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Designing for a 'Sweet Spot' in an Intervention in a Least Developed Country: The Case of e-Government in Bangladesh

by

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ABSTRACT

Despite the potential for information systems to improve societal conditions in developing countries, a lack of cumulative knowledge building to inform interventions hampers progress. This paper reports an integrated action research – design science project that addressed the problem of limited adoption of e-government in Bangladesh and contributes to design theory. Inadequate knowledge of the nature of e-government systems was identified as an underlying cause of many other problems. Activities included the delivery of a training program and a handbook targeted at senior government officers. The project had relatively modest resources and yet yielded positive outcomes. Critical reflection has established a number of design principles for an intervention of this type, with the most important principle being to first identify a "sweet spot", a point of maximum leverage, and then work on it.

Keywords: Developing countries, Design/design science, Action research, E-government

INTRODUCTION

Interventions encouraging information systems (IS) adoption and use in least developed countries (LDCs)[2] are significant for many reasons. Appropriate use of IS has the potential for

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economic and societal benefits for the two-thirds of the world's population who live in the developing countries. The field of research that is engaged with these problems is known as ICT4D - information and communication technology for development. It is a growing field, with an average 39% annual growth rate from 1999 to 2008 (Heeks, 2010). However, despite many initiatives by bodies such as the United Nations, the World Bank and the European Union, many interventions designed to yield desirable improvements have little or no lasting effect and knowledge building of solutions appears far from cumulative. Heeks and Bailur (2007) characterize the problem as "random rocks being thrown into a pool rather than building cairns of knowledge." (p. 256).

E-government is a particularly important area for LDCs. Enhanced e-government can lead to increased compliance with international codes, norms and standards, meaning higher levels of accountability, reduced corruption and more effective systems in important areas such as health and security. Prior studies indicate that use of ICT in government has flow-on effects to other sectors, improving productivity and reducing poverty (Pilat and Lee, 2001; Walsham and Sahay, 2006; World Bank, 2002). According to Heeks (2003), however, 35 % of e-government initiatives in developing countries have been failures (e-government was not implemented or was implemented but immediately abandoned) and 50% were partial failures (major goals were not attained or there were undesirable outcomes). It is important for both research and practice to understand more fully how desired aims can be achieved with e-government interventions in LDCs.

Problems are perceived in theorizing in the context of ICT4D, with an explosion of work on ICTs that is descriptive rather than analytical and that does not provide the solidity for true theoretical foundations (Heeks, 2006). These problems arise despite a wide range of theories being implicated in studies of ICT4D, including actor network theory, structuration theory, institutional theory and innovation theory (see Avgerou, 2008; 2009; Silva and Westrup, 2009;

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[2] LDCs are distinguished by the Economic and Social Council of the United Nations based on three criteria: (1) GNI per capita (under $750), (2) Human Assets Index (HAI) (3) composite Economic Vulnerability Index (EVI). Currently 49 LDCs are identified (UN OHRLLS 2008)

Walsham and Sahay, 2006). Reviews in the e-government field have characterized much of the work as "case stories" - a description of events with no analyzable data or application of theory (Grönlund, 2004; Norris and Lloyd, 2006). More to the point, there has been little work that addresses the need to give interventions in LDCs a sound theoretical foundation in terms of "design theory", systemized knowledge that provides a basis for design and action (Gregor, 2006; Gregor and Jones, 2007). It is this challenge that is taken up in this paper.

Design theory is theory that is prescriptive rather then descriptive and a complete design theory will have the following as mandatory components: the purpose and scope of the theory, principles of form and function, artifact mutability aspects, testable propositions and justificatory knowledge (micro or kernel theory) (Gregor and Jones, 2007). Our contribution in this paper represents a partial theory and focuses on the objectives of a socio-technical artifact (an intervention), the principles of form and function of the intervention and the associated kernel theory. A range of research approaches are proposed for design-type research, including the build-evaluate cycles of Hevner et al. (2004) and the socio-technical IS design science (STISD) of Carlsson et al. (2010). The approach we adopt is based on the combined action research – design science approach proposed by Cole et al. (2005). This approach has similarities to Carlsson et al.'s approach. Although design science draws upon what we already know (kernel theory): "there is not necessarily one way of getting logically from an extant theory to a design theory, some creativity is required" (Carlsson*, et al.*, 2010, in press, p. 6). Especially with a socio-technical artifact, the design process will be iterative and draw upon a number of kernel theories that arise as the designers work towards a solution; the micro-theories are unlikely to be known completely *a priori*. Further, a design project can make a contribution through the assemblage of a number of a design principles into an effective whole, even though one or more of these principles may already be known. Note that this design science approach is theory building. Some testing of the design principles discussed here has occurred because of the iterative development process, but further independent testing is required.

The objectives of the study were to (a) design and carry out an intervention in a LDC (Bangladesh) that would assist in the uptake of e-government; (b) Reflect on work and systemize knowledge in order to contribute to design theory in this important area of ICT4D.

Funding was obtained from the Australian aid agency AusAID in 2008 for the project as Bangladesh is seen as being in need of reform in the public sector (Jamil, 2007; Sobhan *et al.*, 2004). The project ran for 12 months and included the production of a strategy document (Imran *et al.*, 2008) and a training package and workshops in Bangladesh for senior and mid-level government officers, supplemented by the distribution of 300 copies of an ICT Management handbook (Gregor *et al.*, 2008). There are indications that the project led to positive outcomes.

The prime design principle that we postulate is that of "aiming for a sweet spot" – find a point of maximum leverage for gaining results and work on it. The concept of a 'sweet spot' is drawn from golf and tennis players will also recognize the term. As golfers know, there is a part of the face of a golf club, called the sweet spot, which gives the softest feel and the greatest effect when it is used to strike the golf ball. A swing that contacts outside the sweet spot can feel very uncomfortable and will not result in as good a shot as those that make contact in the sweet spot. We think that there is an equivalent sweet spot for interventions in least-developed countries. An element of, or an approach to, an intervention that quickly delivers an effect, or 'unlocks' the ability for the rest of the intervention to succeed, constitutes the sweet spot for the intervention. Further supporting principles are elucidated and are described in the body of the paper.

The paper has significance from a number of perspectives. Theoretically it adds to design theory in an area, ICT4D, where such theory is largely lacking. Practically, it offers systemized knowledge and methods that could be used for guidance in other interventions where the opportunity for societal benefits is also large. Methodologically, the study provides an example of action research coupled with design research in an unusual context, an intervention that is aimed at alleviating a situation at a national level.

The paper proceeds by first describing the relevant conceptual background. The research approach of action research integrated with design science is then described. The following sections describe the context of the intervention, the intervention itself and evaluation of the intervention. Elucidation of the design principles that were important for the project's successful outcomes follow.

CONCEPTUAL BACKGROUND

This section is structured in two parts. The research was framed as an ICT intervention for a LDC, so the section opens with a discussion of relevant literature supporting the approaches to ICT interventions in LDCs, a relatively small but quickly growing field. As the ICT intervention was deliberately aimed at instituting change in the LDC in the form of adoption of e-government, the literature on adoption and change is briefly reviewed to point to fundamental theoretical ideas that informed the intervention's design. Finally, we present some further theoretical elements that informed the design of elements of the intervention.

Theory informing interventions in LDCs

The literature on ICT4D is accumulating at a rapid rate. As noted above, however, there is concern with the development of cumulative knowledge and the lack of overarching theory. Nevertheless, some conclusions can be drawn from this work.

Research has shown that many ICT initiatives have been unsuccessful because they have failed to address underlying contextual issues (e.g., Heeks, 2003). Researchers struggle to find workable solutions and practitioners largely rely on re-use of international best practices to conserve effort and achieve results quickly. There are, however, unique factors in developing countries that must be addressed in planning information technology applications. The "unique environment of each LDC" (Montealegre, 1999) means that "there is no one size fits all approach" (UNDP, 2001). Ignoring this guideline may result in failed systems and continued technological disadvantage (Azad *et al.*, 1998). A particular cultural group is likely to act and behave based on their underlying values, which may be different from those of other cultural groups in similar situations (Zeffane, 1989).

Avgerou and Walsham (2000) maintain that the design and implementation of ICT projects in developing countries must be able to address the specific contextual characteristics of the organization, sector, country, and region. A complete orientation of the design perspective through critical reflection appropriate to the local context is thus important. Evidence of success in such endeavors has been found in a number of past initiatives. For example, in e-government initiatives in Kyrgyzstan and Chile, the provision of user-friendly e-services were provided according to indigenous priorities (UN, 2004). Studies show that culturally-appropriate IT design

can enhance transfer (Struab *et al.*, 2001) where developing countries adopt organizational designs viable in their own environment (Kim and Utterback, 1983). Thus, a pragmatic balance between universal standards and the local sphere is required with provision for local tailoring to specific needs (Braa and Hedberg, 2002; Garcia-Murillo, 2003; Rolland and Monteiro, 2002).

Although a range of theories is implicated in studies of ICT4D there is little convergence on acceptable theoretical foundations for the field as a whole, especially in regard to what theory can be used as guidance in carrying out interventions. Importantly, while the ICT4D literature recognizes the importance of local context and locally-designed information system solutions, little use is made of design theory or design research approaches in addressing the ICT4D issues. Heeks (2003) stresses that the design gap that exists between current reality and the design conception of the West accounts for the large number of ICT failures in developing countries. This gap arises when design stakeholders remain physically and psychologically away from the context, and contradiction occurs due to different meanings between users and designers (Heeks, 2002; Silva, 2007).

Theories of Innovation and Change

In this section we discuss theory that was seen by us as relevant to our problem situation when the project began and informed our overall approach. The body of theory that was identified as most relevant were the innovation and change literature. Through the course of the project, however, it became apparent that this prior literature was lacking in the degree to which it could give us guidance.

The literature on innovation generally, and innovation with respect to ICT particularly, is comprehensive and aspects of this literature informed the current study. For example, organizational change is seen as "ongoing improvisation enacted by organisational actors trying to make sense of and act coherently in the world" (Orlikowski, 1996, p.65). While abundant academic frameworks and literature related to organizational change in the management field are available, most of these theories, developed and tested in the developed world, have been found to be problematic in their application in the socio-cultural environment of least-developing countries (Chen *et al.*, 2006).

Nevertheless, some prominent theories provide a starting point with valuable insights to investigate the innovation phenomena and change management in the LDCs. For example, Rogers (1995) Diffusion of Innovations (DOI) theory shows how new innovations are adopted over a period of time. Rogers explained the innovation and its diffusion as a social process of communicating new ideas through certain channels over time among the members of the society. He emphasized the role of the "change agent", who "influences client's innovation decision in a direction deemed desirable by a change agency" (p.335). This theory has practical value in guiding the development of interventions, particularly in this case where the project team adopted the role of a change agent.

According to Rogers (1995), change agents provide a communication link between a resource system of some kind and a client system. They facilitate the flow of innovation from the change agency to an audience of clients. For this type of communication to be effective, the innovation must be selected to match the client's need. Further, while such communication may appear to be one-way, it should accommodate an effective two-way information exchange. Rogers points out that "The long-range goal of many change agents is to create conditions in which client can help themselves" (p.335). Rogers identifies factors in a change agent's success, including effort in communicating with clients, client orientation, and change agent credibility.

Although useful and developed across a variety of cultures, Rogers' DOI theory was developed originally for adoption of innovation at the individual level and not for organizations. The DOI theory for organizational adoption is less well grounded and comparatively limited in capturing the associated underlying issues, especially with relation to cross-cultural work (Lou *et al.*, 2000; Lundblad, 2003; Lyytinen and Damsgaard, 2001). Further, the DOI literature tends to treat the "innovation" as something immutable, rather than something that can be adapted and appropriated to suit needs in a particular context.

Further Justificatory Theory

Once our project began and as our approach to the problem clarified, the project team called upon a diverse range of knowledge and theory to support the development of the intervention. This backing knowledge is termed kernel theory (Walls *et al.*, 1992) or justificatory theory (Gregor and Jones, 2007) in a design science context. The relevant kernel theory is indicated when we reflect on the design principles and lessons learned from the project in the penultimate

section of the paper. Background knowledge that informed the project included institutional theory (Scott, 2008) and the need for sound governance practices for ICT and senior management's awareness of ICT capabilities (Avison *et al.*, 2006).

METHOD

The research approach adopted was a combination of action research and design science. Although action research and design science are seen by some as separate approaches (for example, Iivari, 2007), others have indicated that they have commonalities and elements of each approach can be combined (Cole *, et al.*, 2005).

Action research is defined by Rapoport (1970) as a method "which aims to contribute both to the practical concerns of people in an immediate problematic situation and to goals of social science by joint collaboration within a mutually acceptable ethical framework" (p. 499). Action research was indicated as a method of choice for our project as we were faced with an immediate problematic situation in which we proposed to intervene and bring about change and we also had to work with an aid agency and partner organizations in Bangladesh with whom we had to establish an ethical and feasible collaborative relationship. The action research approach employed matches that of canonical action research (CAR) as described by Davison et al. (2004).

Further, we incorporated elements of design science research as we aimed to contribute to design theory through reflection during and following our work to elucidate some general design principles.

The framework provided by Cole et al. (2005) for synthesizing design science and action research gives a structure for the description of our method. These authors see four stages in an integrated action research and design science process: (1) Problem Identification; (2) Intervention; (3) Evaluation; (4) Reflection and Learning. Table 1 shows the activities performed in each stage, supplemented by reference to the principles for CAR as described by Davison et al. (2004). Note that these activities did not follow in a strictly linear fashion. Some reflection and learning occurred throughout the project, as would be expected in action research: some elements of the problem became clearer, and evaluation and feedback were sought at a number of points during the design of the products (strategy document, training program and handbook) that were used in the intervention. The evaluation and testing that occurred follows

the socio-technical information systems design (STISD) research as described by Carlsson et al. (2010) and used "naturalistic evaluation" as in Pries-Heje, Baskerville and Venable (2008).

Table 1. Integrated Action Research and Design Science Process		
Stage	*Activities*	*CAR Principle*
All stages	All activities	Principle of Cyclical Process Model
Problem Identification (2005 – 2010)	PhD research: 1) Reviewed literature on ICT4D; 2) Developed a process model of barriers and enablers to e-Government adoption in a LDC; 3) Identified "Lack of knowledge" as a "root cause" of problems.	Principle of Theory: The grounded PhD research led to a theoretical process model of e-Government adoption in a LDC. The planned intervention built on this process model.
Intervention (2007-2008)	1) Proposal submitted to the aid agency with the aims of developing a national strategy for e-government adoption and delivery of programs to educate senior government officials on management of ICT (2007) 2) Formation of taskforce with representatives from all stakeholder organizations. 3) Development of deliverables, with pilot testing. 4) Delivery of strategy document and training package in Bangladesh.	Principle of the Researcher-Client Agreement: The project was governed by a formal deed of agreement between the research group, the aid agency and counterpart organizations in Bangladesh. Principle of Change through Action: All stakeholders were motivated to improve the situation. The intervention, the proposed outcomes, formal approval, and final assessment were all documented in reports.
Evaluation (2008-2010)	Evaluation was an ongoing process, including pilot testing and qualitative and quantitative data gathering.	Principle of Learning through Reflection: Learning occurred in the iterative design approach.
Reflection, Learning (2005 -2010)	Reflection and learning has occurred through research papers (Imran and Gregor, 2010), reports to aid agency, project notebook, evaluation in pilot tests, reflection on underlying design principles for the current paper.	Principle of Learning through Reflection: All stakeholders were involved in reflection on outcomes, in reports and a final briefing. Principle of Theory: This paper develops design principles.

THE INTERVENTION

This section describes the intervention in terms of initial problem identification, the project initiation and the project deliverables.

Problem Definition

The motivation for this intervention emerged from the personal experiences of one author while working in the Bangladesh public sector for approximately 10 years and findings from his PhD research (Imran, 2010). Bangladesh, one of the 49 LDCs, can be characterized as a country with a high power distance where the hierarchical administrative culture inherited from the colonial system has evolved into distinctive hierarchical attitudes in interactions between officials and citizens, superior–subordinate relationships, and the methods of government service delivery (Jamil, 2007; Siddiqui, 1996). The public administration of Bangladesh is heavily influenced by political instability and uncertainty (Jamil, 2007), which poses a threat to continuity of any institutional process.

In-depth research using a series of focus groups and interviews revealed a critical stumbling block for successful adoption of e-government in Bangladesh (Imran, 2010). Public sector decision makers lacked fundamental knowledge and understanding of ICT and also demonstrated a lack of awareness of the strategic use and implications of ICT systems for government business processes. This was a significant finding as this lack of knowledge was found to underlie a range of other previously-identified barriers such as poor infrastructure, low socio-economic condition and lack of leadership. The lack of knowledge and the attitudes of public sector decision makers were identified as a key issue to address to facilitate further success in e-government initiatives.

The eGov Project

Against this background, the research was successful in obtaining a grant for effective and sustainable e-government in Bangladesh under the auspices of the aid program. The aid program is a competitive grant scheme of the aid agency, which aims to improve public sector capacity in selected partner countries for governance and development in priority areas. Based on the research findings described above, the project focused on the critical issue of filling the 'knowledge gap' in e-government in a systematic way to achieve successful adoption of a broader e-government strategy for the public sector of Bangladesh.

The following issues were dealt with in planning the project:

- How could 'know-how' be developed among key decision makers and government officials in Bangladesh concerning the effective use of ICT in public sector organizations?

- What would be the most effective tool for an initial ice-breaking activity?

- How could the initial knowledge building be replicated in a wider community?

Accordingly, after careful consideration two major and necessary deliverables were planned for the project:

- A five year strategy for the effective uptake of ICT and e-government in Bangladesh, and

- A training package and management handbook to build 'know-how' and to reinforce skills transfer to the Bangladesh Government.

Collaborators and participants for this initiative included the Australian Government Information Management Office (AGIMO) and experts from Australia and Bangladesh. The counterpart public service agency of the project was the Ministry of Science and Information and Communication Technology (MOSICT) of Bangladesh, and the Bangladesh Institute of Peace and Security Studies (BIPSS) provided support as a third-party organization.

eGovernment for Bangladesh: A Strategic Pathway to Success

The first project deliverable, under the title above, was a comprehensive report in the form of a published book (Imran*, et al.*, 2008) with a strategic direction for the next five years for Bangladesh. It was developed based on the findings of ongoing research and the detailed review and recommendations of the project task force.

ICT Management Handbook and Training Program: A Guide for Government Officers of Bangladesh

A comprehensive, innovative training program supported by a novel handbook was developed in collaboration with stakeholders and with pilot testing. The program is not designed to teach senior officials how to perform IT management in detail per se. Rather, it is designed to raise awareness and show them why it is important and how to administer the whole process. The course is designed with sufficient references to resource materials and a reading list to allow further pursuit of knowledge. An online resource was also established (website link http://www.ictforldc.com/PSLP/handbook.htm).

The training package includes teaching material with PowerPoint slides, exercises and quizzes with suggested answers, and videos, all of which is designed to take two days to deliver. The package is self-contained, can be re-used over multiple offerings, and can be delivered by people other than the original developers. It comprises four modules that consist of four hours of delivery each.

The package is accompanied by a handbook that is structured to match the delivery modules. Each module was developed by expert consultants in the respective areas based on research findings and best practice guides and refined to suit local conditions through consultation and extensive local involvement. The handbook is not intended to cover everything about ICT management or to be a substitute for project management training or experience, but it serves as a solid starting point for a new project manager or a quick reference guide for more experienced managers. The document templates and checklists referred to throughout the handbook are contained in a companion workbook, also provided to assist the IT manager.

The training program was presented as a two-day workshop in three offerings in October 2008 to a total of 107 participants, starting with 47 'eGovernment Focal Points', one from each of the 47 ministries. The two other offerings were delivered to mid-level government officials who are expected to manage and promote e-government in their respective ministries. Each agency was asked to nominate three to four people to attend the training programs.

Other project outputs

Some specially designed awareness posters (in Bengali) promoting an ICT-based working environment were distributed amongst the participating government officers to hang in their office premises. The coffee mug given as memento of the training program also includes an ICT awareness slogan "Use ICT to fast track your job". The posters were also distributed to government officers training institutions - the Bangladesh Public Administration Training Centre (BPATC) and the Bangladesh Civil Service (BCS) Academy.

EVALUATION AND IMPACT ASSESSMENT

Evaluation of the intervention was ongoing and took a variety of forms, including workshops in which plans for the project were presented for discussion and feedback sought from stakeholders, observation, feedback forms at the training sessions, scrutiny of reports of the program and

related material in the media, informal feedback by email and in interviews and follow-up evaluation 18 months after the project concluded. A project logbook was kept to document observations, evaluation and design decisions as they occurred.

Training workshops

The sense of engagement created by the specifically-tailored program was demonstrated by the two day-long presence and participation of very senior government officials throughout the first program offering. As is typical with senior bureaucrats in high power distance hierarchies, many senior officers indicated before commencing the first offering that they might not be able to remain for more than one or two hours. However, once the program started, none of them left; indeed, many cancelled their day's agenda by phone. Formal and informal feedback from this cohort indicated that the custom-design of the training, targeted at Bangladeshi issues and with real life case studies relevant to day-to-day government tasks, was particularly valued. The training sessions included much discussion about the application of concepts in Bangladesh at the time. Some participants from this training program have later stated that they always carry the handbook and read it whenever they get time.

For example, the following unsolicited email was provided to one of the authors after the training program was completed:

> *"The management team and facilitators devised the programme in a manner where participants found rooms for proactive participations as well as given a scope to understand the status of governmental efforts in Bangladesh at the moment and the priority areas which needed to be addressed and visited to mitigate potential gaps and/or to combat the challenges of the day. In addition, the compilation of thematic proceeds was a unique effort too which, in fact, came out with a very handy booklet. This handbook will help the participants and the ICT policy makers and process implementers in Bangladesh in performing their duties with confidence."* (pers. corr. 2009).

Comparison of pre- and post-training program survey form evaluations indicated a positive effect on understanding of ICT and confidence in their use for the participants in the program.

After the initial offering our training hosts were inundated with requests for positions on the further training program offerings, because our initial training cohort after returning to their workplaces influenced subordinates to attend the workshop. This effect multiplied after the second offering. Unfortunately, we were over-subscribed for the latter training courses by as much as a factor of three and could not service the demand.

Media Reports

The strategy received a very positive reception at the highest levels of government, made clear in the remarks of the Chief Guest at its launch, the Honorable Special Assistant to the Chief Advisor (Minister in Charge).The strategy document and its supporting project were mentioned in the Bangladeshi press a number of times and in the Australian press, indicating that we were attracting attention through our supportive counterpart organizations. The Minister for ICT was seen openly carrying his copy of our handbook to an important meeting on ICT in Bangladesh, exactly the 'handy pocket reference' status we had hoped for.

Demonstrable Outcomes

The handbook became very popular after its release. All 300 copies have been distributed with continuing demand from various part of the Bangladesh government. Many senior officers who were unable to attend the training program requested copies of the books and some bought extra copies for their department. On the basis of this popular demand, MOSICT reprinted another 500 copies of the handbook at its own cost.

A further demonstration of positive outcomes from the project is that the aid agency has funded a further phase of the project 2010-2012, again with support from stakeholders in Bangladesh.

Follow-up Evaluation from First Phase

To gauge ongoing outcomes from the first phase of the project, further evaluation was performed 18 months after its completion. Six face to face interviews with senior participants who are still in their same work role were carried out in June and July, 2010. The interviews were recorded, transcribed and analyzed using qualitative methods.

The findings demonstrate a transformation of mindset amongst senior government officials. As stated by one interviewee, the progam was the *"original sprit and encouragement for taking ICT seriously"* (Interview C, 07 July, 2010). *O*ne of the senior participants further stressed:

> *"What I feel is that, our eyes were opened in that workshop in respect of using ICT in government office, specially the managing of e-Gov in Bangladesh"* - Interview A (22 June, 2010)

A senior officer who was found actively taking a new eGovernment initiative within his ministry commented:

> *"That workshop in 2008 prompted me to think more about e-governance and thereafter we started this e-governance activity through different development projects in ....(my ministry)"*- Interview B (04 July, 2010)

The findings indicate a significant shift from the previous state where lack of knowledge was found to be one of the major hindrances to ICT adoption (Imran, 2010; Imran and Gregor, 2010).

Currently, recognition of the importance of ICT in the government sector of Bangladesh is increasing, with a number of initiatives and projects found across ministries and agencies. The new government has now an agenda for *Digital Bangladesh by 2021*. It is difficult to establish any strong causal links between one specific project like ours and a high-level change in a complex socio-technical environment. We do, however, believe that our project has made some contributions to these ICT initiatives.

ELUCIDATION OF DESIGN PRINCIPLES

In this section we present the meta-level project principles that were identified as the key factors responsible for the positive outcomes from the project. Presenting these principles and the underlying kernel theory potentially allow the specifics of this project to be usefully translated into future interventions in LDCs. The principles and kernel theory are mandatory components of a design theory as specified by Gregor and Jones (2007) and are cast in a format adapted from Lewis (2010). Table 2 shows each principle in summary form, while the rationale for each principle and its implications are given below.

Principle 1: Identify and Act on the Sweet Spot(s)

Rationale: While an intervention in an LDC is likely have a constellation of inhibitors to address, there will likely be one or two underlying causes or concerns that prevent other larger and more obvious inhibitors from being addressed. In the case of the project in Bangladesh, the key inhibitor was a lack of knowledge and the concomitant attitude towards ICT of senior decision makers in the Bangladesh public sector. If the sweet spot is identified and addressed, the remainder of the intervention will be more effective as overcoming the other inhibitors will be facilitated.

Recent literature on organizational change has independently developed the idea of the "sweet spot" (see Ehin 2009), a "nexus point" where individual or organizational efforts to address

public challenges are also building community at the same time. This concept does not, however, appear to have been previously applied in ICT4D.

Implications: The most important implication of this principle is the need to search for the primary underlying inhibitor(s) of a desired outcome in each unique LDC context and then use that inhibitor as a "point-of-leverage". This process may also surface issues that have been obscured because of superficial analysis or judgments.

Principle 2: Engage influential stakeholders

Rationale: An ambitious bottom-up approach targeting on the large population of an LDC can be less effective than a highly-leveraged one. For example, it is almost an impossible task to meaningfully target the 162 million people in Bangladesh. In the LDCs, a majority of the population are under the poverty line, deprived of education and knowledge, and are heavily dependent on government or their leaders (UN OHRLLS 2008). A top-down approach can be effective in bringing about change. A single good government decision affects millions in a LDC.

This principle is compatible with Rogers (1995) DOI where he stressed the mobilization of "opinion leaders" through whom diffusion of innovation is more likely to be successful. Scott's (2001) "institutional mechanism" (especially coercive and normative pressures) are also relevant, as they can be applied to break a status-quo and bring desired change in rigid organisations such as the public sectors in LDCs.

Implications: A key implication of this principle is that senior decision makers must be convinced of the importance of their role in the intervention, even when the ultimate effect is aimed at others (e.g.,lower-level employees, others external to the organization and citizens).

Principle 3: Tailor the Intervention to Suit the LDC

Rationale: In our project, the concept of educating non-ICT management to understand ICT was borrowed from the work of Peter Weill and colleagues at MIT Sloan (MIT, 2010) and the structure of our training program was based around the life-cycle approach to e-government of (AGIMO, 2006). These ideas, however, were tailored and adapted to suit the local context, with local case studies and pilot testing with Bangladeshi participants to ensure material was suitable. The handbook was designed to suit a felt need for a manageable and concise reference that suited the context.

Kernel theory supporting this principle comes from the work in the ICT4D literature that has shown how interventions based uncritically on practices, systems and values from one culture will likely not translate directly to another culture (for example, Avgerou and Walsham, 2000). Note, however, that ideas from developed countries **were** useful − but, they needed adaptation and tailoring to the context.

Implications: The primary implication here is that an intervention should be developed in an iterative process with continuing consultation and pilot testing. There are further implications in the need for local involvement (see Principle 4).

Principle 4: Local Knowledge is Mandatory

Rationale: The depth of local knowledge required for a successful intervention and the engagement of influential local stakeholders can likely only occur when the team includes one or more team members who are natives of the LDC. In our project, cultural sensitivity and appropriateness was facilitated because a lead researcher was a Bangladeshi. The reputation, trust and working experience of this researcher in the local context was of immense value. The key stakeholders from the counterpart organizations were also closely involved as members of the project taskforce.

The effort to include one or more team members with appropriate skills who are (or were) citizens of the target country will be rewarded by the additional sensitivity with which the research can be conducted. This is particularly important in the initial research seeking the 'sweet spot'. Often the issue that is underlying other inhibitors is culturally and even regionally specific. Such subtleties are more often recognizable by members of the culture or region than by outsiders, no matter how earnest they are.

This principle has parallels in Rogers' (1995) recommendations that change agents should have credibility and a client orientation, but goes further.

Implications: Project teams must strive to engage and involve individuals who are native to the target LDC. Keeping a high level of involvement by recipient country nationals will likely add to project costs through travel to and from the recipient country. Training in particular skills or knowledge for local team members may be a further cost.

Table 2. Sweet Spot Intervention Design Principles	
Principle 1.	**Identify and Act on the Sweet Spot(s)**
	Search for and identify the primary underlying inhibitor(s) for a desired outcome and target the initial intervention activity to address and overcome the primary inhibitor(s).
Principle 2.	**Engage influential stakeholders**
	An intervention in an LDC should seek to multiple its effect by engaging highly-influential participants.
Principle 3	**Tailor the Intervention to Suit the LDC**
	Any intervention should be tailored to address the specific requirements for the country, which are identified after careful investigation.
Principle 4.	**Local Knowledge is Mandatory**
	Intervention projects must include team members from the LDC.

Specific Project Lessons

Some additional lessons arose from the project, which although not at the level of general principles, may be useful in other work that has similar goals to ours.

Addressing the problem of the knowledge gap for senior bureaucrats was clearly necessary for this project. But such a process must be handled sensitively in a bureaucracy with a high power distance and where junior staff are often better informed because of a more recent education. Also, senior government officials in Bangladesh are stretched for time, which limits their ability to learn new innovations. So a balance was made to empower them within the shortest possible time with the required awareness, some 'quick win' tips, and checklists presented in a concise "lightweight" approach. The format of the handbook provided with the training program was deliberately set at a size that would fit into a coat pocket or handbag so that it could be carried at all times.

CONCLUSIONS

In this project we undertook an intervention in a LDC with the aim of facilitating the uptake of e-government. The project built on research that developed a causal map of interrelated factors influencing e-government adoption and identified a lack of knowledge of ICT amongst influential decision makers as a "root cause" of other inhibitors. The intervention was funded by an aid agency and was extremely modest in terms of size, project duration and amount of funding (AUD 110,000). In these circumstances, the intervention was designed to squarely address the perceived root cause of other problems and thus gain maximum effect with the available limited effort. The intervention involved a strategy analysis and a training program with support material that was targeted at senior government officers. There are indicators that the intervention had some success.

The project demonstrated the efficacy of an approach blending action research and design science. The action research aspect allowed the team to undertake the intervention and respond to local conditions and factors that could only be identified when operating 'on the ground' and in collaboration with stakeholders. The design theory aspect allowed the formulation of principles that have potential application in other situations. The approach of extracting design principles by reflection following a project matches the final step proposed by Cole et al. (2005)

to "abstract knowledge to make practical and theoretical contribution to the field" (p. 17). The work fleshes out the skeleton offered by Cole et al (2005) for an integrated action research - design science approach and can be regarded as offering a methodological contribution.

An important new idea that has been crystallized in this project is represented by our prime design principle: Identify and Act on the Sweet Spot. In this case the key barrier to progress was identified as lack of appropriate knowledge of the gains to be achieved with use of ICT and how ICT should be managed in a government organization. Building the knowledge of key influencers represented a 'sweet spot' that would promote a greater effect for the overall project. Reflection allows us to claim that preliminary research before an intervention is essential to find important points of leverage and facilitate future success. In other contexts the "sweet spot" may be different (not necessarily a lack of knowledge), but careful investigation is likely to identify 'hidden' inhibitors that represent 'sweet spots' for each specific project. We are unable to find any similar concept in the information systems literature or in the ICT4D literature. Thus, we believe that this idea is novel in theoretical terms and worthy of further investigation.

Additional principles were developed to show how the overarching principles of working on the sweet spot could be achieved. These principles rely more on established theory and knowledge. We believe, however, that the presentation of these principles **in combination** represents a contribution to a nascent design theory for interventions in a LDC. The principles together are:

1. Identify and Act on a Sweet Spot
2. Engage Influential Stakeholders
3. Tailor the Intervention to Suit the LDC
4. Local Knowledge is Mandatory.

The project has obvious important practical implications if the signs of success that we have detected are valid signals. More effective use of e-government is expected to lead to higher levels of accountability, reduced corruption and more effective systems in important areas such as health and security. Further flow-on effects to other sectors and societal benefit can also be expected.

The study does have limitations. We were unable to evaluate the training program and materials as fully as we would like. Further, action research by its nature means the researchers are

intimately involved with the subject matter of the research and their ability to step back and critically appraise the project can be limited.

We are fortunate that the aid agency has funded a further phase of the intervention to allow us to more fully evaluate our earlier work and to further refine the design theory as well as extending our activities.

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