Factors Affecting the Successful Implementation of ICT Projects in Government

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Abstract: A government is a huge and complex organisation, whose operations and strategic focus could be greatly enhanced by the well focussed application of Information and Communication Technologies (ICT) to support improvements in productivity, management effectiveness and ultimately, the quality of services offered to citizens. While the benefits of ICT in government cannot be disputed, there are several concerns about its success as well as the strategies to be adopted in implementation of systems in various countries. In this paper, the characteristic challenges that developing nations face, which make ICT implementation in government fail to succeed are identified and synthesised. The paper presents results of literature review of case studies from both developed and developing countries and preliminary studies grounded in the Kenya e-Government reality. The key factors are identified, synthesised and categorised under common broad categories. This results in a rich picture of ICT implementation experience that helps to identify possible solutions. A descriptive framework for categorising key factors in ICT implementation in government illustrated with references to the literature is proposed. The input variables are categorised into factors for success (drivers and enablers), and factors for failure (barriers and inhibitors). The output variables are categorized into organisational and technological benefits. Finally, an action for success is proposed. This action includes suggestions for increasing the impact of factors for success while reducing the impact of factors for failure and use of available good practice.

Keywords: Government informatics, ICT projects implementation, e-Government, information system, ICT success and failure

1. Background

With the emergence of information and communication technologies (ICTs), and e-Government, it is possible to improve efficiency and effectiveness of internal administration within government and to re-locate government service from government offices to locations closer to the citizens. Examples of such locations are cyber café', telecenters or a personal computer at home or office. While the benefits of ICT in government cannot be disputed, there are several concerns about its success as well as the strategies to be adopted in implementation of systems in various countries. This paper therefore presents the findings of a literature review, knowledge acquired from reviewed case studies from developing countries and a preliminary study grounded on Kenyan government. The paper considers the characteristic challenges that developing nations face, which make ICT implementation in government fail to succeed. A descriptive framework for categorising key factors in ICT implementation in government and an action for success are proposed. The action for success is presented as response to situation specific challenges.

Informatics is a bridging discipline that is fundamentally interested in the application of information, information technology and information systems within organisations. Informatics is therefore the study of information, information systems and information technology applied to various phenomena (Beynon-Davies 2002). Following this definition of informatics, government informatics can be defined as the *application of information, information systems and information technology within government*. This therefore includes application of e-Government which is "primarily to do with making the delivery of government services more efficient" (Bannister, Remenyi 2005).

In support of government informatics, Tapscott (1995, p.xv) argues that ICT causes a "paradigm shift" introducing "the age of network intelligence", reinventing businesses, governments and individuals. Ndou (2004, p.2) quoting Kaufman (1977) observes, "the traditional bureaucratic paradigm, characterised by internal productive efficiency, functional rationality, departmentalisation, hierarchical control and rule-based management is being replaced by competitive, knowledge based requirements, such as: flexibility, network organisation, vertical/horizontal integration, innovative entrepreneurship, organisational learning, speed up in service delivery, and a customer driven strategy, which emphasise coordinated network building, external collaboration and customer services" all of which are supported by ICT.

1.1 e-Governments initiatives

According to Kaul and Odedra (1991) governments around the world have been engaged in the process of implementing a wide

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range of (ICT) applications. Countries have been classified by the United Nations according to their Computer Industry Development Potential (CIPD) as advanced or less developed Mgaya (1999). Advanced include, for example, the United States, Canada, West European countries and Japan; less developed include for example Argentina, Brazil, India, Mexico, Kenya and Bulgaria. For all countries, use of ICTs for government reinvention is increasing not only in investment but also in terms of visibility with a number of high-profile initiatives having been launched during the 1990s. According to Heeks and Davies (2000), this reinvention has taken place especially in the advanced countries. Western countries are convinced that the information society will result in economic and social benefits (Audenhove 2000). The author quoting Organisation for Economic Cooperation and Development, notes that information infrastructures are expected to stimulate economic growth, increase productivity, create jobs, and improve on the quality of life. Heeks (2002) observes that there is a big difference between ICT implementation and use between developed and developing countries. However, Westrup (2002) observes that similarities can also be expected. These similarities include funds which are never sufficient, bureaucracy and user needs. The difference is how problems are addressed in different countries. It can be argued that, with their adequate resources and advanced technology, the Western countries have an easier way of implementing ICT projects than DCs. Most developing countries are characterised by limited computer applications in the public sector, inadequate infrastructure and shortage of skilled manpower (Odedra 1993). Odedra (1993, p.9) notes that "this situation exists not merely due to lack of financial resources, but largely due to lack of coordination at different levels in making effective use of the technology". This uncoordinated efforts can only result in duplication if each department implements its own ICT projects without due regard to compatibility within the government.

2. ICT Implementation in Government of Kenya

Over the last five years, the Kenyan government has initiated some capital investment towards set up and installation of ICT infrastructure. Funding for these investments is achieved through partnerships between the government and development partners. The foreign funding component constitutes the largest percentage of this investment in terms of technology. The government contribution is usually in the form of technical and support staff and facilities including buildings.

So far, the Government Information Technology Investment and Management Framework is connecting all ministries to the Internet under the Executive Network (Limo 2003). The government is also connecting the ministries to run integrated information systems for example the Integrated Financial Management Information System (IFMIS) and the Integrated Personnel and Pensions Database (IPPD).

While developing countries may have similar characteristics, the Kenyan context presents various challenges that affect the successful implementation of ICT projects.

Characteristics that define Kenyan ICT environment:

- Most ICT projects are initially donor funded.
- Some donations are made without prior consultation or carrying out a needs analysis by the recipient organization
- Operational/running costs are met by the government. Funding (capital and human resource requirements) ends with the project phase.
- The budgets for ICT are inadequate but rising.
- A lack of ICT policies and master plans to guide investment. To the extent that, with a number donors funding ICT, there have been multiple investments for the same product due to lack of coordination.
- A focus on ICT applications that support traditional administrative and functional transactions rather than on effective information processing and distribution within and without government departments;
- Unstable ICT resources.

This paper therefore helps to answer the following questions:

1. What critical factors or variables can be identified as important in terms of their effect on ICT project implementation in government?
2. Are there common variables and can the variables be synthesised and categorised under common broad categories for specific action to be taken?
3. Does the resulting analysis of the data lead to a framework that enables analysis and understanding of the ICT implementation experience in Kenya and can it help to identify problems and solutions?
4. Does this in turn result in a framework that can be used to guide ICT

implementation in Kenya and other developing countries?

5. Does the resulting framework build on previous frameworks either in terms of its applicability to real life situations, its inclusive nature, its cohesiveness, and its ability to generate questions for further research?

The research strategy envisaged is close to one used by Doherty, King et al. (1998), since the objectives are partly confirmatory but primarily exploratory. The strategy involves use of in-depth interviews, observation and documentary review. This approach provides new insights, grounded in the Kenya e-Government reality, into factors that contribute to the success or failure of ICT projects. It also shows the relationship between the adoption of good practice during implementation and the resultant level of success attributed to the operational systems. The methodology envisaged therefore has two dimensions, one theoretically based on ICT literature; and the other analytically based on case studies. This paper therefore includes knowledge acquired from a literature review and a preliminary investigation grounded in Kenya.

Figure 1 presents a research framework constructed from these preliminary studies. The framework specifies the area of research interest and shows how ICT implementation success affects ICT facilities quality and information system quality. In turn ICT facilities quality and information systems quality affect the perceived benefits. An ICT project implementation can only be perceived to have succeeded if the perceived benefits are realised. ICT facilities quality can be assessed after careful evaluation of the infrastructure to determine technical functionality. For example if the facilities were for networking different departments, the question may be whether this has been achieved successfully. This will involve a technical and user evaluation of the functional communication systems. Information system quality can only be determined by evaluating the information they generate. For example if the information is for budgeting purposes, the question might be whether the information system can generate accurate and timely financial information.

Perceived benefits are the end products that can be used to judge the success of the whole system. If the perceived benefits like easier communication, networking, and system integration, timely, relevant, complete and useful information are not realised, then the system will be perceived to have failed. Attributes of each component are shown for clarity and focus.Planning and Implementation of ICT projects

A familiar maxim says, 'if you cannot plan it, you do not do it'. Another maxim says, 'I never planned to fail, I just failed to plan'. Planning spans a whole project period. It begins once the project planning activities determine the organization's strategy and identifies the ICT projects. Within the framework of a few fixed constraints, project plans evolve with the lifecycle. The constraints are time and money so each project has a clear deadline and a tight budget.

According to Moran (1998, p.39), plans fall into one of the two categories: vision without substance and a budget without vision. The identified problems of vision without substance are vagueness of future vision, lack of institutional vision, current position and time. Identified issues of budget without vision are questions as to what problem is being solved, what are the priorities and definition of the roles and responsibilities. With ICT projects being advocated for and financed by donors, budget without vision is likely to be the project plan. Maciaszek (2001, p.10) has suggested some planning models and methods for ICT implementation. Further, Aineruhanga (2004) observes that planning as a tool can help in reducing waste by identifying the pre-requites conditions for successful ICT implementation rather than "rushing into a complex e-Government strategy without having first finalized a national ICT policy".

Three reasons are identified for poor project planning in organisations. These are; risk management had not been addressed, business systems had not been justified to the full and lack of involvement from management Knott and Dawson (1999). These can be taken as the major reasons but are not exhaustive. This is due to the diversity of the implementation environments. Also, as noted by Bannister and Remenyi (2000), p.1), when it comes to complex decisions, managers often rely on methods which do not fall within the traditional boundaries of so-called rational decision making. It is observed that managers sometimes base decisions on 'acts of faith, gut instinct or blind faith' (referred to as strategic insight). As noted by Harindranath (1993), though developing countries commit a sizable amount of economic resources to ICT, for them to reap maximum benefits, ICT needs careful planning and coordination prior to implementation and use otherwise trial and error methods of implementation that characterise most government ICT applications will only succeed in the wastage of scarce resources

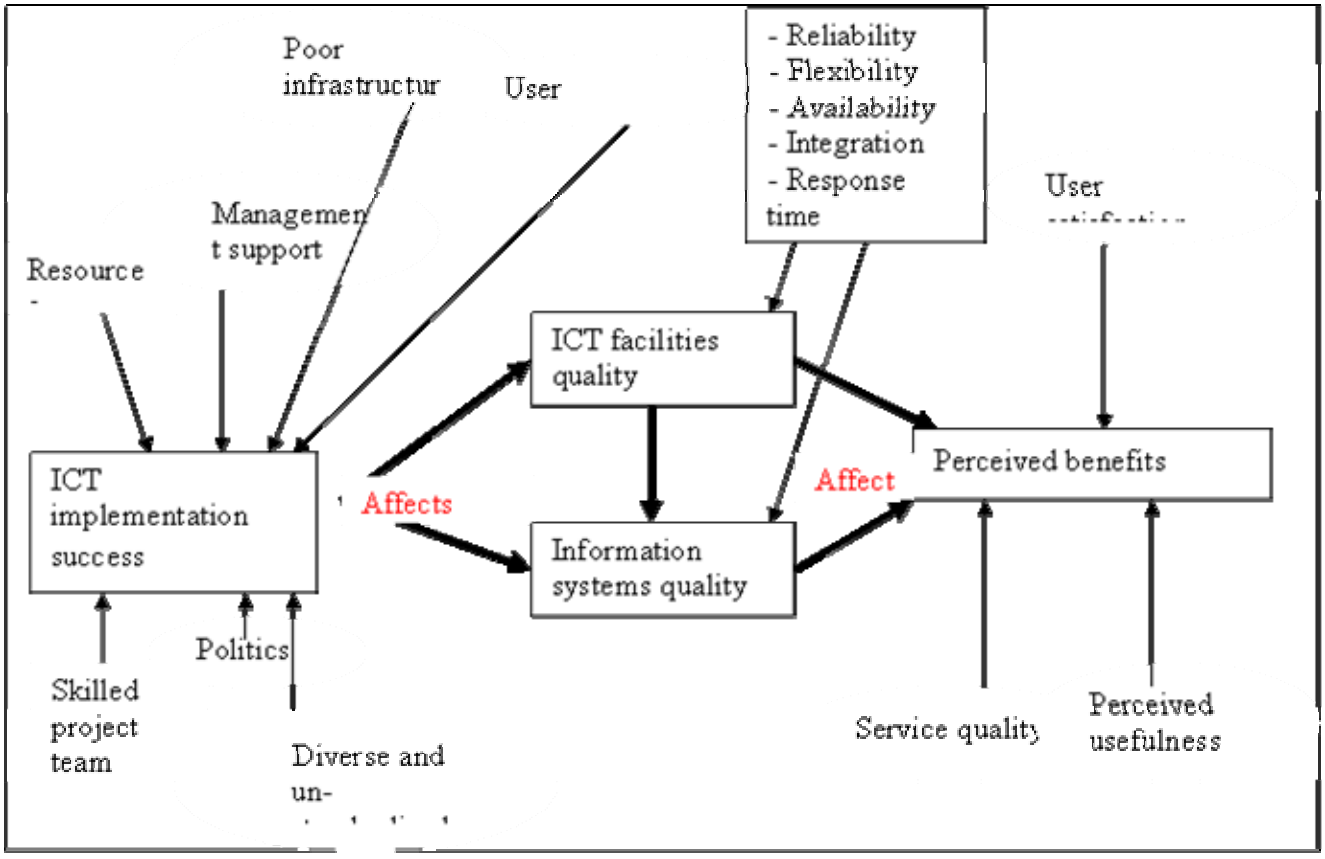

Figure 1: Research framework

3. ICT performance evaluation

ICT evaluation can be defined as establishing by quantitative, and/or qualitative methods the value of the ICT to the organisation Khalifa et al. (2004). Performance cannot be judged as good or bad without the successful implementation of the project. In this paper, the technical or operational implementation of ICT infrastructure is of interest.

Evaluating ICT projects can be quite problematic and can sometimes be quite subjective (Heeks 2002, Currie 1995, Bannister, Remenyi 2004, Irani 2002, DeLone and McLean 2002, Bannister and Remenyi 2000) and there is no single ICT evaluation method that can be applied to all situations (Khalifa et al. 2004). Currie (1995) justifies this position using various case studies drawn from businesses in various developed countries while Heeks (2002) observes that evaluation is subjective and can depend on circumstances including time. Evaluation leads to the determination of success or failure of an ICT project.

4. ICT and IS success and failure

Literature shows that planning and management of ICT projects has a very poor record in developing countries (Galliers et al. 1998, Qureshi 1998, Heeks 2002, Mgaya 1999). However, a careful review of reasons for failure identifies other factors whose presence or absence determines success or failure of projects. To begin with, the researcher looks at the output variables which are the benefits to be achieved if the initiative succeeds. The purpose of this is to clarify the goal of ICT projects. These goals may form a key element to the planning process as described above. Achievement of these goals helps to determine how to classify ICT projects. In addition, perceptions of, and reasons for ICT failure are reviewed and these helps to identify possible key variables.

4.1 Output variables

Many benefits can be achieved using ICT in government. However, a word of caution given by Saul and Zulu (1994) is in order. The authors see ICT as a means to an end and not an end in itself. The value of ICT lies in its ability to assist the government in finding solutions to its problems. ICT expenditure can only be justified if there are benefits accruing to it and not adopting it for its own sake.

The benefits are listed below:

- Cost reduction
- Quality of service delivery

- Increasing capacity of government
- Improved decision making
- Transparency
- Improved efficiency
- Improved access to information
- Other technological benefits for example cheaper and efficient and access to large storage capacities within larger and more advanced computers

4.2 Categorisation of ICT projects failure

Broadly, the assessment of worth of an ICT venture focus on considerations of the success and failure of IS. The issue of ICT failure can be analyzed by assuming that learning from IS failures will provide us with important lessons for formulating successful strategies for the planning, development, implementation and management of information systems. While discussing dimensions of ICT failure, Beynon-Davies (2002, p. 201) considers both the horizontal and vertical dimensions of the informatics model. The horizontal dimension is expressed in terms of the difference between development failure and use failure. The vertical dimension is expressed in terms of failure at the level of ICT systems, IS projects, or organization, or at the level of the external environment. Six types of IS failure is identified as follows:

- Technical failure
- Project failure
- Organizational failure
- Environmental failure
- Developmental failure
- Use failure

Beynon-Davies supports the argument with several case studies and quotes other models for IS failure put forward by Lyytinen & Hirschheim (1987).

ICT success or failure in developing countries can be categorized into three depending on the degree of success (Heeks 2002). First, is the *total failure* of an initiative never implemented or in which a new system was implemented but immediately abandoned. Second is *partial failure* of an initiative, in which major goals are unattained or in which there are significant undesirable outcomes. Associated with partial failure is the *sustainability failure* where an initiative first succeeds but is then abandoned after a year or so. The last is *success* of an initiative where most stakeholders attain their major goals and do not experience undesirable outcomes. For the purpose of this paper, Heeks categorisation is more relevant since it can be used to categorise the few projects implemented by the Kenyan government using the above criterion as the case may be.

5. Factors for ICT success and failure

While discussing factors for success and failure, it is necessary to clarify the “opposite” effect of most factors. This means if the presence of a factor encourages success, the lack of it encourages failure (examples are, proper infrastructure and well motivated staff). The converse is true such that if presence of a factor causes failure, its absence will cause success (examples are bureaucracy, poor project and change management).

5.1 Factors for success

Factors for success are those occurrences whose presence or absence determines the success of an ICT project. They can be drivers or enablers as described by (Moran 1998, Riley 2000, Doherty et al. 1998, Heeks 2003b, Mugonyi 2003, Heeks 2004, Khaled 2003). . Their absence can cause failure and their presence can cause success. *Drivers* are the factors that encourage or reinforce the successful implementation of ICT projects. Some of these are listed below:

- Vision and strategy
- Government support
- External pressure and donor support
- Rising consumer expectations
- Technological change, modernization, and globalization

Enablers are the active elements present in society, which help overcome the potential barriers. Some of these are listed below:

- Effective project, coordination and change management
- Good practice

5.2 Factors for failure

The factors for failure are those occurrences that constraint proper/smooth implementation of ICT projects in government. These can either be barriers or inhibitors as described by (Khaled 2003, Gakunu 2004, Aineruhanga 2004, Heeks 2003a, Ndou 2004, Bhatnagar 2003, Saul and Zulu 1994).

Barriers can be considered as those occurrences that hinder ICT implementation. Some of these factors for failure are listed below.

- Infrastructure
- Finance
- Poor data systems and lack of compatibility
- Skilled personnel
- Leadership styles, culture, and bureaucracy
- Attitudes

Inhibitors do not necessarily prevent the implementation of ICT projects but they do prevent advancement and restrict successful implementation and sustainability. Some of these factors for failure are listed below.

- User needs
- Technology
- Cordination
- ICT policy
- Transfer of ICT idolisers
- Donor push

6. Previous models for ICT project success

Several models for assessing success, failure and the way forward for ICT systems in general DeLone and McLean (2002) and developing countries Heeks (2002) have been suggested. These and other models are considered relevant to this paper. The model proposed by DeLone and McLean (1992, p.87) was later overlaid on a simpler scheme of functionality, usability and utility by Beynon-Davies (2002). This overlaid model introduces the idea of functionality and usability, which are considered relevant to ICT implementation. Beynon-Davies argues that, the worth of an IS will be determined in the three contexts of functionality, usability and utility.

DeLone and McLean (2002, p.2) acknowledged the difficulty in defining information system success and noted that different researchers address different aspects of success, making comparisons difficult and the prospect of building a cumulative tradition for I/S research similarly elusive.

The ITPOSMO model seeks to explain the high rates of failures of information systems in developing countries Heeks (2002). This model assumes the designers of IS are remote which means their contextual inscriptions are liable to be significantly different from user actuality. It assumes the designers come from developed countries or have been trained in developed countries and their knowledge of the local circumstances is at variance with the local reality. This model can be used in explaining some of the reasons as to why implementation of ICT in Kenyan government fails. However, the interest of the paper is on the whole of the ICT implementation which views IS as a passenger.

The first two models deal with ICT/IS in general but Heeks model is for ICT/IS implementation in government and especially in developing countries. All these models act as useful guides in highlighting some of the key variables that affect ICT success. They are considered in this paper as far as they help in shaping the process of identifying the areas of weaknesses in ICT implementation in government. In this paper, functionality is considered to depend on ICT systems and usability and utility are crucial in determining stakeholder satisfaction, which increases stakeholder acceptance, and reduces resistance to adoption.

7. Action plan for success

The best way to achieve maximum benefit for ICT implementation is to have all the factors for success with no occurrence of the factors for failure. However, in real world that is not the case. Given such a situation, an action to increase the chances of success is required. Clockwork (2004) suggests the following framework for implementing e-Government projects.

The framework consists of five stages:

- Examine national e-Readiness
- Identify and prioritize themes
- Develop a program of action
- Apply to target groups
- Implement solutions – the final stage of the framework, is to implement the solutions. A key factor in this implementation is to ensure that the organization is ready and in place to realize the new activities and corresponding changes.

Some ICT best practices that have been "harvested" from a review of successful applications are suggested by Clockwork. Given their simple situation, developing countries are in a position to make effective and speedy use of such best practices for their own purposes. This can be viewed from an angle of 'technology leapfrog' which can be achieved through appropriate technology transfer (Ifinedo 2005).

The suggested best practices in ICT are:

1. Do not underestimate the complex environment in which ICT programs evolve. ICT projects are too often believed to have a technology focus.
2. Be sure to select a project that is expected to demonstrate the greatest benefit for your target group.
3. Government staff should be 're-skilled' to anticipate the changes that accompany an ICT structure and new roles
4. Identify the right technologies.
5. Make a decision on how an organizational process fits your technology.
6. Strong program and project management is essential to develop and implement successful ICT solutions.

7. Do not underestimate the total cost of ownership (TCO) of an ICT project.

The above best practices might not be sufficient but they can act as a basis for further research. In this paper, the best practices have been analyzed but their adoption in Kenya is not clear at this early stage of e-Government implementation.

7.1 Conducting e-Readiness assessment

In this paper, e-Readiness refers to the government ability to take advantage of the ICTs as a facility to enhance and improve its administrative functions. e-Readiness has several components, including telecommunications infrastructure, human resources, and legal and policy framework.

e-Readiness assessment suggested above can be conducted on:

- Data systems infrastructure
- Legal infrastructure
- Institutional infrastructure (standardization of various departmental means of communication and the technology that is used)
- Human infrastructure
- Technological infrastructure
- Leadership and strategic thinking readiness (short, medium and long term plans by specific government ministries)

In this regard, e-Readiness assessment can be used as an information-gathering mechanism for governments as they plan their strategies for ICT implementation. It can help the project team to better understand what impediments to ICT implementation exist and what initiatives are needed to overcome them.

7.2 Design divisibility

Divisibility of local design can decrease chances of failure as explained by Heeks using the Volta River Authority (Ghana) as an example (Heeks 2002, p.109). Divisibility is achieved by: modularity (supporting one business function at a time by allowing separation of, for example, accounting and personnel functions), incrementalism (providing stepped levels of support for business functions by allowing separation of, for example, clerical and management support). In Kenya this has been achieved to some extent. Both the personnel and accounting functions are computerised with varying degrees of success within the ministries. This has been done through the implementation of Integrated Financial Management Information System (IFMIS) and the Integrated Personnel and Pensions Database IPPD). Heeks (2002) observes that design divisibility is therefore a prophylactic against failure and should be adopted more widely.

7.3 Local improvisations

According to Heeks (2002), local improvisation is done to reduce actuality-reality gaps. This can be through hybrids that recognize local capacities and improve success rates. However, Heeks notes that schemes to develop these hybrids in the DCs are virtually nonexistent thus hampering improvisation. Participative approaches to implementation e.g. group working and end-user involvement; have to be carefully considered since most have been developed for the industrialized countries. Examples of how these participative IS techniques were a failure, are the case of Mexico's General Hospital and an end-user development initiative for health IS in South Africa (Heeks 2002). The implementations failed because of the large gap between design assumptions and requirements and actuality of organizations into which ICT was introduced. The conclusion drawn is that these implementations failed because there was too large a gap between the design assumptions and requirements of those techniques and the actuality of organizations into which they were introduced and not necessarily because of participative design is necessarily wrong.

8. A descriptive conceptual framework for developing countries context

A framework for mapping the knowledge gained from both the literature and the case studies is given in figure 3. The framework gives a pictorial representation of a conceptual format of the literature for representational purpose. Input variables are all those factors considered as inputs to an ICT project. Some of these factors though necessary might be absent and are considered to be factors for failure. Other factors are present but their presence becomes obstacles to success. These are categorised as factors for failure.

The input variables that act as the foundation of the ICT project and are considered as main ingredients to ensure the success of the project are referred to as drivers or prerequisites while those variables that encourage success are referred to as enablers or essentials. As ICT projects are implemented, it is necessary to map the input variables to assess where action should be taken.

Output variables are represented as either organisational or technological benefits. The

organisational benefits are the benefits that accrue to the organisation. Technological benefits may not necessarily accrue to the organisation but are regarded as benefits resulting from implementation of the technology. These benefits can be enjoyed by individuals, the organisation and the public.

Lastly the framework shows the response which is presented as action for success. The response proposed has three characteristics. First, it analyses the situation, second, it looks at the various factors contributing to success and/or failure and finally an action for success to a situation specific action. Input and output variables are considered as far as they affect the success and failure of ICT implementation. The framework takes cognisance of broad premises (benefits, challenges and impact) of the Kenyan perspectives discussed in this paper and those observed by (Avgerou and Walsham 2000, Berleur and Drumm 2003, Heeks 2002) for both research and action.

In the response, action is taken to increase the chances of project success by reducing the impact of the factors for failure and increasing the strength of the factors for success.

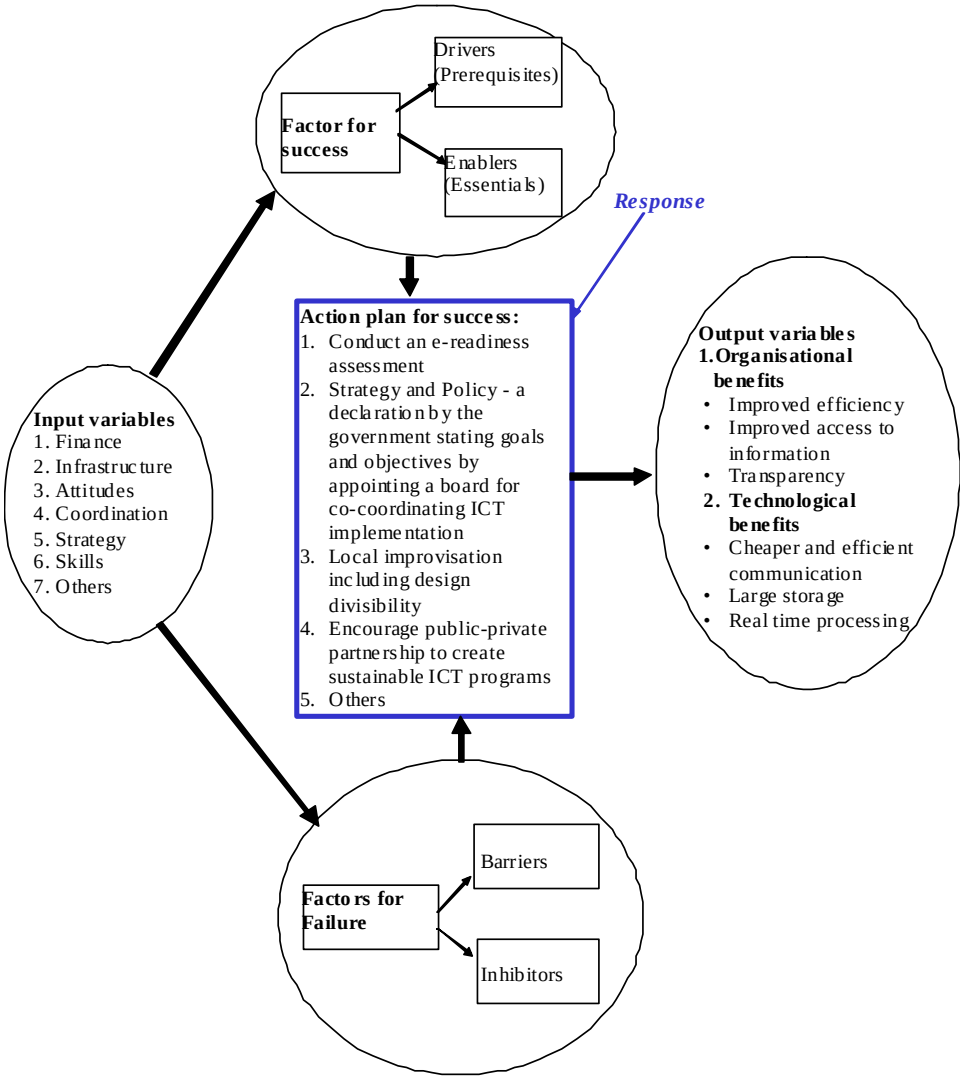

Figure 3: Descriptive framework

9. Conclusion

To fulfil the development needs of ICT projects, those involved in the design, implementation and management of IT-related projects and systems in the developing countries must improve their capacity to address the specific contextual characteristics of the organisation, sector, country or region within which their work is located (Avgerou and Walsham 2000). As the literature reviewed suggests, developing countries are still far behind in implementing e-Government and it is hoped that successful implementation of ICT projects will act as a strong foundation for e-Government initiatives.

In this paper, the factors affecting ICT implementation have been categorised into factors for success and factors for failure. These have been further categorized as either drivers, enablers, barriers or inhibitors. The paper does not classify the factors in terms of their influence. However, vision and strategy and government support are considered important for success while lack of funds and poor infrastructure are considered as major factors for failure.

As many arguments for ICT planning prove, ICT project implementation is a complex exercise and more research is needed to identify challenges, good practice and solutions for successful implementation. This paper analyses and syntheses both all information gathered to develop a framework that hopefully can be used during ICT infrastructural planning and implementation in developing countries.

The response framework discussed in this paper is expected to be used to:

- Provide a basis on which to analyze and specify international support and cooperation from development partners on ICT projects
- To produce guidelines that the governments can use to help define their needs and agendas with regard to government ICT implementation and use
- Provide a basis for assessing good practice for ICT implementation in government
- Contribute to the body of knowledge on ICT implementation

According to Doherty et al (1998), the factors that influence the ultimate level of success or failure of informatics projects have received considerable attention in the academic literature. Doherty et al (1998, p.3) summarised studies on success factors and current research objectives involving empirical studies. Future papers will include the findings of cases studies done in 9 ministries of the Kenyan government. Therefore, this further research will identify and categorise the factors influencing ICT implementation according to their degree of influence in Kenya and suggest possible actions.

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