

[ICT Policies in Developing Countries: An Evaluation with the Extended Design-Actuality Gaps Framework](#)

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Abstract:

Information and communication technologies (ICT) are often represented as a factor in global economic growth and social development. Consequently, countries and governments invest large amounts of resources in the ICT sector. However, it is not certain whether the results of these investments necessarily match expectations. In order to investigate this conundrum, this study evaluates government policies for Information Communication Technologies (ICT) growth in a developing country by extending and utilizing the design-actuality gaps framework. A qualitative analysis of government's ICT policy documents (i.e., design) and interviews with 35 citizens and 54 government officials (i.e., actuality) shows significant design-actuality gaps. Additional insights are derived from two focus groups involving 11 citizens. The analysis shows that not only there are gaps between policy design and actuality but also the dimensions of design and actuality are different. The causes of these gaps are discussed along with implications for practitioners and a theoretical extension of the design-actuality gaps framework. This research contributes to the literature on design-actuality gaps, ICT in developing countries, and government policy evaluation.

Keywords: Design-actuality gaps | policy evaluation | developing countries | ICT for development

Article:

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ICT POLICIES IN DEVELOPING COUNTRIES: AN EVALUATION WITH THE EXTENDED DESIGN-ACTUALITY GAPS FRAMEWORK

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ABSTRACT

Information and communication technologies (ICT) are often represented as a factor in global economic growth and social development. Consequently, countries and governments invest large amounts of resources in the ICT sector. However, it is not certain whether the results of these investments necessarily match expectations. In order to investigate this conundrum, this study evaluates government policies for Information Communication Technologies (ICT) growth in a developing country by extending and utilizing the design-actuality gaps framework. A qualitative analysis of government's ICT policy documents (i.e., design) and interviews with 35 citizens and 54 government officials (i.e., actuality) shows significant design-actuality gaps. Additional insights are derived from two focus groups involving 11 citizens. The analysis shows that not only there are gaps between policy design and actuality but also the dimensions of design and actuality are different. The causes of these gaps are discussed along with implications for practitioners and a theoretical extension of the design-actuality gaps framework. This research contributes to the literature on design-actuality gaps, ICT in developing countries, and government policy evaluation.

Keywords: Design-actuality gaps, policy evaluation, developing countries, ICT for development.

1. INTRODUCTION

Information and communication technologies (ICT) are often represented as a factor in global economic growth and social development. To take advantage of ICT for the socio-economic growth and development of their citizens, developing countries are designing and adopting ICT growth policies and these have been analyzed in the literature (e.g., Cordell and Iannacci, 2010). However, developing policies alone is not enough; the evaluation of the success and failure of these policies is vital for a meaningful impact on ICT growth in a country. The issue of gaps between ICT policy design and their outcomes is the subject of debate in academic research on information systems in many developing countries (Ngololo et al., 2012; Phang and Kankanhalli, 2008).

Several developing nations are dealing with typical ICT issues such as lack of appropriate products, cost of ICT devices, education, local language content, human resources and robust regulatory framework for ICT growth (Touray et al., 2013; Grazzi and Verfara, 2012). In order to overcome these challenges, governments are designing and adopting ICT policies and action plans. The policies and action plans are important tools for governments in attracting foreign investments (Bannister and Connolly, 2014; UNCTAD, 2006). The lack of a theoretical foundation in making and adopting these policies often results in gaps among policy design and actual outcomes and effectiveness of policy

implementation. The challenge of a theoretical basis hinders developing countries in learning from gaps between policy design objectives and actual outcomes.

Building on the *design-actuality gaps framework* (Heeks, 2002), this study develops a theoretical foundation for the evaluation and analyses of the gaps between government policy design and actual outcomes of the implementation of these policies. In this research, we present an *extended* design-actuality framework. We use this framework to conduct a qualitative empirical evaluation within the context of evaluating government policies for ICT growth in a developing country.

While there are alternative lenses to examine government policies, the design-actuality framework is especially relevant and applicable in the case of ICT policies evaluation. It has been used in a number of research studies related to information systems development projects in developing countries (Diniz et al., 2013; Bass and Heeks, 2011; Pozzebbon and Heck, 2006; Gerhan and Mutula, 2007; Best and Kumar, 2008). The framework has also been used to explain success and failure of specific government ICT projects (Gichoya et al., 2006). Furthermore, our research extends the framework to develop a theoretical foundation for the evaluation and analysis of government ICT policies.

Pakistan represents the developing country in this research. Pakistan has had several ICT successes and failures, as ICT policies were developed, adopted and implemented during the last several years. There are several reasons for selecting Pakistan for this research. First, Pakistan is the seventh largest populated country with a population of over 170 million and has the highest one year growth rate of ICT industry (147%) in the world, followed by Bangladesh (135%), and India (97%) (Willing, 2007). Second, a large portion of its population lacks access to basic ICT needs such as reliable electric power, and infrastructure. The cost of traditional ICT infrastructure, devices and services is significantly high and, therefore, the government has pushed deregulation policy with enabling legislation to facilitate wireless ICT access (to avoid laying costly cables based infrastructure). As a result, the telecommunication sector has made significant progress in the last decade. Its subscriber base has climbed sharply reaching 137.7 million in 2014, from only about 0.3 million in 2000 and 34.5 million in 2006 (Imtiaz et al., 2015). The cellular teledensity has jumped to 76% from that of 22% in 2005–06 (Imtiaz et al., 2015). Third, a large segment of Pakistani society suffers from the lack of basic resources, illiteracy, and low income. Even if ICT access was made possible to this segment, it would still be difficult to sustain meaningful impact on their lives. Finally, Pakistan is experiencing an evolving regulatory framework with changes in government ICT policies since the early 1990s (Baqir and Pervez, 2000; Mujahid, 2002; Gao and Rafiq, 2009). Pakistan has continuously experimented with and adopted policies to increase ICT access and strived to create an enabling environment for the growth of the ICT sector. It is our expectation that lessons learned from Pakistan would be valuable and significant for other developing countries experiencing similar ICT growth issues.

The paper is organized in several sections. The next section describes the theoretical background. The research design and the methodology are described in the third section. The fourth section presents dimensions and elements of “design” that are derived from the review and analysis of government’s ICT policies and action plans. It also presents “actuality” and its elements derived from the citizens’ perspective. The fifth section discusses the design-actuality gaps and offers analysis of the causes behind these gaps. Insights are derived from ICT policy making and influencing officials. The last few sections evaluate the validity and trustworthiness of this study as plausible grounded theory research, highlight implications for developing countries, and discuss contributions to the literature on design-actuality gaps, ICT for development, ICT in developing countries, and government policy evaluation.

2. THEORETICAL BACKGROUND

The role of government policies is well recognized in the literature on ICT policies design and development (Wonglimpiyarat, 2014; Larson and Park, 2014; Mann and Schweiger, 2009). According to the United Nations: “government policies that encourage competition and innovation can play a major part in helping developing and transition economies establish and expand information and communication technology networks...” (UNCTAD, 2006). About 44% of developing countries have already adopted national plans for the growth of the ICT sector and another 20% are in the process of developing such plans (Information Economy Report, 2007). Many other countries have adopted ICT policies in recent years. According to Bilbao-Osorio et al. (2013), although most countries around the world have developed national plans to accelerate broadband adoption, the plans vary by both goals and policy recommendations. In any case, developing plans and policies alone are not enough; the evaluation of the success and failure of these policies is vital for a meaningful impact on ICT growth in a country.

The literature on policies evaluation prescribes several evaluation methods to discover “best practices” in government policies (Carmona and Punter, 2013; Mann and Schweiger, 2009; Gibbons, 2008; Rossi and Freeman, 1993). The policies evaluation process can be prospective, i.e., *ex ante*, monitoring studies and retrospective, i.e., *ex post*, (Becher and Kuhlmann, 1995). *Ex ante* policies evaluations are done on outcome estimation and alignment of goals, objectives and action plans associated with the policies. Monitoring studies support policies implementation and make changes to the policies if necessary. *Ex post* evaluations focus on analyzing actual outcomes and provide subsequent legitimacy to policies. The purpose of these policies evaluation processes is to find out “what works and what does not” in policies design and implementation (Papaconstantinou and Polt, 1997). The reliance on *ex post* evaluations is indicative of the lack of theoretical foundation in policies development process. A review of the literature on government ICT policies evaluation in developing countries confirms the lack of theoretical basis for policies evaluation. In fact, for the most part, the extent of recent research on ICT policies evaluation is limited to the identification of successes and failures of national ICT policies in several countries (Olsson, 2006; Samarajiva and Zainuddin, 2008; Gao and Rafiq, 2009; Information Economy Report, 2007, 2011). The categorization of ICT policies into successes and failures without critical theoretical grounding runs into problems of evaluation subjectivity: a failure for one person could be success for another, and evaluation timing: today’s success might be tomorrow’s failure (Heeks, 2002).

In this context, a promising tool for evaluation is the design-actuality gaps framework (Heeks, 2002) and may serve as a possible solution for developing a theoretical foundation for ICT policies evaluation in developing countries. This framework has been used in several studies (e.g., Diniz et al., 2013; Bass & Heeks, 2011; Pozzebon and Heck, 2006; Gerhan and Mutula, 2007; Best and Kumar, 2008; Gichoya et al., 2006; Nemati and Latif, 2011). In the absence of a grand theory, a recognized and often-used framework may be used for analysis (Sprague, 1980) and may eventually lead to the generation of a sound theory. The Heeks’ framework fundamentally aims at evaluating information systems success, failure and local improvisations in developing countries. In order to appropriately use this framework for ICT policies evaluation in developing countries, it is imperative to evaluate and extend the framework.

The original framework is based upon contingency theory (Fiedler, 1964) and is closely related to the idea of fit, congruence or match/mismatch between various factors (Lorsch & Morse, 1974; Sillince, 2005). The notion of design-actuality gaps refers to “an assessment of the match or mismatch between local actuality (‘where we are now’) and system design (‘where the design wants to get us’)” (Heeks, 2002). This idea includes

temporal and systemic contingencies, i.e., the internal and external factors may make actual output to be different from the planned output. In other words, the notion of *gaps* can be understood as deviation of final results from the planned results. This framework recognizes the existence of partial success, where some of the information systems objectives are met, but not all.

The dimensions for evaluating *design-actuality gaps* can be built in a number of ways, e.g., “*theoretically on the basis of information systems literature; descriptively on the basis of a straightforward delineation of components of an information system; and analytically on the basis of case studies*” (Heeks, 2002). The ability to identify dimensions of design and actuality within a given environment makes this framework flexible and extendable. Therefore it is possible to identify dimensions of design and actuality from different perspectives, i.e., dimensions of design can be derived from legal/policies documents, while the dimensions of actuality can be derived from interviews with citizens who are subjected to policies and government officials who were influential in making and enforcing such policies.

A dimension represents a broad concept and it is useful to decompose it into objectively measurable *elements*. Since, the idea of gaps represents deviation of actual results from planned results for each dimension (and elements within), we refer to these gaps as “*performance gaps*”. The performance gaps are associated with the notion of partial success where only some elements of the design dimension were successfully completed. The flexibility to identify dimensions (and their elements) is useful in explaining *gaps* between policies design and actual outcomes.

It is logical to consider using *design-actuality gaps* framework to compare ICT policies design objectives (*where policies wanted us to go*) and actual outcomes (*where we actually got*). The policies will be considered successful, failure or partially successful depending upon the nature of gaps between design objectives and outcomes. To objectively evaluate policies, it will be necessary to identify dimensions and elements of design and actuality that can be evaluated for gaps.

Performance gaps are the differences between what was planned (design) and accomplished (actuality). However, we ran into some interesting situations with our early observations in Pakistan. What happens when the dimensions of *design* and *actuality* or the elements within a dimension do not match? This is particularly true if the dimensions and corresponding elements are identified from different perspectives, as in our case by from a number of policies documents (for design) and citizens (for actuality). The *design-actuality gaps* framework allows for identifying dimensions from different perspectives. Therefore it is appropriate and logical to understand “design” from documented policies and “actuality” from the perspective of those who are subjected to those policies (i.e., the citizens). However, the design-actuality framework does not provide guidance regarding a possible mismatch between dimensions that are identified from different perspectives. In order to overcome this issue, we propose an extension to the framework which has two additional types of gaps: *dimensional gaps* and *elemental gaps*.

Thus, this research makes the following three major extensions to the original *design-actuality gaps* framework:

- (1) Dimensional Gaps: We approach the identification of dimensions from the relevant stakeholders/perspectives: (a) the dimensions of *design* are derived from grounded theory analysis of government ICT policies and action plan documents, supplemented by interviews with public officials, (b) the dimensions of *actuality* are derived from interviews with citizens, high ranking government officials involved in the policies design process and representatives of organizations that were beneficiaries of these policies.

It was acknowledged earlier that the dimensions for evaluating *design-actuality gaps* can be built in a number of ways. Since the dimensions of *design* and *actuality* are derived from two different perspectives, any differences in the *design* and *actuality* dimensions depict dimensional gaps (i.e., a dimension of *design* might not be a dimension of *actuality* and vice versa).

- (2) **Elemental Gaps:** For each dimension of *design* and *actuality*, elements of the dimension are identified. The concept of *elements of a dimension* is important as it breaks down each dimension into measurable components. Any differences in the elements of *design* and *actuality* allow for further in-depth understanding of the gaps.

Since the elements of each dimension of *design* and *actuality* are derived from two different perspectives, any differences in the elements of *design* and *actuality* dimension depict elemental gaps (i.e., *elements of design dimension might not be identical to the elements of actuality dimension*).

- (3) Instead of focusing on a case study of individual information systems development projects (e.g., Gichoya et al., 2006), this research extends the framework to understand government's ICT policies design and citizens' actuality. This extension helps in the estimation of overall success/failure of ICT growth policies design in a developing country. According to Heeks, "*taken alone, these [case studies] provide no basis for estimation of overall failure/success*" of IS development [or ICT growth] in a developing country. Therefore this is a useful extension of the framework as it addresses a range of ICT policies that have implications at national level.

These extensions are shown in Figure 1, which depicts that there are not only performance gaps, but also gaps between the dimensions and elements of design and actuality.

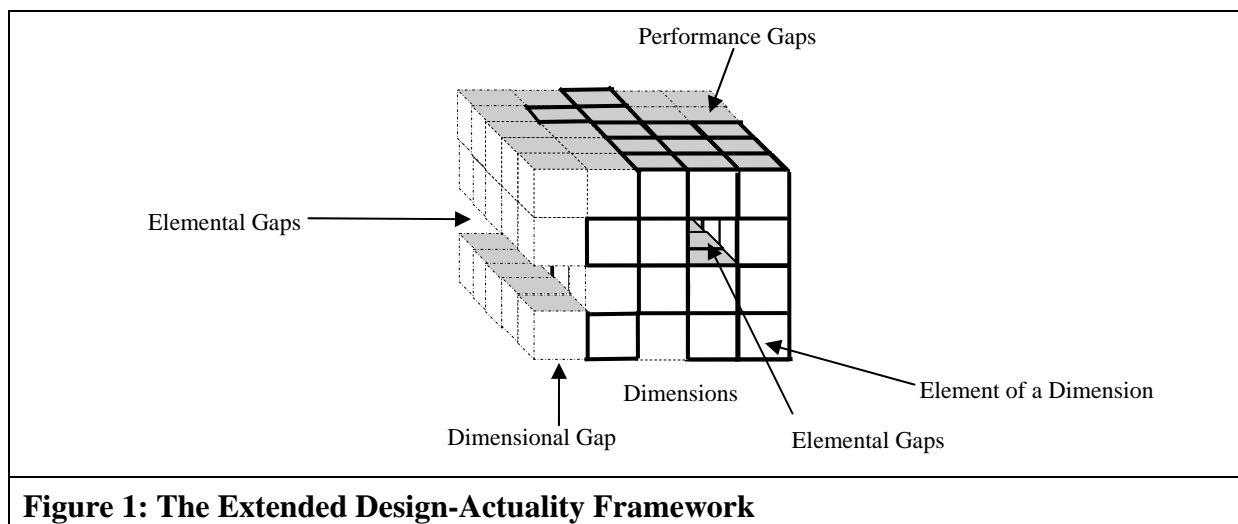


Table 1: Research Plan

Dimensions and Elements of Design					
Data Sources		Analysis Method			Purpose
Published ICT Policies, Action Plans and reports from government agencies. Figure 2 provide details of all documents used in this study.		Grounded theory based analysis and review of documented evidence such as government policies, action plans, and published reports from government agencies.			Identification of <i>design</i> dimensions/ corresponding elements.
Research Participants	Data Collection Method	Analysis Method	Time/Space per participant	How were research participants selected	
Public Officials	14 Interviews	Grounded theory	45 minutes to 2 hours per interview	Current or past position of authority in formulating government ICT policies.	Insights into dimensions of <i>design</i> .
Dimensions and Elements of Actuality					
Research Participants	Data Collection Method	Analysis Method	Time/Space per participant	How were research participants selected	Purpose
Citizens	14 Interviews	Grounded theory based analysis of narratives	1 to 8 hours per interview	<ul style="list-style-type: none"> • <i>Gender</i> (Men vs. Women) • <i>Domicile</i> (Urban vs. Rural) • <i>Education</i> (High, medium, low) • <i>Income</i> (High, medium, low) 	Identification of dimensions of <i>Actuality</i> and corresponding elements.
	Two focus groups of 5 educated and 6 illiterate citizens from urban and rural area respectively	Grounded theory	Approximately 90 minutes for each focus group	<ul style="list-style-type: none"> • Education and Domicile based Focus groups • Representatives from urban area were educated and had high income level. • Representatives from rural area were illiterate and had low income level 	
Public Officials	14 Interviews	Grounded theory	45 minutes to 2 hours per interview	Current or past position of authority in formulating government ICT policies.	Insights into dimensions of <i>Actuality</i> and Identification of gaps.
Industry Officials	30 Interviews	Grounded theory	45 minutes to 2 hours per interview	The ability to influence ICT use at national or societal level	Insights into dimensions of <i>Actuality</i> and Identification of gaps.

3. RESEARCH DESIGN AND METHOD

The grounded theory method has been used in past IS research and guidelines to evaluate the merits of a grounded theory are available (Urquhart et al., 2010). The grounded theory approach is usually employed for developing new theories that are *grounded* in data, e.g., a theory is articulated and can be presented in the form of a narrative, a visual model, or a series of propositions (Cresswell and Brown, 1992). However, this method can also be used in positivist research to understand and extend existing theories (Urquhart et al., 2010). Our use of grounded theory highlights its power as a tool for positivist research. As such grounded theory is primarily used for qualitative data analysis and to extend an existing framework. The grounded theory approach is an appropriate method to conduct this research because it allows for greater degree of richness and *groundedness* in descriptive qualitative data in the form of policies documents and interviews.

As per Checchi et al. (2012), a stakeholder perspective is typically absent in ICT policy formulation. Therefore, in order to extend and better understand design-actuality gaps in government ICT policies, several stakeholders were included in this research as exemplified by four data sources: government policies, citizen interviews, interviews with public officials, and interviews with industry officials. The interviews with the latter two groups provided in-depth insights not only into the design and actuality dimensions but also in understanding of the gaps. Table 1 provides details of the research plan and Figure 2 provides a summary.

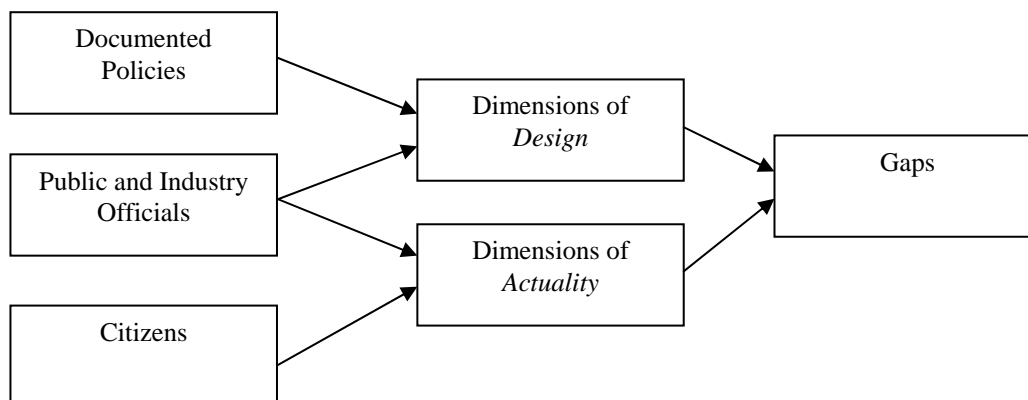


Figure 2: Summary of Data Sources

The *design* is understood in terms of documented government policies and action plans for ICT growth. Figure 3 shows the list of documents, arranged by historical timeline, that were analyzed for the identification of codes to develop dimensions of design. A grounded theory approach was used to identify codes in these documents. These codes were scaled up to determine elements and subsequently dimensions of *design*. Additional insights into the dimension of design were gathered through interviewing public officials who were instrumental in designing ICT policies.

The *actuality* is understood in terms of the citizens' perspective of ICT in their lives, as they are subjected to these policies. Additional interviews with public and industry officials provided further insights into the identification of the dimensions of actuality. Appendix A provides a list of all public and industry officials who were interviewed for this study. Once again, the grounded theory approach was used to identify dimensions of *actuality* from these interviews.

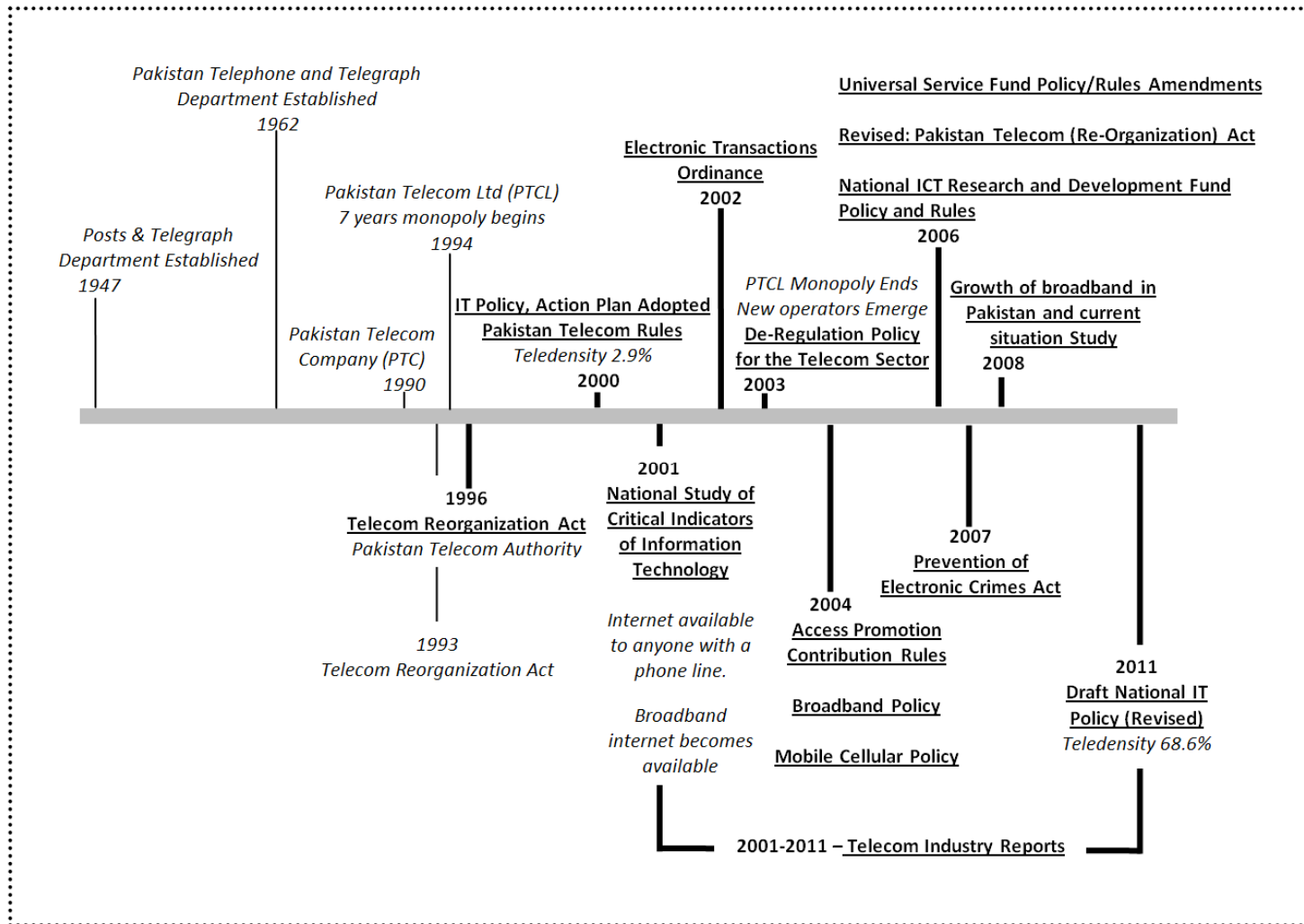


Figure 3: Documents used for the identification of Elements and Dimensions of Design

This figure shows a timeline of major legislative changes in the ICT industry in Pakistan since independence from the British rule in 1947. Italicized text provides a brief description of major changes in time. Documents title used in this study are underlined.

The selection of citizens was a critical step in research design. Theoretical sampling and purposeful selection of research participants were important considerations (Cresswell, 2012; Casey, 1995; Reissman, 1993). Casey (1995) points out that people think and act in patterned manners and therefore, selection of various groups of participants is crucial in getting the widest possible range of responses. Participants were selected along a set of four criteria:

- Gender plays an important role within the socio-cultural environment in a country (Hafkin, 2002; Olatokun, 2008). A total of 26 men and 9 women agreed to participate in the study. In spite of our best efforts, the low participation from women is indicative of the socio-cultural norms, which inhibit women from voicing their concerns and opinions.
- The second selection criterion was domicile. Access to ICT services vary significantly in rural and urban areas and therefore a proportional sampling of citizens from urban and rural areas was made.
- Education and income levels have important roles in a person's ability to effectively use and harness the potential of ICT services (Hsieh, Rai, and Keil, 2008). Therefore, participants were carefully chosen to represent high, medium and low education and income backgrounds.

Appendix A, along with the documents, shows the number of participants according to the four criteria. Each participant belonged to several of these dimension, e.g., a man in an urban area with high income and low education. An unstructured interview protocol was used to avoid leading the participants to answer specific questions alone. Theoretical sampling (Urquhart et al., 2010) was used to ensure a representative involvement of participants from different socio-economic and cultural backgrounds. The interviews began with the following question: *"I am researching the role of ICT growth in people's life, please tell me the story of your life"*. This line of questioning is consistent with Casey (1995) and Reissman (1993), who recommend asking open ended questions to facilitate interviews and building trust between the researcher and the participant. This process also helps in ensuring an understanding of the contextual background of the research participants. Interviews were carefully examined for not only the content and the context of what the citizens said, but also for their background and personal experiences with ICT. Summary backgrounds and narratives of selected interviews are provided in Appendix B.

The data collection and analysis was done between January 2007 and January 2012, involving logistics of conducting a total of 89 in-depth interviews (35 citizens, 54 other stakeholders). This allowed for moments of pause-and-reflect, constant comparison, iterative conceptualization, improving theoretical sampling, scaling up analysis and findings, and better theoretical integration, which are hallmarks of grounded theory research (Urquhart et al., 2010). Most interviews lasted for about 2 to 3 hours. Some participants became so engaged that their interviews lasted as long as 8 to 10 hours. A grounded theory analysis was used to analyze the contents of these narratives. To further develop an understanding of the dimensions of *actuality*, two focus groups with citizens were arranged. The first focus group involved participants in an urban area (citizens with high income and higher academic degrees). The second focus group was organized in a rural area (citizens with low income and low formal education). The selection was made to understand the collective-subjective (Casey, 1995) of research participants in a group setting. The members of these focus groups were chosen upon the recommendations of research participants who were interviewed as individuals. A semi-structured interview protocol was developed to facilitate the focus group. Appendix A shows the details of these research participants and the research sites.

Interviews were conducted in four languages: English, Urdu, Punjabi and Siraiki. Most interviews were recorded on video tapes when allowed by the participant. In a few cases, where participants did not want video and/or audio recording, notes were taken during the interview and extensive reflections and observations were recorded immediately after the interviews. The video recordings were digitized onto a computer hard drive and imported to a qualitative analysis software package, NVivo 8.0. NVivo has the ability to embed identified codes and categories directly on the video file using a process called time-stamping. This eliminated the need to transcribe the interviews. Additionally, it preserved contextual richness of the original interview language, interviewing environment and participants' body language, which are not assured in a transcript. Selective translations (when the interview was not in English) were made for direct quotes in this paper.

4. ANALYSIS AND RESULTS

Before analyzing the dimensions of design and actuality, it is instructive to examine the major ICT related legislative changes in Pakistan in order to understand the historic context. By the end of the 1990s, politicians, bureaucrats, and ICT professionals had realized that, without any communication satellite and a link to the international submarine fiber optic cable for internet, Pakistan would lose opportunities to become an early member of the thriving ICT world. The policy objectives set in *1993-94 Telecom Reorganization Act* fell short of making Pakistan one of the major ICT market players. A major reorganization act, known as 1996 Telecommunication Re-Organization Act, was passed by the parliament that led to the creation of Pakistan Telecommunication Authority (PTA). PTA's objective was to create a fair competitive legal environment for private ICT sector in a deregulated ICT industry. Pakistan Telecommunication Corporation Limited was given seven years of monopoly and the market was slated to be deregulated in 2003. The National Data Organization (NDO) initially spearheaded the effort to formulate ICT policies in 1999; this task was taken over by the Federal Ministry of Science and Technology in early 2000. The policy formulation process involved interactions among 300 IT professionals within Pakistan and abroad. This group put forward two major documents for ICT growth in Pakistan: IT Policy, and the Action Plan. The policy was made available on the internet for public comments and was formally approved by the federal cabinet in 2000. The national ICT policy provided a framework for ICT growth in the country. Figure 3 shown earlier provides a timeline of the legislative changes in the governing ICT regime since Pakistan's independence from the British in 1947. This figure also shows the government policy documents that were used to identify the dimensions of policy *design*.

4.1 Dimensions of Design

A great body of government documents, action plans, evaluations, and public comments have refined the evolution of ICT in the country. Government policy and action plan documents were obtained directly from governmental agencies. These documents were used to identify elements and dimensions of ICT policy design. All policy documents identified in Figure 3 were studied and coded manually with notes and reflections written down in the margins. The codes were later entered in NVivo 8.0 for proper organization. From open codes, several categories of codes were identified. Similar codes were grouped into elements, and similar elements were scaled up into six major themes. These themes represent dimensions of design. The dimensions and corresponding elements of design are shown in Table 2.

Table 2: Dimensions of Design

<i>Dimensions</i>	HR Development	E-Government	Incentives	Legal Framework	Industry Development	ICT Use
Elements of Design Dimensions	National accreditation and testing services	IT in Government	Incentivizing IT investments	Telecom convergence/deregulation	IT market development	Broadband internet growth
	Training Programs	Government Databases		Recognition of e-records	Software industry development	
	Scholarships and non-binding loans	Standards Development	Venture capital	Digital signatures	Software Exports	E-Commerce
	Foreign Faculty Hiring	Data Sharing among agencies	Micro-credit	Intellectual property rights	Hardware industry development	
	Online libraries			Cyber laws		

4.2 Dimensions of Actuality

Interviews with citizens and other stakeholders were analyzed using the grounded theory method. Codes were grouped into categories that constituted elements of the dimensions of actuality. The dimensions of actuality were developed by scaling up similar codes into elements. Categories of elements were further scaled up into dimensions. Table 3 shows the dimensions of actuality and corresponding elements. While most dimensions of actuality match with their corresponding dimensions of design, elements showed significant differences in the understanding of a given dimension. These differences are indications of the gaps that exist in the dimensions of design and actuality. Additionally, one of the dimensions, i.e., impediments, did match up with any dimension of design. Similarly one of the dimensions from design, i.e., incentives, did not appear as a dimension of actuality

Table 3: Dimensions of Actuality

<i>Dimensions</i>	<i>HR Development</i>	<i>E-Government</i>	<i>Impediments</i>	<i>Legal Framework</i>	<i>Industry Development</i>	<i>ICT Use</i>
<i>Elements of actuality dimensions</i>	<i>National accreditation and testing services</i>	<i>IT in Government</i>	<i>Corruption</i>	<i>Telecom convergence/deregulation</i>	<i>Ignored Hardware Industry</i>	<i>Broad-band Internet growth</i>
	<i>Training Programs</i>	<i>Government Databases</i>	<i>Taxes</i>	<i>Cyber laws</i>		
	<i>Scholarships and non-binding loans</i>	<i>Standards Development</i>	<i>Government Business Processes</i>	<i>Intellectual property rights</i>	<i>Software Exports</i>	<i>Cell phone use growth</i>
	<i>Foreign Faculty Hiring</i>	<i>Data Sharing among agencies</i>				
	<i>Online libraries</i>					

4.3 The Gaps

The results show significant design actuality gaps where design objectives were either not completely met or were met only partially. Table 4 shows design-actuality gaps for ICT policies and actual ICT growth. In some cases, the elements of different dimensions do not match between *design* and *actuality*. For example, recognition of e-records and digital signatures that were identified as elements of legal framework in *design* did not appear as elements of legal framework in *actuality*.

5. DISCUSSION: DIMENSION OF DESIGN, ACTUALITY AND GAPS

Several elements of the *design* dimensions were different from those of *actuality*. The purpose of this discussion is to demonstrate the gaps between policy design and actuality and thus identify missed opportunities. It is apparent that some dimensions of design are considered more important than others in policy formulation. The same is true for the dimensions of actuality. Our discussion attempts to reflect these varying emphases whenever possible. It is clear that the extended *design-actuality gaps framework* that we developed in this research provides us with an effective tool to understand and analyze the linkage and disconnect between ICT policy design and its implementation. Each dimension and its elements are discussed below in terms of design, actuality and the gap.

Table 4: Extended Design-Actuality Gaps across Identified Dimensions*

Elements of Design (from public policies)	Elements of Actuality (from Interview data)	Gaps
<i>HR Development</i>		
National accreditation and testing services	National accreditation and testing services	Limited scope; testing services to find scholarship recipients remained active for four years but scholarship funds no longer available
Training Programs	Training Programs	Limited success; Plans to establish seven IT universities shutdown in 2008
Scholarships and non-binding loans	Scholarships and non-binding loans	Funding is no longer available; no implementation of non-binding loans
Foreign Faculty Hiring	Foreign Faculty Hiring	Funding became scarce; no longer active
Online libraries	Online libraries	Implemented but use is limited
<i>E-Government</i>		
IT in Government	IT in Government	Isolated success stories; overall use of IT in Government is limited
Government Databases	Government Databases	Isolated success stories; overall use of Government databases limited
Standards Development	Standards Development	No notable implementation
Data Sharing among agencies	Data Sharing among agencies	No notable implementation
<i>Incentive</i>		
Incentivizing IT investments		Limited and vanishing incentives
Venture capital		No Implementation
Microcredit		No Implementation
<i>Impediments</i>		
	Corruption	Bribes in setting up and execution of private sector business
	High Taxes	High sales, activation and corporate taxes levied on ICT industry.
	Government Business Processes	Complicated government businesses processes; inter-agency coordination
<i>Legal Framework</i>		

Telecom convergence/ deregulation	Telecom convergence/ deregulation	Deregulation successfully completed; lack of focus in evolving regulations
Recognition of e-records		Limited discussion; No Implementation
Digital signatures		Limited discussion; No Implementation
Intellectual property rights	Intellectual property rights	Limited discussion; No notable implementation
Cyber laws	Cyber laws	Cyber law passed in December 2007; limited awareness/implementation
<i>Industry Development</i>		
IT market development		Little to No Implementation
Software industry development		Little to No Implementation
Hardware industry development	Ignored Hardware Industry	Completely ignored this area of ICT sector
Software Exports	Software Exports	No substantial gains in exports
<i>ICT Use</i>		
Broadband Internet growth	Limited broadband internet growth	Limited growth – 130,281 broadband subscribers
E-Commerce		No Implementation
	Cell phone use growth	99.18 million subscribers in August 2010 up from 306,493 in June 2000

**Dimensions and elements of “design” are identified from government ICT policy documents and actions plans. Dimensions and elements of “actuality” are derived from interviews with citizens. Further insights are gained from interviewing officials making or influencing government policies for ICT growth.*

5.1 Human Resource Development

Design: Government policies in Pakistan placed a great deal of emphasis on human resource development. These policies recognized the evolving nature of ICT tools, services and knowhow. It was considered by far the most important ICT policy strategy. It was viewed as a means for providing strong roots to the ICT industry by way of developing ICT expertise for local and export needs. The emphasis on IT education required the establishment of the Virtual University of Pakistan and provision of ICT services and tools at existing public sector universities. The development of “world-class” B.S., M.S. and Ph.D. programs was one of the major undertakings of this policy. At the same time, mandatory computer literacy for high schools students was recognized. A national educational extranet project was proposed to enable knowledge sharing among universities and linking them to digital libraries for teaching and research. A national accreditation council was planned to ensure quality IT education. A human resource development fund was proposed which would require ICT companies to contribute 1% of their profits towards scholarships and non-binding loans. The concept of non-binding loans was a revival of religious provisions for supporting education with loans that will be forgiven if the receiver was not able to pay. Additionally, no finance charges were to be collected on loaned funds.

Financial autonomy was proposed for information systems and computer science departments in public universities so that they can “attract and retain” qualified faculty members to respond to changing ICT industry requirements. A policy provision was included for providing foreign universities with incentives to setup distance learning and resident degree programs in Pakistan. Another important aspect was to increase opportunities for women in the ICT and telecommunication sector. A mega plan to establish seven IT universities in collaboration with foreign universities was developed and funding was allocated to it.

Actuality: This dimension of *design* witnessed partial success in certain aspects of *actuality*. The establishment of the Virtual University of Pakistan was a major milestone. Large sums of investments yielded a high-tech university that was built around developing quality ICT human resource. State-of-the-art lecture recording and broadcasting facilities were developed. Lectures were broadcast using PakSat I (an aging satellite bought by the Government of Pakistan for the purpose of reserving space for a sophisticated future satellite). The university currently caters to the needs of about 50,000 students across Pakistan and offers undergraduate and graduate programs in computer science and business administration. Similarly, efforts made towards establishing national accreditation and testing services were limited in scope. Scholarships, foreign faculty hiring and online libraries are capital intensive projects. With the difficult financial situation since 2007 in many countries around the world, the funding for these projects has been shrinking.

Gaps: Performance gaps are most apparent in this dimension. The policy set several policy goals (i.e., elements) that were not fully realized. Some elements of this dimension saw an utter failure. For example, the plan to establish seven IT universities was shutdown in late 2008 due to unavailability of already allocated funds and other “undisclosed” [political] reasons. Scholarship recipients who went abroad for higher education (Ph.D. in most cases) under this scheme are facing problems because of the reduction or discontinuation of committed financial aid. Non-binding educational loans were not even given out. The foreign faculty hiring program which worked actively for a few years was finally shutdown. Plans to implement computers and ICT education in high schools were not realized. Online libraries and access to journals and books are available only to researchers and some graduate students, but the overall impact of the availability of these resources cannot be felt. Several

research participants had reservations even about the only program which did seem to work, i.e., The Virtual University project. Several participants pointed out that the establishment of Allama Iqbal Open University (AIOU) in 1970s revolved around similar objectives. This university caters to about a million students in Pakistan and abroad and uses ICT for the dissemination of educational content. Recently, due to the cutbacks in funding, AIOU is unable to develop modern ICT systems to support the delivery of their educational content. Establishing yet another “distance learning” university did not seem as problematic as devoting 100% of the newly acquired resources such as PakSat I to a brand new university. Questions around full utilization of these resources along with quality of education also remain. The CEO of a large telecommunication company said:

“We have applicants for various ICT jobs who have earned undergraduate and graduate degrees. When we ask them to demonstrate their ‘computer abilities’, they can barely find alphabets on the keyboard”.

Another research participant said:

“We can talk as much as we want about the good progress of ICT in the country; the fact is that if you go out today and visit a high school, you will know how difficult it is to even find teachers who can use a computer”.

Setting lofty goals in government policies exhibits the lack of theoretical understanding of fundamental social-economic issues. This highlights the need for understanding the causes of gaps between policies design and actuality (as we attempt to describe later).

5.2 E-Government

Design: The ICT policy and action plan recognized that the use of ICT for socio-economic development cannot be accomplished unless ICT becomes a part and parcel of government services. A focus on developing ICT capabilities to support government processes emphasized and required the government to provide funding for several initiatives, such as providing computers to government officials and staff, development of software for government services, and websites for various government bodies. Additionally, government agencies such as the National Database and Registration Authority were established to provide database capabilities for government’s future planning purposes. In order to facilitate data sharing and exchange between government bodies, standards were to be planned. Government agencies were encouraged to roll out their plans for computerization and increase the role of ICT in their interaction with citizens and other government agencies.

Actuality: In order to achieve the objectives set out in policy documents, several steps were taken. The creation of the National Database Organization (later named National Database and Registration Authority – NADRA) demonstrated that the use of ICT for developing national databases was a doable task. It is the largest IT organization in the country and undertook the development of national identification system as one of its first projects. This project increased international confidence in Pakistani identification documents by reducing the possibility of counterfeit ID cards, passports, and birth certificates. Similarly, the e-government directorate took a number of initiatives including computerization of national elections rolls and computerization of business processes for land records and law enforcement. Furthermore, most of the government agencies have online presence in the form of websites and downloadable forms.

Gaps: Severe performance gaps were observed between policies design and actuality. While there are some isolated success stories, it is difficult to find a sizable impact of the various e-government initiatives. A few government agencies such as NADRA, Election Commission of Pakistan and Federal Board of Revenue, received funds for establishing databases and computerized systems. However, most other government agencies continue to operate in an age old manner. The lack of trust among government agencies and the lack of resources prohibits the transfer of skills and knowledge. The unwillingness and hesitation of agencies to share its data with others has led to a general frustration among agencies that have a legitimate reason to access these data. For example, in criminal cases where law enforcement officers need access to bio-metric data or cell phone tracking, the process is very complicated. It takes months and years to process a request after appropriate authorizations and court subpoenas are obtained. One of the law-enforcement officers who participated in the research said:

“My parent’s home was broken into and the thieves made out with a lot of valuables. One of them called in and demanded a ransom. Through the caller ID and personal contacts at Pakistan Telecommunication Authority in Islamabad, I was able to get information such as national ID card number, most frequently called numbers from that cell phone and the cell phone locations for the last week. From the national ID card number, I had to pull a few strings at NADRA and we had the perpetrators arrested in a few days. If I had to follow the rules through proper channel, my office would have never even heard from those who have access to this kind of data.”

When one visits a government office, computers can be seen everywhere. However, it soon becomes apparent that those computers are used primarily for word processing, if at all. Network connectivity is limited and access to basic computing and connectivity resources is a privilege. Inter and intra organizational communication relies on manual systems dating back to the twentieth century. The ICT training programs for government officials are limited to teaching them the use of presentation, word processing and spread sheet programs. There are rarely any computer applications to support government business processes and most of the records are still paper based.

These examples highlight a number of performance gaps in government’s policies and actuality. This situation shows a lack of interagency coordination even for resources that are already available. It is easy to obtain evidence through backdoor channels because official channels are too complicated to work. Exacerbating the lack of data sharing among government agencies is the severe lack of standards to support such sharing. For a policy that is not based upon a sound framework and without consideration of interactions with other parts of the systems, it is easy to fall through the cracks.

5.3 Incentives vs. Impediments

These two dimensions, although interrelated, did not match in the analysis and the results of *design* and *actuality*. This situation represents a dimensional gap in the extended design-actuality framework. The government policies attempted to make a big impact on a certain aspect of ICT growth and but it was not realized as a dimension by those who were subjected to the policy. Citizens and industry officials were of the view that incentives in the policy actually became impediments for ICT growth.

Design: The ICT policy and action plan called for incentives for local and foreign investors. These incentives included extended tax holidays for businesses, promise to lower taxes, and

easing up the business setup process. To encourage entrepreneurship, the policy set out plans for establishing venture capital to fund innovative business plans. In addition to providing support to conduct business in Pakistan, the policy required the government to provide support and funding to citizens in the form of micro-credit for ICT devices such as computers, and accessories.

Actuality: Several major international telecommunication players from Europe and the Middle East invested in the Pakistani ICT sector. This brought in financial investments along with human resource capabilities to Pakistan. It opened up a huge market for Western equipment manufacturer for their products and services. Foreign direct investment rose from \$6.1 million in 2001-2002 to \$1.9 billion in 2005-2006 and \$1.8 billion in 2006-2007 (PTA, 2015). These achievements were made mainly by offering extended tax holidays on corporate income, lowering of taxes and easing up the process of establishing a new business. While these incentives helped attract capital flow in the country, most of the capital flowed back out of the country in the payments of loans and interest. The venture capital fund to support entrepreneurial businesses was never realized and the microcredit scheme to support citizens in the purchase of ICT equipment was never offered. However, while the country experienced a continuous growth in FDI inflows from 2000-2008; in 2009-2013, it has suffered a persistent decline. This reversal is mainly due to political and economic instability, and poor law and order reinforcement (Minhas and Ahsan, 2015).

Gaps: The gaps between policies design and actuality are most vivid in this case. This situation shows that gaps existed at a level that cannot be explained in terms of performance gaps from the original design-actuality gaps framework. Therefore, it serves as a support for extending the framework to include gaps that exist when dimensions of design and actuality do not match. The lack of careful theoretical consideration in the policies design process overlooks its impact on other prevailing policies and laws that may contradict the new policy. For example, the ICT growth became a major revenue stream for the government and ICT related income was taxed heavily in the form of increased sales tax (21%) and rolling back sales tax subsidy on the purchase of computers and hardware. Other incentives for ICT investments such as tax holidays and lowering of taxes were also rolled back. The ICT policies were developed without regard for the legal frameworks that govern other government agencies. For example, Federal Board of Revenue has the responsibility to increase government revenues by taxing income, services and merchandise. On the other hand, ICT service providers were collecting activation tax, excise duty, income tax and sales tax on devices and services – creating some confusion. The culture of corruption that hinders infrastructure development across the country is an additional source of financial burden on service providers. Research participants regarded this situation as impediments. Additionally, the promise to smooth out the business setup process (which involved coordination among several government agencies) lacked implementation. It actually allowed for the rampant corruption to creep in and cause anxiety for investors. A research participant stated:

“It is almost like an industry standard that you will pay 50,000 rupees [US\$400] to a lineman in bribes when you need an electricity connection.”

In addition, many other design elements were not realized. For example, the promise of one-window operation for setting up ICT businesses did not materialize. As a result, the new businesses learned to survive in a culture of corruption. It is as if the culture of corruption is feeding on itself. In summary, this dimension of *design* did not live up to its promise and led to a new dimension of actuality which made the situation even more dismal.

5.4 Legal Framework

Design: The ICT policy recognized the need to develop a legal framework and regulatory environment that protects the interests of investors while providing socio-economic development opportunities for citizens. A number of steps were proposed such as telecom convergence and deregulation policies, cyber laws and intellectual property rights. Plans were also made towards recognizing the legal value of digital records and digital signatures.

Actuality: One of the major accomplishments in this area was the successful formulation and execution of telecommunication convergence and deregulation policy. The end of monopoly in the ICT sector allowed new businesses to emerge and invest in Pakistan. The constitutional and legal support for the establishment of Pakistan Telecommunication Authority, Pakistan Electronic Media Regulatory Authority, National Database and Registration Authority, Software Export Board at national level, e-government directorate and IT Boards at provincial levels have proven to be effective vehicles in advancing government's ICT policies. The cyber laws ordinance became law in December 2007 and software anti-piracy plans were introduced and widely communicated.

Gaps: Several gaps can be observed in the execution of this dimension. Lack of priorities and frequent changes in the operating regime of the ICT industry has created problems of compliance for service providers. Software anti-piracy rhetoric has been visible in slogans alone and little efforts have been made toward prosecuting commercial interests that pirate, market and benefit from software piracy. This situation has not only curbed revenues for international software providers such as Microsoft and Oracle but also hampered local software industry's ability to produce software for local needs. This is one of the reasons that the software industry in Pakistan has only focused on developing business outside of Pakistan. Similarly, cyber laws became an avenue to restrict electronic media's ability to report on government by barring photography on public property without consent. A lack of legal framework and protocols for data sharing within government bodies that allow the use of digital records for prosecution and defense were also pointed out by the research participants.

5.5 Industry Development

Design: While the telecommunication industry received considerable government support, other sectors of ICT industry were ignored. Particularly the hardware industry suffered from this neglect significantly. Before the adoption of the ICT policy, Pakistan had a number of telecommunication product manufacturing facilities in the country. In the past, to strengthen and support telecommunication monopolies, the government of Pakistan had an extended ban on the import of telecommunication hardware. However, to encourage healthy competition, the policy required the government to abolish import bans and allow for competition to exist. It was expected that healthy competition will allow for the growth of the ICT industry. Similarly, several steps were proposed to support and further develop software industry and overall ICT market development.

Actuality: Government ICT policies realized that ICT growth is only possible by identifying and developing new IT markets both inside and outside the country. To support the software industry's search for international markets development, Pakistan Software Export Board (PSEB) was established in 1995. A number of steps were taken to support the software industry. For example, IT parks were established in three major cities and IT companies were given subsidies to establish their offices in IT parks. These parks were equipped with high speed internet connection necessary for doing business in the international environment. The

Board also helped in obtaining quality certifications such as ISO 9000 and capability maturity model (CMM) levels to the software companies. However, most research participants pointed out that the software industry did not receive much needed attention from the government and that the current growth in the software industry is the result of the private business efforts alone.

Gaps: Pakistan is among the world's nations with a high amount of ICT infrastructure penetration. However, a lack of focus on this dimension has also resulted in the ignoring of the hardware design and manufacturing industry. For a software industry to thrive, it must explore local opportunities for business instead of solely relying on foreign business. The hardware industry has probably been the most neglected aspect of ICT growth in the country. Several interviewees showed deep concerns over the plight of the hardware industry, in particular. The hardware manufacturing facilities that used to run at capacity are now shutdown after the ban on importing ICT products was lifted. A participant who was aware of the situation said:

“Just look at the state of hardware industry. The manufacturing facilities are in ruins. We import 50 million phones each year. Don't you think a hardware provider would be interested in erecting a manufacturing plant right here in Pakistan instead of importing it? All we need to do is give them financial reasons to do that. This will bring jobs, technology and experience in manufacturing in the country.”

A visit to a very large hardware design and manufacturing facility near the capital, Islamabad, exhibited a troubling situation. This facility that once employed thousands of highly skilled workers has been shut down with broken windows and corroded structures. The facility was shut down as the demand of the latest technological products was easily met with imported goods rather than designing and manufacturing them locally. The gaps in *design* and *actuality* are apparent in this case, and demonstrates the need for aligning policy objectives, plans and actual outcomes.

5.6 ICT Use

Design: To encourage ICT use, the government policy set out goals and objectives to increase ICT penetration within the government, businesses and citizens. Plans were made to educate and encourage business owners to computerize their business processes and enable them to offer electronic commerce capabilities to their customers. The policy called for the increased use of credit cards, a national clearing house for credit card transactions and infrastructure for online credit card processing. A specific portion of the policy was dedicated to exhibit government's dedication towards increasing broadband internet penetration as a vehicle for increasing ICT use.

Actuality: The overall success of “ICT use” by citizens is highly dependent on the interactivity of the ICT applications deployed by the government and businesses. ICT use by the government is very limited and still a privilege. The government officials may have personal and professional email accounts but the communication on those channels is not related to government or business. Similarly, it is possible to see business use of ICT at work in business-to-business communication but not business-to-citizen communication. The government and business communication with citizens still relies heavily on print media as has been the case for decades since independence in 1947. Another reason for the lack of ICT use can be attributed to the lack of broadband access. Less than 1% of the population has

access to a broadband connection (PTA, 2015) and these connections do have data limits which restrict their use.

Gaps: There is a stark contrast between what was designed and what was actually accomplished. As evident, the overall ICT use in the country is not uniform. For example, the use of cellular phones is on the rise significantly with 111 million cell phone users (PTA, 2015). However, Internet use and e-commerce use are limited to niche markets. Even though the government put forward a separate “Broadband Policy” in 2004, it has yet to produce any results comparable to the cellular telecommunication industry. Broadband internet user count was only 1.6 million in October 2011 (PTA, 2015). There is a great opportunity and need for broadening the internet user base and allowing people to use the internet for financial transactions. The challenge is even more complicated by the cash nature of the Pakistani economy. Several government officials (to protect corrupt practices) and businesses (to avoid taxes) do not use electronic commerce facilities in order to bypass accountability that ICT brings for all. Only an occasional sighting of ICT use for businesses in terms of electronic cash registers is possible in the affluent areas of large cities. A number of “happy” government officials consider it computerization of the business process when they are given access to a computer to type a letter, print it on a printer and forward the paper copy for manual mail sorting and processing.

The ICT use for personal communication may be regarded as a partial success. The use of ICT to facilitate social contact is one of the most acknowledged elements of ICT use. The participants shared a number of emotional stories of the impact of ICT use in their personal lives such as:

“I don’t cry anymore; I can speak with my children as much as I want” or “when I am on a business trip abroad, I can still see my 5 and 2 years old girls on a webcam and they can see me too; ICT keep us united even when we are physically apart”.

A woman who was studying at one of the prestigious universities in Pakistan explained:

“I probably would not be pursuing higher education if I didn’t have a cell phone. My parents didn’t feel that they can keep in touch with me anytime they wanted and they were worried about my safety in a large city 700 kilometers away from my home”.

These narratives are indicative of the success of this dimension only in terms of ICT use by citizens in their personal and social communications, while ignoring important aspects of ICT use in government and industry. Furthermore, many participants pointed out the dark-side of technology. Several participants shared stories where ICT use had caused socio-cultural problems, such as:

“I know it is wrong to steal money to pay for my cell phone bill but I cannot help it”

“I cannot concentrate on anything because of I am always getting emails and SMS – even in the middle of the night”

“I have seen a lot of girls and boys making out on phone and even deciding on marrying without their parents’ approval; this is very bad”

Appendix B provides further insights into the background of citizens who participated in this research and how ICT have impacted their lives. This analysis makes the gaps in the design and actuality dimensions readily apparent and highlights the need for developing a thoughtful design and careful execution of the policies.

5.7 Causal Analysis of the Gaps

There are several reasons for the existence of gaps between policy design and actuality. In order to develop an improved and holistic understanding of these reasons, it is important to evaluate these gaps from multiple perspectives (i.e., citizens/consumers rights, business interests, and government interests), which might help in alleviating these gaps and create synergy in design and actuality of government ICT policies. These causes are identified from a qualitative analysis of the interviews with citizens and government officials. The following discussion and analysis has implications for designers and policymakers, and encourages them to design policies that assure appropriate consideration of multiple interests. Particularly, developing countries could benefit significantly with an increased role of ICT if they pay careful attention to reducing ambiguities in government and business transactions with citizens and customers.

Lack of Citizens' Involvement in Policy Design. The importance of experienced officials and visionary technocrats cannot be denied in policy design but the lack of citizens' involvement in this process only widens the design-actuality gap. The need for citizen involvement is akin to user participation in IT projects, having been long regarded a major principle in IS design (e.g., Ives and Olson, 1984). In the case of ICT policy design process in Pakistan, the proposed policy document was placed on the website of the Ministry of Science and Technology for public comments and review during 2000. This was an unusual step in government policy making and did attract some feedback from citizens. However, there were several problems with the level of citizens' participation. First, the proposed policy document was written in English which is not the national language of Pakistan and only a small number of educated people could understand it. Second, internet access was limited and expensive in 2000 (only 10 major cities had dial-up internet service). As a result the public comments were not only limited in number but also ignored a large segment of society. A participant said:

“We have bureaucrats and technocrats who think they know everything that's good for citizens. It is easy for special interest groups to influence their opinion in a culture of corruption. May be their policies will be well received and win citizens' support if they had actually made an effort to find out citizens' needs and then formulated public policies”.

It is imperative to increase citizens' participation in policy design in order to bridge the *design-actuality gap*. The public comments can be solicited through communication avenues that are already available to citizens such as newspapers, radio and TV announcements. It is expected that citizens' involvement would lead to the protection of consumer interests, in turn affecting ICT growth positively.

Inter-Agency Coordination and Inconsistent Policies. Policy evolution is a natural phenomenon to be expected in an environment where policy designers do not have a great deal of experience with formulating successful policies. Inconsistencies in policies can lead

to coordination gaps between government agencies, making it difficult to fulfill promises made to citizens and businesses. A research participant reflected:

“The promised incentives in IT policy attracted significant amount of investment and ICT infrastructure grew rapidly. The Federal Board of Revenue realized that ICT growth could increase government revenues. They started taxing everything... 21% in sales tax on ICT services and equipment, high service activation tax and several other taxes. ‘One-window operation’ to facilitate business setup process only remained a promise. Now, ICT Service providers are facing tough time in justifying their investment decision due to fierce competition and disregard from Government officials for ICT service providers concerns”.

The import duty on ICT products is another example of inconsistent government policy which hampers local ICT manufacturing. The policy requires manufacturers to pay 5% import duty on parts and collect 15% general sales tax with 6% advance tax on finished products. However, importers have to pay only 5% import duty if they import only the finished products. This creates discouraging tax implications for local manufactures. Similarly, dispute resolution mechanism that involves local, provincial or federal judicial system is not only costly but also requires several years of court proceedings for minor disputes.

It is therefore important to ensure consistency in policies and coordination among government bodies to fulfill promises made to consumers and investors. Government agencies and regulatory bodies need to balance consumer interests and business interests that can help bridge design-actuality gaps and help ICT growth. This notion is in conformity with the systems approach advocated in the IS field which advocates attention to subsystems and interrelationships between them (e.g., Nolan and Wetherbe, 1980).

Political Instability – Changes in Government Interests. Political instability and frequent changes of governments hamper the continuity of policies and negatively impact local and foreign investments (Minhas and Ahsan, 2015). Between 2002 and 2015, eight prime ministers took control of the government in Pakistan, i.e., Zafarullah Khan Jamali (Nov 2002 - Jun 2004), Chaudhry Shujaat Hussain (Jun 2004 - Aug 2004), Shaukat Aziz (Aug 2004 - Nov 2007), Muhammad Mian Soomro (Nov 2007 - Feb 2008), Yousaf Raza Gillani (Feb 2008 – June 2012), Raja Perviz Ahrif (June 2012 – March 2013), Mir Hazar Khan Khoso (March 2013 – June 2013), and Nawaz Sharif (June 2013 - Present). The frequent changes in governments, political confrontations and assassinations have been detrimental to ICT growth. One participant said:

“You cannot expect an investor to keep investing when you don’t know what mayhem might await your business... a riot, a mob or may be a political showdown”.

Political instability has another downside in the form of change in priorities and unavailability of committed funds to ICT development projects. The controversial role of Pakistan Electronic Media and Regulatory Authority (PEMRA) in controlling ICT services such as television and broadcast services was mentioned in the interviews frequently. Citizens expressed displeasure with the government’s policy of shutting down news channels during political crises such as civil society movement against Musharraf regime in 2007-2008 and the “long march” against Zardari regime in 2009 to reinstate the Chief Justice of the Supreme Court.

Political stability is important in ensuring the protection of ICT service providers' business interests and consumers' rights. The growth is difficult when ICT service providers and investors are not assured of their interests and consumers feel alienated by the policy design process. Political instability also hampers the government's ability to keep promises and promote a supportive environment for ICT growth. With instability, the perspectives and interests of politicians and policy makers change over time leading to uncertainty in political support for ICT growth.

Lack of Protection for Private Sector Business Interests. While competition among private sector ICT products and services providers is fierce, there is simultaneously a need to ensure protection of their business interests in order for ICT growth to continue. For example, ICT tariff policy allows Pakistan Telecommunications Authority (PTA) to control tariffs charged by ICT service providers and interconnect fees for completing service requests among ICT service providers. While this policy has benefitted citizens by lowering services rates, private sector's business interests are compromised due to their inability to control these tariffs. This leads to a situation where services providers focus on the development of ICT services and markets that are more profitable. The neglect is apparent in broadband internet services, software development for local markets, and hardware manufacturing industry, which ultimately impedes ICT growth.

PTA interacts with representatives of select private sector businesses in developing and implementing ICT policies (such as involvement of mobile service providers). However, this involvement is not at a level that satisfies private sector business interests. For fairer tariffs and policies, there seems to be a need to broaden the involvement of private sector businesses.

6. Trustworthiness of the Research

The trustworthiness of qualitative research is a measure of its credibility and validity. This study is assessed against a set of guidelines for conducting grounded theory research provided by Urquhart et al. (2010). These guidelines serve as criteria to judge the quality and effectiveness of the process in developing the *design-actuality gaps* framework. Table 5 provides a description of the five guidelines, and an assessment of how those guidelines were applied to enhance the trustworthiness of this research.

Table 5: Assessment of Quality of the Research

Guidelines for conducting grounded theory studies in IS	Description of the Guideline	How this study fulfills requirements of the guideline
Constant comparison	Constantly comparing instances of data labeled for particular category with other instances of data in the same category	This guideline is satisfied by constantly comparing categories from different set of data (such as policy documents) to interviews with citizens and policy making/influencing officials. Comparisons were made with categories (dimensions) and codes (elements) were discovered from the interviews with citizens.
Iterative Conceptualization	Increasing level of abstraction by relating categories through the	Axial coding method was used in order to relate categories of codes (dimensions) and key concepts (elements of <i>design</i> and

	process of theoretical coding.	<i>actuality</i> dimensions).
Theoretical sampling	Purposeful selection of where to sample from next in study. It ensures comprehensive nature of theory and truly grounding it in data.	Theoretical sampling done for other policies that affect ICT policies and actions plans as research progressed. Theoretical sampling done at the level of citizens selection along four dimensions i.e., gender, domicile, income and education. Theoretical sampling done for the selection of policy making/ influencing officials.
Scaling up	It is a process of grouping higher level categories into broader level themes. It enhances generalizability of the study.	Organization of categories into themes done for the three data sets, i.e., policy documents, interviews and focus groups with citizens and interviews with policy making/influencing officials. These themes are further scaled up in the final generalized theory.
Theoretical Integration	Relating theory to other theories in the same or similar field. It is the process of comparing substantive theory generated with other, previously developed, theories. It contributes to theoretical integration in discipline and help in the generation of formal theories.	The study discusses findings within the context of <i>design-actuality gaps</i> framework. It contributes to further development of the framework by the theoretical integration of <i>country context gaps</i> and <i>hard-soft gaps</i> into <i>performance gaps</i> and proposing two more types of gaps, i.e., <i>dimensional gaps</i> and <i>elemental gaps</i> .

7. Limitations and Future Research

The qualitative research methodology employed in this research is appropriate for unexplored and new domains. IT based socioeconomic development in the context of a developing country is a relatively unexplored territory, making the qualitative methods highly desirable. Furthermore, the highly regarded design-actuality framework was employed and extended as an overarching guide to steer our exploration. While qualitative methods reveal many new concepts and in-depth insights, they also suffer from issues such as representativeness and generalizability. In this sense, no single research method stands out and therefore this study needs to be followed by positivist and quantitative methodologies, such as surveys, in order to accumulate certified knowledge and develop theory for IT based socio-economic development. Some possibilities in this realm include the verification and refinement of the constructs proposed in this research, their validation in different regional and country contexts, and operationalization of the constructs for survey-based studies. Another interesting application will to apply institutional theory (Scott, 1995) to the understanding of ICT policy implementation. Implicit in our research was the consideration of “regulative institutions” and coercive forces in policy implementation. However, cognitive institutions and normative institutions may also have roles in terms of exerting mimetic and normative pressures on governmental bodies (Scott, 1995).

8. Contributions and Conclusion

Our research aims to understand and explain ICT design, its realization, and the gaps in the context of a developing country – an undertaking largely lacking in the IS literature. The ICT design was understood by analyzing Pakistan government's ICT policies, and the actualities were evaluated by understanding its citizens' experiences. Furthermore, the study led to the refinement of the design-actuality gaps framework by introducing the concepts of *dimensional gaps* and *elemental gaps*. This flexibility allows for greater depth in the assessment process and in identifying ways to bridge the gaps by enhancing the design process. Our research also contributes to the literature on ICT for development and ICT in developing countries, as it explains the case of ICT growth in Pakistan. The literature on policy evaluation is also enriched by developing a method to assess policy design success in terms of design objectives and citizens' actuality. Additionally, our study is an exemplar in the application of an intensive qualitative research method. The grounded theory method was used to extend an existing framework and assess the gaps between *design* and *actuality*.

The implications for policymakers of developing countries include the need for a thorough assessment tool that encourages the involvement of citizens and business representatives in the policy design process, in order to minimize design-actuality gaps and have a greater impact on the country's ICT growth. Embedded in our research are lessons for developing countries that need special attention in the development and execution of ICT policies, plans and strategies. The challenge for researchers is to further refine the policy evaluation framework, refine the constructs, develop their operationalizations, and use alternate research methodologies, leading ultimately to a sound theory for ICT based socio-economic development.

9. References

- Baqir, M.N. and Parvez, S. (2000) IT Policy, *Computer News* 4, 10, 15-31.
- Bannister, F. and Connolly, R. (2014) ICT, Public Values and Transformative Government: A Framework and Programme for Research, *Government Information Quarterly* 31, 1, 119-128.
- Bass, J. and Heeks, R. (2011) Changing Computing Curricula in African Universities: Evaluating Progress and Challenges via Design-Reality Gap Analysis, *The Electronic Journal of Information Systems in Developing Countries* 48, 5, 1-39.
- Becher, G. and Kuhlmann, S. (1995) *Evaluation of Technology Policy Programmes in Germany*, Norwell, MA: Kluwer Academic Publishers.
- Best, M. and Kumar, R. (2008) Sustainability Failures of Rural Telecenters: Challenges from the Sustainable Access in Rural India (SARI) Project. *Information Technologies and International Development* 4, 4, 31-45.
- Bilbao-Osorio, B., Dutta, S., and Lanvin, B. (2013) The Global Information Technology Report 2013. *Growth and Jobs in a Hyperconnected World 2*.
http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf
- Carmona, M. and Punter, J. (2013) *The Design Dimension of Planning: Theory, Content and Best Practice for Design Policies*. Routledge: Place.
- Casey, K. (1995) The New Narrative Research in Education. *Review of Research in Education* 21, 211-253.
- Checchi, R. M., Loch, K. D., Straub, D., Sevcik, G., and Meso, P. (2012) National ICT Policies and Development: A Stage Model and Stakeholder Theory Perspective. *Journal of Global Information Management* 20, 1, 57-79.
- Cordella, A. Iannacci, F. (2010) Information systems in the public sector: The e-Government enactment framework. *The Journal of Strategic Information Systems* 19, 1, 52-66.

- Creswell, W. and M. Brown. (1992) How Chairpersons Enhance Faculty Research: A Grounded Theory Study. *Review of Higher Education* 16, 1, 41-62.
- Creswell, J. W. (2012) *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Sage.
- Diniz, E. H., Bailey, D. E., Dailey, S. L., and Sholler, D. (2013) Bridging the ICT4D Design-Actuality Gap: "Human ATMs" and the Provision of Financial Services for "Humble People." *CONF-IRM Proceedings Paper 13*, Natal, Brazil, May 22-24.
- Fiedler, F. (1964) *A Contingency Model of Leadership Effectiveness: Advances in Experimental Social Psychology (Vol.1)*. Academic Press, New York.
- Gao, P. and Rafiq, A. (2009) The Transformation of the Mobile Telecommunications Industry in Pakistan: A Developing Country Perspective. *Telecommunications Policy* 33, 5, 309-323.
- Gerhan, D. and Mutula, S. (2007) Testing a Recent Model of ICT in Development: Botswana and its University. *Information Technology for Development* 13, 2, 177-197.
- Gibbons, M. (2008) The Evaluation of Government Policies for Innovation. *Review of Policy Research* 3:3-4, 476-482.
- Gichoya, D., Hepworth, M., and Dawson, R. (2006) Factors Affecting the Success and Failure of Government ICT Projects in Developing Countries. *Proceedings of the 2nd International Conference on E-Government*, Dublin, Ireland.
- Grazzi, M. and Vergara, S. (2012) ICT in Developing Countries: Are Language Barriers Relevant? Evidence from Paraguay. *Information Economics and Policy* 24, 2, 161-171.
- Hafkin, N. (2002) Gender Issues in ICT Policy in Developing Countries: An Overview. *UN Division for the Advancement of Women Expert Group Meeting on Information and Communication Technologies and Their Impact On and Use as an Instrument for the Advancement and Empowerment of Women*, Seoul, Republic of Korea, 11-14.
- Heeks, R. (2002) Information Systems and Developing Countries: Failure, Success and Local Improvisations. *The Information Society* 18, 2, 101-112.
- Hsieh, J.J.P.A., Rai, A. and Keil, M. (2008) Understanding Digital Inequality: Comparing continued Use Behavioral Models of the Socio-Economically Advantaged and Disadvantaged. *MIS Quarterly* 32, 1, 97-126.
- Imtiaz, S. Y., Khan, M.A. and Shakir, M. (2015) Telecom Sector of Pakistan: Potential, Challenges and Business Opportunities. *Telematics and Informatics* 32, 2, 254-258.
- Information Economy Report. (2007) *Science and Technology for Development: The New Paradigm*, United Nations, New York and Geneva.
- Information Economy Report. (2011) *ICTs as an Enabler for Private Sector Development*. United Nations, New York and Geneva.
- Ives, B., and Olson, M. H. (1984) User Involvement and MIS Success: A Review of Research, *Management Science* 30, 5, 586-603.
- Larson, J.F., and Park, J. (2014) From Developmental to Network State: Government Restructuring and ICT-led Innovation in Korea. *Telecommunications Policy* 38, 4, 344-359.
- Lorsch, J., Morse, J. (1974) *Organizations and Their Members: A Contingency Approach*, Harper & Row, New York, NY.
- Mann, S., and Schweiger, J. (2009) Using the Objective Hermeneutics Method in Policy Evaluation, *Evaluation* 15, 4, 445-457.
- Minhas, A. and Ahsan, A. (2015) An Empirical Analysis of Foreign Direct Investment in Pakistan. *Studies in Business and Economics* 10, 1, 5-15.
- Mujahid, Y. H. (2002) Digital Opportunity Initiative for Pakistan. *Electronic Journal of Information Systems in Developing Countries* 8, 6, 1-14.

- Nemati, N., and Latif, A. (2011) The Unintended Consequence: The Symbiotic Relationship between ICT and a National Transition. *International Journal of E-Politics* 2, 3, 14-26.
- Ngololo, E. N., Howie, S. J., and Plomp, T. (2012) An Evaluation of the Implementation of the National ICT Policy for Education in Namibian Rural Science Classrooms. *African Journal of Research in Mathematics, Science and Technology Education* 16, 1, 4-17.
- Nolan, R. L., and Wetherbe, J. C. (1980) Toward a Comprehensive Framework for MIS Research. *MIS Quarterly* 4, 2, 1-19.
- Olatokun, W.M. (2008) Gender and National ICT Policy in Africa: Issues, Strategies, and Policy Options. *Information Development* 24, 1, 53-65.
- Olsson, T. (2006) Appropriating Civic Information and Communication Technology: A Critical Study of Swedish ICT Policy Visions. *New Media & Society* 8, 4, 611-627.
- Papaconstantinou, G., and Polt, W. (1997) Policy Evaluation in Innovation and Technology: An Overview. In *Conference Policy Evaluation in Innovation and Technology, Capítulo 1*.
- Phang, C. W. and Kankanhalli, A. (2008) A Framework of ICT Exploitation for E-participation Initiatives. *Communications of the ACM* 51, 12, 128-132.
- Pozzebon, M., and Heck, E. (2006) Local Adaptations of Generic Application Systems: The Case of Veiling Holambra in Brazil. *Journal of Information Technology* 21, 2, 73-85.
- PTA. (2015) *Telecom Indicators*, Pakistan. <http://www.pta.gov.pk/index.php?Itemid=599>
- Riessman, C. K. (1993) *Narrative Analysis*. SAGE Publications, New York, NY.
- Rossi, P. H., and Freeman, H. E. (1993) *Evaluation: A Systematic Approach*, 5th ed., Sage, Newbury Park, CA.
- Samarajiva, R. and Zainuddin, A. (2008) *ICT Infrastructure in Emerging Asia: Policy and Regulatory Roadblocks*, Sage Publications, New Delhi, India.
- Scott, W. R. (1995) *Institutions and Organizations*. Thousand Oaks, CA, Sage.
- Sillince, J. (2005) A Contingency Theory of Rhetorical Congruence. *Academy of Management Review* 30, 3, 608-621.
- Sprague, R. H. (1980) A Framework for the Development of Decision Support Systems. *MIS Quarterly* 4, 4, 1-26.
- Touray, A., Salminen, A. and Mursu, A. (2013). ICT Barriers and Critical Success Factors in Developing Countries. *Electronic Journal of Information Systems in Developing Countries* 56, 7, 1-17.
- UNCTAD. (2006) *Effective Government Policies Termed Vital for Closing Digital Divide in Developing Countries*. <http://unctad.org/en/pages/PressReleaseArchive.aspx?ReferenceDocId=7679>
- Urquhart, C., Lehmann, H. and Myers, M. (2010). Putting the 'Theory' back into Grounded Theory: Guidelines for Grounded Theory Studies in Information Systems. *Information Systems Journal* 20, 4, 357-381.
- Willing, N. (2007) *Top 10 Emerging Mobile Markets*, <http://www.lightreading.com/top-10-emerging-mobile-markets/d/d-id/639492>
- Wonglimpiyarat, J. (2014) Innovative Policies to Support Technology and ICT Development. *Government Information Quarterly* 31, 3, 466-475.

Appendix A. Documents, Selection of Participants, Research Sites and ICT Coverage Area

Documents included in the identification of the dimensions and elements of ICT Policy “Design”

No.	Document Title	Publication/Adoption
1	Pakistan Telecommunication (Re-Organization) Act, 1996	1996
2	Pakistan National IT Policy	2000
3	Pakistan Telecom Rules	2000
4	National Study of Critical Indicators of Information Technology	2001
5	Electronic Transactions Ordinance	2002
6	De-Regulation Policy for the Telecommunication Sector	2003
7	Access Promotion Contribution Rules	2004
8	National Broadband Policy	2004
9	Mobile Cellular Policy	2004
10	Universal Service Fund Policy/Rules Amendments	2006
11	Pakistan Telecommunication (Re-Organization) Act, 1996	2006 with amendments
12	National ICT Research and Development Fund Policy Framework	2006
13	National ICT Research and Development Fund Rules	2006
14	Prevention of Electronic Crimes Act	2007
15	Growth of broadband in Pakistan and current situation	2008
16	Telecom Industry Reports by Pakistan Telecom Authority (PTA)	2000-2011
17	Draft National IT Policy (Revised)	2011

Qualitative Interviews for the identification of the dimensions and elements of “Actuality”

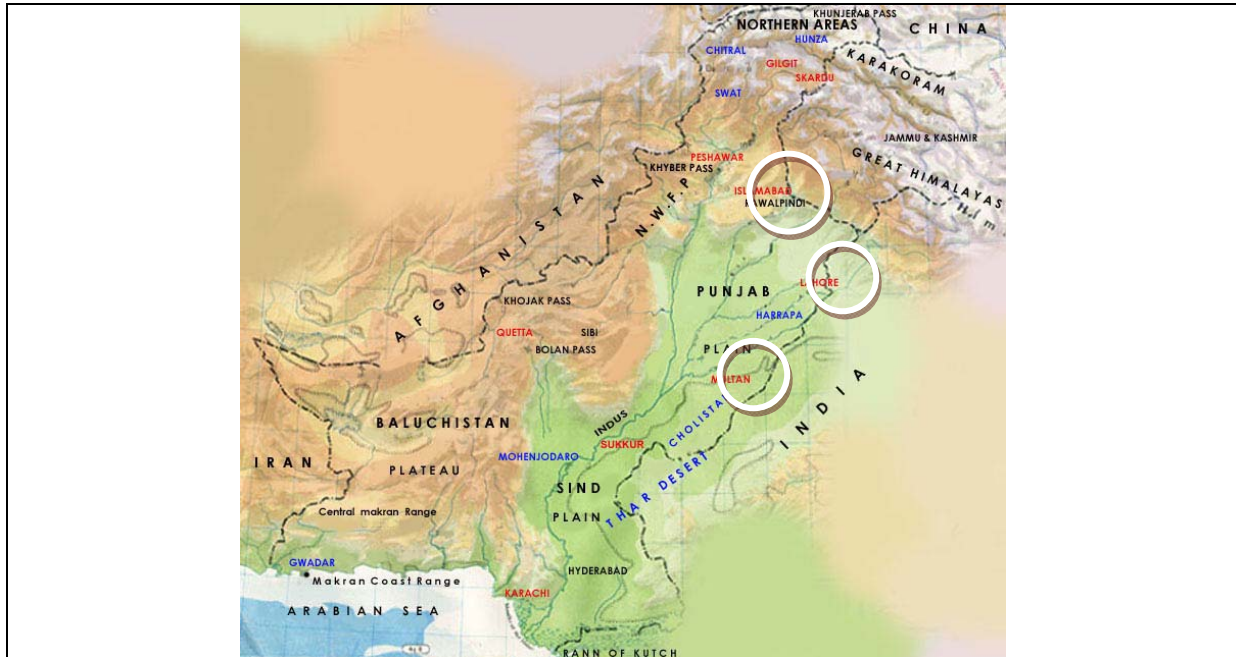
Citizens	Contextual Background of Citizens	Interviews																								
Total of 35 Citizens selected. The context of participants' interviews was particularly considered. The dimensions of this context included consideration for gender, domicile, income and education.	<table border="1"> <thead> <tr> <th colspan="2"><i>Gender</i></th> <th colspan="2"><i>Domicile</i></th> </tr> <tr> <th>Men</th> <th>Women</th> <th>Rural</th> <th>Urban</th> </tr> </thead> <tbody> <tr> <td>26</td> <td>9</td> <td>19</td> <td>16</td> </tr> <tr> <th colspan="2"><i>Income</i></th> <th colspan="2"><i>Education</i></th> </tr> <tr> <th>High</th> <th>Low</th> <th>High</th> <th>Low</th> </tr> <tr> <td>17</td> <td>18</td> <td>17</td> <td>18</td> </tr> </tbody> </table>	<i>Gender</i>		<i>Domicile</i>		Men	Women	Rural	Urban	26	9	19	16	<i>Income</i>		<i>Education</i>		High	Low	High	Low	17	18	17	18	35
<i>Gender</i>		<i>Domicile</i>																								
Men	Women	Rural	Urban																							
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<i>Income</i>		<i>Education</i>																								
High	Low	High	Low																							
17	18	17	18																							

Qualitative Interviews for the identification of the elements of “Actuality”

Participant Category	Representative Organizations	Interviews
Government Officials	Ministry of IT and Telecom	1
	Ministry of Science and Technology	1
	Pakistan Telecommunication Authority	2
	Government Adviser and Consultant	1
	Pakistan Software Export Board	1
	Pakistan Electronic Media Regulatory Authority	1
	Pakistan Frequency Allocation Board	1

	National Database and Registration Authority	3
	Election Commission of Pakistan	3
	District ICT Director – District Vehari (Punjab)	1
Service Providers		
	Backbone connectivity provider (PTCL)	1
	Broadband Service Provider	1
	Narrowband Service Provider	1
	Cable Provider (for triple play services i.e. TV, voice, data)	1
	Cell Phone Service Provider (Ufone, Mobilink, Zong)	3
Hardware/Software Industry		
	Hardware Provider	1
	Software Developers	6
	Infrastructure Developer	3
Electronic Media		
	Online News Services	1
	TV	1
	Radio	1
Educational Institutions		
	Distance Learning Institutions	2
	Traditional Education Institutions	2
Activists and NGOs		3
	Activists from Civil Society	1
	Member of the National Parliament	1
	Non Governmental Organizations	1
Law Enforcement		
	Federal Investigation Authority	1
	Federal Investigation Authority (Cyber Crimes Unit)	1
	Punjab Police	1
	Islamabad Police	2
	Islamabad Traffic Police	3
	Islamabad Rescue 15 Police	2
	Islamabad Police ICT Services Development Unit	2
Total		54

Research Sites



Research Sites includes urban and rural areas in and around Islamabad, Lahore and Multan regions. These cities are surrounded by several rural and underdeveloped towns and villages that lack access to basic ICT infrastructure and services. The ICT infrastructure disparities within close proximities made these sites ideal for this research. These disparities ensured widest possible responses in how citizens understood and explained the *actuality* of ICT growth.

ICT Coverage Area



ICT coverage area in Pakistan (white space within the country boundaries represents coverage area) - The current ICT services coverage area is about 60% of the geographical spread of the nation. The ICT coverage map is a good indication of the population distribution across Pakistan. Most the population is traditionally spread close to water bodies such as rivers, lakes or sea coast in Pakistan. The Indus River flows from North to South in Pakistan and the map clearly depicts the path of this river as well as coverage on the coast line in south. Most of this coverage is through wireless networks such as cell phones and microwave rely antennas for TV and radio broadcasts. However, this spread is not uniform in several respects. Even within the broadly defined “coverage areas” there are situations where access to only the most basic forms of ICT are available if at all, i.e., wireless voice telephony and radio.

Appendix B. Summary of Backgrounds and Narratives of Select Participants

Participant #	Selection Criteria	Background and Narratives Summary
1	Gender: Woman Domicile: Rural Education: Illiterate Income: Medium ~50 years old entrepreneur	<p>This participant has a small cloth sale business in several nearby towns close to her village. She travels as far away as 300 miles to buy cloth at whole sale prices and sells at profit to villagers who cannot travel. Her business has grown significantly since she got a cell phone. Her customers call her and tell what they want when she is traveling. Her personalized service for customers has increased her revenues. She said: <i>“I continuously travel from one village to another and for buying wholesale cloth. My customers love the fact that they can place ‘special orders’”</i>.</p>
2	Gender: Man Domicile: Urban Education: High School Income: High ~35 years old entrepreneur	<p>This participant owns a small mechanical parts manufacturing facility in a small urban area. The demand for his quality parts has grown steadily between 2003 and 2007. In late 2007, he imported a used machine to automate the manufacturing process. However, the machine had missing parts and was not in operational condition. He used internet to find a manual for this machine, made and fixed some parts and brought the machine in operational condition. The variation in production process has gone down (0.0001% rejection rate) and demand has increased significantly (800% in one year). He uses internet, email and cell phone to stay in touch with his clients in different countries. He said: <i>“I have no idea what I will do without internet”</i>. He said: <i>“my business has expanded several folds since I started using a phone and email to keep in touch with my suppliers”</i>.</p>
3	Gender: Woman Domicile: Urban Education: Graduate Income: High ~50 years old school teacher	<p>Her children permanently live in the United States. She said: <i>“I don’t cry anymore; I can speak with my children as much as I want without worrying about the bill”</i>. Calls to United States and most other countries do not cost more than local call toll. She said she used to wait every weekend for her children to call her. Now she can call whenever she wants. <i>“I sometimes see my children on a webcam as well”</i> she said. This is one of the most important changes that ICT have brought in her life.</p>
4	Gender: Man Domicile: Rural Education: Illiterate Income: Low ~40 years old honey farmer	<p>He travels to find places with flowers for his bees. In addition to keeping in touch with his family, he relies on his cell phone to find markets where he can get best rates for his honey. He said: <i>“I do not have to run around anymore to find a better rate”</i>. Sometimes bees develop a deadly fungus. He can immediately call someone to bring treatment for his bees from a far off city. He said: <i>“It is very expensive and difficult to raise bees once again if they die due to fungus. I don’t suffer those losses anymore because I can get medication right away”</i>.</p>

5	Gender: Man Domicile: Urban Education: Illiterate Income: High ~38 years old entrepreneur	This “illiterate mechanical engineer” was making a pulley system for a machine that could be used in construction or agriculture businesses to fetch loads or water. He said: <i>“I got the idea from a TV program. I already have a customer who will be using it in his construction business”</i> . Additionally, he runs public transport system with 5 passenger vans. <i>“I can keep in touch with my employees and know exactly where they are when the van breaks down and I have to go and fix it”</i> he said.
6	Gender: Woman Domicile: Urban Education: Graduate Income: Low ~24 years old university student	<i>“Initially, My parents did not allow me to go to Islamabad to study at one of the premier universities in Pakistan”</i> this participant said. Her parents were concerned of her safety in a city as far away as 500 miles. However, things changed when they got her a cell phone and found out that they could always stay in touch with her. She said: <i>“I probably would not be pursuing higher education if I didn’t have a cell phone and my parents didn’t feel that they can keep in touch with me anytime they wanted”</i> . She has access to a large online library which helps her in research and access to latest publication on her areas of interest. She explained: <i>“I use online library to find research papers to support my literature review and research”</i> .
7	Gender: Man Domicile: Rural Education: Illiterate Income: Medium ~23 years old barber	This participant works in his father’s barber shop. He spends hours on phone with prostitutes. His daily pocket money is Rs 20 but his daily cell phone expense is Rs. 500. To satisfy his addiction, he steals money from the barber shop cash drawer. <i>“I know it is wrong to steal money to pay for my cell phone bill but I cannot help it”</i> he said. <i>“My father wants me to get married but I have a lot of aspirations. I want to be famous and rich and have a good life”</i> he added. He explained: <i>“The cell phone makes me live a life of fantasy and I feel that I am important because some women need me. I know it is not considered good but I cannot help it and don’t know how to stop it”</i> .
8	Gender: Woman Domicile: Rural Education: Illiterate Income: Medium ~50 years old housewife	<i>“I have seen a lot of girls and boys making out on phone and even deciding on marrying without their parents’ approval; this is very bad”</i> this participant said. This conservative woman in a village admits that cell phones are very helpful in several aspects but doesn’t want young girls and boys to be carrying phones around just to waste time on “useless” talk. She sees a major transformation in the social structure in rural areas where parents are losing control over their children in young age due to cell phones.
9	Gender: Woman Domicile: Urban Education: Graduate Income: High	This participant accidentally got involved in IT administration because of good credentials in project management. <i>“My boss did not give me a choice and wanted me to head the IT department. I told him that I didn’t know a thing about computers and he said, you can learn these things. I got a big raise too”</i> . She explained: <i>“I enjoy this job because I have learned a lot</i>

	~45 years old IT administrator	<i>here but it has turned my family life upside-down</i> ". She carries her phone with her when she is cooking food for her children just in case her services are needed during network and IT services disruptions.
10	Gender: Man Domicile: Urban Education: Illiterate Income: Medium ~34 years old donkey cart owner	This participant hauls loads from warehouses to furniture showrooms when someone makes a purchase in a showroom. <i>"The owner of the showroom would go peak out of his place to see if a donkey cart person was there"</i> he said. Then he got a cell phone. He cannot read... not even numbers (he visually matches patterns for a phone number on a piece of paper and dial pad of his phone when he needs to dial a number). He explained: <i>"Someone helped me with setting up the phone for distinctive ring tones. Showroom owners give me a missed call, and I can recognize who needs my help by a specific ring tone setup for a particular showroom owner. Now, I can work as much as I want"</i> .
11	Gender: Man Domicile: Urban Education: High School Income: High ~27 years old plumber	<i>"I started my plumbing business a few years ago. I rented a place to setup my shop. I did a mediocre business"</i> he said. He bought a cell phone in 2007. Now, he only puts his cell number on the business card. He explained: <i>"I do more business and my customers never have to leave their place to come see me. They just call me and I am there for service and repair in a few minutes"</i> . His business has expanded significantly and costs have gone down. He explained: <i>"my costs of doing a business have gone down because I don't need to rent a shop anymore"</i> .
12	Gender: Man Domicile: Urban Education: Graduate Income: High ~39 years old vice-president of a software development house	This participant travels frequently to see his clients overseas in Europe and United States. <i>"ICT have changed my life; my life revolves around these technologies"</i> he said. He uses online meetings with his clients but for major decisions such as signing off a large project or deliver final product in a ceremonial manner, he travels for weeks away from his little children, wife and old parents. <i>"When I am on a business trip abroad, I can still see my 5 and 2 years old girls on webcam and they can see me too; my mother does not feel that I am away because she can still see me and speak with me every night before she goes to bed. ICT keep us united even when we are physically apart"</i> he added.