and its implications on learning models is beyond the scope of this thesis. It is, however, interesting to point out that education is able to develop alongside the needs of ICT.

This is supported by a report of the International Labour Office (ILO) on learning and training in the knowledge society. The report recognizes that *"people's endowment of skills and capabilities, and investment in education and training, constitute the key to economic and social development"*[79]. Skills and training increase productivity and incomes, and facilitate everybody's participation in economic and social life[80]. A strong statement on this subject is made in the report: *"Economic growth and social development of countries are invariably associated with large and sustained investments in education and training."*[81] The development of ICT skills is necessary to be able to use ICT and the role of government in this process is unique and of great importance.

It is obvious that across countries in the world, social, economic, and institutional developments are different. Although there can be a similar focus of governments in general, the ways in which this focus is put into practical policies differs. On this note, human resources development and training, and the institutional framework on which they are based, have evolved in different ways. For example, countries such as Austria, Germany, and Switzerland have a tradition of profound involvement of employers and private organizations in education and training. This is in contrast with the more school-based systems in Finland, France, Sweden, the former centrally planned economies and many developing countries. Aside from these differences

[76] Jory, 2001, p. 60

[77] Petersen and Wehmeyer, 2004

[78] Thijssen et al., 2002

[79] ILO, 2002, p. 4

[80] ILO, 2002

[81] ILO, 2002, p. 4

between countries, in e.g. the role of government, a set of common principles underpin countries' efforts in developing learning, training, and human resources development policies and systems that ultimately influence the ICT use in organizations[82]. These principles have been confirmed and implemented by various international and regional institutions, such as the ILO, the EU, the G8, and the OECD. These principles are[83]:

- Establishing an enabling environment that encourages investment in human resources development and training by all stakeholders;
- Developing an institutional framework for human resources development and training that is relevant to countries' social and economic context and level of development;
- Ensuring equal access to human resources development and training for all, irrespective of socio-economic status, ethnic origin, etc.;
- Developing partnerships between various stakeholders in the delivering of learning, education, and training programmes;
- Relying on learner-centered strategies and practices, with an increasing emphasis on the use of ICTs.

These principles are partly directed at national planning and influencing of ICT skills, but also for a great part at organizations. Therefore these principles return in the second part of this thesis, when government influence on ICT skills in information intensive organizations in Tehran is research. Moving from a nation-wide to a person-centered view, ICT skills are described below.

Developing ICT skills can be initiated and stimulated on various levels; national, organizational, individual, etc. This part of the research focuses on how government influences ICT skills in organizations. ICT skills of people in organizations are sometimes called 'digital skills'[84]. Digital skills can be subdivided in three types[85]:

- *Operational skills.* Operational skills refer to the ability to use a computer and its most important programs (e.g. text processing, drawing, e-mail, operating

[82] ILO, 2002

[83] ILO, 2002, p. 15

[84] Dijk, 2003, p. 26 and also based on Gannon-Leary et al., 2001

[85] Dijk, 2003, p. 26-32

the Internet, etc.). It is a widespread mistake to think that operational skills are the only type of digital skills. Acquiring a minimal amount of operational skills with regard to ICT can be seen as a necessary prerequisite for using ICT and learning skill concerning the content.

- *Information skills.* Information skills are skills that indeed concern more with content. Information skills with regard to ICT are the abilities to search, select, and process information from computer and network files. Having information skills means to be able to use form as well as content of the information available through ICT.
- *Strategic skills*. Strategic skills are information skills supplemented by application and context of information. With regard to strategic skills, information is a means to achieve a goal that can be reached on own initiative. Strategic skills with regard to ICT are a way to improve the situation of a person or an organization.

The focus of governments that intend to stimulate the digital skills increasingly shifts from operational skills to information or even strategic skills. This shift in focus signifies that ICT use is with same increase seen as a goal while it was intended a means for organizations and people to higher goals, instead of a goal in itself. National efforts aimed at developing the ICT skills of citizens are often (re)formulated in the context of countries' efforts to undertake major education and training reforms aimed at ensuring that their training policies and systems better meet contemporary economic and social needs[86]. To clarify this, an example of practical government action to influence the (ICT) skills of citizens is given. This can take the following form:

- Helping more young people to apply for upper secondary general or vocational education and complete their studies;
- Developing students' learning skills in all sectors of the education system;
- Increasing the provision of non-university higher education;
- Expanding opportunities for adults to study for upper secondary and post-secondary vocational qualifications and to pursue other studies that improve their employability and capacity for further learning;
- Developing methods for recognizing non-formal and informal learning;

[86] ILO, 2002

- Etc.[87]

The base of this is to develop a knowledge base that will help citizens to find their way in the information society. It is imperative to develop individuals' learning abilities by offering opportunities for learning and training that are tailored to target groups at different stages of their lives; e.g. young people, (unemployed) adults, etc. who are at risk of seeing their skills overtaken by rapid change. This includes three main components[88]:

- The development of local learning centers;
- The promotion of new basic skills, in particular in ICT;
- Increased transparency of qualifications.

As the above points out, the influence of government on ICT use in information intensive organizations by developing ICT skills is not always direct. Indirect influence of government by developing ICT skills is regularly established in the form of a variety of public-private partnerships. This can for example be seen in partnerships between the private sector and universities. This kind of partnerships is a form of public-private partnership and is often set up to combine the effectivity and efficiency of the business world with the high standards of the universities[89]. Another example of this is seen in Japan. The Japanese government promoted ICT use among SMEs and key industries. These promotion efforts involved partnerships of the central and local governments and business. The costs of training, consultants, information services, R&D, and demonstration projects were shared[90].

4.3.1 ICT skills in the model

The influence of government on ICT use in information intensive organizations by developing ICT skills is both direct and indirect. This is graphically presented in figure 4-8, in which the indirect influence via public-private partnerships is added. The

[87] This is an example taken from the government's development plan of Finland as summarized in ILO, 2002, p. 8

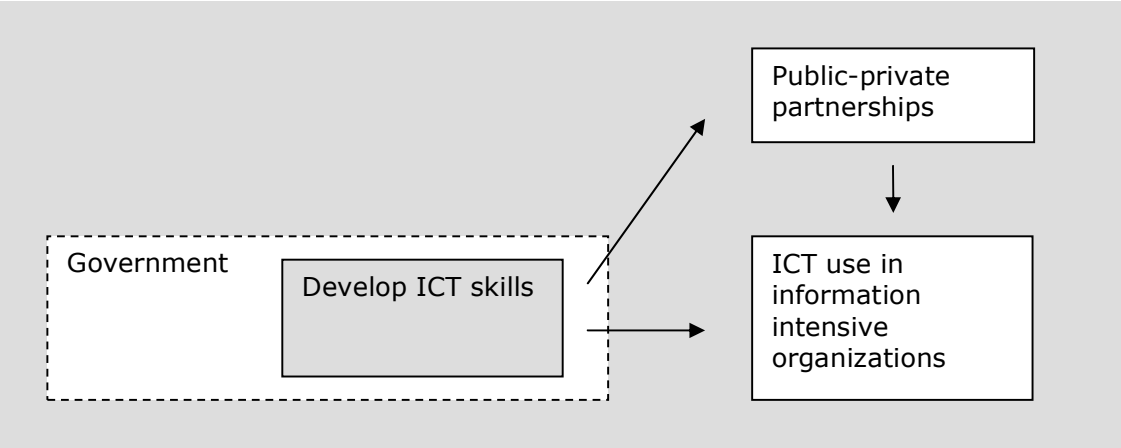
[88] ILO, 2002, p. 8

[89] Scott, 1989

[90] Hanna et al., 1996, p. 202

direct influence of government is established by making the development of ICT skills a part of national education policy. The indirect influence of government is established by encouraging public-private partnerships on various levels. These partnerships enhance the ICT skills that are needed for effective ICT use in organizations.

Figure 4-8 The influence of government on ICT use in information intensive organizations by developing ICT skills[91].



4.4 ICT regulations and institutions

The development and use of a technology is not just guided by political and social institutions, the institutions themselves can be the most urgent and important development. This is illustrated by List when discussing the England of the 1830s; *"England's manufactures are based upon highly efficient political and social institutions, upon powerful machines, upon great capital resources, upon an output larger than that of other countries, and upon a complete network of internal transport facilities."*[92] An example more related to ICT use is that in 1982 former British Prime Minister Margaret Thatcher, a strong supporter of laissez-faire economy, insisted that the diffusion of ICT depended on the central role that government must

[91] Modification of figure 4-7, based on the above

[92] List in Heng, 2000, p. 157

play in promoting its development and application[93]. These examples indicate that government has played an important role in technology use and development in the past and it can be assumed that this is true in the present and will remain true in the future.

The role governments can play is subject to change and development parallel to or anticipating on relevant developments in ICT. However, ICT does not require a change in the basic values of a society: *"Although it is still highly unclear where these ICT developments will lead us, the developing on-line environment is challenging governments all over the world to fundamentally rethink their existing legal frameworks and to figure out a regulatory approach towards the range of activities that are happening there.(…) Technological developments can be steered so that, for instance, fundamental values and norms can continue to be guaranteed."*[94] Governments can also play an important part in the introduction and use of new ICTs, and their development towards new areas; *"To be able to effectively influence the ongoing ICT process, governments try to get involved as early as possible in the 'design process' of the new on-line world, looking for the most optimal regulatory approach with their current knowledge of ICT developments."*[95]

The concept of institutions has been used at several moments in this research. In this part of the research, institutions have a specific meaning and function that is described here to avoid confusion. Institutions are in this part of the written rules and regulations as designed and enforced by government. When attributed to a view, the regulatory view of Scott[96] describes institutions in a way that fits this research; institutions according to the regulatory pillar contain *"rule-setting, monitoring, and sanctioning activities".*[97] Another author that describes institutions as they are seen in this part of the research is North[98]. North makes a distinction between formal and

[93] Howkins in Heng, 2000, p. 74

[94] Koops, 2006, p. 3

[95] Koops et al., 2006, p. 4

[96] 2001

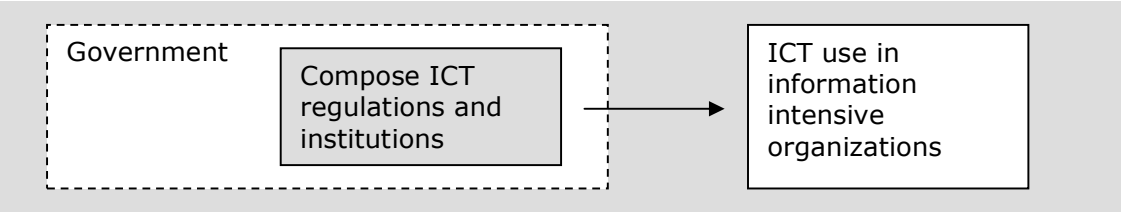
[97] 2001, p. 52

[98] 1990

informal institutions. The institutions in this part of the research are similar to formal institutions. Formal institutions are explicit rules that are composed with the intention of stimulation certain interaction, but not all interactions. Formal institutions are, among others, political, social, and economic rules and laws[99].

The institutional framework and regulations initiated by government play a crucial role in expected and (un)wanted developments in the use of ICT. Important in this is the way in which possibilities or barriers are created regarding the implementation and use of ICT in organizations[100].

Figure 4-9 The influence of government on ICT use in information intensive organizations by composing ICT regulations and institutions[101].



In the book 'Starting points for ICT regulation' Koops et al. researched the ICT regulatory starting points of the US, Europe, Asia and the Pacific region. They also research the ICT regulatory starting points of international organizations; OECD, G7/G8, WIPO, WTO, ITO and WSIS. From these regulatory starting points a list of general ICT regulatory starting points is composed, which gives an indication of which ICT regulations are considered important and are applied throughout the world[102]:

- *Regulation should be technology neutral.* Just as regulations are generally not gender-specific or age-specific, the intention is to keep them not technology-specific. The goal of this regulatory starting point is to regulate the functions and effects in society, not the means. Regulation does not mean to regulate the technology itself, but only the effects of technology use. Aside from the

[99] North, 1990

[100] Batenburg, 2002, p. 48

[101] Part of figure 4-2

[102] Koops et al., 2006

fact that regulations must not discriminate certain technologies, a reason for this approach is that regulation must not hinder the development of ICT. Some side notes on this regulatory starting point are that regulations are only usable when they are sustainable, subsidiary and proportionate, and transparent.

- *What holds off-line, should also hold on-line.* This regulatory starting point seems simple; it means for example if something is illegal and punishable outside the ICT context, it will be illegal and punishable within the ICT context. This starting point can be applied in several ways. In the first place, existing rules can be applied to the ICT context. Secondly, this regulatory starting point can be applied by designing new rules for within the ICT context that have an outcome similar to a comparable situation outside the ICT context. Finally, it is possible to design new rules that apply both to outside and within the ICT context.
- *Self-regulation should be the starting point.* Although self-regulation and government regulation seem two distinct and mutually exclusive forms of regulation, in practice they are often each other's complement in the regulation and coordination of behavior. This regulatory starting point is deemed relevant because it is assumed that self-regulation to a certain extent is more flexible, efficient, and adequate. Especially in a rapidly developing situation as the ICT context this is assumed. Given that the two concepts are in practice each other's complements, some situations require special attention. From various policy papers a list of criteria that require deliberation is composed when self-regulation can be considered and when government intervention is called for: fairness, inclusiveness, compliance, transparency, legal certainty, context, and efficiency. When self-regulation is insufficient, government will intervene, e.g. when government intervention results in more fair or transparent behavior in the ICT context. A final remark on this regulatory starting point is a rephrase: *"ICT regulations should not be purely a government activity, but should also involve private parties."*[103]
- *ICT-related regulation should be accomplished at an international level.* This regulatory starting point comes from the general assumption that in order to facilitate the development and use of ICT, and to provide for adequate legal

[103] Koops et al., 2006, p. 148

> security, harmonization at an international level is desirable. Cases of interest in this context are copyright, domain names and Internet governance, personal data protection, and cross-border law enforcement. Considering the border-crossing nature of ICT, this starting point is not to be ignored. However, there are obvious aspects that vary from country to country, therefore, this is a multi-dimensional issue, and no common approach seems available; *"(…) in dealing with ICT rule-making at an international level, the question is how social, cultural, economic, and individual identity and diversity can be balanced with the obvious advantages of harmonization (legal security, minimum level of fundamental rights, etc.)"*[104].

For each of this regulatory starting point, situations and examples can be given to which they don't apply. But although they are not universally valid, they give an indication of how and to what extent governments and international organizations influence the ICT context and thus the ICT use in organizations.

It has been mentioned several times in this thesis that governments can stimulate or limit the use of ICT in organizations. This can be done for different reasons. In this part both types of governmental action regarding ICT use are discussed; to stimulate and to limit ICT use by means of regulations and institutions.

4.4.1 Stimulate ICT use by regulations and institutions

Stimulating the use of a technology is done in various ways. The government can play an important role by implementing a stimulating policy.

Part of a stimulating ICT policy is to show organizations the surplus value of ICT use in comparison with the use of older technology. Designing and developing applications and technologies that actually have a significant added value is in general a responsibility for hardware and software producing organizations, both public as private. The government does influence this by supporting these organizations in various ways. Financial support is discussed in paragraph 4.5. Other

[104] Koops et al., 2006, p. 200

than financial support, there is a challenge for government to stimulate the right organizations[105].

Another important part of ICT policy is to take away negative aspects of the image that surround the use of ICT. An important issue in this is trust. Government can organize trust for organizations that use or are interested in using ICT, trust in the security of transactions, communications, and privacy. Next to this, organizations must be able to trust the government that its relevant institutions and agencies take the necessary actions to prevent or constrain the use of ICT by criminals, racists, terrorists, extremists, and pornographers. The actions taken by government do not only require national effort, but also require the support of international initiatives. International initiatives can support ICT use by implementing effective regulations and acting against abuse[106].

Actions taken by government to implement ICT use in their daily work by the different agencies have been known to create a spill-over effect to other organizations in the country. The spill-over effect of ICT use in government practices can also be seen as the example function that governments have to organizations in the country. Next to this, governments can stimulate ICT use by making important information or services available through ICT[107].

4.4.2 Limit ICT use by regulations and institutions

Limiting the use of ICT in information intensive organizations is often initiated by the government to protect or in some way guide organizations in a certain direction. By means of example, this is illustrated in a practical setting when Katz discusses the access to information in colleges and universities: *"Access to institutional records is highly regulated by federal and state statute, by myriad regulations, and by institutional policy – and rightly so, since colleges and universities are the custodians*

[105] Dijk, 2003, p. 63; Hanna et al., 1996

[106] Dijk, 2003, p. 63-64

[107] Hanna, 2003

of men and women entering adulthood, of patients requiring care in campus medical centers, of people participating in research protocols, and so forth."[108]

Particularly with regard to the Internet or other information networks, governments have implemented a regulatory and institutional framework. Research shows that an often seen first reaction of governments to the Internet, namely apprehension, can be found in many of these frameworks. Especially more repressive governments have doubts and worries regarding the effects of free access to information. Research shows that instead of allowing for an invisible hand or lending a helping hand on this subject, governments were more likely to take a 'grabbing hand' view of regulation[109]. This was the cause of a suppressed use of the Internet. Ultimately, the research states that a country's regulatory approach to ICTs can have a large impact on its ubiquity and use throughout the country[110].

4.4.3 Regulations and institutions in the model

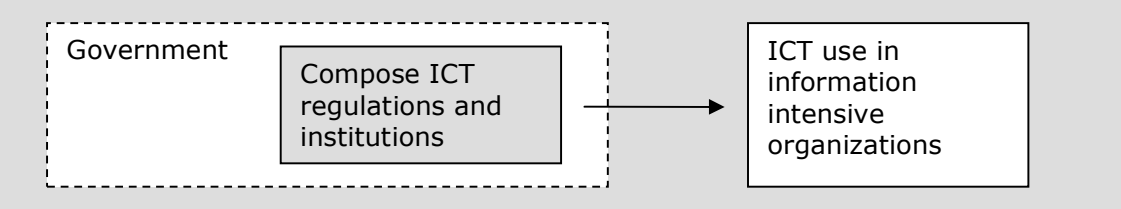
The influence of government on ICT use in information intensive organizations by composing ICT regulations and institutions can take two forms; government can choose to stimulate or limit ICT use. Often, both strategies are used at the same time on different aspects of ICT use. The model on this part of the research remain the same (figure 4-10), but the arrow that represents the influence has been given more depth and meaning.

[108] Katz, 2002, p. 54

[109] Wallsten, 2005, p. 14

[110] Wallsten, 2005

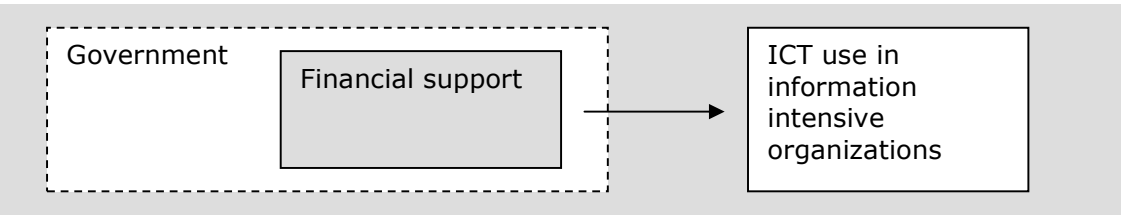
Figure 4-10 The influence of government on ICT use in information intensive organizations by composing ICT regulations and institutions[111].



4.5 Financial support

With respect to government stimulation of ICT use in organizations this research has so far shown that governments are willing and able to go to great lengths to stimulate organizations in their ICT use. Several ways have been discussed; providing an ICT infrastructure, improving ICT skills, and developing regulations and institutions. Perhaps the most obvious way of influencing ICT use is discussed in this part of the thesis; financial support of ICT use in information intensive organizations, which is depicted in figure 4-11.

Figure 4-11 The influence of government on ICT use in information intensive organizations by financial support[112].



On this particular subject, the first consideration that a government has to make is between the level and scope of intervention, assuming that there is always some kind of financial support of ICT use. As Hanna et al. put it: *"The risk of state intervention should be weighed against the dangers of not intervening. Selectivity in intervention is often necessary in view of scarce public resources and the need to*

[111] Similar to figure 4-10

[112] Part of figure 4-2

focus national resources for fast learning and maximum impact."[113] In their study, Hanna et al. found that the cases of the fastest industrializers indicate that such interventions are feasible and successful. Another case suggested that *laissez faire* did not lead to the preferred outcomes[114].

When a national strategy is developed, it is often developed to complement or at least build on current or previous strategy. The fact that many countries have implemented an incoherent strategy with bad results does not mean that they should abandon their ideas and initial motivations. However, the step must be made towards developing a strategy that is coherent and results in logical and realistic interventions. This is achieved by understanding these factors and processes that make for effective and strategic interventions. Considerable policy mistakes can be avoided by limiting the duration of government support and setting performance-oriented criteria for projects and organizations[115].

4.5.1 Direct financial support

Direct financial support from a government offered to organization to stimulate ICT use seems straightforward and one of the most direct ways to achieve this goal. In a lot of cases this, however, is an elaborate process with a variety of outcomes. Direct financial support to influence the use of ICT is often part of a governmental technology policy. It may take the form of subsidy, for which some government procurement is a possible instrument to help the diffusion and use of a technology. This has been the case, for example, in the restructuring of China in becoming an ICT industry giant. Inefficient organizations were subsidized to change the focus from inefficient electronics to a focus on the computer market[116]. This shows that direct support can be given as subsidies to producers as well as users. The effectiveness of subsidies to users depends on the extent to which subsidies causes producers of the technology to change the prices[117].

[113] 1996, p. 211

[114] 1996

[115] Hanna et al., 1996

[116] Kraemer and Didrick, 2001

[117] Stoneman and Diederen, 1994, p. 925

The effectiveness of a subsidy policy depends, among others, on the time profile of the subsidy. If the subsidy is to exist for a limited time period, this leads to adoption and use of the technology by organizations. However, if a subsidy is designed and implemented to last for a long time or even forever, it has only a slight impact on the adoption and use of a technology. A subsidy that is to take place in the future has a delaying effect on the adoption and use of a technology by organizations[118]. Although most policy initiatives of this type are usually of relative minor size in organizations budget, the diffusion and use of a technology, such as ICT, is strongly affected by government policy. This is seen in the effectiveness of the stimulating policy of lowering computer prices by governments, which has an immediate positive effect on the use of ICT[119].

In the research of Hanna et al. financial support proved to be essential in promoting ICT use; credit policies promote ICT. Incentives targeted at ICT producers and users were and are updated every two to five years. A practical example of this is seen in the approach by the government of Japan. In this case, credit was channeled through a Japanese government agency to buy domestic computers and lease them to organizations within Japan[120].

4.5.2 Indirect financial support

Indirect financial support can take many forms. With respect to ICT use, the expectations of this kind of government policy are generally to induce technologists to increase the use of scientific advances, but also to lead to generate technologies that are more 'applicable'[121]. This was, for example, an important part of the Chinese economic transition in the 1990s; *"China transformed its science and technology system to spur growth and development. This was done in part by creating state-owned but market-oriented enterprises linked to state research institutions in order*

[118] Stoneman and Diederen, 1994

[119] Kraemer and Didrick, 2001

[120] Hanna et al., 1996, p. 200

[121] Stoneman and Diederen, 1994

to commercialize the technologies developed in those institutions." [122] Tassey describes two policy responses of government that stimulate scientific knowledge on technologies. Although he recognizes there is a 'gap' between the availability of scientific knowledge and the ability to use this technology in organizations, effective stimulating policies have a stimulating effect on the use of a technology in organizations. This is especially true when this gap is reduced or even entirely removed in the early generic phases of technology research [123] .

The first policy initiative is that of direct funding of early-phase technology research. This does involve direct financial support, but does not directly influences the use of a certain technology in organizations. This direct funding of technology developments is initiated by governments to ultimately develop commercial products, processes, and services for organizations. This direct funding benefits governmental research organizations, private research organizations, and in most cases a joint-venture of some kind in which both public and private parties take part[124].

The second policy response described by Tassey is that of tax incentives. Tax incentives are often seen as investment policy and investment trends indicate that this can be an important role for policy[125]. Organizations can be stimulated to explore 'high-risk' technology applications and research or speed up existing processes.

The most important difference between these two policy approaches is that direct funding is usually a more effective mechanism for developing and diffusing specific elements of a technology. Tax incentives are on the other hand more efficient and neutral in supporting organizations throughout a society[126].

Governments around the world realize the potential of ICT use and the consequent improvements in business practices. An important role in indirect financial support lies in public-private partnerships. In some cases it is even believed that certain

[122] Lu, 2000, in Kraemer and Didrick, 2001, p. 4

[123] Tassey, 1996, p. 583

[124] Tassey, 1996, p. 589

[125] Stoneman and Diederen, 1994; Tassey, 1996

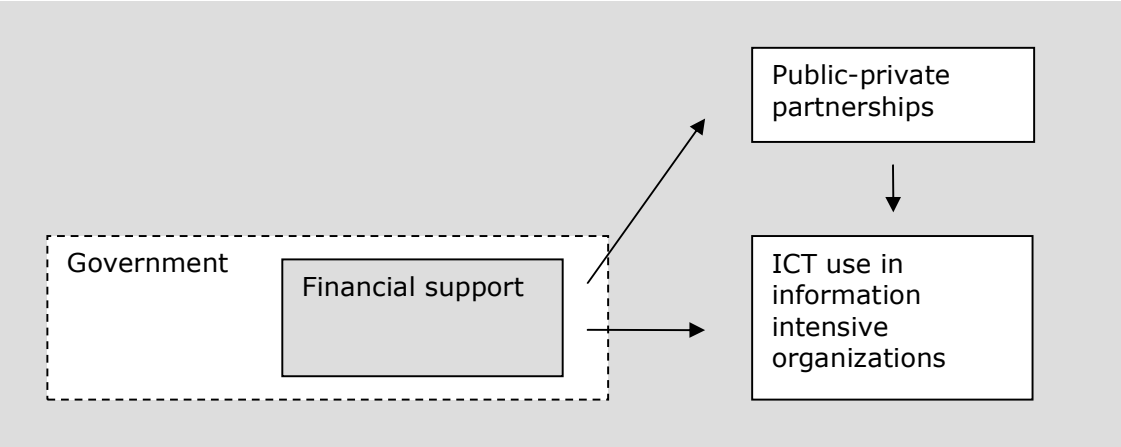
[126] Tassey, 1996

initiatives can only succeed when government and business are genuine partners during design and implementation. The general division of functions is as follows: *"Government coordinates and subsidizes. The private sector provides some funding, delivery channels, and knowledge of market failures, learning requirements, and user preferences."*[127]

4.5.3 Financial support in the model

The influence of government on ICT in information intensive organizations by financial support can be both direct and indirect (figure 4-12). Direct influence of government often takes the form of subsidies, benefits, and credit policies. Indirect influence of government is in most cases established in the form of supporting or setting up public-private partnerships.

Figure 4-12 Influence of government on ICT use in information intensive organizations by financial support[128].



4.6 Conclusion

[127] Hanna et al., 1996, p. 203

[128] Modification of figure 4-11

In this first part of the thesis the influence of government on ICT use in information intensive organizations according to literature is researched. The model presented in the beginning of this chapter (figure 4-2) provides the paragraph headings. At the end of the conclusion in this paragraph, a modified, more complete model is presented based on the literature research. The goal of this first part of the thesis is to answer the following research question:

> What is the influence of government on the use of information and communication technology in information intensive organizations according to literature?

The use of ICT in information intensive organizations can not realistically be researched as independent entity; it is subject to different kinds of influences. Influence of government is one of the most important influences, because ICT as a technology is too important on societal, cultural, and economic level for government to ignore. Although the methodology and extent to which different governments intervene differs, every government initiates some efforts to be part of ICT. ICT use in organizations is a means to a goal. In general, this goal is to become part of the information society, which is in some way the goal of many governments. There are various ways to provide an overview of government influence on ICT use. Based on literature and the need for a clear overview, four ways in which government can establish influence have been identified:

1. *Provide ICT infrastructure.* ICT infrastructure is a system of generic and relatively permanent basic facilities for collecting, storing, processing, and transporting data and knowledge that is the foundation for further development and use of specific information systems. With respect to ICT use in information intensive organizations, the ICT infrastructure has an enabling and stimulating function. The ICT infrastructure needs to be affordable, efficient, and effective to enable information intensive organizations to use ICT. One of the implications of this is that the public ICT infrastructure needs to be able to link to the organizational ICT infrastructure. Information infrastructure takes ICT infrastructure to a higher level, which can be useful in discussing the future and current developments in the ICT infrastructure. The

government can enable and stimulate ICT use in information intensive organizations by providing this ICT infrastructure as effective as possible.

2. *Develop ICT skills.* ICT skills in the workforce are a prerequisite for organizations to be able to perform on an information intensive level. The stimulating and enabling effect of ICT can be compared with that of ICT infrastructure to such an extent, that it is sometimes referred to as the knowledge infrastructure. To understand, produce, and most of all use the new information and communication technology, there is a widespread need to posses a range of ICT competences. It is essential for the state of the ICT skills in the workforce to develop parallel to the needs that exist in an information society. A set of common government principles underpin countries' efforts in developing learning, training, and human resources development policies and systems that ultimately influence the ICT use in organizations:
   - Establishing an enabling environment that encourages investment in human resources development and training by all stakeholders;
   - Developing an institutional framework for human resources development and training that is relevant to countries' social and economic context and level of development;
   - Ensuring equal access to human resources development and training for all, irrespective of socio-economic status, ethnic origin, etc.;
   - Developing partnerships between various stakeholders in the delivering of learning, education, and training programmes;
   - Relying on learner-centered strategies and practices, with an increasing emphasis on the use of ICTs.

   The influence of government on ICT use in information intensive organizations by developing ICT skills is both direct and indirect via public-private partnerships.

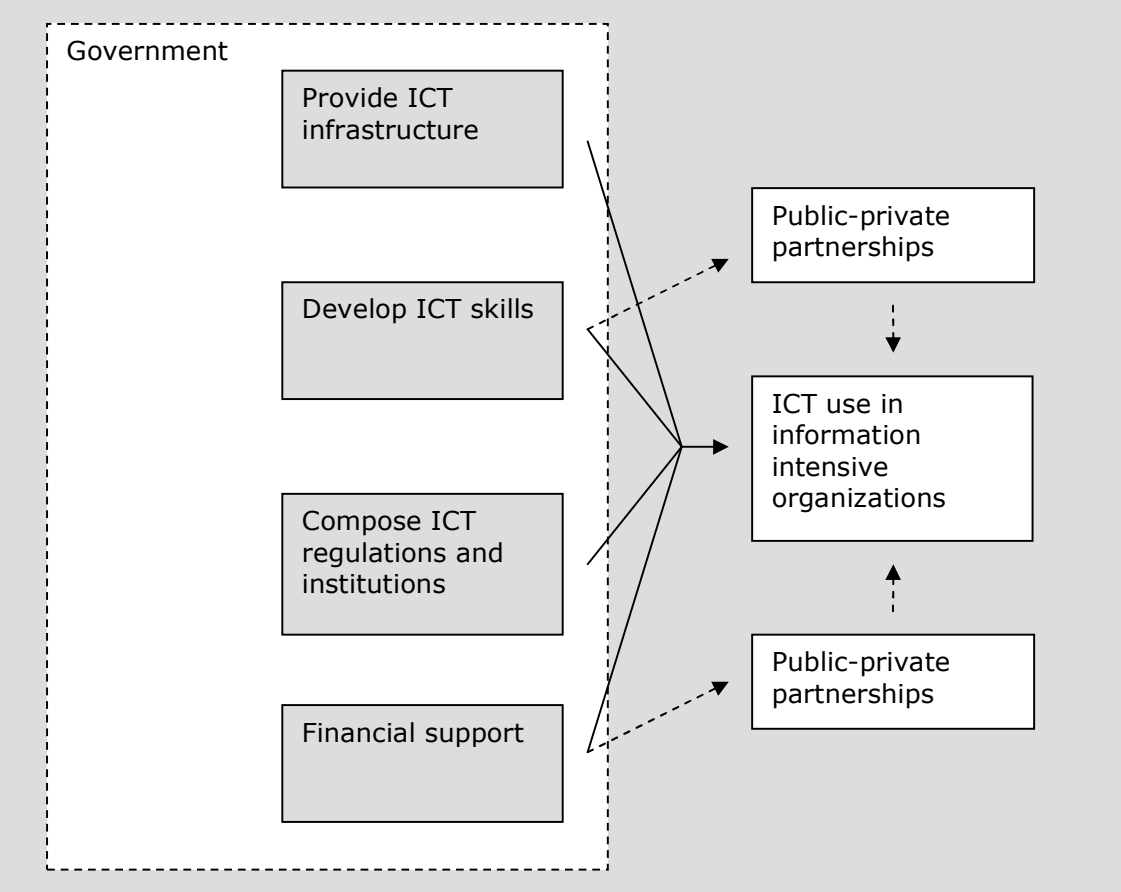
3. *Compose ICT regulations and institutions.* The institutional framework and regulations initiated by government play a crucial role in expected and (un)wanted developments in the use of ICT. Important in this is the way in which possibilities or barriers are created regarding the implementation and use of ICT in information intensive organizations. There are some ICT

regulatory starting points to facilitate the use of ICT in organizations that are applied throughout the world. With the use of these starting points, the regulations are technology neutral, in line with off-line regulations and values, aimed at self-regulation and internationally orientated. ICT regulations and institutions can be designed to stimulate of limit the ICT use:

- Governments can stimulate the use of ICT in information intensive organizations by promoting policies, by taking away barriers such as lack of trust, and by using ICT in government agencies and service.
- Limiting the use of ICT in information intensive organizations is often initiated by the government to protect or in some way guide organizations in a certain direction. Especially information in certain institutes or on the Internet in general is the focus of governments.

4. *Financial support.* With respect to financial support of government to stimulate ICT use in organizations, governments need to develop a strategy that is coherent and results in logical and realistic interventions. This is achieved by understanding these factors and processes that make for effective and strategic interventions. Governments can establish this influence in a direct and in an indirect manner:
    - Direct financial support is an effective way for government to influence ICT use in information intensive organizations. However, the effectiveness can vary. Due to often limited budget, direct financial support is in most cases part of a carefully planned technology policy. It can take various forms such as subsidies, benefits, and credit policies.
    - Indirect financial support by government is in most cases established by means of general tax incentives or takes the form of direct funding of (public-private) projects. The most important difference between these two policy approaches is that direct funding is usually a more effective mechanism for developing and diffusing specific elements of a technology. Tax incentives are on the other hand more efficient and neutral in supporting organizations throughout a society.

Figure 4-13 The influence of government on ICT use in information intensive organizations.



This is the final model of government influence on ICT use in information intensive organizations. The four options of governments have remained the same, but the arrows that represent the influence now come together before pointing to ICT use. This is done to signify that throughout this first part of the thesis, it has become clear that there are some similarities and complementarities between the four options. However, the most important reason for this is to show that these four options can be quite useless when they are not tuned to each other and together part of a carefully planned government policy. The indirect influences are shown as dashed arrows. This is not to downplay their relevance or importance; on the

contrary, it is to stress just that. Public-private partnerships are essential in this context.

So, what is the influence of government on ICT use in information intensive organizations? This has proven to be a difficult, but interesting question. The answer is given in the conclusion of this first part of the thesis and in the model presented in figure 4-13. This model is not only the answer to the first research question; it is also the beginning in answering the second research question. The second part of this thesis draws upon this final model in order to evaluate the model in the situation in Tehran.

Part II – Interviews in Tehran

5 Introduction

The second part of this thesis discusses the theoretical background outlined in the chapters above in the context of information intensive organizations in Tehran, the capital of the Islamic Republic of Iran. Tehran is the research location for this part of the research. First, some basic data on Iran and its capital are given to provide a frame of reference. Then, information intensive organizations in Tehran are introduced. This introduction is not the result of an extensive literature research, but rather a short overview of some important and interesting information that is useful to understand this part of the thesis.

After this introduction the methodology that is used in this part of the thesis is discussed. The research is done in the form of semi-structured interviews which follow the same basic structure of the chapters in the first part of this research. The interviews and the analysis of these data are also presented in this part.

5.1 Iran

Figure 5-1 Iran and its neighboring countries[129].

The Islamic republic of Iran has been a republic since the Islamic revolution of 1979, which caused the end of the monarchy of Shah Reza Pahlavi. The most important international events after the revolution are the war with Iraq from 1980 until 1988 and the deteriorating relationships with the US and the Western world[130].

Since the revolution a dualistic governmental structure has evolved. This structure consists of official institutional power relationships on one side and unofficial informal power relationships on the other. The Islamic religion plays an essential part in every aspect and layer of present-day Iranian society.

Currently, the power lies by the religious supreme leader ayatollah Khamenei. The chosen conservative president is Ahmadinejad, but his power is limited[131].

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[129] http://www.cia.gov/cia/publications/factbook/geos/ir.html

[130] Keddie, 2003

[131] Kamrava and Hassan-Yari, 2004

Hofstede provides a valuable insight in a culture on various dimensions. Not going into detail on these dimensions, the conclusions of Hofstede's data on Iran are useful to get a better understanding of the country. The combination of high scores on the dimensions 'Uncertainty Avoidance' and 'Power Distance' creates a society that is control-oriented and allows inequality. These cultures are more likely to follow a class system that does not allow significant upward mobility of its citizens. This combination also creates a situation where leaders have virtually ultimate power and authority. It is not unusual for new leadership to arise from armed insurrection – the ultimate power, rather than from diplomatic or democratic change. The low score of Iran on the 'Individuality' dimension shows a collectivist society, rather than individualist. Most commitments (e.g. family, business relationships) are close and long-term. Loyalty is the key word, more important than other societal rules and regulations. Iran scores average on 'Masculinity', this would indicate that while women might be limited in their rights, it may be due more to religion rather than a cultural paradigm[132].

5.1.1 Iran and ICT

Iran is one of the largest economies in the region and the second largest OPEC oil producer. English is taught in many schools and about 60 percent of the population is under 21 years old. Education level is high. This young and educated population provides solid ground for developments in ICT[133].

Due to other priorities in the development of the country, Iran stayed behind in the development of the necessary ICT infrastructure[134]. The war with Iraq and economic problems demanded the attention and funds. When the emphasis shifted to reconstructing and developing the country, it was mostly focused on domestic production of various industrial and agricultural goods toward self reliancy. ICTs, such as the Internet, were initially promoted by the Iranian government to provide an alternative means of scientific and technological advancement during the troubled economic period that followed the war with Iraq. As Rahimi states:

[132] www.geert-hofstede.com

[133] IRICA, 2005

[134] IRICA, 2005

"The Islamic revolution was, as the 1979 Iranian revolutionaries recognized, an unprecedented event in modern history in that it emphasized the significance of faith in the scientific pursuit of knowledge, and use of the Internet fits this self-image."[135]

The Iranian government has been interested in the development of ICT since the early 80s. In 1980, the High Council of Informatics was established as the Iran's highest authority regarding informatics. The first official e-mail ever to be sent from Iran was sent in 1993. It contained a simple greeting from the director of the Institute of Theoretical Physics and Mathematics to the University of Vienna[136]. In 1994, the first regulation on ICT was officially implemented. Furthermore, the key role that application of ICT can play in social and economic development of Iran has only been identified and acknowledged in the past decade. In 1998, more attention was given to ICT in Iran in the third five-year plan[137].

The real turning point in the history of ICT in Iran was the enactment of the first TAKFA-project in 2002. This project was the first time ICT spending of government agencies were planned in the national budget. It also made expansion of ICT application a national priority[138].

5.2 Tehran

Tehran, the research location, is the capital of Iran. It is the biggest city of the country, with a population of over 12 million. Although efforts are made to decrease the level of progress between Tehran and other big cities such as Kish and Isfahan and especially the provinces, Tehran is ahead on most aspects of technology and economy. On most aspects, Tehran has an example function for the rest of the country. In short; on most levels of development Tehran leads and the rest of the country follows. This makes Tehran an important and interesting research location.

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[135] Rahimi, 2003, p. 1

[136] Seifkashani, 2003; Rahimi, 2003

[137] Tabesh et al., 2004

[138] IRICA, 2005

5.3 Organizations in Tehran

Because this thesis focuses on information intensive organizations in Tehran, it is relevant to give a short description of different aspects of organizations in Tehran. First, the organizational culture in Tehran is discussed. Since there are virtually no studies that focus on organizations in Tehran specifically, the information presented is mostly based on information in Iran which applies to organizations in Tehran. The cultural view on organizations is used by e.g. Johnson and Scholes as a way of explaining that (organizational) strategies are the outcome of the taken-for-granted assumptions and routines of organizations[139]. It has been argued that organizational culture can be highly influenced by societal culture[140].

As in many countries in the Middle-East, Iran has maintained a very strong traditional heritage that is based on Islamic traditions and laws. This cultural heritage has influenced organizational structure and behavior[141]. An example of this is the large proportion of organizations in Iran that is small, family-owned or dominated, and highly centralized.

The most important aspects of Iran's organizational culture are identified as a result of various studies[142]. In Iran, an employee is loyal to the organization, is highly oriented on performance, supports a high power distance, shows low societal collectivism, and high in-group collectivism. More moderate attributes of Iran's organizational culture are the altruistic and friendly side, the low assertiveness and the relatively low orientation on the future.

The major Arab cultural values that affect organizational performance are: an individualistic approach to work, the dislike of manual work, the 'top man' syndrome, and the importance of the extended family as one of the most important social organizations in the Arab world. These values have affected organizations in three

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[139] Johnson and Scholes, 1999, p. 58

[140] Hofstede, 2003

[141] Dev Sharda and Miller, 2001

[142] Dastmalchian et al., 2001; Hofstede, 2003; Alavi and McCormick, 2003; these study reports can be consulted for a more detailed look at this subject.

major ways. First status and seniority significantly outweigh ability and performance in importance. Second, organizations are centrally controlled with a low level of delegation; authoritarian management is predominant and subordinates act with deference and obedience. Third, nepotism is regarded as natural and acceptable. Arab managers view their organizations as family units and often assume a parental role in them[143]. Another interesting remark in this context is provided by Johnson: *"The influence of the government, the existence of an extended kinship system, and the importance of friendship in determining types of work and responsibility is extensive in the vast majority of Iranian organizations."*[144]

The score of Iran on Hofstede's cultural dimensions 'Uncertainty Avoidance' and 'Power Distance' mentioned before has consequences on organization type in Iran. From figure 5-2 the organizational type that is most likely to occur can be derived[145].

Figure 5-2 Uncertainty Avoidance, Power Distance, and organizational form[146].

	High uncertainty avoidance	**Low uncertainty avoidance**
Low Power Distance	Workflow bureaucracy	Implicitly-structured non-bureaucracy
High Power Distance	Full bureaucracy	Personnel bureaucracy

Figure 5-1 shows that in Iran, with high scores on Hofstede's dimensions uncertainty avoidance and power distance, a full bureaucracy can be expected to be the most common organizational type. This is the typical organization form for most Islamic countries.

[143] Al-Faleh, 1986, p. 20-24, in Dev Sharda and Miller, 2001

[144] Johnson, 1980, p. 65, in Dev Sharda and Miller, 2001

[145] Hofstede, 1980

[146] Hofstede, 1980

6 Methodology

The unit of analysis in this second part of the research is ICT use in information intensive organizations in Tehran. The unit of observation is the manager in these organizations.

6.1 Data collection

The data is collected with the interview as research methodology. The type of interview used is the semi-structured interview. The interviews have a structure that is the same for every interview. In fact, the same general questions are asked to all respondents. The general questions are created and ordered based on literature and are designed to provide insight in ICT use at information intensive organizations in Tehran. Asking extra questions during the interview, digging deeper in a certain topic, is possible, but the main questions are the same. This similarity facilitates analyzing and comparing of the interviews later in the research[147].

The semi-structured interview as a method of research is chosen because it is flexible, respondent oriented, and leaves room for additions by the respondent and the interviewer during the interview. This is indirectly expressed by Riesman in his description of the ideal interviewer; *"The ideal interviewer is the person who can adapt a standardized questionnaire to the unstandardized respondent."*[148]
The interviewer and respondent are not equal partners, because the interviewer introduces topics and defines and controls the interview situation[149]. The respondents will remain anonymous.

6.1.1 Selection of respondents

[147] McNamara, 1999

[148] Riesman in Baker, 1999, p. 220

[149] Baker, 1999, p. 240, p. 247

The first and most important consideration that is made in selecting the respondents is based on Baker. She underscores the importance of approaching possible respondents that are able and willing to answer the questions[150].

First, three open interviews have been done in the Netherlands to prepare for the interview setting and for the job of interviewer. The respondents of these interviews are known experts on Tehran and organizations in Tehran. Their knowledge on organizations in Tehran and on norms, values, and appropriate behavior in an interview setting supports the researcher. These interviews are not analyzed, because they have a supporting function to the researcher.
The preparations for Tehran as a research location also involve the experiences of the Dutch team of consultants, who have experienced life and organizations in Tehran. The goal of these preparations is to limit interviewer bias in the interviews and thus maximize reliability and validity[151].

Then, interviews in Tehran have been done. The respondents for the interviews in Tehran are selected from a list of 48 information intensive organizations issued by the Dutch Embassy in Tehran. This list contains information intensive organizations located in Tehran that have a relationship with the Dutch Embassy in Tehran. All organizations from this list are contacted by means of an invitation letter which can be found in appendix I. Seven organizations have agreed to participate in the research. The respondents are managers or directors from the organizations. To simplify interview references in this thesis all respondents are described as managers. They are interviewed as experienced experts on the research subject in the situation in Tehran. The information intensive organizations that are involved in this research are:

- Two banks, one is a governmental bank, one is a private bank;
- Two consultancies;
- One university;
- Two ICT project management bureaus.

[150] Baker, 1999, p. 204

[151] Baker, 1999; Aldridge and Levine, 2001

The main reason for selecting managers and directors is because they will be able to answer the interview questions and in that way contribute to reaching the research goals[152]. Also, it is advised by Eden and Ackermann, because *"senior participants often have a more strategic or holistic view of the organization, covering a wider range of issues"*[153]. Another reason for this choice is of a practical nature; managers are more likely to be able to communicate in English.

6.1.2 The interview

The interview is to a certain extent a conversation, or a professional conversation. Using interviews, or conversations, as a research method is a natural way for human beings to get to know other people and learn about their experiences, feelings, hopes, and the world they live in[154].

As mentioned above, the interviews are semi-structured. The semi-structured interview is *"an interview whose purpose is to obtain descriptions of the life world of the interviewee with respect to interpreting the meaning of the described phenomena"*[155]. It has a sequence of themes to be covered, as well as suggested questions. Yet at the same time there is a possibility to make changes of sequence and forms of questions in order to follow up the answers given and the stories told by the respondents[156]. Each interview follows the same basic structure, which is based on the theoretical model presented in the first part of this research. Certain guidelines from Baker are kept in mind; the questions are worded in a simple, neutral way in order to avoid distortion of the response[157]. Also, Kvale's and Rubin and Rubin's remarks on the interview as conversation or, more specifically, guided conversation are taken into account[158].

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[152] Baker, 1999, p. 204

[153] Eden and Ackermann, 1998, p. 301

[154] Kvale, 1996

[155] Kvale, 1996, p. 5-6

[156] Kvale, 1996, p. 124

[157] Baker, 1999

[158] Kvale, 1996; Rubin and Rubin, 1995

The interview questions are composed based on a consideration that is again made by Baker. She stresses the importance of composing and presenting the questions in a way that is understandable and acceptable. E.g. the questions are in a language the respondent are comfortable with and asked in a way that doesn't have a negative connotation to the respondent[159].

The interviews are done in English and recorded with an mp3-player with a memory capacity of one gigabyte. The device is tested and proved to produce a high quality sound recording and provide enough memory to store the interviews.

The basic structure of the semi-structured interviews is presented in appendix II.

6.2 Data selection and analysis

The meaning of what was said in the interviews is of main interest. Therefore there is no need for a transcript that features non-verbal communication, e.g. grunts, hesitations and lengths of pauses[160]. In the analysis of the interviews, the focus is on what is said, not on how it is said. All respondents are managers or directors of information intensive organizations in Tehran, and their contributions to the research are of equal importance.
The interviews are recorded and written out. In the analysis, the three steps of Baker[161] and Miles and Huberman[162] are followed:

- *Condensing the data.* Baker explains this first step as follows: *"The data need to be condensed. This requires choosing which information to keep and which to discard and determining how to combine notes without stripping away the meaning and significance of the subject"*[163]*.*The data is to be processed in such a manner that the central themes and meanings can be ascertained and pulled together. The data are coded into these central themes and meanings

[159] Baker, 1999, p. 204

[160] Arksey and Knight, 1999, p. 141

[161] 1999

[162] 1994

[163] 1999, p. 335

and irrelevant data is filtered out[164]. When contradictory or unique data is derived from interview transcripts, these will be displayed when they appear relevant.

In coding the interview data issues mentioned by Arksey and Knight[165] are taken into account. These issues thoroughly prepare inexperienced interviewers and researchers to the interviews and the analysis[166]. The coding of the interview data is done by the principle of 'cut and paste'. Portions of speech are coded and cut out of the transcript and pasted with similar portions under a category[167].

Condensing the data of the interviews held in Tehran in this way, results in a useful set of data. The stories and information not relevant to this research, which are inevitable in semi-structured interviews, are filtered out. The structure of the semi-structured interview (see appendix II) follows the structure of the first part of this research. Analysis of the answers to the interview questions start with processing the answers in a so-called 'monster matrix'. This matrix gives a clear overview of the outcome of the research and consists of keywords and quotes[168]. The monster matrix is presented in appendix III.

- *Displaying the data.* On this second step, Baker states: "*The second effort requires figuring out ways to present the information so that it will be vivid and vital to the readers"*[169]. The coded data are displayed in words and a summary is displayed in one or more matrices to improve readability and surveyability. In displaying the data, the relationship between display and

[164] Baker, 1999, p. 335

[165] 1999

[166] Arksey and Knight, 1999, p. 161-171

[167] Arksey and Knight, 1999, p. 163

[168] Miles and Huberman, 1994

[169] 1999, p. 335

analysis moves from summarizing to analyzing in order to make sense in setting up a display and finally lead to explanations[170].

Displaying the data in this way is not only of value to the reader, but also to the researcher. An overview of all the data from the interviews is essential for the next step.

- *Developing conclusions.* The third step Baker describes as: *"… the data have to be interpreted so that conclusions can be drawn which the researcher can establish as valid and convincing"*[171] .The explanations are linked to the research question and conclusions are drawn. This phase is supported by Miles and Huberman's strategies for drawing conclusions from qualitative data[172].

These are the steps that are followed to select and analyze the data from the interviews, which are presented in the following chapter.

[170] Miles and Huberman, 1994, p. 101 (in Baker, 1999, p. 337-338)

[171] 1999, p. 335

[172] in Baker, 1999, p. 343 and in Arksey and Knight, 1999, p. 169

7 Analysis – the influence of government on ICT use in information intensive organizations in Tehran.

7.1 Introduction

The final model from the first part is used to analyze the data from the interviews. This chapter begins with referring to the monster matrix as presented in appendix III. The monster matrix is set up as described in Miles and Huberman[173]. The matrix follows the basic structure given in chapter four. Each of the four ways in which government can influence ICT use in organizations forms a row of the matrix. In the seven columns the relevant quotes and key words from the interviews on the row subjects are stated. There are seven columns that represent the interview quotes and key words from the interviews of the information intensive organizations that participated in the research.

The data from the monster matrix are presented in this chapter following the structure which is set up in chapter four. Each chapter on a certain influence of government on ICT use in information intensive organizations in Tehran is illustrated with relevant quotes on that subject. Then, these interview data are described, clarified, and if relevant grouped together. The following part of this research, in chapter eight, presents conclusions and recommendations.

7.1.1 ICT use in information intensive organizations in Tehran

First, it is interesting to note how important the use of ICT is to information intensive organizations in Tehran. Each of the respondents from the organization that participated in the research indicates that in their organizations ICT use is important, which can be expected from information intensive organizations. For example, ICT use is described as *"essential"* (organization III), *"necessary for business"* (organization I), and as *"the most important instrument to get the job done"* (organization IV).

[173] 1994

Therefore, it was not difficult to get satisfying response on the interview questions. ICT use is an essential part of organizations in Tehran and the managers and directors of the interviewed organizations are interested in all sides of the issue. The various ways in which government influences ICT use in the organizations in Tehran are elaborately described in the interviews. An analysis of these interviews is presented in the following chapters.

7.2 ICT infrastructure

The importance of the ICT infrastructure is made clear in the first part of this thesis. The ICT infrastructure has an enabling and stimulating function with respect to ICT use in information intensive organizations. For this function of ICT infrastructure to be of positive impact on ICT use in organizations, it has to be affordable, efficient, and effective. This seems to be the case in Tehran on a moderate level. Most respondents indicate that the ICT infrastructure is old, but adequate. A typical quote on this, from organization II:

> *"The ICT infrastructure is workable; the improvements in the last years are noticeable. The telephone network has improved significantly over the last years. Internet connections are mediocre on global standards, but good on Tehran standards."*

Albeit an infrastructure that is not quite state of the art, information intensive organizations experience the enabling and stimulating effect of the ICT infrastructure to some degree. More important to this research, of course, is the influence of government on this.

All respondents state that government influence on the ICT use in their organizations by providing an ICT infrastructure is substantial, because of the heavy investments that have been made in the ICT infrastructure, especially in the last years. These investments have improved the situation in organizations, but the general opinion is that government investments have not been enough:

> *"… there are still many investments to be done in this area."* (organization II)

> *"The government should invest more in this."* (organization III)

> *"The ICT infrastructure has been invested in, but it hasn't been in line with the demand."* (organization IV)

The government is making efforts to stimulate ICT use in organizations by providing an ICT infrastructure, but there are some government initiatives with respect to ICT infrastructure that limit the ICT use in organizations. In the conclusions of the first part of this thesis, it states that the public ICT infrastructure needs to be linked to the organizational ICT infrastructure. This is in Tehran only partly the case. The manager from organization I describes why:

> *"Private investments in infrastructure are risky, because the government is unpredictable and can impose regulations and restrictions on certain types of infrastructure. This has a negative effect on infrastructure investments by private organizations."*

This is in a way seconded by the manager in organization IV, who states that:

> *"… the focus is on control more than on quality."*

The manager in organization I further explains the situation in Tehran and its effect on ICT use:

> *"With the government as a mediator in service and infrastructure, there is a great lack of service due to typical bureaucracy. This problem affects private service providers and indirectly every organization that tries to use ICT in this way."*

The limiting effect on ICT use by government initiatives is discussed more extensive in the paragraph on regulations and institutions. The influence of government on ICT use in information intensive organization is substantial, but not always in a positive way. The use of ICT in information intensive organizations in Tehran is moderately constrained by the quality of the ICT infrastructure and the focus of government.

However, the general opinion of managers in information intensive organizations in Tehran is that the ICT infrastructure is adequate and workable and allows them to use ICT in the manner they want.

7.3 ICT skills

For any organization that wants to perform on an information intensive level, an ICT skilled workforce is a prerequisite. All respondents from the information intensive organizations in Tehran note that there is a sufficient 'supply' of ICT skilled people. The manager from organization V answered to this in a manner that summarizes the opinion of all respondents:

> *"Most people have adequate ICT skills, which is important for work. It is not difficult to find people with the right level of ICT skills."*

From the interviews, it becomes clear that ICT use is not hampered, but rather facilitated by the availability and quality of ICT skills in Tehran. In the final model in the conclusions of the first part of this thesis, the influence of government on ICT skills is indicated to be both direct and indirect.

7.3.1 Direct influence of government on ICT use in information intensive organizations in Tehran by developing ICT skills

The government has in Tehran a big influence on ICT use in information intensive organizations through the development of ICT skills. Most respondents agree that the development of ICT skills is an important part of the government policy on ICT and has been from the beginning. The government has taken an active approach in developing ICT use in information intensive organization by developing ICT skills. This is among others indicated by the manager of organization II, followed by an example of how this is done from the same manager:

> *"The focus of government the last five years was to prepare organizations in Tehran for using ICT. Training was the most important instrument to prepare organizations."*

> *"To improve ICT skills in both the university as organizations, the government brings e-learning to the universities and organizations."*

This indicates that government policy in Tehran shares principles with some of the common principles that were discussed in the first part of this thesis. The first two principles of establishing an enabling environment and developing an institutional framework both with respect to human resource development are to some extent comparable to what government in Tehran sees as important. Not only are ICT skills in Tehran developed in standard school settings, but also in the workplace, which indicates that the government is focused on establishing an enabling environment.

The third common principle that gives an indication of a countries' effort in developing ICT skills is centered on equal access. Human resource development and training are in principle accessible to all, regardless of socio-economic status, gender, ethnic origin, etc. A key issue in Tehran, as indicated by the interviewed managers, is gender. The manager of organization II said the following on the issue of gender with respect to ICT skills in Tehran and its possibilities and consequences:

> *"Training people to use ICT is for a great part focused on women. Tele-working is a good way for women to stay in touch with developments and even to work for a certain amount of time, because a lot of women are not allowed to work after marriage. Tele-working could facilitate this."*

> *"One of the consequences of government policy is that 60% of the university students are female."*

Also, the fact that three out of seven of the interviewed managers are female could be seen as an indication that this policy in Tehran results in management functions for women. Equal access to the development of ICT skills with respect to gender is an important part of government policy. Since other equal access issues, such as socio-economic status and ethnic origin, were not discussed in the interviews, there are no statements on this in this research.

The fourth common principle is about the development of partnerships between various stakeholders in the delivering of learning, education, and training programmes. This principle is discussed for the situation in Tehran in the next paragraph, since the subject of ICT skills is for reasons of surveyability divided in direct and indirect government influence.

The last common principle concerns the focus on learner-centered strategies and practices, with an increasing emphasis on the use of ICTs. A result of government policy on ICT use in education is the budget and focus of education. Government has made a considerable budget available to integrating ICT in the educational system, which is stated by the manager of organization VII:

> *"Government invests in the application of ICT in schools and workforce development, and primary and secondary schools, and vocational training institutes. The government also invests in the application of ICT in all higher education institutes."*

Not only does the educational system use ICT, the universities that focus specifically on ICT skills perform adequate to the needs of information intensive organizations:

> *"The universities that focus on ICT skills are of a good quality."* (organization I)

> *"The mission of universities in Tehran has shifted from just a mainframe to providing a complete ICT experience to the students."* (organization VI)

When compared to the ICT infrastructure, the 'knowledge infrastructure' in Tehran is of a better quality. It does enable and stimulate the use of ICT in information intensive organizations in Tehran.

7.3.2 Indirect influence of government on ICT use in information intensive organizations in Tehran by developing ICT skills

There are numerous ways in which a government can indirectly influence ICT use by developing ICT skills. As pointed out in the previous paragraph, the focus of the

fourth of the common principles on skill development is on the development of partnerships between various stakeholders in the delivering of learning, education, and training programmes. The various stakeholders that are involved in partnerships as a result of government policy are discussed in this paragraph. The stakeholders are government agencies, educational institutions such as universities, and national and international private organizations. In Tehran the focus in this respect is on keeping the ICT skilled people in Tehran and to import ICT skills and know-how. First, the focus on keeping ICT skilled people in Tehran is described by the manager of organization II:

> *"The focus of government with regard to ICT skills is to keep the young, skilled, and educated people in Tehran, instead of letting the brain-drain happen, by making it attractive for them to stay."*

The second focus of government is to import ICT skills. This is also described by the manager of organization II:

> *"It is an active policy of the government in Iran to import knowledge on technology and ICT from foreign countries. The most important instrument to achieve this is public-private partnerships."*

> *"Another way to improve ICT skills by the government is to guide international partnerships in such a way, that the knowledge is imported to Iran instead of just the simple production."*

The protection and import of ICT skills in Tehran is not the only way in which government indirectly stimulates ICT skills. When new ICT developments are implemented in Tehran by government agencies, training is an important part of this implementation:

> *"When a new development is ready, it is advertised and then 50% of the costs of the entire project are spent on training the people to work with the new technology."* (organization III)

The manager of organization V gives another reason for the level of ICT skills in Tehran as a result of government action:

> *"Digital skills are becoming basic skills, also because all government organizations rely on ICT. This has sky-rocketed in the last five years."*

This is in line with the statement made in the first part of this thesis on the implementation and use of ICT in the daily work of government agencies. This has a stimulating effect on the use of ICT in other organizations in the form of a spill-over effect and because of the example function that government agencies have. Aside from this, governments can stimulate ICT use by making important information or services available through ICT, which is partly the case in Tehran.

As a final point, the manager of organization VI attributes part of the level of ICT skills to the public-private partnerships between universities and the business sector, which are stimulated by the government:

> *"Students are very often placed in project teams in the business sector that work for the university."*

From the wide variety of indirect ways for government to influence ICT use by developing ICT skills, the government has made decisions that according to the interviewed managers have made a positive impact. The policy of government on this subject has a positive influence on the ICT use in information intensive organizations in Tehran.

7.4 ICT regulations and institutions

The institutional framework and regulations initiated by government play a crucial role in expected and (un)wanted developments in the use of ICT. From the interviews, many relevant ICT regulations and institutions that have influence on the ICT use in information intensive organizations in Tehran are derived.

As pointed out in the first part of this thesis, governments compose ICT regulations and institutions either to stimulate or to limit the use of ICT. These two approaches

to ICT regulations and institutions as they apply to the situation in Tehran are discussed separately.

7.4.1 Stimulating the use of ICT in information intensive organization in Tehran by regulations and institutions

Although it is beyond the scope of this research, it seems obvious that the availability of ICT hardware is important for organizations in order to be able to use ICT. In Tehran, due to several import restrictions, this is not a simple matter. Almost all respondents have described this situation in some way. Focusing on the role of government on this matter, the free trade zones were often brought up, e.g. by the manager of organization I:

> *"The free trade zones, Kish and Chabahar, are a positive influence on ICT investments and use for organizations in Tehran. Up-to-date equipment is imported for low prices and assembled in Tehran. This is a deliberate government policy and it works."*

Although another respondent mentioned that the free trade zones are being reduced in capacity every year, this part of government technology policy is at the moment a stimulant for ICT use in information intensive organizations in Tehran.

Apart from this policy on the supply-side of ICT use, the government composes regulations and institutions on the demand-side of ICT use. Information intensive organizations in Tehran, such as banks, are guided in a certain direction by regulations and institutions. This direction is ultimately designed to stimulate ICT use in Tehran, and thus in information intensive organizations in Tehran:

> *"ICT applications as e-banking and e-government are achieved by establishing regulations and institutions which organizations must follow."* (organization II)

> *"There are ICT related regulations and institutions that tell the bank to develop and focus on certain projects, such as e-banking facilities and paying*

with bank cards. This is generally done by localizing and customizing ICT software from abroad to Iran needs." (organization III)

"The government promotes ICT use through stimulation of e-banking, e-commerce and so on." (organization VII)

The government focuses on designing regulations and institutions for specific developments. This differs from the first of the regulatory starting points designed to facilitate the use of ICT in organizations, which are described in the first part of this thesis. This first regulatory starting point suggests that regulations should be technology neutral. The regulations mentioned in the quotes above are specific regulations to stimulate the development of that specific aspect of ICT, e.g. e-banking. This indicates that government in Tehran focuses on the development of certain technologies instead of a general regulatory framework. By supporting these ICT related developments, however, the government does try to take away the barrier of lack of trust. If government supports e-banking, organizations are more likely to trust it and use it in their operations in the same way they work with other government initiatives.
These regulations and institutions are composed by a government organization with a specific goal. The development in this government organization is described by the manager of organization VII:

"A specific national authority is assigned to guide and stimulate ICT development and use in organizations. The PTT Ministry has changed to the ICT Ministry and specific ICT laws were approved: e-commerce law and ISP and Internet law."

With regard to the stimulation of ICT use in information intensive organizations in Tehran, the government makes important efforts.

7.4.2 Limiting the use of ICT in information intensive organization in Tehran by regulations and institutions

The second regulatory starting point from the first part of this thesis states that regulations should be in line with off-line regulations and values. The government in

Tehran is making extra efforts with respect to that starting point. An interesting aspect of ICT use in Tehran is the fact that there is Internet content filtering:

> *"The government of Iran is struggling with maintaining the national identity with respect to a technology that is as much internationally oriented as ICT, especially with national Islamic norms and values and the regulations and institutions that emerge from them."* (organization II)

> *"Regulations and institutions are made on Islamic morals, but are often not thought through on a technical level."* (organization I)

These regulations and institutions are composed according to Islamic morals and values, not specifically to limit ICT use in information intensive organizations. The effect of Internet filtering on ICT use is described by different managers:

> *"The filters and other restrictions on information do not have an effect on operations."* (organization IV)

> *"The government will probably need some time to get used to ICTs. After a couple of years the restrictions will fade away."* (organization VI)

From the interview it became apparent that ICT use in information intensive organizations is not limited by the Internet content filtering. However, others aspects of government did appear to limit ICT use:

> *"Given the fact that the political situation in Tehran is unpredictable and unclear, rules and regulations concerning ICT are unpredictable. This is a problem for all organizations in Tehran."* (organization II)

> *"Every decision or act from the government and by the government is characterized by the slowness and indifference of the bureaucracy."* (organization II)

> *"Regulations and institutions that affect the ICT use in organizations are mostly import and export regulations."* (organization V)

Government regulations and institutions that limit the use of ICT in information intensive organizations do not appear to be a deliberate part of policy. The slow, unpredictable, and bureaucratic attitude of government has the most important limiting effect on ICT use. The Internet content filtering filters information that is of no use to information intensive organizations.

However, it gives an indication that government is not especially orientated at the self-regulatory aspect of regulations and institutions. This is the third regulatory starting point and it doesn't seem important to government in Tehran. Also, the fourth regulatory starting point, international orientation, is not one of the priorities of government. One reason of this is the import and export restrictions. Government in Iran focuses on self-reliance. However, as was described in the paragraph on ICT skills, the government is interested in international relations with regard to knowledge exchange. Therefore, the international orientation of regulations and institutions can be described as selective. The government is determined to find its own, unique way with respect to regulations and institutions and is planning to play an important and active role in this issue.

7.5 Financial support

With respect to financial support of government to stimulate ICT use in information intensive organizations in Tehran, the government needs to develop a strategy that is coherent and results in logical and realistic interventions. The government can establish this influence in a direct and in an indirect manner.

7.5.1 Direct financial support for the use of ICT in information intensive organizations in Tehran

Direct financial support is in most cases part of a carefully planned technology policy. It can take various forms such as subsidies, benefits, and credit policies. As described in the first part of this thesis, direct financial support seems to be straightforward, but, also in Tehran, it is an elaborate process with a variety of outcomes. Direct support from governments for ICT use in information intensive

organizations takes different forms for the different organizations in Tehran. For the private organizations, the opinions differ as to how easy or difficult it is to find financial support from government banks for ICT initiatives:

> *"It is not easy for organizations to get money from government or private banks for investments."* (organization I)

> *"There is enough money for investments in ICT. Money is available at government owned and private banks."* (organization V)

Only ICT related initiatives specifically aimed at education can count on governmental financial support, as described by the manager of organization II:

> *"Organizations receive budget from the government to educate and upgrade their staff to maintain a certain status. There is also money for specific training available to organizations."*

It is a different story for governmental information intensive organizations that rely on government budget to develop their ICT use.

> *"For ICT projects that have the central bank's approval, there is always enough money. Time and money are not an issue."* (organization III)

> *"The budget of universities is sufficient."* (organization VI)

This big difference between governmental and private information intensive organizations appears for the first time in this interview research. This is only of impact in discussing direct financial support. As was expected based on the theoretical part of this thesis, the direct financial support from government takes various forms. The findings from the interviews are that the government in Tehran focuses on the development of specific ICT projects.

7.5.2 Indirect financial support for the use of ICT in information intensive organizations in Tehran

Indirect financial support is in most cases established by means of general tax incentives or takes the form of direct funding of (public-private) projects. Indirect financial support from the government is provided through a government framework, called TAKFA:

> *"Government policy is to invest in certain projects, not to provide general benefits to a sector. If a project is approved as a valuable project, it becomes part of the governments TAKFA-plans and it gets subsidized."* (organization I)

> *"Within the TAKFA-framework, there is a lot of money available for developments in ICT in Tehran."* (organization I)

> *"Budget is specifically allocated to projects that fit the national TAKFA-framework, around 2000 so far. Key points of this framework so far are consultancy, infrastructure of organizations, and human resource development."* (organizations VII)

> *"Money is used to stimulate public-private partnerships."* (organization VII)

For universities, the government stimulates public-private partnerships to attract financial resources:

> *"The strategic policy of the universities is to expand the relationship with the business sector. At the moment the budget received from the business sector equals the governmental budget. In the future, the business budget will be three times the size of the governmental. The universities do not see a conflict of interest in this, because they are comfortable with supplying practical knowledge, but with high standards."* (organization VI)

In the first part of this thesis, the difference was made between government policy in the form of general tax incentives and the direct funding of (public-private) projects. From the interviews it becomes obvious that the government in Tehran chooses the road of funding (public-private) projects. This has been found to be a more effective mechanism for developing and diffusing specific elements of a technology.

7.6 Conclusion

Apart from the complete conclusion of this research that is presented in the third part of this thesis, these are the concluding remarks on the influence of government on ICT use in information intensive organizations in Tehran. This concluding paragraph is the last of this second part of this thesis, which purpose is to answer the second research question:

> To what extent is the influence of government on the use of ICT found in information intensive organizations in Tehran?

In the first part of this thesis it was concluded that the influence of government is one of the most important influences, because of the importance of ICT use on a societal, cultural, and economic level. The importance of ICT use on these levels is a reason for every government to intervene to some extent.

The answer to the question to what extent the government influences ICT use in information intensive organizations in Tehran is the goal of this conclusion. The conclusions have the same general structure of the conclusion as part one of this thesis to get a clear overview and uniformity.

The short answers to the second research question are: the influence of government on ICT use in information intensive organizations in Tehran is substantial and decisive:

- The government provides a controlled, but adequate ICT infrastructure, which allows for a moderately satisfying use of ICT;
- The government invests effectively, both directly as indirectly, in the development of ICT skills, which enables and stimulates the use of ICT;
- The government stimulates ICT use by composing ICT regulations and institutions that facilitate certain ICT developments, but limits ICT use, to some extent unintentionally, by its slow, unpredictable, and bureaucratic attitude;

- The government stimulates ICT use by financially supporting specific projects and developments and encouraging public-private partnerships.

These points are described more elaborately here, based on the interviews with the managers of information intensive organizations in Tehran.

1. *Provide ICT infrastructure.* Information intensive organizations in Tehran are moderately satisfied with the ICT infrastructure that is provided by government. It enables and stimulates ICT use to an average level, which means that it could be better according to the respondents. The influence of government on this is substantial, because it is generally recognized that the government has made heavy investments in the ICT infrastructure in the last years. However, the government investments have not been enough. Apart from these efforts from government to stimulate ICT use, some government initiatives limit the ICT use in information intensive organizations in Tehran. The focus of government on control rather than quality causes an ineffective link between public and private infrastructure. However, the managers generally agree that the ICT infrastructure is adequate and workable and allows them to use ICT.

2. *Develop ICT skills.* ICT use in information intensive organizations in Tehran is not hampered, but rather facilitated by the availability and quality of ICT skills. The influence of government on this is generally agreed to be crucial. The development of ICT skills in Tehran is and has been an important part of government policy. This policy is to develop ICT skills on all levels of education and in the workplace, with equal access for the people of Tehran. The government has made a considerable budget available to integrating ICT in all levels of the educational system. With respect to indirect influence of government on ICT use by developing ICT, the focus of government in Tehran is on keeping ICT skilled people in Tehran and to import ICT skills and know-how from other countries. Another expression of government policy is that with implementation of new ICT developments, efforts are made to train people to use it. The government agencies use ICT, e.g. by making information or services available through ICT, which causes a spill-over effect, serves as an example function, and ultimately stimulates ICT use. Public-

private partnerships between universities and the business sector are stimulated by government. The policy of government on developing ICT skills has a positive influence on the ICT use in information intensive organizations in Tehran.

3. *Compose ICT regulations and institutions.* The government in Tehran is determined to find its own, unique way with respect to regulations and institutions and is planning to play an important and active role in this issue. As described in the first part of this thesis, government can compose regulations and institutions to stimulate or to limit ICT use in organizations.
    - The first mentioned ICT use stimulating regulation concerns the free trade zones that allow for reasonably priced import of ICT hardware. Furthermore, information intensive organizations in Tehran, such as banks, are guided by regulations and institutions in a direction that is ultimately designed to stimulate ICT use. The government focuses on the development of certain ICTs instead of setting up a general regulatory framework. With regard to the stimulation of ICT use in information intensive organizations in Tehran, the government makes important efforts.
    - Some regulations and institutions, e.g. Internet content filtering, are composed according to Islamic morals and values, not specifically to limit ICT use in information intensive organizations. Government regulations and institutions that limit the use of ICT in information intensive organizations do not appear to be a deliberate part of policy. The slow, unpredictable, and bureaucratic attitude of government has the most important limiting effect on ICT use. The Internet content filtering filters information that is of no use to information intensive organizations.

4. *Financial support.*
    - As described in the first part of this thesis, direct financial support seems to be straightforward, but, also in Tehran, it is an elaborate process with a variety of outcomes. From the interviews, an important distinction arises between non-government and government information intensive organizations. Non-government organizations

have varying success in finding financial support from government for ICT use. Particularly budget specifically aimed at education of ICT skills can count on financial support. Governmental organizations have no problems in terms of time and money when initiating or developing ICT use.

- Indirect financial support from the government is provided through a government framework, called TAKFA. Organizations that are in the TAKFA-framework have no difficulties in finding financial support. TAKFA-projects are a form of public-private partnerships. Another form of these kinds of partnerships is initiated by universities and stimulated by the government; universities team up with the business sector to attract financial resources. For universities, the government stimulates public-private partnerships to attract financial resources.

Part III – Conclusions and discussion

8 Conclusions

This third and final part is the conclusion of both previous parts of this thesis and an answer to both research questions together. To begin, each research question is answered in short. Then, the conclusions of both previous parts are presented together to conclude this thesis:

> What is the influence of government on the use of information and communication technology in information intensive organizations according to literature?

The influence of government on the use of ICT in information intensive organizations according to literature is a result of the need for governments to establish its country as (part of) an information society. Also, the importance of ICT on societal, cultural, and economic level prompts governments to guide and control its development. Therefore, the influence of government can generally be stated to be pervasive and significant. The following instruments are available to governments in order to influence the use of ICT:

- Provide an ICT infrastructure;
- Develop ICT skills;
- Compose ICT regulations and institutions;
- Financial support.

> To what extent is the influence of government on the use of ICT found in information intensive organizations in Tehran?

The influence of government on ICT use in information intensive organizations in Tehran is substantial and decisive:

- The government provides a controlled, but adequate ICT infrastructure, which allows for a moderately satisfying use of ICT;
- The government invests effectively, both directly as indirectly, in the development of ICT skills, which enables and stimulates the use of ICT;
- The government stimulates ICT use by composing ICT regulations and institutions that facilitate certain ICT developments, but limits ICT use, to some extent unintentionally, by its slow, unpredictable, and bureaucratic attitude;
- The government stimulates ICT use by financially supporting specific projects and developments and encouraging public-private partnerships.

The basic structure of these conclusions is the same as the conclusion of part one complemented with the data from the interviews of part two. The model that was made based on the literature research in part one is used to describe the situation in Tehran from part one.

1. *Provide ICT infrastructure.* With respect to ICT use in information intensive organizations, the ICT infrastructure has an enabling and stimulating function. The ICT infrastructure needs to be affordable, efficient, and effective to enable information intensive organizations to use ICT. The public ICT infrastructure needs to be able to link to the organizational ICT infrastructure. For information intensive organizations in Tehran, the enabling and stimulating function of ICT is moderately experienced because of the government focus on control instead of quality. This reduces the effectivity, also because information intensive organizations are reserved in linking to public infrastructure.

2. *Develop ICT skills.* ICT skills in the workforce are a prerequisite for organizations to be able to perform on an information intensive level. To understand, produce, and most of all use the new information and communication technology, there is a widespread need to posses a range of ICT competences. For information intensive organizations in Tehran, the quality and availability of ICT skills are in line with needs, which is the result of the influence of government policy which stimulates ICT skill development. A set of common principles that underpin countries' efforts in developing

learning, training, and human resources development policies and systems ultimately influence the ICT use in organizations is discussed here with a description of the situation in Tehran:

- Establishing an enabling environment that encourages investment in human resources development and training by all stakeholders. This is pursued in Tehran by government via (financially) supporting investments in and development of ICT skills;
- Developing an institutional framework for human resources development and training that is relevant to countries' social and economic context and level of development. This is pursued by government in Tehran in the same way as the above principle and backing it up with an institutional framework that focuses on development of ICT skills;
- Ensuring equal access to human resources development and training for all, irrespective of socio-economic status, ethnic origin, etc. The one issue that came up in this respect was the issue of gender. ICT use is seen by information intensive organizations and government in Tehran as a possibility to reduce the difference between gender;
- Developing partnerships between various stakeholders in the delivering of learning, education, and training programmes. The stakeholders in the case of Tehran are government agencies, educational institutions such as universities, and national and international private organizations. All stakeholders are stimulated with varying policies to form partnerships to develop ICT skills in Tehran;
- Relying on learner-centered strategies and practices, with an increasing emphasis on the use of ICTs. The underlying strategy of government policy in Tehran on ICT skills is the application of ICTs in all levels of education.

– *Compose ICT regulations and institutions.* The institutional framework and regulations initiated by government play a crucial role in expected and (un)wanted developments in the use of ICT. The government in Tehran is determined to find its own, unique way with respect to regulations and institutions and is planning to play an important and active role in this issue.

With the use of these starting points, according to the interviewed managers, the regulations are: technology neutral (regulations and institutions in Tehran are not), in line with off-line regulations and values (government regulations and institutions in Tehran are), aimed at self-regulation (government regulations and institutions in Tehran are not) and internationally orientated (government regulations and institutions in Tehran are selective).

ICT regulations and institutions can be designed to stimulate of limit the ICT use:

- Governments can stimulate the use of ICT in information intensive organizations by promoting policies, by taking away barriers such as lack of trust, and by using ICT in government agencies and service. Government in Tehran creates free trade zones, uses ICT, and makes efforts to take away barriers by supporting certain ICT projects.
- To limit the use of ICT in information intensive organizations is often initiated by the government to protect or in some way guide organizations in a certain direction. Government regulations and institutions that limit the use of ICT in information intensive organizations do not appear to be a deliberate part of policy. The slow, unpredictable, and bureaucratic attitude of government and its regulations and institutions has the most important limiting effect on ICT use. The Internet content filtering filters information that is of no use to information intensive organizations.

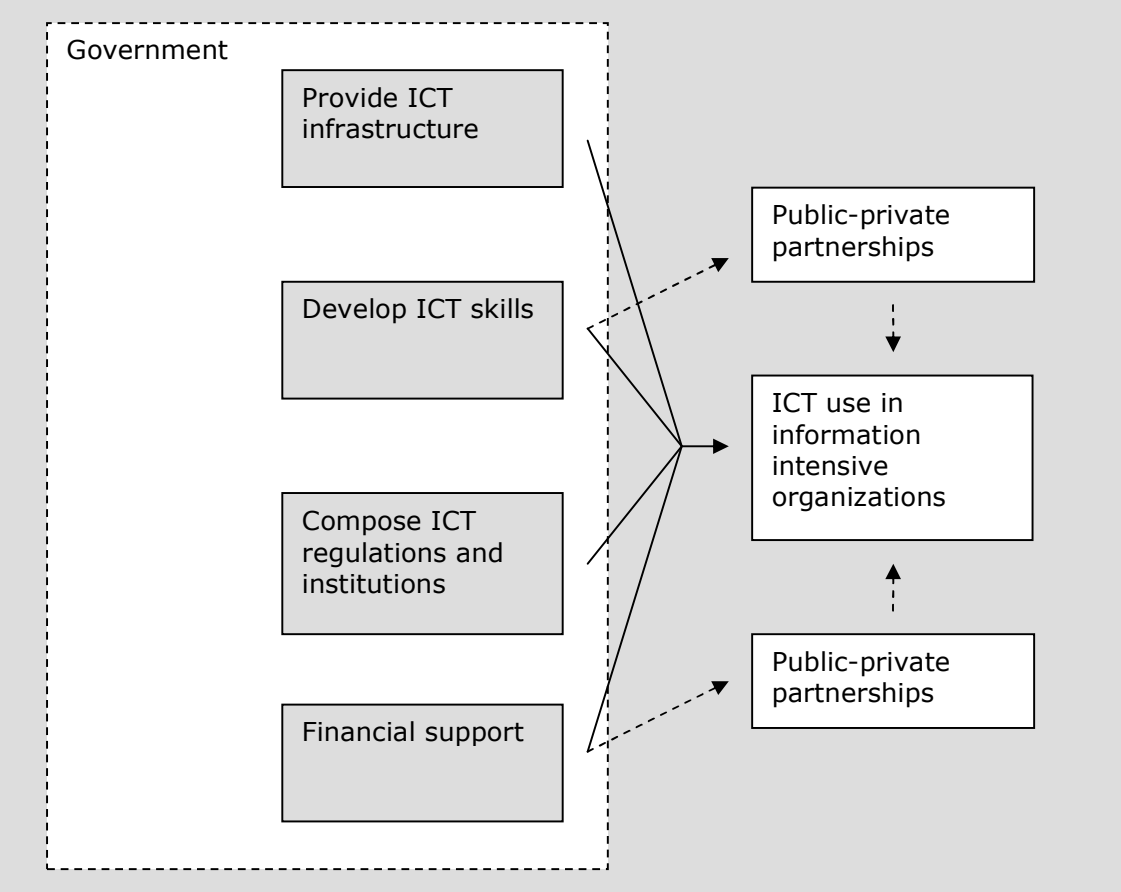
3. *Financial support.* With respect to financial support of government to stimulate ICT use in organizations, governments need to develop a strategy that is coherent and results in logical and realistic interventions. Government can establish this influence in a direct and in an indirect manner:
    - Direct financial support is a powerful way for government to influence ICT use in information intensive organizations. In Tehran, non-government information intensive organizations have varying success in finding financial support from government for ICT use. Particularly budget specifically aimed at education of ICT skills can count on financial support. Governmental information intensive organizations

have no problems regarding time and money when initiating or developing ICT use.

- Indirect financial support by government is in most cases established by means of general tax incentives or takes the form of direct funding of (public-private) projects. In Tehran, indirect financial support from the government is provided through a government framework, called TAKFA. Organizations that are in the TAKFA-framework have no difficulties in finding financial support. TAKFA-projects are a form of public-private partnerships. Another form of these kinds of partnerships is initiated by universities and stimulated by the government; universities team up with the business sector to attract financial resources.

With regard to the model, as seen in figure 8-1, the basic structure that resulted from the literature researched proved a practical and complete model to evaluate the situation in information intensive organizations in Tehran.

Figure 8-1 The influence of government on ICT use in information intensive organizations.



9 Discussion

This discussion is to describe certain limitations of the research, in order to inform the reader. Several choices have been made in this thesis that have influenced the research. This thesis can only be complete if these choices are mentioned here in this discussion. They are discussed here in the same structure of the thesis, i.e. part one and part two of this thesis are discussed respectively.

In the first part of this thesis, the literature research, only literature in English and Dutch is used. This has been done for practical reasons. However, for a thesis that is partly focused on the situation in Tehran, this could negatively affect the research, because many interesting literature might be in Farsi, which is the common language in Tehran. The first part of this thesis is focused on the influence of government on ICT use in information intensive organizations in general. The limitations that might be the result of the literature that is included in this research is to some extent countered by including research reports that not only covered the Western countries. A substantial amount of literature used in this thesis is based on data not only from Europe and the USA, but also from Asian, Middle-East, and Arab countries. In that way, universal conclusions from literature are, among other, used as resource on which the first part of this thesis is based. Consequently, the question if a study located in Tehran can be based on literature research based on the database of Tilburg University, which includes global literature, can be answered by stating; yes, to some extent. There is, however, no doubt that literature in Farsi, or in another language for that matter, would enrich and complement this research to a certain extent.

Another limitation from the first part of this thesis is the focus of this research. The focus is on government influence on ICT use. Therefore, this research should be seen as a research that is part of a bigger context. Various other concepts influence the use of ICT, which are interesting to research and would complete this research. Also, the different arrows from the structurational model of technology from Orlikowski are interesting to research. As was described in the introduction of the first part of this thesis, this research is part of a context, which doesn't diminish how interesting this research is, but does put the outcomes in perspective.

The last limitation of the first part of this thesis concerns the four options of government that are the basis of the model, and indeed of this entire research. The

model is set up with the intention of being exhaustive. However, there are other ways, perhaps more complete and extensive, in which to set up a similar research. The choices that were made in this respect were made for practical reasons; the research had to be feasible and have a clear basis. Future research can be set up in a more extensive matter.

The second part of this research also is subject to important limitations. The most important one is the limited amount of interviews. With seven managers as respondents the outcomes of this research has limited generalizability. This doesn't mean that the outcomes are worthless. It does mean that future research is more valuable if it includes more respondents.
Also, the interviews were in English, and however all respondents were comfortable with speaking English; a Farsi speaking researcher might have been able to do more efficient interviews.
Another remark with regard to the interviews is time. As is mentioned several times in this thesis, developments in information intensive organizations and ICT are happening continuously and rapidly. The time-difference between the interviews and the completion of this thesis is almost a year. This must be taken into account when discussing the outcomes of this research.

As to the thesis as a whole, it is a descriptive research. Little effort is made to put forward solutions to some of the possibilities and problems. This research describes where the possibilities and where the problems are. An interesting addition would be to conduct a research on what government can do to improve ICT use in information intensive organizations in Tehran.

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11 Appendices

In the thesis various references are made to the appendices, which can be found in the following paragraphs.

11.1 Appendix I – Invitation letter

Influence of government on ICT use in organizations in Iran

Dear Sir/Madam,

The doctoral thesis I am writing focuses on ICT use in organizations in Iran. As a student at Tilburg University in the Netherlands I write this thesis to obtain my masters in Policy and Organizational Sciences. The goal of my thesis is to find influence of government on ICT use in organizations in Tehran.

From a preliminary literature study I gathered relevant factors that could play a significant role. This literature study was carried out to prepare myself and to get a view of the situation of my research location, which is Tehran. These factors are:

- ICT infrastructure;
- ICT skills;
- ICT regulations and institutions;
- Financial support.

For the research I will use literature as well as interviews. The literature study and interviews will take place in both the Netherlands and Tehran.

It is essential for the research to have access to relevant documentation and respondents. The respondents are experts on the use of ICT in their organization. The interviews will be recorded and a report of the interview will be sent to the respondent for possible alterations and additions. After this review by the respondent a definitive report of the interview is composed.

The study will be supervised by the Tilburg University and by Triarii, a consultancy bureau specialized in government policy. The management summary will be available to everybody that cooperated with the study.

With kind regards,

Gert-Jan van der Panne

Telephone: 070-3283574

e-mail: g.vdrpanne@uvt.nl

The Hague, the Netherlands

11.2 Appendix II – Basic structure of the interview

Part	Subject
1	Introduction to the research.
2	Introduction to the organization and the function of the respondent.
3	Research questions: – Status of ICT infrastructure; – Influence of government on ICT use by providing an ICT infrastructure; – Status of ICT skills; – Influence of government on ICT use by developing ICT skills; – Status of ICT regulations and institutions; – Influence of government on ICT use by ICT regulations and institutions; – Status of financial support with regard to ICT; – Influence of government on ICT use by financial support.
4	Completion of the interview.

11.3 Appendix III – Monster matrix

	Organization						
	I	II	III	IV	V	VI	VII
ICT infrastructure	The focus of government is not on quality of infrastructure, but on control of information that flows through the infrastructure. The government invests in infrastructure. There is an asymmetrical, unfair competition between government as service/infrastructure provider and private providers; this prevents organizations from looking of ICT solutions for certain problems. However, private organizations invest in	The ICT infrastructure is workable, the improvements in the last years are noticeable. The telephone network has improved significantly over the last years. Internet connections are mediocre on global standards, but good on Tehran standards. The government has spent a lot of money on telecommunications infrastructure in Tehran, and there are still many	ICT use is essential for organizations in Tehran; the most used ICTs are e-mail and Internet. All communication and research projects are done with computers. E-mail is the most important way of communication, but project meetings are face-to-face. ICT infrastructure is adequate.	The computer is the most important instrument to get a job done. We do not yet use Internet banking. Security is important; therefore there is a central server. A new approach to banking is in development, with the complete package: Internet	E-mail is the most important way of communication (about 95%) and has replaced the fax almost completely. The organizations ICT applications are all outsourced and it relies on the partners to stay up-to-date. Organization 5 has a special network, which has no restrictions and	The ICT infrastructure is adequate, but it could be better. There is not enough budget for this. There is complete connectivity on the entire campus. Development and upgrading op on-campus ICT services is an important part of the university 5-years goals. In the end, the entire university	Heavy investments in infrastructure that follow four aspects: networks, laws, standards, and resources. To provide extra incentive for the use of ICT in organizations, tech parks and incubators are created.

ICT infrastructure (continued)	infrastructure (for example inclined satellite reception equipment for $ 70,000.-). Private investments in infrastructure are risky, because the government is unpredictable and can impose regulations and restrictions on certain types of infrastructure. This has a negative effect on infrastructure investments by private organizations. With the government as a mediator in service and infrastructure, there is a great lack of service due to typical bureaucracy. This problem affects private service providers and indirectly every organization that tries	investments done in this area.	A great influence on the state of ICT, for example the infrastructure, is the embargo that Iran is faced with. Some high technology that exists is not available to Iran and must be invented in Iran itself.	banking, telephone banking, etc. The newest ICT development in this bank is an SMS-service by which information can be accessed. The ICT infrastructure should be faster and more reliable. It is not adequate. The government should invest more in this.	is of a very good quality. The Internet on the Iranian network is subject to filters and restrictions, which obstructs the use of Internet on this network. Combining the special and Iranian network is impossible, because it is too difficult to guarantee maximum security, which is essential for organization 5. Mobile communications are an important part of ICT use.	activities are to be online and wireless. Budget is enough, but more would be better. The universities provide computers and other ICT facilities to students, because these facilities are essential for students to be active on the university. The current status is relatively adequate. An example is the infrastructure;	

ICT infrastructure (continued)	to use ICT in this way. Organizations as ICT users need stability and reliability, which is compromised in this way. This government policy has lead to strikes before. The physical information structure (for example the cable network) in Tehran is old, which causes problems. ICT is necessary for business. For example, in Tehran, having Internet is as important to organizations as having telephone. The policy has been to invest in mobile phones, and still the				The ICT infrastructure has been invested in, but is hasn't been in line with the demand. Examples of this are mobile phone cut-offs or even no reception at all. Mobile communication is in a bad situation. There have been attempts to open up the markets, also for organizations from other countries. The government never allowed that part of the infrastructure	the bandwidth is sufficient to work with and the backbone on the university works ok. The conventional industries (for example the oil industry) do not yet use ICT a lot, only on a basic level.	

ICT infrastructure (continued)	connection falls out or there is no connection established at all. There were contacts with Turkcell to become the second mobile phone provider, but these negotiations were stopped with the transition of parliament.				to be in the hands of a company. Especially not from another country. Part of this is because of security. Focus is on control more than on quality. An example of this is the Turkcell deal that never came. The ICT infrastructure is now for a great deal dependent on rented satellite space.		
ICT skills	A lot of knowledge on ICT is the result of international projects and cooperating with foreign consultants.	It is an active policy of the government in Iran to import knowledge on	ICT skills are not learned at the organization, the people that	The computer is the most important instrument to get a job	Most people have adequate ICT skills, which is essential for work. ICT skills	The mission of universities in Tehran has shifted over the last years	The government invests in human resource

ICT skills (continued)	Tehran is home to ICT workers, for example software engineers, which can compete on an international level, but are much cheaper than comparable workers from other countries. The universities that focus on ICT skills are of a good quality. People with ICT skills in Tehran are available, but everyone wants them. The top is wanted. Our strategy is to try to employ people with low skills and educate them within the organizations. The higher the skills, the higher the salary. This creates loyal and happy employees.	technology and ICT from foreign countries. The most important instrument to achieve this is public-private partnerships. Certified consultants in Tehran serve as mediators between foreign investors and local organizations. The government pays more than half (70%) of the costs of this mediation. When the partnership is focused on training and education, the government pays 80%. The focus of government with regard to ICT skills	work there, have been hired as ICT developers and experts and learned at the university. The average age is 25; the previous generation does not have the needed knowledge. ICT updating training is only attended when the experts themselves believe it is necessary. Only one person from the team attends training and passes the essential knowledge from training to	done. Everyone has basic ICT skills and at least a basic knowledge of the English language. It is not difficult to find ICT skilled people to work for the bank. One of the policies of universities is to provide a broad knowledge base. Specific knowledge is learned in working. Most ICT skills	are an important part of the skills of a new employee. Most ICT skills are learned at the university. It is not difficult to find people with the right level of ICT skills. These ICT skills are generally highly correlated with the knowledge of the English language. Digital skills are becoming basic skills, also because all government organizations rely on ICT (for example the Internet and	from just a mainframe to providing a complete ICT experience to the students. The software for educational purposes is developed and maintained within the university by graduate students. Students are very often placed in project teams in the business sector that work for the university. In that way, it is	development with regard to ICT. Government invests in the application of ICT in schools and workforce development, ant primary and secondary schools, and vocational training institutes. The government also invests in the application of ICT in all higher education institutes; medical, engineering, social sciences, art, etc.

ICT skills (continued)		is to keep the young, skilled, and educated people in Tehran, instead of letting the 'brain-drain' happen, by making it attractive for them to stay in Tehran. To improve ICT skills in both the universities as organizations, the government brings e-learning to the universities and the organizations, if these entities show a need and a readiness for it. On a moderate scale, ICT skills are stimulated to the people by making essential information available through	the team members. When extra ICT skills are required for a certain project, the project members study and learn these extra skills at home. The policy of the government is exercised through the central bank and it is one of the ways to make the people in Tehran more aware of and accustomed to ICT and more capable of and comfortable	and knowledge that is needed to work is gained from the Internet and by the initiative of the employee. There is also (informal) knowledge transfer between organizations. Learning from organizations over the border is only done through consultants that have international clients. The focus of banks with regard to their	mobile phones). This has sky-rocketed in the last 5 years.	no problem for universities to find ICT skilled persons. The problem is to keep them and employ them after graduation, because the private sector can pay them more money. The level of ICT skills in Tehran is good, there is a high demand for student with above average ICT skills. The young generation,	Government funded research centers provide new or improved developments on the field of ICT.

ICT skills (continued)		the Internet. For example, the score on certain tests, the amount of money on a bank account, etc. Another way to improve ICT skills by the government is to guide international partnerships in such a way, that the knowledge is imported to Iran instead of just the simple production. Focus is on learning from such projects, not just doing them. Finding people with the right ICT skills is not difficult, because people in Tehran are smart and very eager to	with working with ICT applications. This is often referred to as 'creating a culture of ICT'. When a new development is ready, it is advertised and then 50% of the costs of the entire project is spent on training the people to work with the new technology. Finding people with adequate ICT skills is not difficult. It often begins at the university. The students that best fit the	employees is to keep them up-to-date on ICT developments. This is not done in cooperation with universities, but with training within the organization.		which is big in Tehran, is very interested in ICT development.	

ICT skills (continued)		learn and work with their knowledge. Certificates of skills (for example doctorate degree) are very important. The challenge is in finding the right people from within your family with the right skills. The good side of this is that you have trust and a good mentality in the organization. The inquisitive and curious nature of people in Tehran has led people to buy computers and an Internet connection and to stay updated. More than half of the population is young, which	requirements of the organization are taken out of the university and are brought up-to-date by training.				

ICT skills (continued)		generally means that these people have at least basic ICT skills. Organizations receive budget from the government to educate and upgrade their staff to maintain a certain status. There is also money for specific training available to organizations. The Iranian government understood at an early phase that importing hardware is not the most important, but the know-how is. The focus of government the					

ICT skills (continued)		last five years was to prepare organizations in Tehran for using ICT. Training was the most important instrument to prepare organizations, both at managerial and at lower levels. Then, when the infrastructure was being developed and ICT became more and more important in organizations, people had at least the basic ICT skills. A focus of this training was also on language skills. Farsi as a computer language is the basis in Tehran and is growing in popularity,					

ICT skills (continued)		replacing English. This makes computer work more accessible to people in Tehran, yet on international level it causes problems. The government supports this by funding projects that make programs or other ICT applications Farsi-based. In this way, the government is very Farsi-oriented. Training people to use ICT is for a great part focused on women. Tele-working is a good way for women to stay in touch with developments and even to work for a certain amount of					

ICT skills (continued)		time, because a lot of women are not allowed to work after marriage. Tele-working could facilitate this. One of the consequences of this policy is that 60% of the university students are female.					
ICT regulations and institutions	Investments in infrastructure are risky, because the government is unpredictable and can impose regulations and restrictions on certain types of infrastructure. This has a negative effect on infrastructure investments and in the same way on ICT use by private organizations.	Given the fact that the political situation in Tehran is unpredictable and unclear, regulations and institutions concerning ICT use are unpredictable. This is a problem for all organizations in Tehran. An active policy of the government is	There are ICT related regulations and institutions that tell the bank to develop and focus on certain projects, such as e-banking facilities and paying with bankcards. This is generally done by	The filters and other restrictions on information do not have an effect on operations. Regulations and institutions do not interfere with the banking operations.	E-business is not used to get resources, also because of the US embargo that causes a blocking of credit cards. ICT applications are often not legal to import as a whole, so a lot of ICT applications are	The US sanctions are a problem for the international aspirations of universities. These sanctions have existed for ten years. The ICT regulations and	Regulations and institutions are eased with regard to ICT needs to stimulate the use of ICT in organizations. A specific national authority is assigned to guide and stimulate ICT

ICT regulations and institutions (continued)	The regulations and institutions with regard to ICT use are naïve; very strict for legal users, but very lenient or even non-existent for illegal users. The government is very keen on status and control and is proud. Nepotism in government operations is not unusual. The government mediates between FLAG (Fiber-optic Link Around the Globe) and private organizations. The result of this is that there is only one gateway in and out of Iran through fiber and that gateway is controlled. Providing a complete range of services	to privatize government agencies. The government of Iran is struggling with maintaining the national identity with respect to a technology that is as much internationally oriented as ICT, especially with national Islamic norms and values and the regulations and institutions that emerge from them. ICT applications as e-banking and e-government are achieved by establishing regulations and institutions which	localizing and customizing ICT software and applications from abroad to Iran needs. There is, however, a lot of competition between the banks. The general focus and guidelines for the banks are discussed in monthly meetings at the central banks, which are attended by a representative from every bank in Iran. New developments	The rules of the central bank are binding, but they also have guidelines both of which are the voice of government policy. An example of government policy exercised through the central bank is that by 2006 every bank must provide the possibility to the customers to pay with a smartcard.	imported in parts and assembled in Tehran. Most of these are imported via the trade free zones Kish and Chabahar. This is allowed by the government, but it is reduced every year. Regulations and institutions that affect the ICT use in organizations are mostly import and export restrictions. It is at the moment too attractive for smugglers. If	institutions are less strict (not so sensitive) in the university than in the rest of Tehran. The focus is on the ethical side of it. An example of how restrictions based on Islamic moral effects technology is the radio. When radio came to Iran, the government was very nervous because of its potential of giving a voice	development and use in organizations. Specific laws approved: - Foreign investment protection and guarantee law. - E-commerce law. - ISP and Internet law. - PTT Ministry changed to ICT Ministry. - Copyright law. ICT is specifically implemented to stimulate the use of Farsi in ICT. The government

ICT regulations and institutions (continued)	(importing laptops, infrastructure, etc.) is essential, because one business can be taken away from you by the government. Regulations and institutions are made on Islamic morals, but are often not thought through on a technical level. The free trade zones, Kish and Chabahar, are a positive influence on ICT investments and use for organizations in Tehran. Up-to-date equipment is imported for low prices and assembled in Iran. This is a deliberate government policy and it works. Apart from Internet, there are no limitations	organizations must follow. Every decision or act from and by the government is characterized by the slowness and indifference of the bureaucracy. Within public-private organizations, especially the money the government has to pay the private organizations can take up to 6 months or even a year. This is a big risk in working with the government. This is one of the reasons why it is appealing to work with an experienced	in the banking sector must get approval from the central bank. This is often a result of many negotiations. The rules that apply to government owned banks are stricter than the rules for private banks.		there were more realistic rules on international trade, ICT use in organizations would grow because the ICT would become cheaper, more up-to-date, and better.	to the wrong people. Everyone that bought a radio was put on a list and they were given extra attention. They had to state officially that they would not use the radio for 'wrong' purposes (such as anti-government). After a couple of years, the government and the people became more used to the technology and the restrictions faded away.	promotes ICT use through stimulation of e-banking, e-commerce and so on.

ICT regulations and institutions (continued)	from government regulations and institutions that interfere with ICT use in organizations. The Internet is limited; this starts with the fact that every organization that wants Internet has to get a license. There is a thorough inspection by government agencies of servers and computers every month. Visiting a forbidden website (for example porn) is reason for an immediate shut-down. Then, the organization is closed and all computers are confiscated. In court, the organization can then explain and perhaps go back to work. This unpredictable side of having an	organization. The filters on Internet on grounds of morality and security do not have a big influence on ICT use in organizations. The sites that are filtered are not interesting for a serious organization. The filters on Internet on grounds of morality and security do not have a big influence on ICT use in organizations. The most serious problem with the filtering is the amount of money that is spent on				This will probably also happen with the Internet. An important factor that is holding back the development of ICT use in organizations in Tehran is the fact that the people who are in charge in government and important industries, did not grow up with ICT. They are for example, used to the telephone and the wrist watch, technologies	

ICT regulations and institutions (continued)	organization in Tehran is a reason to be constantly aware of the regulations and institutions. This is comparable with staying updated about ICT developments. In Tehran, the tendency is to be not just a user, but also a producer and developer. This is reflected in the rule that states that international organizations must establish a local office in Tehran in order to do business. In that way, the focus is on importing not only the devices, but on importing knowledge and technology.	this, while the results are not very good. The money could have served a much better purpose.				that are used throughout the country. When the current generation establishes itself in these high places, ICTs will be more of a natural instrument.	
Financial support	It is not easy for organizations to get	Organizations receive budget	For ICT projects that		There is enough money for	ICT investments	Budget is specifically

Financial support (continued)	money from government or private banks for investments, only when there is a good relationship and the organization's credit is good. Then, it can be arranged within a month. Government policy is to invest in certain projects, not to provide general benefits to a sector. If a project is approved as a valuable project, it becomes part of the governments TAKFA-plans and it gets subsidized. It is therefore very important for new projects, to get into TAKFA. Within the TAKFA-framework, there is a lot of money available for developments in ICT	from the government to educate and upgrade their staff to maintain a certain status. There is also money for specific training available to organizations.	have the central banks approval, there is always enough money. Time and money are not an issue.		investments in ICT. Money is available at government owned and private banks, which then become part of your investment and charge user fees. This can in the end cost a lot more money. The financial situation for organizations to invest in ICT (or, for that matter in anything) is not very good because of the high 'interest' and high inflation. This is called the Dutch	are seen as key investments in the future of universities. The budget is sufficient, however, the biggest problems for the universities ultimately relate to the budget and its limitations. The university does involve in projects for the business sector. The business sector does not in effect pay the university for	allocated to projects that fit the national TAKFA framework (around 2000 so far), key points of this framework so far are consultancy, infrastructure of organizations, and human resource development. Money is used to stimulate of public-private partnerships. ICT use in organizations is promoted by using ICT in government organizations

Financial support (continued)	in Tehran.				sickness.	it, but donate money. The strategic policy of the university is to expand the relationship with the business sector. At the moment the budget received from the business sector, equals the governmental budget, in the future the business budget will be three times the size of the governmental. The universities do not see a conflict of	and the implementation of e-services.

Financial support (continued)						interest in this, because they are comfortable with supplying practical knowledge, but with high standards.	