Most e-Government-for-Development Projects Fail
How Can Risks be Reduced?

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Abstract

eGovernment can make a valuable contribution to development. However, at present, the majority of e-government-for-development projects fail either totally or partially. This paper explains the underlying cause of failure: the oversize gaps between project design and on-the-ground reality (known as 'design-reality gaps'). The dimensions of these gaps are identified, as are archetypal situations in which failure is likely to occur. The paper then provides a step-by-step guide to identifying and addressing failure risks for e-government projects. It concludes with a real-world case study of using the design-reality gap approach to reduce risks in an e-government project.

A. The Extent of e-Government Failure

eGovernment – the use of information and communication technologies (ICTs) to improve the activities of public sector organisations – brings with it the promise of greater efficiency and effectiveness of public sector operations. For this and other reasons, an increasing number of e-government projects are being implemented in developing and transitional economies.

Behind the hi-tech glamour of these projects, though, lies a dirty reality – the majority of projects are failures. To explore this further, we can divide e-government initiatives into three camps:
- *Total failure*: the initiative was never implemented or was implemented but immediately abandoned.
- *Partial failure*: major goals for the initiative were not attained and/or there were significant undesirable outcomes.
- *Success*: most stakeholder groups attained their major goals and did not experience significant undesirable outcomes.

We have very little data about rates of success and failure of e-government in developing/transitional countries, but this paper provides some baseline estimates from two sources:
- A poll in September 2002 of members of the eGovernment for Development Information Exchange, who have relevant e-government expertise.
- Analysis of more than 40 reports on e-government cases from developing and transitional countries, submitted for academic assessment at the University of Manchester.

Putting these sources together, the following working estimates are produced for e-government projects in developing/transitional countries:
- 35% are total failures,
- 50% are partial failures, and
- 15% are successes.

These failures come at a high price for the world's poorer countries, and six categories of potential costs of e-government failure can be identified:
1. *Direct Financial Costs*. The money invested in equipment, consultants, new facilities, training programmes, etc.
2. *Indirect Financial Costs*. The money invested in the time and effort of public servants involved.
3. *Opportunity Costs*. The better ways in which that money could have been spent, if it was not spent on the e-government failure.
4. *Political Costs*. The loss of 'face' and loss of image for individuals, organisations and nations involved in failure.
5. *Beneficiary Costs*. The loss of benefits that a successful e-government project would have brought.
6. *Future Costs*. An e-government failure increases the barriers for future e-government projects. It does this in two main ways. First, through loss of morale of stakeholders, particularly e-government champions, who may 'defect' to the private sector or overseas. Second, through the loss of credibility and loss of trust

in e-government as an approach to change. This increases risk aversion in some stakeholders; and provides support for others with vested interests in the status quo.

A key problem among e-government practitioners is a lack of awareness of these costs. Most costs are intangible; few are ever measured in the event of e-government failure; e-government failures are often hushed up. This may explain why, despite the high costs of failure and the high prevalence of failure, many officials and politicians are still very keen on e-government.

Here, though, we must recognise this high cost of failure, and look for ways to reduce risks. We start by understanding why so many projects fail.

B. Understanding e-Government Failure

Central to e-government success and failure is the amount of change between 'where we are now' and 'where the e-government project wants to get us'.

'Where we are now' means the current realities of the situation. 'Where the e-government project wants to get us' means the model or conceptions and assumptions built into the project's design. eGovernment success and failure therefore depends on the size of gap that exists between 'current realities' and 'design of the e-government project'.

The larger this design-reality gap, the greater the risk of e-government failure. Equally, the smaller the gap, the greater the chance of success.

Analysis of e-government projects indicates that seven dimensions – summarised by the ITPOSMO acronym – are necessary and sufficient to provide an understanding of design-reality gaps:
- **I**nformation
- **T**echnology
- **P**rocesses
- **O**bjectives and values
- **S**taffing and skills
- **M**anagement systems and structures
- **O**ther resources: time and money

Putting these dimensions together with the notion of gaps produces the model for understanding success and failure of e-government that is shown in the figure below.

Current Reality		**Design Proposal for New eGov Project**

Information ⟷ Information

Technology ⟷ Technology

Processes ⟷ Processes

Objectives and values ⟷ Objectives and values

Staffing and skills ⟷ Staffing and skills

Management systems and structures ⟷ Management systems and structures

Other resources ⟷ Other resources

Reality ⟷ **Design**

Gap
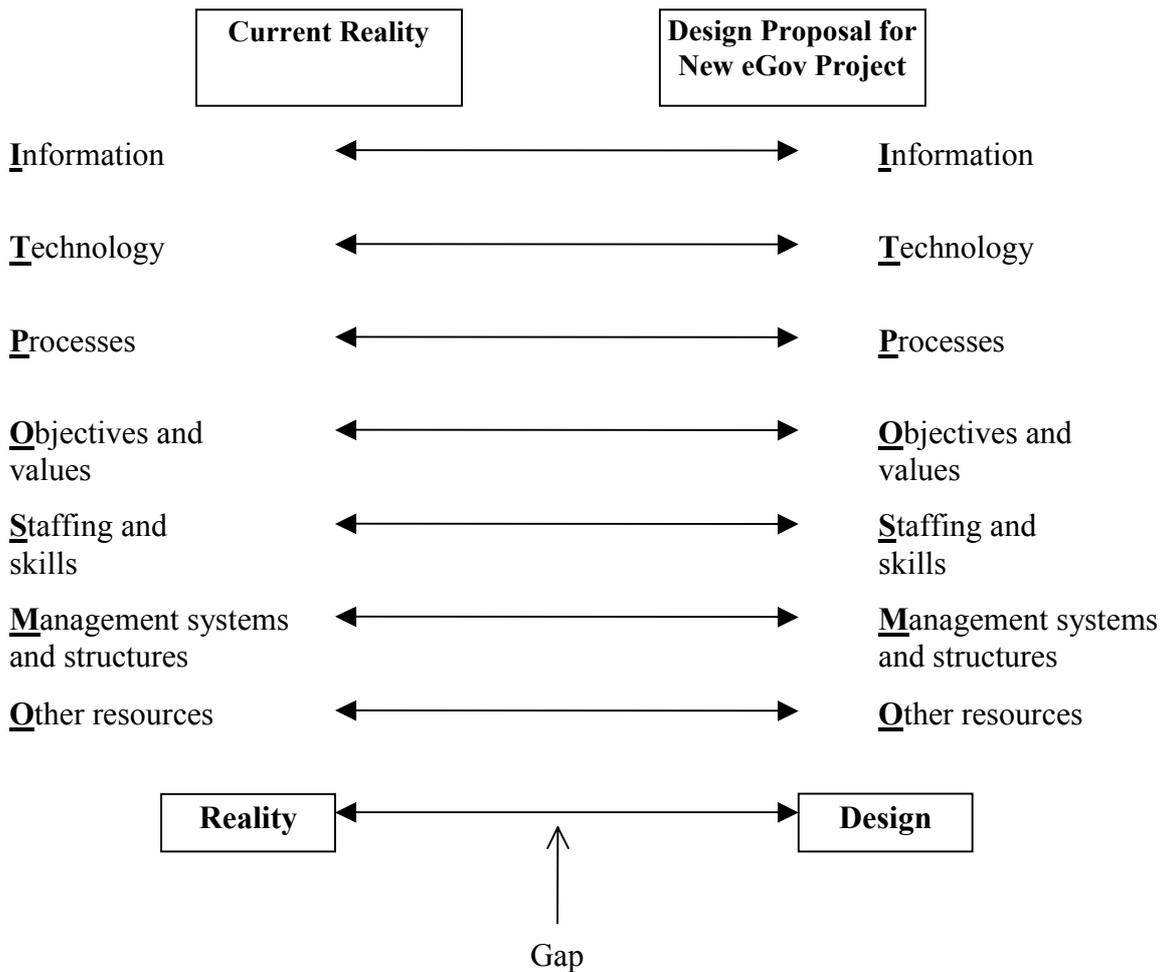
eGovernment Failure Thumbnail Sketch

A scientific information system was intended to support strategic decision making in a Natural Resources Ministry in East Africa. There were gaps between system design and Ministry reality, along dimensions including:

- *The information dimension*: the system design assumed that its creation of formal strategic information would be of value to Ministry functioning. In reality, informal information and gut feelings were what decision makers valued and used.
- *The process dimension*: the system design assumed that a rational model of structured decision-making held sway within the Ministry. This mismatched the dominant reality of personalised, even politicised, unstructured decision-making.
- *The objectives and values dimension*: the system was designed within, and reflecting, a scientific environment which had a 'role culture' that valued rules and logic. In reality, it was to be used in a political environment which had a 'power culture' that valued self-interest and hidden agendas.
- *The management systems and structures dimension*: the system was designed for an organisation that had both structures and systems to support strategic decision making. In reality, such structures and systems did not exist within the Ministry.

All of this means that there were significant design-reality gaps. The result was failure: the system produced information, but this information was largely ignored by decision makers.

Design-Reality Gap Archetypes of eGovernment Failure

eGovernment failures come in more varieties than Heinz. However, archetypes of failure do exist: situations when a large design-reality gap – and, hence, failure – is more likely to emerge.

Hard-Soft Gaps. How do we think about ICTs? Often in terms of machinery and engineering, rationality and objectivity. Many e-government systems get designed according to these notions. The trouble is, many government organisations do not adhere to these 'hard' ideas. In reality, they are dominated by 'soft' factors: people, politics, emotions and culture. When a hard e-government design meets a soft reality, there is a large gap, and a strong likelihood of failure.

Private-Public Gaps. Despite the best efforts of some, the public sector remains fundamentally different from the private sector. Yet too many IT firms, IT consultants, government officials et al. forget this. They pick up an information system designed for the private sector. Then they try to shoehorn it into a very different public sector reality. This is a classic case of square pegs and round holes. The large design-reality gap generates lots of heat and noise, not much light and, ultimately, plenty of failure.

Country Context Gaps. It sometimes seems only the first half of 'Think Global, Act Local' gets remembered. Governments, donors and consultants seeking quick fixes for development try to pull solutions off-the-shelf from other countries. But New Delhi is not New York, and Lusaka is not London. So there is often a large design-reality gap when you try to introduce in a developing/transitional country an e-government system designed in and for an industrialised nation. Partial or total failures are the frequent result.

C. Addressing eGovernment Failure

If you can reduce the gaps between design and reality, you can reduce the risk of e-government failure. How should this be done? The following steps give an overall guide.

Step 1. Assess Design-Reality Gaps

Assessment consists of questions relating to the seven 'ITPOSMO' dimensions, with attached rating numbers.

1. Using each of the seven ITPOSMO dimensions in turn, analyse two things. First, the organisational reality relating to that dimension that exists right now at the time of

analysis. Second, the conceptions/requirements within the design of the e-government application.

2. For each one of the dimensions, give a numerical rating to indicate the size of the design-reality gap on that dimension. The rating for each dimension's gap can be anywhere on a scale from zero to ten. As a guide, illustrations are just given here for gaps corresponding to ratings of zero, five and ten, but all numbers in the range are possible. Illustrative ratings:
- 0 rating would indicate 'no change between the design proposal and current reality';
- 5 rating would indicate 'some degree of change between the design proposal and current reality';
- 10 rating would indicate 'complete and radical change between the design proposal and current reality'.

3. Thus, for example, taking the first dimension – information – 0 would indicate that the information used in the e-government application was exactly the same as the information currently really being used in the organisation. 5 would indicate that the information used in the e-government application was somewhat different from the information currently really being used. 10 would indicate that the information used in the e-government application was completely and radically different from the information currently really being used.

The other six dimensions to be rated from zero to ten are:
- the technology used in the agency (comparing the requirements contained within the design of the e-government application vs. the real situation now);
- the work processes undertaken in the agency (comparing the processes needed for successful implementation of the e-government application vs. the real situation now);
- the objectives and values that key stakeholders need for successful implementation of the e-government application vs. their current real objectives and values;
- the staffing numbers and skill levels/types required in/by the agency (comparing the requirements for successful implementation of the e-government application vs. the real situation now);
- the management systems and structures required in the agency (comparing the requirements for successful implementation of the e-government application vs. the real situation now);
- the time and money required to successfully implement and operate the new application compared with the time and money really available now.

Presenting the Results

The simplest and crudest thing you can do is add up the rating numbers for all seven ITPOSMO dimensions and interpret them according to the following table.

Overall Rating	Likely Outcome
57 – 70	Your e-government project will almost certainly fail unless action is taken to close design-reality gaps.
43 – 56	Your e-government project may well fail unless action is taken to close design-reality gaps.
29 – 42	Your e-government might fail totally, or might well be a partial failure unless action is taken to close design-reality gaps.
15 – 28	Your e-government project might be a partial failure unless action is taken to close design-reality gaps.
0 – 14	Your e-government project may well succeed.

In addition, the scores for each individual dimension can be presented using a table or a diagram arranged to show the gaps in size order from largest to smallest.

Variations on the Basic Technique

1. Who does it
These seven rating scales can be used by a single individual, such as a project consultant or project manager, to help them with their own understanding and recommendations. Alternatively, a more participative approach can be used. The seven scales can be presented to a group of key project stakeholders in a facilitated workshop. The stakeholders discuss and rate each dimension. The main problematic design-reality gaps are identified. The workshop would then move on to work out how best to close those gaps (see guidance below on gap reduction).

2. Weighted dimensions
The basic technique makes a questionable assumption – that all dimensions/gaps are equally important to the success and failure of the project. A more complex variation would involve two rounds. In the first round, the risk assessment team would assign a weight to each of the dimensions. An 'ordinary' dimension might be given a weight of 1; a dimension that was considered 'important' in the particular e-government project could be given a weight of 2; and a dimension that was considered 'very important' in the particular project could be given a weight of 3. The weighting score would be multiplied by the rating to give an overall set of weighted ratings. For example, if 'objectives and values' were felt to be very important for this specific project, that dimension could be given a weight of 3. If the design-reality gap on that dimension was estimated to be only moderate, it could be given a rating of 5. The overall weighted rating for that dimension would be 3 x 5 = 15.

From experience, the objectives and values dimension should be given a higher weighting than other dimensions because it incorporates key elements such as politics, culture, self-interest, motivation, and the aspirations that a whole variety of different stakeholder groups seek to achieve from the new e-government system.

3. More complex dimensions
The use of just seven rating scales is very much a 'blunt instrument'. A more sophisticated – also more time-consuming – approach is to break each main dimension down into a series of sub-dimensions. Each sub-dimension is then allocated its own rating scale. For instance:
- The 'technology' dimension could be broken down into three sub-dimensions: software, hardware and networks.
- The 'staffing and skills' dimension could be broken down into one sub-dimension for each significant staff grouping involved and/or one sub-dimension for each of the six key e-government competencies (strategic, change/project management, information systems development and management, hands-on, interpersonal, 'intelligent customer' (contracts, suppliers, procurement)).

Such sub-dimensions can either be pre-set or they can be determined within a facilitated workshop. In the latter case, sub-dimensions can be attuned to particular organisational contexts.

4. Creating your own dimensions
This 'attuning' just mentioned can go further: stakeholders can use the seven suggested ITPOSMO dimensions merely as a starting point for discussion, and can then develop their own particular dimensions and sub-dimensions that are seen to be relevant to the specific context. Design-reality gaps can then be assessed for each one of those dimensions/sub-dimensions.

5. Incorporating drivers
Design-reality gaps can be thought of as constraints or risks to implementation of an e-government project: they give a sense of what may make the project fail. They may not give a good sense of what may make the project succeed: the drivers. The drivers can be analysed as well, and illustrated alongside the gaps/constraints/risks using a force-field diagram with drivers on one side and constraints on the other.

6. Process as the focus
In the basic and variant approaches described above, two things can be borne in mind:
- The outcome: a sense of gap between design and reality.
- The process: the deeper understanding – of reality, of design, of other stakeholders – that gap analysis creates.

In some situations, the process may be more valuable than the outcome. It may then be appropriate to take a more iterative, learning approach to gap analysis. Here, stakeholder groups revisit gap analysis at regular intervals during the project cycle. They reflect on the dimensions selected, the ratings and the closure techniques. They also reflect on what has been learned about the project and the e-government implementation process.

Step 2. Determine Action

If you have a significant overall design-reality gap, you should take action since you may be heading for failure. If you have a significant design-reality gap on a particular dimension, you should take action since this may cause you problems. Assessing whether a gap is 'significant' is a matter for discussion, debate and judgement. However, an overall gap of more than about 20, and an individual dimension gap of more than about 5 could give cause for concern.

"Taking action" means either:
1. Changing the design of the e-government project to make it more like reality, and/or
2. Changing current reality to make it more like the assumptions/requirements within project design.

Selected techniques will, of course, depend on which dimension(s) the gap occurs. Take the example of a financial gap along the 'other resources' dimension. This gap could be reduced by scaling-down the project remit and thereby reducing cost (design change).   Or it could be reduced through public—public or public—private collaboration that increases the supply of available finance (reality change).

A sample of gap reduction techniques is presented in more detail below. Some techniques are *generic*: they relate to one or more ITPOSMO dimensions. Other techniques are *specific*: they relate to one specific dimension.

In selecting a technique for a particular project, practitioners should ensure that the technique is not only desirable but also feasible. There is no point considering techniques that could reduce risks in theory, but not be implemented in practice.

Step 3a. Generic Gap Reduction Techniques to Reduce the Risk of eGovernment Failure

i. Legitimising and mapping current reality. To succeed in e-government – and to properly identify design-reality gaps – you have to understand current reality. Yet this may be difficult to achieve. eGovernment leaders can help by 'legitimising reality': by encouraging stakeholders to express the difference between prescriptive models of what they <u>should be</u> doing, and real depictions of what they <u>are actually</u> doing.

Techniques for exposing and mapping organisational realities play a role here. Self- and third party observation helps expose realities. Use of soft systems tools such as 'rich pictures' helps map realities. Prototyping helps both, particularly helping users to understand their real information needs.

ii. Customisation to match realities. In the 1970s and 1980s, government was rebuked for reinventing the wheel by custom-building each IT solution from scratch.

In the 2000s, the pendulum has swung too far the other way. Government agencies in developing/transitional countries too readily try to install ready-made digital solutions that have been designed for private sector firms and/or for organisations in other countries. As described above, this can represent a failure archetype.

To combat such problems, managers of e-government projects must be competent enough and confident enough to demand designs that match their government's unique reality. The keywords for such projects must be 'customised' not 'off-the-shelf'; 'adapt' not just 'adopt'.

In many cases, this will require national and/or sectoral and/or in-house e-government development capacities to be strengthened. This will also affect selection of software vendors and developers. One key criterion will be their demonstrable willingness and ability to understand client contextual realities and to customise e-government systems accordingly.

iii. Client—vendor relationship management. The squeeze on public sector skills and cash means that e-government projects are increasingly outsourced to the private sector. This can exacerbate the traditional gulf between developers and clients, by stirring in an additional clash of culture and values. Gaps between vendor design and client reality readily emerge.

To reduce these design-reality gaps, much more attention needs to be paid to active management of the client—vendor relationship. Successful e-government projects are adopting innovative approaches to build mutual understanding and shared objectives. Gap reduction techniques include vendor shadowing of key client staff, joint team-building events, joint profit sharing and open book accounting.

For government, this heightened focus on supplier relationship management means the development of new skills and roles, including relationship building, contract facilitation, contract monitoring and vendor development. It also means a renewed emphasis on other roles that must remain in-house such as strategic management, business analysis and change management.

Modularity

10
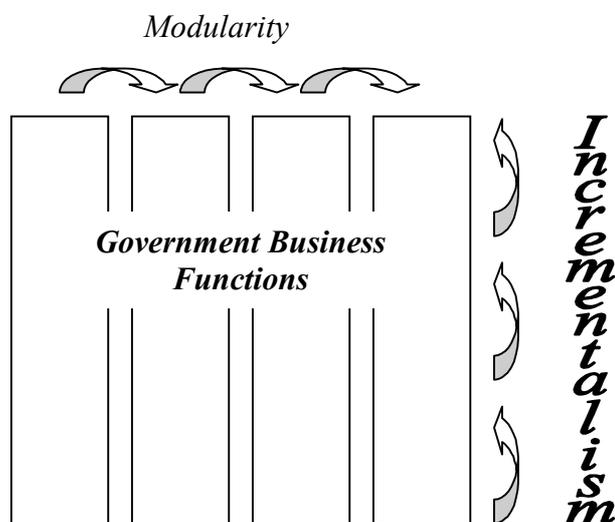
iv. Step-by-step: modularity and incrementalism.   The bigger and bolder the e-government project, the greater the risk of failure. Developers must reconfigure such projects to limit the extent of change (i.e. of design-reality gap) at any given time.

Stretching project time horizons is one technique. There is also a growing consensus behind modularity (supporting one business function at a time) and incrementalism (providing stepped levels of support for business functions) within e-government projects (see figure above).

v. 'Hybrids' and 'tribrids'. Design-reality gaps often arise in e-government because of a 'two tribes' mentality that afflicts most developing/transitional economy governments. IT designers understand technology but not the realities of government. Public officials and politicians understand the realities of government but not the technology.   To close these gaps, projects need to develop and use 'hybrid' professionals, who understand both perspectives. We might even call them 'tribrids' (see figure below), because they combine three aspects: understanding the technology *and* the business of government *and* the role of information in government.
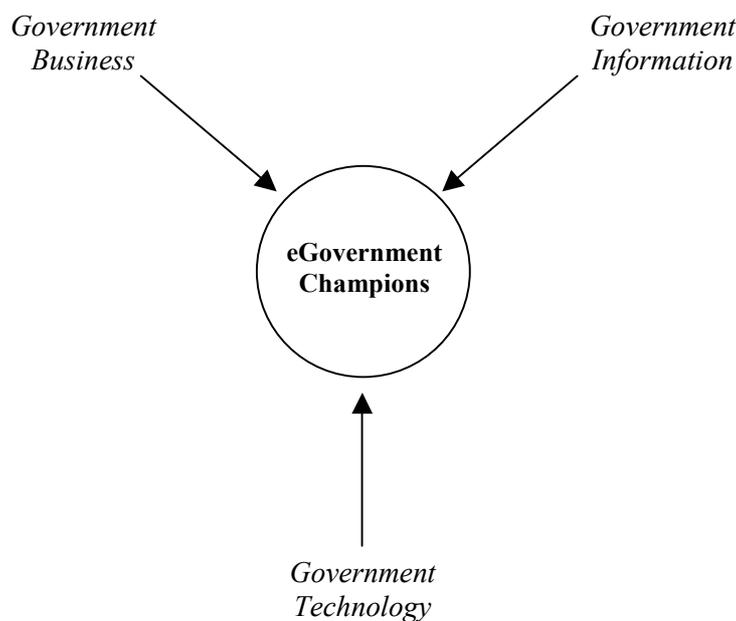
vi. Scope limitation: KISS and automation. eGovernment projects sometimes fail because they try to change too many things at once. One way to address such over-large design-reality gaps is to cut down the scope and ambition of the project design; sticking with the valuable design motto 'KISS': *Keep it Small and Simple.* One way to incorporate KISS is by trying to freeze all except the technology dimension. How? By simple automation of existing activities. The intention is to retain the same information, same processes, same management systems and structures, etc., but merely change them from manual to computerised operations. In other words, you attempt to create no design-reality gap (no change) on most ITPOSMO dimensions. Although criticised in hindsight as being insufficiently bold, simple automation can be a very good – and successful – way to institutionalise new technology in a particular aspect of public sector operations.

vii. Reality-supporting not rationality-imposing applications. There is a continuum of e-government applications, as shown in the diagram below. At one extreme, there are 'rationality-imposing applications', such as decision support systems. These include in their design a whole series of assumptions about the presence of rational information, processes, objectives and values, management structures, etc. These rationalities must either be present in the organisation as a pre-condition for successful implementation of this application, or they must be imposed. In many government organisations, the introduction of such applications will not succeed because of the large gap between the application's required rationalities and current organisational realities.

At the other extreme, there are 'reality-supporting applications' such as word processing or email. By comparison with rationality-imposing applications, reality-supporting applications require fewer rational pre-conditions or impositions. They can therefore work successfully in a wider variety of government organisational situations. eGovernment projects will therefore be more likely to succeed if they focus on 'reality-supporting' rather than 'rationality-imposing' applications.

<table>
<tr><td>Supporting
Organisational
Reality</td><td></td><td>Requiring/Imposing
Organisational
Rationality</td></tr>
<tr><td colspan="3">**Continuum of eGov Applications**</td></tr>
</table>

Step 3b. Dimension-Specific Gap Reduction Techniques to Reduce the Risk of eGovernment Failure

i. Information dimension.
- Undertake a professional requirements analysis in order to draw out true information needs of stakeholders.
- Use prototyping – getting users to use a test version of the e-government application – in order to help them explain what information they really need.

ii. Technology dimension.
- Investigate ways in which government reforms could be delivered without ICTs.
- Investigate ways in which government reforms could be delivered using the existing ICT infrastructure.
- Avoid leading-edge technologies in your design.
- Investigate opportunities for use of donated or recycled equipment.

iii. Process dimension.
- Keep doing things the same way, only with the addition of some new technology (see generic point above about automation).
- Avoid business process reengineering; instead, at most, look at optimisation or minor modification of existing processes within the e-government application design.
- Consider a two-stage approach: in the first stage, processes are optimised without any change to ICTs; in the second and later stage, new ICTs are brought in.

iv. Objectives and Values dimension.

- Use rewards to alter stakeholder objectives and values (e.g. messages of management support, better pay, better working conditions, career advancement, etc.).
- Use punishments to alter stakeholder objectives and values (e.g. threats, reprimands, transfers, worsened pay and conditions, etc.).
- Communicate with stakeholders about the system: sell the true benefits and address the true negative aspects.
- Get key stakeholders (those regarded as key opinion formers or those vociferous in their resistance to the e-government application) to participate in the analysis and/or design of the e-government application.
- Base e-government application design on a consensus view of all main stakeholders.
- Use prototyping: this helps incorporate stakeholder objectives in the design, and also helps to make actual stakeholder objectives more realistic.
- If feasible in skill, time and motivational terms, get users to help develop and build the e-government application.

v. Staffing and Skills dimension.

- Outsource contracts in order to improve the current reality of available competencies (though this may increase other gaps).
- Train staff to improve current reality of competencies.
- Improve recruitment and retention techniques to reduce competency (staff) turnover.
- Make use of external consultants (though this may increase other gaps).
- Hire new staff to expand the volume of current competencies.

vi. Management Systems and Structures dimension.

- Make an explicit commitment to retain the existing management systems and structures within e-government application design.

vii. Other Resources dimension:

- Prioritise e-government applications that maximise revenue generation for government (e.g. those dealing with tax, fees, fines, etc).
- Seek additional financing from donor or central government agencies.
- Take out loans from private sector institutions.
- Get private firms to develop, own and operate the e-government application.
- Charge business or wealthier users of the e-government system.
- Scale-down ambitions of the e-government project.
- Extend timescales of the e-government project.
- Negotiate central/shared agency IT agreements to reduce hardware and software costs.
- Use 'one for all' contracts that are reusable.
- Use project management techniques to reduce waste and delays.
- Outsource contracts in order to reduce time (and possibly costs) gaps.
- Make use of open source software (though cost savings are often less than anticipated).

D. Case Study Example

This case study illustrates use of the design-reality gap approach in relation to computerisation in a national Epidemiology Service based in Central Asia. It is the job of the Service to provide plans, reports and programmes about a variety of disease and public health issues.[1]

Application Description

The application was the planned introduction of computers into the Epidemiology Service to replace the previously-manual processes of gathering, processing, storing and reporting disease and public health data. The main software was a series of packages for registration and analysis of various specific diseases and public health risks. These created a single common computer-based information system with local, regional and national databases that relied on common data items.

Application Drivers

Within the Epidemiology Service, there was a general awareness that the existing information systems did not allow the Service to monitor and analyse current health trends properly, or to make public health decisions in an effective and timely manner. Thus, top managers within the Service were a key driving force behind the application as they sought improvements in the Service's performance. There was also general external support for the programme, with the President wedded to modernisation of the public sector, and with citizens – becoming used to growing democratic processes in the country – voicing demands for better information and better health services more generally.

Stakeholders

The project was initiated by senior managers of the Epidemiology Service, and agreed by staff of the Ministry of Health. Key users were most staff at all levels within the Epidemiology Service – managers, health specialists, statistical specialists, and (later) information systems personnel, and external users in various ministries, local authorities, research institutions and international organisations. Ordinary citizens were the ultimate source of much of the data, and also the ultimate intended beneficiaries of the project.

Design-Reality Gap Analysis

Design-reality gap analysis compared the assumptions/requirements within the application design with the reality pertaining just before that design was implemented along the seven 'ITPOSMO' dimensions:

- *Information*: the design built on the pre-existing data items and systems within the Epidemiology Service but altered these to create an updated and rationalised set of data classes, and a new set of data capture forms. This created a medium design-reality gap on this dimension. Gap score: 5.
- *Technology*: the design assumed the use of a broad range of software and hardware, with two PCs per statistical department in all the offices of the Service. The initial reality was manual operations: paper supported by typewriters, phone,

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[1] This case was prepared with the assistance of Valeriya Krasnikova.

fax and post. This created a large design-reality gap on this dimension. Gap score: 8.5.

- *Processes*: the design assumed automation of pre-existing Epidemiology Service processes with some amendments made to the way in which data was gathered, processed, stored and output – with many previously human processes (including checking and retyping of figures) being altered to computerised processes. Almost all of the key public health decisions were to remain as they did prior to computerisation (only assumed to be made more efficiently and effectively). This created a medium design-reality gap on this dimension. Gap score: 5.

- *Objectives and values*: the design assumed that the objectives of the project (automation of processes, better decision-making) were shared by all stakeholders. In reality, prior to computerisation, most senior officers supported these objectives, since it was they who had initiated the project. However, most staff within the statistical departments initially opposed the system; they feared changes in their working patterns and they feared job losses. Overall, there was a medium design-reality gap on this dimension. Gap score: 5.

- *Staffing and skills*: the design made two significant assumptions. First, it assumed the ongoing presence during and after implementation of a cadre of staff with strong IT and information systems skills. The initial reality was that no such staff existed in the Epidemiology Service. Second, it assumed a reduction by 50% in the numbers of staff within the statistical departments since human intervention in many data-handling processes would no longer be required. Clearly, this was significantly different from the initial reality before computerisation. The design also assumed the addition of some new skills, but no other changes in large numbers of jobs within the Service. Overall, this created a medium/large design-reality gap on this dimension. Gap score: 7.

- *Management systems and structures*: the design proposed some cosmetic changes to pre-existing structures, with the statistical departments being renamed information systems departments. Otherwise, though, the Epidemiology Service's systems and structures were designed to remain as they were at the point of initial reality. Overall, this created a small design-reality gap on this dimension. Gap score: 1.5.

- *Other resources*: there were fairly generous allowances for the project timescale – approximately two years – within the overall design that mapped well onto the availability of personnel. The overall design budget called for expenditure of around US$1.1m, but this was seen as being likely to be roughly matched by staff cost savings in the statistical department. This meant an overall small design-reality gap on this dimension. Gap score: 1.5.

- *Overall*: there was an overall medium design-reality gap in this case. Total gap score: 33.5.

Design-Reality Gap Reductions During Implementation

As suggested in the table above, a medium/33.5-score design-reality gap may well bring some problems for an e-government application.

However, the Epidemiology Service took actions during the implementation process that helped to reduce the size of the gaps:

- The automated system was prototyped with various groups of staff. This led to alterations in design elements to ensure they were closer to the real objectives/vision of those staff members; it enabled the active involvement of staff

in the project, causing some of their real objectives and values vis-à-vis the system to come more into line with those anticipated within the design; and it reduced the time required to implement the package, bringing it even closer to the reality of time that was available.

- The Service's Human Resource department organised a promotional campaign on behalf of the new system, informing all staff about its function and value. They created a set of personal reward/motivation plans. They prepared a set of job positions for those displaced who did not wish to leave the Service. All of these helped alter the reality of staff objectives and values held about the system, particularly staff within the statistical departments. These objectives and values came more into line with those required within the automation system's design.

- The HR department also organised a series of training activities, and supported production of a good set of guidance documentation on the system. Both of these brought the reality of staff skills and other competencies more into line with the design requirements.

As a result, what was judged to be a medium design-reality gap at the start of the implementation process had been reduced to a small/medium design-reality gap later in the implementation process.

Evaluation: Failure or Success?
The overall computerisation project was largely successful, as might well be expected with a small/medium final design-reality gap implemented over two years.

The project was completed within time and within budget. All of the installed software systems are in frequent use within the Epidemiology Service itself, though usage rates by external users are lower. There has been a small but consistent and significant increase in usage of data provided by the Service. Perhaps most importantly, the system can be credited with a key role in disease control. For example, shortly after the system's introduction in 1997 a rise in diphtheria cases was detected via the system. Coverage of the vaccination programme was strengthened, and revaccination was organised. By 2000, coverage levels had risen from an average 88% to 99%, and diphtheria case levels had returned to their historical norm. Such actions were possible with the manual system, but automation reduced the decision-making period from 15 to 2 days, and also helped cut costs by allowing better prioritisation, planning and targeting of vaccination.

The only reported problems faced by the project have been constraints due to some rather outdated PCs being included in the installation, and conflicts that initially arose between health/epidemiological staff and IS staff, including conflicts at management level. Of course, those staff who were displaced from the statistical departments might well have a different opinion about the application, and not rate it as 'largely successful' from their perspective.

Conclusions on Design-Reality Gaps
One of the good practices of this project was that it was participative, ensuring that the design and implementation process involved a broad range of stakeholders. Information needs analysis covered managers, statistical officers, and external users to ensure a small gap between designed and actual information needs. The project was guided by a mixed team of epidemiological and information systems specialists,

ensuring that design elements such as processes or skill requirements did not fall too far out of line with existing realities in the Epidemiology Service. As well as this generic good practice, other specific gaps recognised early in the project were later reduced in order to increase the chances of project success.

Overall, the case demonstrates the applicability and value of the design-reality gap approach. This approach, if more widely used, offers the opportunity to address the chronically-high failure rate of e-government-for-development projects.