THE POWER WITHIN THE USERS: A SOCIAL CONSTRUCTION ANALYSIS OF THE E-MEXICO WEB PORTAL

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By

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ABSTRACT

In 2001, the Mexican government launched the e-Mexico system. The idea was to reduce the digital gap by providing computer and internet access through telecenters (Digital Community Centers) as well as by producing relevant content in Spanish (e-Mexico web portal). These efforts were to be realized through a collaborative network involving diverse federal dependencies and private interests. Because of the public nature of this project, it was supposed to address a wide heterogenous set of users. Many scholars have focused on the Digital Community Centers while obviating the role of the web portal and its users. This thesis is interested in answering how did the development of the e-Mexico portal evolve, and what role did users play during the process. This thesis will heavily rely on the Social Construction of Technology (SCOT) theory to explain the intricacies of the e-Mexico system.

The following thesis is structured in five sections. The first chapter serves as an introduction to the study and gives a brief context and explanation of what to expect in the following pages. The second chapter explains the origin of SCOT and it also exposes and counter argues the criticism it had suffered. Chapter three is a case study analysis of e-Mexico and it explains how the project started, what actors are involved and what is its current situation. The fourth chapter shows the results of a series of interviews conducted with key people involved in the design and development of the e-Mexico web portal. The final chapter shares some key findings and limitations in the present research as well as new paths for future studies.
Dedications

I was able to make it here because many people believed in me and opened innumerable doors on the way. I would like to thank my parents Pilar and José Carlos as well as my brother Jaime, for pushing me through the very first door. A special dedication to my advisor, Linda Garcia, as well as second reader, David Ribes, for patiently opening one of the most difficult doors: my mind. My CCT friends, professors, colleagues and staff, thank you all for keeping the good doors opened while others shut. To all the people at the Berkley Center, specially Tom, Melody, and señores Cris and Pablo, for opening amazing paths of support. Thanks also to all my other friends from different walks of life, we have opened previous doors that lead me here. Special thanks to my interviewees at e-Mexico and INFOTEC for opening the portals to their projects. I would also like to thank CONACYT for sponsoring my time at Georgetown, this door was the most important of all.

Let us find new portals to open.
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Chapter I – Introduction

During the first years of the World Wide Web, web portals were the starting point for Internet users searching for information (Tatnall, 2005). Many new companies, such as Yahoo!, Altavista and Lycos, were founded around this idea, which proved to be economically successful. The success of these companies was built around the idea of concentrating information and making it available to their users. Sometimes these firms also provided other type of web related services such as email, forums, and news. Today, web portals try to provide the greatest amount of information and services, thereby creating captive users that need to go to only one place to obtain what they need.

Over the last years, governments have also supported the idea of provisioning electronic information to their citizens. They saw the Internet as a unique opportunity to extend their public services and administration. To date, they have mainly used web portals as a tool to make information available. By going online, public administrations expand their “window of services,” which allows them to interact more easily with citizens. The utilization of information and communication technologies (ICTs) by public entities is known as electronic government or e-Government. This term serves as a big umbrella under which many services are gathered and provided through web portals. However, not everyone has equal access to ICTs and the Internet, a gap that exists not only among nations but also within countries.

The provisioning of public services through the Internet has gained momentum through the signing of the Millennium Development Goals (MDG). These goals, which are sponsored by the United Nations (UN), are intended to promote, among many other things, the sharing of information and communication technologies (ICTs) to reduce the digital gap
and bring about economic development by the year 2015. Many countries are complying with the UN project by issuing public policies to develop e-government systems as well as projects that aim to provide computer and internet access to those who do not have it. While acknowledging the benefits of designing and implementing e-Government policies, some scholars (Dada, 2006; Delivering E-government , 2006; Kannabiran, Xavier & Banumathi, 2008; Luna-Reyes & Gil-García, 2009) note that these efforts are not working as expected, especially in developing countries.

Many scholars interested in policy analysis and other areas (Heeks, 2008; Raiti, 2006; Tongia & Subrahmanian, 2006; Unwin, 2009; Zhao, 2008), have started to focus more on the role ICTs have in development, a branch of research also known as ICT4D. Some of these scholars point to the failure of ICT policies to address the realities of the developing world. Others have attributed failure in transferring government services to the online realm to the lack of understanding of ICTs and institutional arrangements. Some other scholars blame the digital gap on the lack of public infrastructure. Many others point to the lack of trust in physical government institutions. Surely these are all contributing factors. However, one factor that has yet to be analyzed sufficiently is the role of the user in this whole process.

Only recently have scholars (Anokwa, Smyth, Ramachandran, Sherwani & Schwartzman, n.d.; Beale et al., n.d.; Chetty & Grinter, n.d.) from the field of human-computer interaction (HCI) begun to focus on the role that users and computers play in development. This approach is also known as HCI for development or HCI4D. The problem that some of these scholars have identified (Silcock, 2001) is that, unlike the private sector, which targets specific audiences according to market segmentation, governments must
address and serve a wide range of citizens –if not the whole population– each of whom has a specific set of needs. This makes the design and development of technology very complicated.

While many scholars promote the adoption of ICTs because there is a relationship between ICT adoption and economic growth (Sciadas, 2005), some point out that soft factors might be influencing adoption. Thus, it is possible to find cultural differences, lack of trust in public institutions, or low infrastructure capacity as problems. Another group of scholars has been more keen to analyze the issue of adoption and ICTs by focusing on the empowering benefits. However, not many have approached this issue from the perspective of user-centered design or UCD.

A user-centered design approach has been widely used as a way to design and develop projects. In fact, the OECD (Organisation for Economic Co-Operation and Development) recently released a report (Wang, 2009) analyzing the importance of switching paradigms in the design and development of e-government projects. Wang, for example, explains that there is a shift “from a government-centric paradigm to a citizen-centric paradigm, putting more attention on the context (e.g. social, organisational (sic), and institutional factors) in which e-government is developing and on the outcomes for users.” (p.14). However, these are not the only factors that should be addressed. Hence, many scholars are starting to ask for user involvement in the design and development of e-government projects. According to these scholars, this approach is the only path to sustainability.

Just as the OECD has called for a reorientation of the approach to e-government, so too scholars from HCI have started to do the same with respect to UCD and ICTs. Just
recently, for example, some scholars (Best, Smyth, Serrano-Baquero & Etherton, 2009; Dearden, 2008; Dearden et al., 2007; Luckin, Dunckley & Dearden, 2007; Marsden, Maunder & Parker, 2008; Putnam, Rose, Johnson & Kolko, 2009) proposed a new approach to UCD for development, called UCD4D. When designing and developing a technology, two approaches might be followed: system-centered or user-centered. The former approach is considered to be too deterministic because it relies on the benefits of technology alone, giving the designers an exalted position (Johnson, 1998). In contrast, many view the latter model as the epitome of good design because it includes practically all stakeholders, thereby giving a greater role to the user. Today, practically no one would disagree that incorporating users in the design and development processes of a technology helps to increase the adoption of a technology.

This thesis aims to explore this issue by focusing on the following questions: What is the main purpose of a government web portal? What actors are involved in its development, and how do their agendas shape the outcome? How does a web portal manage to address a diverse set of users? What role do users have in the design process, and how are their needs incorporated during its development? How technology itself affects the outcome?

The theory of social construction of technology (SCOT) (Pinch & Bijker, 1984) characterizes the role of different stakeholders involved in the design and development of a technology. It describes how an artifact evolves within the context of four stages: interpretive flexibility, relevant social groups, closure and stabilization, and technological frame. Pinch and Bijker suggest two methods of research that can be used in applying this framework: identify the relevant groups (follow the actors) and interviews. This
framework can be very useful in analyzing the creation process behind web portals, allowing the researcher to identify the negotiations made, the achieved consensus, and the actors who are left out.

The SCOT method is not without its critics. Many scholars, for example, question the method of analysis because they believe that a true consensus cannot be reached (Russell 1986; Klein 2002; Clayton 2002; Cooley 2004; Valderrama 2004; Venkatesh 2005) given the power inequalities between users and developers. Nonetheless, I believe that the benefits of the SCOT approach exceed its limitations, especially in the case of research that focuses on the role of users—a factor that might very well help explain why a development project is adopted or not. Hence, I will employ this approach in the following case study of the e-Mexico web portal.

In 2003, the Mexican government officially launched the e-Mexico system. The idea was to reduce the digital gap in Mexico by providing computer and internet access through computer kiosks (Digital Community Centers) as well as by producing, and making available relevant content in Spanish (e-Mexico's web portal). These efforts have been coordinated and realized through a collaborative network among diverse federal and private interests. Although some scholars have written about this project, they have paid little attention to the role of users in the process, focusing on the uses of the computer kiosks and overlooking the other half of the e-Mexico project: the web portal.

With this gap in mind, I will address the following question: How did the development of the e-Mexico portal evolve, and what role did users play during the process? This focus on the role of users is important because as scholars, such as Kossick
(2003), have noted, technological determinism impregnates many projects of development and e-government.

The thesis will be organized as follows. Chapter two sets up a conceptual framework and literature review on the social construction of technology approach (SCOT), put forward by Trevor Pinch and Wiebe Bijker. SCOT explains that an artifact is a negotiation of interpretations and meanings among different relevant groups: policy makers, engineers, designers, and users. I will also address concepts related to development and ICTs, such as the digital gap and leapfrogging. I will then characterize the concepts of e-government and web portals.

My third chapter is a case study analysis of e-Mexico’s web portal. By applying the SCOT framework, I will analyze the historical development of the e-Mexico project focusing on the web portal and the role users had in its design and development.

The fourth chapter will explain the methodology I will employ in conducting my empirical research, which will entail a series of interviews with key actors that have worked in the development of the e-Mexico web portal. The interviewees will be drawn from two sides of the e-Mexico project: those in charge of coordinating the creation of the web portal, and those in charge of the infrastructure and design of the web portal. These interviews will help me untangle and understanding the designers’ and developers’ criteria when building this web portal, how the issue of multiple users was addressed, and how the users where incorporated in the process.

The fifth chapter will summarize my efforts as well as my findings. It will identify problems in my analysis, and the need for future research.
Chapter II – Conceptual Framework and Literature Review

This chapter will layout a conceptual framework based on the social construction of technology. Employing this framework will help identify the role users have in the design and development of an artifact. Since its conception, the SCOT model has been criticized for not addressing very well the role of users. However, the model has been improved by incorporating new elements that provide more depth. This chapter will also review how governments are using information and communication technologies (ICTs) to reduce the digital gap. SCOT can shed light on e-government issues because all too often policy makers employ a deterministic approach (Bekkers & Homburg, 2007; Helbig, Ramón Gil-García & Ferro, 2009; Kossick, 2003). Deterministic approaches typically exclude users, and thereby may discourage the final adoption of ICTs. The chapter begins by defining technological determinism and then moves to the social construction of technology.

Technology out of Control: Technological Determinism

To many people, the development of technology appears as an act of creativity by a “lonely inventor” always looking for a “eureka” moment. Not surprisingly, therefore, inventors are often perceived as an elite, and their inventions are sent to solve every problem. Societies marvel at their discoveries, and use them in an effort to prosper and thrive. This perspective, although tempting and logical on face value, ignores the fact that many actors are actually involved in the development of an artifact. It mainly leaves society out of the picture, failing to explain how social groups influence the design and development of technologies.
Technological determinism has a long history, and was used for many years to explain the relationship between technology and society. Technological determinism stems from the idea that artifacts influence all areas of life, and society has little to do with its development or impacts. As Winner (1993) says, it is the view that nothing can subdue technology; “technology is out of control.”

On his essay on technological momentum, (Hughes, 1994) defines technological determinism as “the belief that technical forces determine social and cultural changes. (p. 102)” He also explains that as a technological system grows in complexity, it is harder for society to shape it and actually the system tends to shape society more.

As Sally Wyatt say (Wyatt, 2007), technological determinism keeps fascinating some scholars within STS and other social settings as well. Government fascination can be found “in the responses of policy makers and politicians to challenges about the need for or appropriateness of new technologies. (p.167)” Wyatt recalls that technological determinism is founded in the idea that technological progress equals social progress and this idea has endured because of its simplicity. The author points that this view is rooted in our culture so deep that even nowadays is very alive. She even goes further by asking the readers of her article to acknowledge the “determinist” within everybody in order to clarify the purposes it plays within society.

Wyatt identifies (p.174) four types of technological determinism: justificatory, descriptive, methodological, and normative. The Justificatory model can be found in policy documents and is largely deployed by actors. The Descriptive model can be found in the work by Donald MacKenzie, Judy Wajcman, Thomas Misa, Merrit Roe Smith and Leo Marx. Wyatt explains they are mainly concerned in avoiding technological determinism as an
explanation however they recognize it when others use it. They use complex models to explain sociotechnical changes. The Methodological approach can be found in the work of Robert Heilbroner, David Edgerton, and Thomas Hughes. Wyatt explains how all the historical studies on technology start from one artifact and this is also true in some “deviant” approaches such as ANT and SCOT. Wyatt suggests that focusing in technology it is sort of saying all scholars are deterministic. The last model, the Normative, can be mainly found in Hughes momentum and Langdon Winner. Wyatt suggest that this approach explains that certain technologies grow so much that cannot be controlled at all. Wyatt also explains that scholars embracing this approach criticize constructivists’ denial of holding technology more accountable.

On the other hand, critics of technological determinism, mainly constructionists, have two problems regarding these approaches: they do not like the idea that a) development of technology happens outside of society without social, economical or political influences; and b) technology causes or determines social change. Technology determinism has come under a lot of criticism, especially from the school of thought labeled the Social Construction of Technology or SCOT. This theory has provided a reasonable explanation by interpreting technology as a social construction where the design and development of artifacts are negotiated among different actors.

**Controlling Artifacts: The Social Construction of Technology (SCOT)**

Determinism inhibits the development of democratic controls on technology because it suggests that all interventions are futile. [...] if we do not foster constructivist views of sociotechnical development, stressing the possibilities and the constraints of change and choice in technology, a large part of the public is bound to turn their backs on the possibility
of participatory decisionmaking (sic), with the result that technology will really slip out of control. (Bijker; 1995a) p.281

This quote encapsulates the fear that many constructivists hold regarding determinism: the latent incapacity of controlling technology. It is for this reason that some constructivist scholars have argued that, although inventors play an important role, other groups influence the development of technologies as well. Technology, they argue, is a social construct. A good example of this thinking can be found in Pinch and Bijker’s major work on the social construction of technology (SCOT) by (Pinch & Bijker, 1987). The authors explain that many relevant groups are involved in the process of designing, developing and deploying a technology.

Pinch and Bijker’s main contribution to science and technology studies was to demystify the idea of the lonely inventor, who—like Dr. Frankenstein—created something beyond his, or society’s control. As noted above, this deterministic narrative favored a linear model whereby the development of technology was inevitable and social actors could do little about it. Taking issue with this approach, Pinch and Bijker envisioned the development of technology as a more complex process. Thus, they developed a multilinear model based on the idea that technology shapes society but society shapes technology as well. Given the many players involved, SCOT seeks to understand why some variants of technology die while others survive.

In laying out their argument, Pinch and Bijker employed a case study of the bicycle. In particular, they sought to understand how bicycles evolved from an unsafe artifact only used by certain social groups to a safer and more accessible technology. They were able to trace down the different circumstances that transformed the high wheelers into modern
bicycles by comparing the successful stages of design and development with the unsuccessful ones. The authors noted that different social groups understood the technology of the bicycle differently and that this affected its ultimate construction.

**Relevant Social Groups**

To begin their analysis Pinch and Bijker define the groups in society that are relevant to the technology. These groups can be organizations or any groups of organized or unorganized individuals. Included among these groups are those who oppose the development of an artifact, as, for example, the anti-cyclists in the case of the bicycle. Regarding users (or consumers) of technologies, Pinch and Bijker automatically assign them the status of relevant social group. However, they do not focus much on them, and this has provoked some criticism from other scholars.

In identifying these groups, Pinch and Bijker acknowledge that “all members of a certain social group share the same set of meanings, attached to a specific artifact. (p.30)” It is also important to determine if the relevant groups have any interest at all in the artifact under study. Clearly, certain relevant social groups shape the design and development of an artifact more than others, which is why Pinch and Bijker suggest that the first step in analyzing a technology is to identify who forms the relevant groups. As they note:

In deciding which problems are relevant, the social groups concerned with the artifact and the meanings that those groups give to the artifact play a crucial role: A problem is defined as such only when there is a social group for which it constitutes a "problem." (p.30)

Pinch and Bijker utilize diagrams as a way to better identify the conflicts between groups when they face a problem and find a solution. The authors explain that using these
diagrams “brings out clearly all kinds of conflicts.” They first start by identifying the relevant social groups (Figure 1) and how they relate to an artifact.

![Figure 1](image1.png)

**Figure 1** | Relationship between an artifact and the Relevant Social Groups.  
The authors then try to identify the problems (Figure 2) each group experience in relation to the artifact.

![Figure 2](image2.png)

**Figure 2** | Relationship between one Relevant Social Group and their perceived problems.  
Finally, Pinch and Bijker incorporate to their model the idea that for every problem there might be different variants of solutions (Figure 3).
Pinch and Bijker also identified sub groups. According to some social characteristics, these groups could be heterogeneous or homogeneous. The authors explain that during the development of bicycles, all women shared some social characteristics and constrains that prevented them from riding bikes comfortably and safely. This problem generated a homogeneous group that was excluded from the design process. Often, groups such as these, are excluded, or ignored, from the design and development processes until another relevant group includes them in the process.

One of the biggest critiques of the SCOT approach is that it obviates differences of power in social relations. Pinch and Bijker suggest that descriptions about power and economic strength should only be done when it is relevant. They argue that SCOT is interested in shared meanings only. Pinch and Bijker explain that to understand the social construction of a technology, the relevant groups need to have a shared meaning of the artifact. This is called interpretive flexibility.
Interpretive flexibility

Emphasizing that technology is a social construction, Pinch and Bijker contend that its shape is determined by one factor in particular—the different meanings that different groups give to a certain artifact. They label this factor “interpretive flexibility” which they say also affects how an artifact is designed:

By this we mean not only that there is flexibility in how people think of or interpret artifacts but also that there is flexibility in how artifacts are designed. There is not just one possible way or one best way of designing an artifact. (Pinch and Bijker, 1987, p.40)

However, when all the relevant groups have reached an agreement, through social interactions such as negotiations, that an artifact does not need any further design or development, a technology reaches stabilization and closure is achieved.

Closure

When relevant groups have found a solution to a certain problem, Pinch and Bijker say it has reached closure. However, they explain that reaching closure does not imply the problem is “solved” in its literal sense. Actually, it is relevant social groups that say when the problem is solved either with the help of rhetoric or by redefining the problem. Technology by itself does not reach stabilization; it is the negotiations among groups designing and developing an artifact that reach it. As a result, the best technology does not always win.

Rhetoric plays an important role in stabilizing a technology and Pinch and Bijker identify two kinds of usage. The first is when relevant groups reframe the problem to persuade users and other groups to accept their viewpoint. This helps them win allies that will eventually translate in adopting the new artifact. A second rhetorical resource is
redefining the problem. Relevant groups can translate a not so popular solution from one specific problem to another. By doing so, they might generate a positive result not seen before. Pinch and Bijker use the example of the air tyre to explain this. The tyre was developed and usually advertised as a way to reduce vibrations. However, some relevant groups found this was not a real problem for them to keep using the high wheelers. Then, manufactures found that air tyre could help increase speed. With this discovery, they redefined the solution for another problem. The air tyre was eventually adopted.

The SCOT model proves that negotiations among different groups are constantly used while constructing an artifact. The model illustrates the need to include the sociopolitical context while analyzing a technology.

**Wider context**
Pinch and Bijker barely discuss the wider social context in their model. Although their explanation is brief, they do highlight the importance of this context to understand how groups shape technology. The last stage of the SCOT model aims to demonstrate how the content of a technology relates to the wider sociopolitical context. Pinch and Bijker explain that “the sociocultural and political situation of a social group shapes its norms and values, which in turn influence the meaning given to an artifact. (p. 46)”

As noted by (Klein & Kleinman, 2002), this last stage in the model has been highly criticized by some other scholars. The next part of this chapter will elaborate more regarding the critiques and how Pinch and Bijker have overcome these issues.

**Critique and Defense**
Many scholars critique SCOT (Clayton, 2002; Cooley, 2004; Epperson, 2002; Klein & Kleinman, 2002; Valderrama, 2004; Venkatesh & Shin, 2005; Winner, 1993) for failing to
address issues on power and users. Others (Russell, 1986) argue that the SCOT model does not allow all members of society to have equal access to participate as relevant groups involved in the design and development of an artifact. This limitation resembles a sort of determinism because it limits the possibility for change. However, Pinch and Bijker have tried to reply to many of these claims by making additions and improvements to their model.

Including Users within a Technological Frame

The first to address these issues was Bijker. In one article (Bijker, 1993) that later served as a foundation for his book (Bijker, 1995a), Bijker expanded the SCOT model by adding the concepts of technological frame and inclusion. Bijker points out that demonstrating the interpretative flexibility of an artifact helps to understand and reveal the social processes that constitute it. For this reason, the analysis is not focused in technology alone. An important part of this process that Bijker models is the technological frame, which guides the interactions, as well as the thinking, that occurs among different groups while developing a technology (Bijker, 1995b).

A technological frame does two things: “it explains how the social environment structures an artifact’s design [...] and how existing technology structures the social environment. (p.173)” Bijker identified three characteristics of these interactions between society and technology through technological frames: a) they are heterogeneous because they are formed by different components such as cultural values, goals, scientific theories, test protocols, and tacit knowledge; b) they are not fixed because they need to be sustained through constant interactions, making it a dynamic process; c) a technological frame “offers both the central problems and the related strategies to solve them” ((Bijker, 1995a), p.123).
However, as the technological frame is built through interactions it creates a structure that constrains future interactions.

According to Bijker, a technological frame structures the interactions of social groups but it cannot do it completely, because actors hold different degrees of inclusion and are situated within more than one technological frame. In order to explain this, Bijker identifies three different configurations related to technological frames and groups: a) when no clear dominant frame is available, groups can develop different innovations and enrolling others becomes important to achieve the success of a specific innovation; b) when one frame is dominant, it allows one predominant group to define both problems and solutions; this is where the degrees of inclusion play an important role; and c) when two or more frames are available, groups exchange arguments with little value for other groups and rhetoric becomes important to achieve closure.

**Users as Agents of Change**

In turn, Trevor Pinch joined Ronald Kline to write another article (Kline & Pinch, 1996) using the SCOT framework. This time the authors were interested in explaining the role users have in the social construction of technology as agents of technological change. Kline and Pinch took into account some weaknesses on the SCOT model pointed out by other scholars. They acknowledged that the idea of closure was a little too rigid in the original model. This strictness does not help explain when different social groups are able to open the “black box.” Opening the black box means reinterpreting the artifact’s flexibility and therefore starting the whole process of redesigning the artifact anew. Kline and Pinch also concede that the model failed to explain social structure and power relationships.
Despite criticisms of the model, Kline and Pinch strongly believe that SCOT has advantages in analyzing users as agents of technological change. To demonstrate this, they analyzed the adoption process of cars (a relatively stable technology) in rural America. In this interesting case, the authors explain how users reinterpreted this technology during the 1920s and 30s. The case shows that farmers were at first reluctant to adopt cars because it threatened their calm lifestyles. However, when cars were transformed into tractors and power supplies for appliances, the rate of adoption grew. The artifact’s use was reinterpreted.

This case study illustrates the important role users play when reinterpreting a technology’s flexibility by assigning new meanings (or usages) to an artifact. As Kline and Pinch explain:

“although manufacturers may have ascribed a particular meaning to the artifact they were not able to control how that artifact was used once it got into the hands of the users. Users precisely as users can embed new meanings into the technology. (p. 776)”

The case study of cars in rural America illustrates how a technology’s closure can be challenged during use. This dispute occurs when users start sharing new meanings regarding the artifact that were not intended by the actual designers of the technology. With this analysis, Kline and Pinch describe how users shape an artifact and in turn technology affects users. Although this case explains the role users might play in redirecting a technology during usage, it fails to explain the users’ role in the design and development phases of a technology.
**Users as Designers**

Trevor Pinch recently co-edited a book (Oudshoorn & Pinch, 2003) trying to understand the role of users from many different perspectives. The book is a collection of articles that aim to explain “how users consume, modify, domesticate, design, reconfigure, and resist technologies. (p.1)” In their introduction, Oudshoorn and Pinch challenge the notion that users and technology are separate objects of research. They contend, instead, that users and technologies are co-constructed, or mutually shaped. According to the editors, this approach challenges the deterministic linear model of technological innovation and diffusion.

Oudshoorn and Pinch point out that feminist historians and gender studies have enriched the study of technology and society by adjusting the focus on users. However, the authors claim that the SCOT model shares some responsibility too. For example, the bicycle case study bases a considerably amount of its arguments on the role women held during the development of bikes.

According to Oudshoorn and Pinch, the subject of feminist studies’ has proven to be very helpful while analyzing the diversity of users as well as the power relations between users and other actors in technology development. A good example of this are feminist historians. They are fond of users and use whereas feel indifferent to stories of men inventing and mastering technology. Feminist historians also reject the idea that scientists and technologists are the beginning and end of everything. Some scholars of gender studies have shifted the view on users from passive recipients to active participants while feminist sociologists have identified three types of users: end users, lay end users, and implicated actors. Oudshoorn and Pinch define these three groups by reciting the work of feminists:
End users are those individuals and groups who are affected downstream by products of technological innovation. [...] Lay-end users was introduced to highlight some end users’ relative exclusion from expert discourse. [...] Implicated actors are those silent or not present but affected by the action. (p. 6)

Within the implicated actors, Oudshoorn and Pinch identify two more categories: “those not physically present but who are discursively constructed and targeted by others and those who are physically present but who are generally silenced/ignored/made invisible by those in power. (ibidem)"

**Why choose this theory?**

After reviewing so many concepts it is important to sum these ideas to gain order and clarity, as well as to link them to ICTs. SCOT is not only a theory; it is also a methodology. Despite initial criticisms by other scholars, SCOT’s model has been greatly improved so that it can serve as a solid framework to analyze sociotechnical systems. Pinch and Bijker’s model is also amendable to the use of interview data, and provides guidance for its collection and use.

SCOT aims to identify the causes surrounding a technology’s failure or success. It does so by identifying the relevant social groups and what meanings they share regarding an artifact (this is also known as interpretative flexibility). SCOT acknowledges that social interactions among different groups are responsible for the design and development of a technology, in contrast to determinism’s lone inventor. These interactions are constrained by technological frames, which shape how groups think and act. Social groups participate in the design and development of an artifact according to a degree of inclusion.
The biggest criticism of the SCOT model has been its lack of clarity when referring to users and power relations among relevant groups. However, subsequent articles by Pinch and Bijker demonstrate the importance of users in the design and development processes of technologies. As Oudshoor and Pinch (2003) note in the introduction to their book, How Users Matter “It has long been recognized that the most sophisticated and complex computer hardware and software will come to naught if users don't known (sic) how to use them.” (p.2)

The authors explain too how the field of information technology has played an important role in “developing new ideas of how the user-technology nexus should be conceptualized” (p.2). They also point out that this field of study has helped private industries related to computer design and software development to be more aware of users. Oudshoor and Pinch identify the studies conducted on work practices, user interfaces and human-computer interaction.

On the other hand, many development projects funded by governments and based on the diffusion of ICTs, are criticized for its deterministic approach. The following lines will deepen on ICTs and the reduction of the digital gap.

**ICTs for the Digital Poor: Building Bridges over the Digital Gap**
The rapid adoption growth of information and communication technologies (ICTs) among developed nations has created a gap with developing nations. Many international organizations such as the OECD (Organisation for Economic Co-operation and Development), the WEF (World Economic Forum) and the World Bank, have special units that study the phenomena of ICT and its relationship with economic growth. However, according to some studies (Ahmad, Schreyer & Wöfl, 2004; Dutta & Mia, 2010; Force,
adoption in developing countries is still far behind more developed nations. Despite the efforts to bridge the digital gaps among nations, some countries are struggling more than others.

These efforts to close the digital gap could also be diminished by the lack of consent regarding the use of terms. As pointed out by (Nyaki Adeya, 2002) it is hard to define what ICTs mean because different international organizations employ different meanings and definitions. It is hard to believe that a working definition has yet to be established. In SCOT’s terms, organizations have not reached closure regarding a definition for ICTs. This lack of definition is a severe problem, given the huge role that computers and the internet are playing nowadays.

A simple definition of ICTs could be any artifact that can store, retrieve, manipulate, transmit or receive information electronically in a digital form, such as: computers, cell phones, telephones, televisions. For the purpose of this thesis, ICTs will be understood as the usage of computers and internet for development. Within this definition, internet applications such as web portals will be included as well.

**Uses of ICTs**

ICTs’ applications can be found in different areas such as entertainment, commerce and education. Governments, too, have started to adopt ICTs to make their processes more transparent and efficient. Many scholars agree on some common benefits regarding ICT adoption: they help reduce time and space; reduce communications costs; and facilitate interaction among people. An even stronger arguments favoring ICT adoption is its relationship with development. Studies (Sciadas, 2005) and organizations such as OECD, WEF and World Bank all promote the adoption of ICTs because adopting these technologies
are associated with economic growth by improving access to and transparency of information. However, not everyone has the resources to benefit from its adoption.

**A Digital Gap or Digital Poverty?**

Despite the shared enthusiasm regarding ICT adoption and economic development, some scholars (Dada, 2006; *Delivering E-government*, 2006; Kannabiran, Xavier & Banumathi, 2008; Luna-Reyes & Gil-García, 2009; Merrit-Tapia & Reséndiz-Romero, 2008; Tongia & Subrahmanian, 2006) have noted that the adoption process is not working as expected, especially in developing countries.

Most people attribute this problem of adoption to the lack of access to ICTs—a situation known as the digital gap or digital divide. However, some scholars refrain from using the term digital gap because it is simplistic. It tends to reduce the problem to one of haves and have-nots. They prefer the term digital poverty because it identifies other factors that might be influencing the adoption.

In fact, many issues can be found that are related to low levels of ICT adoption: lack of relevant content (interests and language); lack of funds; bad infrastructures (slow connections and outdated equipment); lack of skills (Users not culturally prepared; low levels of digital literacy and literacy in general, no previous experience with ICTs); deficient Interaction (Graphic user interface, information architecture); lack of user centered design processes.

Galperin and Mariscal’s edited book (2007) on digital poverty is a collection of articles that address all these issues. In one of these articles, Gover Barja and Björn-Sören Gigler (Barja & Gigler, 2007) identify three types of structural constrains –local, usage, and technological– related to the adoption of ICTs. Regarding structural usage constraints, the
authors suggest that these are formed by a group of internal factors related to ICTs such as connectivity, content, training, and sustainability (p.22). These factors might include problems with equipment, lack of relevant content, lack of skills in users and lack of human structure to manage the ICTs.

Until recently, governments were unaware of the importance of adopting ICTs. Some organizations and governments address one or two of these structural constraints but usually leave others unattended. To promote a coordinated effort, the United Nations (UN) started supporting some initiatives to help improve the lives of the digital poor.

**Development Millennium Goals: Aiming for Digital Inclusion**

As a symbolic effort to reduce disparities in the world, the members of the UN signed in 2000 an agreement to assist impoverished nations by improving significantly their lives by the year 2015. This agreement is known as the Millennium Development Goals (MDG) and it covers a wide array of issues: End Poverty and Hunger, Universal Education, Gender Equality, Child Health, Maternal Health, Combat HIV/AIDS, Environmental Sustainability, and Global Partnership.

This thesis focuses on goal eight, paragraph F, which relates to access and adoption of ICTs. It states: “in cooperation with the private sector, make available the benefits of new technologies, especially information and communications.” This goal has detonated the creation and funding of many projects, supported either by private or public interests.

The role of governments in the adoption of ICTs has become relevant lately with the issuing of inclusion and digital policies. The major problem in rural areas and poor communities is that private telecommunication companies are not risking building infrastructure without a market (Garcia, 2005). This is why many of the policies are
intended to provide access to computers and the internet. Many countries have followed the communal kiosks model, where people share access.

On the other hand, governments are also fond of adopting the use of ICTs because it facilitates improvements in service while helping build better government. By adopting ICTs, governments aim to make interactions with citizens and businesses more efficient, transparent and cost effective. These benefits can even improve internal government processes by making them more efficient.

**Critique: Leapfrogging and the Determinist Discourse**

The use of ICTs for economic and social development, however, faces two types of critiques. The first one is the idea of leapfrogging (Davison, Vogel, Harris & Jones, 2000), understood as deployment of ICTs in developing nations sponsored by developed countries. It is worrisome because usually these technologies are not designed with end users of developing countries in mind. As importantly, the exported artifacts do not take into account the needs of final users in developing countries. Some claim that this model of diffusion is a form of colonialism too because it repeats dependency patterns.

The second critique is related to the deterministic discourse that fuels the diffusion of ICTs. Some scholars have criticized (Schech, 2002; Thompson, 2002; Thompson, 2004; Van Dijk & Hacker, 2003; Wilson, 2009) the model adopted by some technologists. Ideas such as “move people to the information society” or “technology will help reduce differences” are founded in a strong technological determinism.

To overcome these critiques, many governments and organizations have tried to adopt a different approach. Governments have better knowledge about their citizens than foreign organizations. This is why during the last years governments have started to issue
policies to support the adoption of ICTs. On the other hand, scholars from developed countries are more concerned now with the adoption of ICTs for development (ICT4D). The UN is also supporting this new field of ICT4D as a way to break leapfrogging and incorporate end users in the design and development processes.

**HCI4D and UCD4D**

Other fields related to the design and development of technologies are coming together as well. Areas such as human computer interaction (HCI) have started to develop new models to approach design issues and international development. HCI is the field within information technology studies that is concerned with finding better interactions between humans and computers. The main purpose is to align the cognitive model of humans with that of computers. New fields such as HCI for development (HCI4D) have started to explore how to incorporate end users in the design and development of ICT4D. This has also fostered the creation of new models, such as the user–centered for development (UCD4).

International organizations promoting the adoption of ICTs for development and e-government are switching too. The OECD released a couple of years ago a study (Wang, 2009) that suggested making the switch from user-centered to citizen-centered design. This new approach based on citizens means switching too the paradigms in design and development of e-government projects. Wang, for example, explains that there is a shift “from a government-centric paradigm to a citizen-centric paradigm, putting more attention on the context (e.g. social, organisational (sic), and institutional factors) in which e-government is developing and on the outcomes for users.” (p.14).
Summary
As discussed in this chapter, many development projects funded by governments, hold a deterministic approach regarding the adoption of ICTs. The term digital gap suggests a deterministic influence because bridging the gap implies that the problem is solved by providing access to technology alone. The usage of this term is also a reductionist view of the problem because it leaves out of the picture other social constrains that might be influencing the adoption of ICTs.

As the SCOT model explains, designing and developing an artifact is a social construction where many groups are involved. However, users hold a very special position in this model. Without users adopting an artifact, the technology cannot be further developed.

In the following chapter I will present the case study of the e-Mexico system, a government funded project to reduce the digital gap in Mexico. I will pay special attention to the web portal as a socially constructed artifact and try to explain the role users played in its development. Not many studies have used the SCOT framework to analyze the design and development of ICTs by governments. However, I believe this framework provides an interesting approach for understanding the sociotechnical factors that influence the development of a web portal.
Chapter III – Case Study: e-Mexico’s Web Portal

I instruct Pedro Cerisola, the Communications’ Secretary, to begin as soon as possible the e-Mexico project, so that the revolution in information and communication have a truly national character and reduce the digital divide between governments, businesses, households and individuals, reaching every corner of our country. (Vicente Fox during his inauguration address, 2000)

As discussed in the previous chapter, the digital divide can be understood as the difference between those who have access to ICTs and those who do not. The previous chapter also enumerated the reasons why the term digital divide is too simplistic; the phenomenon actually involves many other social and political issues usually taken for granted.

In a recent study (Mariscal et al, 2008) conducted by the Economic Research and Teaching Center in Mexico (CIDE), the authors acknowledged the importance of providing access to ICTs as a first step to reducing the digital divide. Notwithstanding this, the authors also found that the digital divide is not only a matter of having access to ICTs, it is also about making effective use of those technologies. Unfortunately, many ICTs projects for development and e-government initiatives take a deterministic approach where it is assumed that technology alone will suffice.

The following chapter is a case study analysis of the Mexican solution to close the digital divide. In the year 2000 the federal government launched e-Mexico, a project designed to provide computer and Internet access as well as relevant content for marginalized communities. Considering the size of the e-Mexico project, this chapter will pay special attention to the Mexican web portal as a socially constructed artifact, and will aim to describe the role different users played in its development.
This chapter begins by discussing some indicators of ICT access in Mexico. This data was obtained through a recent survey conducted by the National Institute of Statistics and Geography (INEGI) in Mexico and the United Nations’ Millennium Development Goals (MDGs). The analysis of these indicators is important because the e-Mexico project wanted to first tackle the gap in access. Considering this interest, it is also important to review how the e-Mexico project was designed and developed. Therefore, the second part of this chapter discusses what some journal articles, books, and magazines have concluded about this project.

**Digital Poverty and Access to ICTs in Mexico**

As discussed in the previous chapter, ICTs encompass a variety of technologies that help people communicate or access information. In a recent survey in Mexico by INEGI (2007), the ICT indicators were defined as those households with access to television sets, fixed telephone lines, cable TV, computers and Internet. While Mexico performs very well in the first two categories, the percentage of Mexicans that have access to computers and Internet is still low compared to similarly developed countries. (*OECD Information Technology Outlook*, 2008).

According to the 2007 survey by INEGI, 22% of the population in Mexico can access a computer from their homes while only 12% has access to Internet. However, these percentages increase once outside the household, where 22% of the population has access to Internet and almost 33% to a computer. Inequality between rural and urban areas is also present in the adoption of computers and the Internet. According to a study by CIDE (Mariscal et al, 2008), the majority of adopters are concentrated in urban areas, that is 92.4% in contrast to 7.6% for rural areas.
**ICTs Indicators and the MDGs**

INEGI seem to have a broader conception of ICTs compared to the UN's Millennium Development Goals. In the most recent indicators for the goal of global partnership for development, the UN categorizes ICTs differently: internet users (per 100 people), mobile cellular subscriptions (per 100 people), telephone lines (per 100 people). Despite this narrow categorization, the recent improvements in Mexico regarding ICT access are evident (table 1). Mobile cellular subscriptions have experienced huge growth compared to other technologies; they now cover 71% of the population. On the other hand, the adoption of telephone lines seems to have stagnated during the last ten years.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Mexico’s indicators for ICTs in the MDGs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet users (per 100 people)</td>
<td>0.0</td>
</tr>
<tr>
<td>Mobile cellular subscriptions (per 100 people)</td>
<td>0</td>
</tr>
<tr>
<td>Telephone lines (per 100 people)</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: ("Millennium Development Goals Indicators," n.d.)

It is worth highlighting that almost 22 percent of the population in Mexico has access to the Internet. This low penetration rate could be related to the low adoption of telephone lines. As most access to broad band connections is done through telephone companies, such as
TELMEX, or cable TV, distributors mainly focus on urban areas. \textit{(OECD Key ICT Indicators, n.d.)}

It is tempting to relate the growth of Internet users between 2000 and 2005 to e-Mexico because it was during that period that the project was launched and became very active. Despite the apparent association between these two events, it is impossible to prove this relationship, as there are no public studies that could support this claim. It is also worth remembering that similar growth rates in Internet access can be found in other countries during this period, as key ICTs indicators from the OECD make evident. So to what extent has e-Mexico reduced digital poverty, and what groups have played a role and why. This chapter, together with chapter four, seeks to answer these questions.

\textbf{A Policy to Reduce Digital Poverty}

In order to fight the disparity in access between urban and rural areas, and at the same time to comply with the MDGs, the Mexican government established the creation of the e-Mexico system in December 2000. The Secretariat of Communications and Transportation (SCT) was given the task of setting up a team that would bring together the efforts of different interests, both public and private, to reduce the digital gap. This new office was named e-Mexico National System Coordination, although it just recently changed its name to Coordination of Information and Knowledge Society. From this point forward, this thesis will refer to this coordination as “e-Mexico office” while the project will be known as “e-Mexico system.”

\textit{Designing a Digital Solution}

According to SCT’s web page ("El Portal e-México," 2010), the digital gap became a public policy matter because it was believed that, by addressing it, three goals might be achieved:
a. Promote the country’s transition to a new social, economic and political environment

b. Guide and facilitate Mexico’s transition to an information and knowledge society through the design of digital services intended for the citizens of the XXI century

c. Comply with international agreements regarding the information and knowledge society

The main objective of this program was to reduce the digital divide in communities with more than 400 people by providing computers and Internet access through telecenters or Digital Community Centers (DCCs). A second objective was the design and development of a web portal (e-Mexico web portal) that would make available relevant content in Spanish as well as indigenous dialects, such as Mayan and Mazahua.

In order to achieve these goals, the e-Mexico system was designed along three strategies or axes (Table 2): connectivity, content and systems. Each axis had the purpose of addressing a specific need. Connectivity would provide access to computers and Internet through the creation of DCCs; content would be responsible of creating access to digital services on information and knowledge; and systems would make content available through the design, development and maintenance of a web portal.
### Table 2 | e-Mexico’s Axes

<table>
<thead>
<tr>
<th>Connectivity</th>
<th>Content</th>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Provide Internet &amp; Computer Access</em></td>
<td><em>Produce Relevant Content</em></td>
<td><em>Make Content Available</em></td>
</tr>
<tr>
<td>Digital Community Centers</td>
<td>e-Gov e-Health e-Learning e-Economy</td>
<td>Keeping the Systems Running &amp; e-Mexico’s Web Portal</td>
</tr>
</tbody>
</table>

Source: information taken from e-Mexico

**A Web of Coordinated Efforts**

As noted by some scholars (Luna-Reyes & Gil-Garcia, 2008; Luna-Reyes, Gil-Garcia & Cruz, 2007) the work done by the e-Mexico office has consisted of building networks of collaboration among different groups. This has proven to be very helpful since no more than thirteen people are employed within the e-Mexico system. It is important to describe each of the three strategies in greater depth to better understand the social interactions within the e-Mexico system.

**a. Connectivity: Interconnecting Mexico**

The Digital Community Centers are the star project in e-Mexico. Their development has been a joint effort between the SCT, the Secretariat of Public Education (SEP) and many other governmental organizations. In 2005 there were 7,202 DCCs and most of them were administered by SEP (Table 3). The instructors in charge of these centers are also supported by the Secretariat of Education. Today the DCCs total 9,500, and the distribution has not changed that much.
### Table 3 | Distribution of Digital Community Centers Among Government Branches in 2005

<table>
<thead>
<tr>
<th>Government Branch</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretariat of Public Education</td>
<td>50.78</td>
</tr>
<tr>
<td>National Institute for Adult Education</td>
<td>21.56</td>
</tr>
<tr>
<td>Secretariat of Social Development</td>
<td>9.33</td>
</tr>
<tr>
<td>Secretariat of Health</td>
<td>8.79</td>
</tr>
<tr>
<td>Oportunidades (Development Project)</td>
<td>5.47</td>
</tr>
<tr>
<td>National Institute for Federalism and Municipal Development</td>
<td>2.35</td>
</tr>
<tr>
<td>Secretariat of Communications and Transportation</td>
<td>1.35</td>
</tr>
<tr>
<td>National Commission for the Development of Indigenous Peoples</td>
<td>0.24</td>
</tr>
<tr>
<td>e-Hidalgo</td>
<td>0.14</td>
</tr>
</tbody>
</table>


The e-México system has also encouraged the expansion of access to telephone lines by creating new household markets that demand new Internet services from telecommunication companies. These companies are also strategic partners for e-México as they have provided Internet service for the DCCs.

b. **Content: Producing Knowledge**

The collaboration among government branches is also present within this axis. That is, other public and private organizations are associated with the production of content as well. The e-México office coordinates production through committees where four government secretaries are directly involved – health, public education, economy and public administration. Other government groups have been invited as well, but they have a low presence in the portal. These groups include the secretariats of labor and social welfare (STPS) and social development (SEDESOL). Educative organizations, both private and
public, are also included in the production of educational materials. It is important to note that each group owns and is responsible for the content published electronically.

The production of content focuses on four priority areas, or pillars: e-learning, e-health, e-economy, and e-government. The e-Mexico web portal describes them as follows:

**e-Learning:** Provides new ways of accessing knowledge, education and training to promote an integral development for Mexicans. Advocates egalitarian access to education and culture, always having respect for citizen’s identity and cultural environment.

**e-Health:** Increases society’s general well-being and health. This system provides the chance to access health institutions by overcoming social, cultural and geographic obstacles.

**e-Economy:** Accelerates the economic development within the digital economy by focusing on micro, small and medium businesses while increasing economic competitiveness. Favors a culture of digital services within Mexican society, using digital sharing processes and promoting chains of value, to drive the country to a new economy.

**e-Government:** Promotes a transparent government where citizens can easily interact at all levels of government. Builds digital citizens that exercise their right to be informed and access the public services provided. Assures the population’s right to access the information related to public administration.

According to the SCT, during the course of six years these four areas have been able to produce more than 19,000 different records or web pages that can be accessed through
the e-Mexico web portal. (Table 4) (*Programa Sectorial de Comunicaciones y Transportes, 2007-2012, 2007*)

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Records</td>
<td>&lt;4,000</td>
<td>&lt;5,300</td>
<td>&lt;10,500</td>
<td>&lt;16,700</td>
<td>&lt;19,000</td>
<td>N.D.</td>
<td>N.D.</td>
</tr>
</tbody>
</table>

*Source:* information taken from the Presidency’s Annual Reports, SCT, and e-Mexico

**c. Systems: Making Content Visible**

The e-Mexico web portal plays an important role in this strategy: it has the responsibility for making the content available to a diverse set of users. The SCT states the mission of the web portal as a project that will

> Strengthen the intercommunication among Mexicans, expanding coverage and a range of basic social services through a mega-network that incorporates the latest advances and technological innovations, and integrating the efforts of various actors to support a more equitable national development. (“El Portal e-México,” 2010)

The portal’s design, development, and maintenance are conducted by INFOTEC under the supervision of the e-Mexico office (Industry’s Information and Documentation Fund). INFOTEC is a government research center that studies and promotes the application and adoption of information technologies in Mexico. It also designed and developed Webbuilder, the software used for building the e-Mexico web portal. In 2004, the web portal entered *The Stockholm Challenge Award*, and although it did not win, it was one of top ten finalist within the category of e-government sites.
Since its official launch in 2003, the web portal’s graphic user interface (GUI) has had two major changes related to layout and information architecture (Figure 4).

**Figure 4 | Evolution of e-Mexico’s Web Portal**
The latest GUI has been in use since 2006 and it displays the information following a basic organization:

**Pillars:** The relevant content produced by the secretariats is arranged under the four topics previously explained: e-Learning, e-Health, e-Economy, and e-Government.

**Users:** Because this project has a public nature, it is supposed to address a large and heterogeneous set of users, so some of the information is organized according to the potential user’s background and interests: Elderly, Peasants, Businesspersons,
Students, Family, Youth, Children, People with disabilities, Indigenous, Migrants and Women. Some of the contents in the web portal are written in Mayan and Mazahua as well as English and French.

**Support:** The information under this menu offers a variety of topics but it is mainly focused on helping students in their school projects.

**Services:** This menu is supposed to address every citizen’s needs related to official paperwork and forms.

**e-Mexico Forums:** Its main objective is the promotion and creation of online communities. These virtual spaces are intended for citizens that share similar interests so they can exchange information and knowledge or even personal experiences for the common good.

**What Scholars Say about e-Mexico?**

The lack of transparent and reliable information is one obstacle that scholars have identified while studying the e-Mexico system. This problem was noted by Teresa Márquez, an anthropologist in Mexico, in a magazine article (“e-Mexico: ¿Qué es? ¿Funciona?,” 2005) published in 2005. She explains how the scarce data provided by the project is mainly focused on infrastructure and leaves out other important information:

> The first e-Mexico indicators are oriented to assess the object –measuring connectivity, that is the technical behaviors– therefore obviating the subject’s perceptions and learning capacities (p.36)

As Márquez notes, the only indicators facilitated by the federal government are mainly related to the production and infrastructure for the project. The success of the project is
highlighted by the number of pages displayed, the number of new DCCs, or the amount of records produced. On the other hand, there is practically no public data, reports, nor evaluations that explain the progress of the e-Mexico project in terms of empowerment. This lack is identified in the one and only official assessment on the project.

On the other hand, while only a few studies have addressed the impact of the DCCs, practically none have addressed the web portal. It is this gap in the literature that inspired this thesis. The following table attempts to organize the most significant articles and studies about the e-Mexico project. By cross-referencing the articles under axes and fields of expertise, this table aims to expose the remaining gap regarding the systems strategy. Mainly, the web portal has not been studied thoroughly as other areas of the project such as the DCCs.
## Table 5 | e-Mexico’s Studies Cross-referenced with Axes and Fields

<table>
<thead>
<tr>
<th>Connectivity</th>
<th>Content</th>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizational Studies</strong></td>
<td>Luna-Reyes et al. (2007) Collaborative digital government in Mexico: Some lessons from federal Web-based interorganizational information integration initiatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Luna-Reyes et al. (2007) E-mexico: collaborative Structures in mexican public administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Luna-Reyes et al. (2008) The Impact of Institutions on Interorganizational IT Projects in the Mexican Federal Government</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Self made
According to some scholars, the project has been a success from an organizational point of view. Two studies by Luna, Gil-García and Cruz (2007a; 2007b) and a third by Luna-Reyes, Gil-García and Estrada-Marroquín (2007) analyze the organizational success of the e-government initiatives, using as a major example the e-Mexico project.

In the first article (2007a), the authors follow a case study approach. Based on their conclusions, the success behind the e-Mexico project can be attributed to the “virtuous circle” of relationships between institutions and the collaboration among them. In their second article, Luna-Reyes, Gil-García and Cruz (2007b) expand their case study to include the whole e-Mexico system. They outline the many elements that shape the system and characterize the benefits that have been achieved and the challenges still to be faced.

Another article by Luna-Reyes, Gil-García and Estrada-Marroquín (2007) suggests that some internal issues might be affecting the results. They found that people in charge of e-Mexico are constrained by some “institutional arrangements” that may negatively affect the implementation of the technology. They point out that arrangements such as the “adequacy of human and financial resources, as well as well-defined goals and indicators, have an impact on technological characteristics such as utility, quality of information, or ease of use. (p.38)” These three elements are important for the success of the web portal too. The complexity of the topics discussed, as well as the user interface, likely influence the users’ experience and likelihood of adoption. Also, the wide variety of possible users represents a problem because each user might have different levels of digital literacy.

Users and the Web Portal
Since its conception, the project has aimed to incorporate some social groups in the design and development of the e-Mexico project. In February of 2001, the e-Mexico office
organized a Public Consultation Forum to gather the opinions and ideas of scholars, the
government, and citizens. Ever since, this has been the only time other social groups have
been directly incorporated into the design process. As explained in the previous chapter, an
artifact is built through the interpretations and negotiations of different relevant groups.
Although the role users play in this process is hard to identify, it is important to know them
better in order to facilitate more adoption.

Knowing more about users could help identify potential problems during use. As a
study of telecenters in Mexico (Huerta & Sandoval-Almazán, 2007) found, users showed
both skill deficiencies while navigating a nonlinear environment and a lack of the skills
necessary to evaluate the quality of the information they found. The authors also found
that technical and language barriers, such as Internet speed, as well as unfamiliarity with
English, deepens the digital divide. So what the authors found is that diffusing a complex
technology such as the computer or Internet can have a negative effect on the objective of
reducing the digital divide.

Another problem that e-Mexico is facing has to do with the people that are adopting
the technology. This study by CIDE (Mariscal, Gil-Garcia & Aldama, 2008) found that the
beneficiaries of e-Mexico are mostly young people in the DCCs. They mainly use the centers
for academic projects and for socializing with the help of email and chats. More interesting
is that there is a high rate of usage of the Internet for entertainment purposes like playing
online video games.

This finding matches the information provided by the e-Mexico project regarding the
most visited web pages from the DCCs (Table 6). According to this information, a majority
of the sites visited are related to email and video games. It is also interesting that only two web addresses are related to government services.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Web Page</th>
<th>Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>redescolar.ilce.edu.mx</td>
<td>3,607,706</td>
</tr>
<tr>
<td>2</td>
<td><a href="http://www.hotmail.com">www.hotmail.com</a></td>
<td>2,865,204</td>
</tr>
<tr>
<td>3</td>
<td><a href="http://www.google.com.mx">www.google.com.mx</a></td>
<td>1,358,179</td>
</tr>
<tr>
<td>4</td>
<td><a href="http://www.t1msn.com.mx">www.t1msn.com.mx</a></td>
<td>725,994</td>
</tr>
<tr>
<td>5</td>
<td>ads.web.aol.com</td>
<td>649,000</td>
</tr>
<tr>
<td>6</td>
<td><a href="http://www.esmas.com">www.esmas.com</a></td>
<td>573,564</td>
</tr>
<tr>
<td>7</td>
<td><a href="http://www.cca.org.mx">www.cca.org.mx</a></td>
<td>504,848</td>
</tr>
<tr>
<td>8</td>
<td>logs.eresmas.com</td>
<td>499,342</td>
</tr>
<tr>
<td>9</td>
<td>windowsmedia.com</td>
<td>420,222</td>
</tr>
<tr>
<td>10</td>
<td><a href="http://www.google.com">www.google.com</a></td>
<td>349,640</td>
</tr>
<tr>
<td>11</td>
<td>web.tramitanet.gob.mx</td>
<td>279,044</td>
</tr>
<tr>
<td>12</td>
<td><a href="http://www.tvazteca.com">www.tvazteca.com</a></td>
<td>276,039</td>
</tr>
<tr>
<td>13</td>
<td>redir.windowsmedia.com</td>
<td>256,763</td>
</tr>
<tr>
<td>14</td>
<td>popup.msn.com</td>
<td>235,081</td>
</tr>
<tr>
<td>15</td>
<td><a href="http://www.batanga.com">www.batanga.com</a></td>
<td>209,507</td>
</tr>
<tr>
<td>16</td>
<td>vote.esmas.com</td>
<td>204,676</td>
</tr>
<tr>
<td>17</td>
<td>webpdp.gator.com</td>
<td>178,068</td>
</tr>
<tr>
<td>18</td>
<td><a href="http://www.juegosjuegos.com">www.juegosjuegos.com</a></td>
<td>170,620</td>
</tr>
<tr>
<td>19</td>
<td><a href="http://www.cartoonnetwork.com.mx">www.cartoonnetwork.com.mx</a></td>
<td>154,245</td>
</tr>
<tr>
<td>20</td>
<td>xlime.offeroptimizer.com</td>
<td>140,712</td>
</tr>
<tr>
<td>21</td>
<td>mx.yahoo.com</td>
<td>135,790</td>
</tr>
<tr>
<td>22</td>
<td><a href="http://www.videojuegos.com">www.videojuegos.com</a></td>
<td>128,258</td>
</tr>
<tr>
<td>23</td>
<td>sisier1edomexico.gob.mx</td>
<td>125,988</td>
</tr>
<tr>
<td>24</td>
<td>g.ceipmsn.com</td>
<td>123,467</td>
</tr>
<tr>
<td>25</td>
<td>jd.cb.msn.com</td>
<td>121,672</td>
</tr>
</tbody>
</table>

Source: e-Mexico

Regarding the access to government portals from DCCs (Table 7), the e-Mexico portal is ranked 165th, representing 0.06% of the web visits. Other government portals that offer online services such as web.tramitanet.gob.mx and www.gob.mx show similar percentages
of access, and they are located even further down in the scale, in positions 373 and 399, respectively.

Table 7 | Government Sites Accessed from DCCs in 2004

<table>
<thead>
<tr>
<th>Rank</th>
<th>Web Page</th>
<th>Hits</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>redescolar.ilce.edu.mx</td>
<td>2,946,054</td>
<td>9.90</td>
</tr>
<tr>
<td>37</td>
<td><a href="http://www.hidalgo.gob.mx">www.hidalgo.gob.mx</a></td>
<td>91,530</td>
<td>0.31</td>
</tr>
<tr>
<td>64</td>
<td><a href="http://www.redescolar.ilce.edu.mx">www.redescolar.ilce.edu.mx</a></td>
<td>46,480</td>
<td>0.16</td>
</tr>
<tr>
<td>152</td>
<td><a href="http://www.salud.gob.mx">www.salud.gob.mx</a></td>
<td>19,632</td>
<td>0.07</td>
</tr>
<tr>
<td>165</td>
<td><a href="http://www.e-mexico.gob.mx">www.e-mexico.gob.mx</a></td>
<td>17,661</td>
<td>0.06</td>
</tr>
<tr>
<td>176</td>
<td><a href="http://www.sep.gob.mx">www.sep.gob.mx</a></td>
<td>16,459</td>
<td>0.06</td>
</tr>
<tr>
<td>214</td>
<td>sisertedomexico.gob.mx</td>
<td>13,746</td>
<td>0.05</td>
</tr>
<tr>
<td>227</td>
<td><a href="http://www.ocampo-gto.gob.mx">www.ocampo-gto.gob.mx</a></td>
<td>13,083</td>
<td>0.04</td>
</tr>
<tr>
<td>231</td>
<td><a href="http://www.elbalero.gob.mx">www.elbalero.gob.mx</a></td>
<td>12,854</td>
<td>0.04</td>
</tr>
<tr>
<td>244</td>
<td><a href="http://www.inegi.gob.mx">www.inegi.gob.mx</a></td>
<td>12,092</td>
<td>0.04</td>
</tr>
<tr>
<td>251</td>
<td>inepja.inea.gob.mx</td>
<td>11,895</td>
<td>0.04</td>
</tr>
<tr>
<td>254</td>
<td><a href="http://www.sonora.gob.mx">www.sonora.gob.mx</a></td>
<td>11,541</td>
<td>0.04</td>
</tr>
<tr>
<td>256</td>
<td><a href="http://www.siser-alianzacontigo.gob.mx">www.siser-alianzacontigo.gob.mx</a></td>
<td>11,445</td>
<td>0.04</td>
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<tr>
<td>271</td>
<td><a href="http://www.sat.gob.mx">www.sat.gob.mx</a></td>
<td>10,715</td>
<td>0.04</td>
</tr>
<tr>
<td>273</td>
<td><a href="http://www.chiapas.gob.mx">www.chiapas.gob.mx</a></td>
<td>10,658</td>
<td>0.04</td>
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<tr>
<td>274</td>
<td><a href="http://www.campus-e-mexico.edu.mx">www.campus-e-mexico.edu.mx</a></td>
<td>10,607</td>
<td>0.04</td>
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<tr>
<td>278</td>
<td><a href="http://www.emexico.gob.mx">www.emexico.gob.mx</a></td>
<td>10,077</td>
<td>0.03</td>
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<td>295</td>
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</tr>
<tr>
<td>296</td>
<td>cursospr.inea.gob.mx</td>
<td>9,482</td>
<td>0.03</td>
</tr>
<tr>
<td>342</td>
<td><a href="http://www.tlaxcala.gob.mx">www.tlaxcala.gob.mx</a></td>
<td>8,019</td>
<td>0.03</td>
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<tr>
<td>359</td>
<td><a href="http://www.edomexico.gob.mx">www.edomexico.gob.mx</a></td>
<td>7,529</td>
<td>0.03</td>
</tr>
<tr>
<td>368</td>
<td><a href="http://www.itlp.edu.mx">www.itlp.edu.mx</a></td>
<td>7,318</td>
<td>0.02</td>
</tr>
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<td><a href="http://www.tramitanet.gob.mx">www.tramitanet.gob.mx</a></td>
<td>7,190</td>
<td>0.02</td>
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<tr>
<td>399</td>
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<td>6,520</td>
<td>0.02</td>
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<tr>
<td>400</td>
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<td>6,517</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Source: e-Mexico
This chapter has provided a review of the e-Mexico project and has started to identify some of the relevant social groups involved in its development. This case study has described the development of the e-Mexico system with special attention on the web portal. As explained in the previous chapter, the SCOT theory is a good model to unravel the developmental process of a technological artifact. The following chapter, therefore, will go deeper in this analysis and will discuss the results of a series of unstructured interviews with some of the relevant groups involved in the design and development of the web portal. The analysis of these interviews will help explain how the current situation of the web portal is an important part of the e-Mexico project.
Chapter IV – Applying SCOT: Method and Interviews

The previous chapter gave an overview of the whole e-Mexico project and focused on its web portal. It identified some of the relevant groups involved in the design and development of e-Mexico as well as some of the problems that have affected the system. The following chapter summarizes a series of unstructured interviews conducted with key individuals involved in the design and development of the e-Mexico web portal.

The interviewees were selected by following SCOT’s model, which stresses the identification of relevant social groups in an artifact’s controversy such as the decision behind the election of a certain technology above another. By using this method, this chapter aims to explain the problems each of these groups have faced regarding the design and development of the web portal and the solutions they came up with. This chapter helps explain how social interactions have shaped the artifact, in this case a government web portal, and how final users were taken into account.

Interviewing with SCOT

As previously discussed in this thesis, the SCOT model provides tools to analyze the social interactions related to the design and development of an artifact. Bijker and Pinch suggest there are four steps to follow:

- Identify Relevant Groups
- Describe them in more detail by mentioning power relations and economic strengths
- Identify the problems each group faces while interacting with the artifact
• Describe the different solutions they came up with, including the non-technical

The case study previously discussed covered practically all of these points. However, the exclusive analysis of public data and scholarly articles does not provide the whole picture. Bijker and Pinch also suggest incorporating interviews and “following the actors.” Although the e-Mexico project probably has hundreds of actors interacting, the scope of this thesis is only interested in those groups that have had a direct influence on the web portal. So this chapter is primarily concerned with two groups: the e-Mexico office and INFOTEC.

The previous chapter described how the e-Mexico office has built a network of collaborations related to various functions. Regarding the development of the web portal, the e-Mexico office has relied on the secretariats that produce the content, and has allied with INFOTEC to design and develop the web portal system and the user interface. INFOTEC is also in charge of keeping the web portal updated under e-Mexico’s supervision.

The interviewees were selected because of their unique roles in the process of building this technological artifact. Given the research question: “how did the development of the e-Mexico portal evolve, and what role did users play during the process?”, we need to unveil the social interactions of those groups that influenced the design and development of the e-Mexico web portal.

**Different Groups, Different Interpretations**

SCOT is interested in knowing the different interpretations every group has regarding a technology, and how they solve a controversy and manage to reach a consensus. The following aims to identify these elements through a series of interviews conducted with some groups within the e-Mexico project. In order to maintain confidentiality, the real
names of these individuals will not be used. However, it can be said that most of them hold high-ranking positions or were involved during the launch of e-Mexico.

E-Mexico arranged two interviews with collaborators involved in the web portal project (WP) as well as experts in connectivity and infrastructure (CI) matters. In addition, INFOTEC coordinated a group interview with diverse employees involved in e-Mexico such as a project coordinator, a software engineer and a graphic designer. The project coordinator (PJ) is in charge of making the link with the e-Mexico office. The software engineer (SE) has been working in the design and development of Webbuilder, a content management system used for the e-Mexico portal. The graphic designer (GD) has been collaborating in the design and development of the graphic user interface for the web portal. Another interview was conducted with one of the four coordinators that have been in charge of the e-Mexico system. This interview provided some useful insights about the history of the project and the decisions taken regarding the web portal.

The following section divides the interview's results into four topics: the e-Mexico System; e-Mexico Web Portal; Webbuilder; and Other Elements. Each topic is subdivided according to problems and solutions. This arrangement matches the SCOT model regarding what obstacles the social groups find while interacting with an artifact and what results they reach to overcome them.

**e-Mexico System**

The development of the whole e-Mexico project has greatly influenced the development of the web portal. It is important to highlight some key issues that came up during the interviews because they provide background for upcoming matters in this thesis.
Indicators are Dropping

Problem: The e-Mexico interviewees all agreed that a major problem regarding the whole project is that access indicators are dropping in comparison to other countries in the region and even the world. Mexico has often been used as a model of e-government policy for developing countries because many projects have won international awards. However, its reputation has been changing lately as other countries show better results for reducing the digital gap. Mexico seems to have stagnated.

Another problem related to connectivity is the speed of access that the e-Mexico infrastructure provides. Each Digital Community Center has a 1 mega byte per second connection, which makes it difficult for users to use video streaming or other online applications that demand faster connections.

Solution: The solution here is not easy as noted by the interviewees. Raising these indicators requires a huge investment in infrastructure. E-Mexico is working in collaboration with the state owned electric company to use their fiber to interconnect cities and governments. This project would increase the access to bandwidth in poor communities.

Connectivity priority versus social priority

Problem: The lack of coverage in connectivity is still an issue. Ever since the project was launched in 2000, e-Mexico and the federal government have been greatly concerned with interconnecting Mexico by providing Internet access and facilitating the distribution of access. Ten years later the situation has not change much. As all interviewees from e-Mexico expressed, this remains the main problem regarding the digital gap. One interviewee highlighted the importance of connectivity: “Adoption is not a barrier for
connectivity or access. However, without connectivity there is no access, and without access there is no adoption.”

Solution: Despite the apparent benefits of interconnecting Mexico, the project needed a social approach as well. This dual approach accounts for the axes on content and systems, allowing the project to move away from a deterministic view where all that matters is the access to technology.

Small Office
Problem: The lack of personnel, as well as a tight budget, compounded the problem of achieving success. “Too many fronts and so little hands.” This is e-Mexico’s feeling in general of having such a big project in the hands of as few as twelve people. The e-Mexico office is similar in rank to other sub-secretariats, but it started with half the budget and a reduced personnel.

Solution: As noted by some scholars, and confirmed through the interviews, e-Mexico has been able to coordinate the work of many areas to overcome the lack of budget and personnel. As someone mentioned during an interview “we have to produce millions of dollars in value with a budget of only hundred of thousands.”

Hierarchical Political System Versus Horizontal E-Government System
Problem: Another problem has been the introduction of a non hierarchical model of collaboration in the government. As noted by some of the interviewees, this model has changed the way some organizations within the government work together and has faced some resistance. As e-Mexico is a small office within the Communications Secretariat, it does not hold political power to “get things done” from other areas.
Solutions: E-Mexico has promoted a new participatory model. The idea was to get all the parties involved in social development to share their knowledge and resources. As someone in e-Mexico noted, this type of collaborative work begins by “sponsoring some projects through e-Mexico, generally without the consensus of all interested parties. When the project started working, this approach made it easier to enroll other groups that at the beginning were reluctant to join.”

Another solution involves sharing the budget. Sharing was done through a bank trust that is funded by all those interested in reducing the digital gap. Every secretariat has a vote regarding the investment of the resources. However, this solution has turned into a problem related to access to public information. The few evaluations and assessments funded through this trust are protected by the laws of bank secrecy, and are not accessible through any official channel such as the office of public information.

e-Mexico Web Portal
The previous chapter explained how e-Mexico is structured around three axes: connectivity, contents, and systems. Although the web portal plays a strategic role within the whole project, it had a rough start and even faced some unforeseen problems.

No initial plans to have a portal
Problems: During the first three years of e-Mexico, there were no plans of designing and developing a web portal. However, groups outside e-Mexico were exerting pressure by questioning the lack of results.

Solutions: The first version of the portal was designed using Typo3, a free and open source content management system. It was a basic version including information regarding the four axes on economy, health, education and government as well as one discussion forum.
Another solution adopted for designing the web portal was found through benchmarking. By analyzing the best practices in other e-government projects, e-Mexico was able to design and develop the web portal in collaboration with INFOTEC. Actually, this practice of benchmarking has been widely used in the whole project. Some of the interviewees acknowledged the big influence some e-government projects such as Singapore or Korea have had in e-Mexico.

*Unexpected uses of the portal*

Problem: The first version of the web portal included a discussion forum. In the beginning final users were posting messages and exchanging information. A few weeks after it was launched, many citizens started using the forum to channel complaints and demands to the federal government.

Solution: As e-Mexico was not instructed nor legally constituted to deal with these types of requests, they had to shut down the forum. Many of the requests were channeled to the office for citizen advice within the president’s office. Subsequent versions of the e-Mexico web portal offered forums as well, but the access was more constrained and regulated. As of today, these forums are not working, despite the fact that they are visible in the web portal.

*Lack of consistency in production of content*

Problem: Although the collaborative nature of the project has fostered the production of more than fifteen thousand records related to health, economy, education and government, there has been a lack of consistency in the quality of the content and a lack of standard practices for programming. This problem materialized despite the efforts of having editorial committees that supervise the production of the content. Another issue affecting
the portal is the lack of support from some private education institutions that have failed to provide free content to the project.

Solution: No solutions were shared during the interviews.

**Webbuilder**

As mentioned before, the first version of the portal was designed using Typo3. However, the second version of the portal was built using Webbuilder 2.0, a software designed and developed in Mexico by INFOTEC. The adoption and further use of this artifact has spawned some problems that are related to the web portal.

* Modifications to Webbuilder

Problem: The 2.0 version of Webbuilder did not meet many of e-Mexico’s requirements regarding the management of content and portal design. However, as noted by someone at e-Mexico "Webbuilder does not limit the capacities of e-Mexico’s portal; rather it is the constant development of the portal that demands better software.”

Solution: INFOTEC, in collaboration with e-Mexico, adjusted the software to meet the project’s needs but this turned out to generate further problems.

* Modifications impede upgrade

Problems: The customization of Webbuilder led to a situation where all of e-Mexico’s content and records could not be upgraded to a newer version of Webbuilder. Actually Webbuilder is currently working as a 4.0 version, while the e-Mexico portal is still working on the 2.0 version. As noted by people from INFOTEC, this old version of Webbuilder affects the behavior of the web portal as well as how it is displayed in newer web browsers.
Solution: The solution proposed by INFOTEC called for a six-month project to upgrade all the records but e-Mexico rejected this option for the high costs associated with it. Right now e-Mexico is exploring the option of switching to new software because, as they pointed out, Webbuilder is not a standard in CMS (content management system). Webbuilder uses a “file system” while many other similar types of software utilize “data bases.” However, INFOTEC noted that e-Mexico was not willing to do the upgrade because it “could not see any direct benefit for the final users.”

Other Elements
This final topic addresses problems and solutions that could be considered non-technical. Practically all interviewees mentioned some problems that were not related directly to the use of an artifact, but affected the design and development of the web portal.

No incorporation of users in the process
Problem: Both e-Mexico and INFOTEC acknowledged the practical null inclusion of final users in the design and development of the web portal. However, many of the interviewees constantly made references to how the efforts to reduce the digital gap are focused on citizens.

Solution: The interviewees were able to recall only two situations where users were involved. The first one was in 2001 when e-Mexico organized a series of public hearings in which citizens, scholars, policy makers and telecomm companies, among many others, participated in a discussion to build strategies to reduce the digital gap.

Users were also involved through focus groups during the second redesign of the web portal’s user interface. E-Mexico, in collaboration with INFOTEC, conducted a series of evaluations where “users were invited to navigate through the portal and to share their
perceptions and feedback on how well the portal was covering the users’ needs. As someone in INFOTECH mentioned, “the objective of these evaluations was to validate what we had built so far and identify the final needs that could be incorporated.” It also provided a chance to know what new topics could be included.

No evaluations nor assessments
Problem: The interviewees say e-Mexico’s access indicators are dropping, but there is still no reliable information or assessment mechanisms to evaluate the real impact of the project. Most of the studies are made based on the perceptions of users or by reflecting on the access data. However, there are still no studies on how e-Mexico is empowering users. Solution: The interviewees acknowledged that there are no upcoming plans to develop evaluations of the project.

Political transitions
Problem: People in e-Mexico recognize how the change of government has affected the adoption of some projects such as the virtual communities in the web portal. As noted by some interviewees, e-Mexico is the only project that was initiated by Vicente Fox and survived the transition from his government to Felipe Calderon’s administration. Not many presidential projects survive a change of administration in Mexico. The people in e-Mexico see this as a worrisome problem as the new president will be in office until 2012.

On the other hand, INFOTECH explains that the constant changes in e-Mexico’s coordination has affected the development of new projects and even their role in the project. INFOTECH has noticed how their role switched from being a project consultant to one of just maintenance and updating the web portal.
Solution: Regarding the uncertainties that a change of administration provokes among government projects, interviewees from e-Mexico shared the idea that there are no possible solutions as it is a matter out of their control. Regarding the development of new projects through INFOTEC and in collaboration with e-Mexico, INFOTEC acknowledged a will to retake an innovative approach that could help the project.

**Digital illiterates**

Problem: During the interviews, members of e-Mexico explained how there seems to be a disconnect between the digital policies and Mexican realities. Although e-Mexico has advised all levels of public administration to produce e-government services, some small localities have failed to offer better online services. Two problems are present here: the complexities of Mexican paperwork and the predominance of illiterate digital citizens.

There is also a disconnect between the policies and realities of certain economic sectors. e-Mexico representatives explained how a vast part of the Mexican economy is based on an informal economy and these groups tend to not pay taxes or hold a stable location. The latter makes access to a computer or Internet very difficult. A digital policy that aims to help them adopt e-commerce or pay their taxes online will not benefit them as it does not make any sense at all in their context.

Solution: However, e-Mexico representatives suggested that these sectors could benefit from technologies if new policies were made focusing on their needs and realities. They mentioned how owners of small food stands could share recipes with other colleagues or even learn financial basics to better administer their businesses. All of this could be done through the portal.
Underprepared and underpaid promoters

Problem: The e-Mexico office has relied on collaboration to build the Digital Community Centers and to produce content for the web portal. However, final users need a link to appropriate these technologies. e-Mexico, in collaboration with the Public Education Secretariat and other organizations, has trained thousands of people to become digital promoters. Despite this collaborative effort, many of these promoters are underpaid or underprepared to deal with the technologies.

This is not the first time a project involving technologies and education has faced some problems. As noted by one of the interviewees, the Public Education Secretariat usually does not propose integral and systemic solutions, as it did with the “tele-education system.”

Solution: e-Mexico is proposing an “army” of 300,000 university students to reach every corner of marginalized areas to educate and to form a critical mass of digital citizens. This will be done through the mandatory community work that every university student is expected to complete during his or her final year.

Where did the Users Go?

This chapter highlighted the results of a series of interviews with people involved in the design and development of e-Mexico. Although this is not the place to draw some conclusions, three findings can be identified: the project is characterized by a lack of a significant involvement of final users in their design processes; connectivity, therefore focus on technology, remains a big concern where most of the efforts are concentrated; and finally, the selection of certain technologies have shaped the development of the web portal.
in a negative fashion. The following chapter will try to wrap up everything we have
discussed so far and will also aim to discuss in more depth these findings.
Chapter V – Conclusion and Future Research

This thesis started with one question in mind: How did the development of the e-Mexico portal evolve and what role did users play during the process. The previous chapters have discussed these matters to explore answers about the social situations involved in the building of a technological artifact such as a web portal. The SCOT model provided a solid framework to study the e-Mexico web portal and this framework will help build the conclusion as well.

The following part will discuss the findings of this study by using some of SCOT’s elements. It will also share some limitations faced during this research and will further develop some new questions to provide suggestions for future research.

Findings Using SCOT

The SCOT theory seeks to explain why—during the design and development of an artifact—some technologies are chosen over others. Building on interviews of relevant social groups, this model can also help identify the groups involved or excluded during this selection process. In the case of e-Mexico’s web portal, users seem to have been the most excluded group. Their exclusion has probably affected the further adoption of computers and the internet, thereby facilitating a drop in ICTs indicators, as well as failing to fail to reduce the digital gap as expected. However, this is not the only problem e-Mexico is facing. As some of the interviews shown, other technical and non-technical issues are affecting the whole project.

_Interpretative flexibility_

SCOT contends that different groups have different interpretations of an artifact. This situation applies to the different interpretations each relevant group gives to different but
complementary concepts such as the digital gap and ICTs. In keeping with this perspective, this research found, that Mexican and international organizations do not agree on which technologies should be grouped under the term ICTs. The same is true with respect to the approach needed to define the digitally excluded. As discussed in this thesis, while some scholars talk about a digital gap or digital divide, others prefer the term digital poor. However, choosing one approach over another eventually shapes how the problem is interpreted, and how and why the technical solutions are adopted to solve it. If too much importance is given to the lack of connectivity, other social issues—such as how to solve the users’ lack of digital skills or even digital illiteracy—are left aside.

**Closure**

SCOT claims that closure is reached when a problem is solved. However, the problem is said to be solved only when the relevant groups claim it to be so. According to SCOT, to reach closure, relevant groups use rhetorical resources to win allies who share the same view, or to redefine the problem to obtain common solutions.

E-Mexico relies on a network of collaborators to build its web portal and to produce content. Because e-Mexico does not have a high status within the federal government, nor the resources to achieve a huge task such as reducing the digital gap, it relies heavily on others by building networks of trust. Many projects promoted by e-Mexico started without all the interested parties, but as the project evolved these parties eventually joined when they saw some results. However, relying on others does not guarantee good quality in the content produced, and this generates a new problem.

Regarding the redefinition of problems to find new solutions, SCOT purports that the best technology does not always win. This was the case of Webbuilder, the software
designed and developed by INFOTEC, and adopted by e-Mexico to build the web portal. Choosing this software and customizing it to meet the needs of e-Mexico stagnated the future development of the web portal itself by not allowing the records to be compatible for upgrading to newer versions of Webbuilder.

The e-Mexico office has redefined a problem in search of a solution many times. One interviewee, for example, shared the story of how a Catholic priest in a small Mexican town criticized the upcoming inauguration of the new Digital Community Center (DCC). He warned his parish about the dangers of the Internet, mainly pornography, and the threat it represented to children. The people of e-Mexico invited the priest to inaugurate and bless the DCC –a custom and a courtesy in Mexico– and showed him the benefits of the Internet by displaying the official website of Vatican City. The priest marveled, and during the following sermon he encouraged the community to attend and benefit from the new DCC. Enrolling key actors is crucial to promote adoption.

Wider Context
As SCOT points out, the sociopolitical context of a relevant group has a great influence on norms and values and thus on the different meanings that group assigns to a certain technology. The Communications and Transportation Secretariat (SCT) is in charge of building infrastructure and most of the time it works with other areas of government and telecom companies. However, they rarely interact with citizens. It is not in the tradition of the SCT to design projects that relate to end-users; there is always a middle man doing this part of the job.

The e-Mexico project was designed and developed according to the SCT’s way of building infrastructure, that is to say by providing access through prioritizing connectivity.
However, as some of the interviewees noted, the project needed a social approach. That is how the idea of the web portal was born. This project was promoted through a government organization without any previous knowledge about how to interact with final users. That is why other departments—such as the Secretariats of Public Education and Social Development-- had more interaction with users through the DCCs and digital promoters. Unfortunately, the web portal continued to be administered by the e-Mexico office, within the SCT.

The web portal is the tangible result of the whole e-Mexico project, but as some of the interviewees within the SCT claim, it is not the most important. One interviewee admonished the idea of studying the web portal. As he noted: “focusing on the leaf will not let you see the forest.”

Technological Frame
This was the last variable to be incorporated into the original SCOT model, and it has proven to be difficult to integrate. The SCOT approach focuses on how the social environment structures the artifact’s design, and how existing technology structures the social environment. During the interviews many situations came up about how these two forces have shaped the design of the web portal.

When the first forum was launched to discuss the web portal, users opened “the black box” by posting comments against the government or demanding better services. The lack of legal authority forced the e-Mexico office to shut down the forums, and in some cases channel the petitions to the competent authorities. As noted by some interviewees, e-Mexico had neither the responsibility nor the interest to offer and administer a forum of complaints. Although the forums were re-launched, and are still running, the access is
nowadays more restricted and controlled. As one interviewee pointed out, this tighter control has led to the desertion of most of the online communities, practically useless now.

Many of the interviewees share a common discourse about designing and developing the project with the users in mind; but only on rare occasions have the users have been involved in the process. The only prominent example was the forum opened to society in the very beginning of the project, which was designed to elicit ideas about how to build e-Mexico. The urge to connect communities by first investing and building infrastructure might have shaped the shared view of the project.

Although not an artifact per se, benchmarking techniques have had a great influence on the design and development of the e-Mexico project in general, and have become a dominant technological frame in the whole process. As noted by most of the interviewees, this technique had been used constantly while excluding other design approaches, such as user-centered or participatory design.

The dominant technological framework has focused on access to computers and the Internet. Despite the statistics that have shown how mobile phone adoption in Mexico has increased greatly during the last years, there are no future projects that build upon this technology. Many of the interviewees claim that 10 years ago cell phones were not a viable option, and that nowadays the problems are related to incompatibilities between the standards chosen by different telecom companies.

**Graphing the Findings**

The following map (figure 6) looks at the case study of e-Mexico in the content of SCOT’s model. Accordingly it highlights the intricacies and complexities in the design and development of e-Mexico’s web portal. The diagram shows the areas where problems have
been solved but also other areas that need attention. This graph synthesizes the findings in this thesis as well as depicts the current situation of the web portal.

**Figure 6** | Applying the SCOT model to e-Mexico’s web portal
Research Limitations

There are two major limitations to this research: the lack of studies interested in web portals for development, and difficulties associated with accessing public information related to e-Mexico. Due to constraints in budget and time, the number of interviews, as well as the relevant groups, was limited. Without these limitations a wider picture might have been painted.

Regarding the available information, most of data was outdated or inconsistent among organizations and studies. For example, indicators about Internet and computer access show slightly different numbers depending on whether they were obtained through the UN, the World Bank or other Mexican organizations. On the other hand, the lack of assessments and clear objectives in e-Mexico also made it difficult to understand the real impact of the project as a whole, and the state of the web portal in particular.

The inability to interview other relevant groups such as the Secretariats in charge of producing the content meant that an important part of the project was omitted, but it has not affected the major conclusions of this study. Although it would have been helpful to interview the Secretary in charge of launching e-Mexico, the chance to interview other people involved since the beginning of e-Mexico compensated to some extent for this omission.

New Questions and Future Researches

This thesis’s research question – How did the development of the e-Mexico portal evolve and what role did users play during the process – remains partially unanswered. The first part of this question could be answered with the help of the case study and the interviews.
However, the role users played in the design and development of the web portal remains unanswered for two reasons.

The first is related to SCOT’s methods. For example, it was difficult to identify the final users – and therefore difficult to interview them– because this group is numerous and heterogeneous. The SCOT method is helpful to explain the relations among small elite groups, but bigger, more heterogeneous ones are difficult to study give this theory. However, this research maintains that users were generally not included in the design and development of the web portal. Based on the interviews, it is clear that users had little or no participation in the processes.

The second issue relates to the lack of access to some usability studies conducted by e-Mexico and INFOTEC. With proper access to these studies, which were conducted during the second redesign of the graphic user interface (GUI) of the web portal, it would have been easier to determine how well users’ needs were incorporated into the final design. It might also have helped to explain why some petitions where adopted while others discarded. The lack of this data limited the scope of this thesis.

Another area for further research might focuses on the empowerment role that the web portal has played in the whole process of reducing the digital gap. As noted by many scholars, the e-Mexico project lacks assessments and evaluations that measure the real impact that it is having in the lives of its users. Although connectivity is needed, producing relevant content is equally –if not more– important to produce digital citizens. Further studies could also explore the role played by e-Mexico’s web portal GUI in the adoption process.
Final Remarks

The skepticism shown by some people within e-Mexico regarding the value of studying the web portal suggests that this artifact does not play an important role in the project despite being a window that grants access to all the information produced in coordination with so many areas. This research takes issue with this belief. These final remarks will try to point out some barriers that will need to be removed in order to develop better digital citizens.

Joint efforts. As some of the interviewees pointed out, there are many government offices doing the same job with respect to digital policy. In these instances as well lack of coordination has produced diluted results. For example, some interviewees described the situation in which one rural school might have up to three different satellite antennas providing Internet access. This state of affairs only helps increase the costs of connectivity and adds more complexity. The same applies to the different e-government initiatives. There are up to three different citizen web portals administered by the government, and they all provide practically the same information regarding matters of official paperwork.

Policies for citizens and welfare. As noted by one interviewee, many projects do not survive a change of government. Many times social projects are promoted and linked to one political figure, and the newcomer will destroy and rebuild a similar project. This wastes time and money as every six years –the length of a presidential term– new projects are launched and old ones abandoned.

Open the scope. In other countries, projects, similar to e-Mexico, are administered by the ministries of education. The fact that the Mexican project was promoted from within the SCT might have bred a deterministic approach whereby connectivity appeared to be the most important dimension. However, as one interviewee reflected, projects might have
been promoted in other areas of government, because connectivity was not a major issue. Despite a shared belief in the importance of building digital citizens, most efforts aimed to reduce the digital gap.

User-centered and participatory design approaches. To say that all efforts are focused on users is not the same as adopting a user-centered approach. Assessing E-Mexico, the magazine ("e-Mexico: ¿Qué es? ¿Funciona?," 2005) pointed out that many decisions are made without any previous studies of users’ needs. Incorporating the users in the processes will guarantee a better adoption of the technology. Ways must be found so that users can communicate with designers and developers. However, Internet usage statistics within the DCCs show that users are not especially interested in this topic. As some e-Mexico statistics have shown, users are more interested in accessing other type of private web portals related to entertainment rather than entering public projects such as e-Mexico’s web portal.

Clear goals and assessments. The lack of clear goals and assessments is probably the most important barrier to be overcome. As a project evolves in its implementation, it is important to know what is working and what is not. Without clear or realistic goals and objectives, this task can be ignored, as there is not feedback about how well the project is performing. Many scholars have noted this problem. Needless to say, however, this problem cannot be addressed without access to critical information.
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