Computing, Information Systems & Development Informatics Journal
Vol. 8 No. 4, December, 2017 - www.cisdijournal.org

The Impact of System Analysts on Infrastructural Development in the Nigerian Economy

Oluwatunde, S.J.
Mathematics & Computer Science Programme
Caleb Business School
Caleb University, Lagos, Nigeria.
Email: oluwatundesola@yahoo.com

Omonayin, E.T.
Department of Computer Science
Baze University
Abuja, Nigeria.
omonayin@yahoo.com

ABSTRACT

Infrastructure is basic essential services that should be put in place to enable development to occur. Economic development of Nigeria can be facilitated and accelerated by the presence of infrastructure. If these facilities and services are not in place, development will be very difficult and in fact can be likened to a very scarce commodity that can only be secured at a very high price and cost. The provision and development of infrastructures have been the subject of much theoretical analysis and empirical studies. In fact, the rate of infrastructure project failure remains high in comparison with other high-tech projects. The objective of this paper is to create a systemic framework that is broad enough to represent a wide range of possible factors that may impact systems performance. The proposed framework is a triple-system(S) model comprising a set of three sub-systems of strategic project planning and delivery process, the organizational contexts and a formalized technology-enabled infrastructure project system. The methodology of the triple-S framework was adopted in this paper.

Keywords: Economy; Infrastructure development; Information System; Project; System Analysis

CISDI Journal Reference Format
Oluwatunde, S.J & Omonayin, E.T. (2017): The Impact of System Analyst on Infrastructural Development in the Nigerian Economy. Computing, Information Systems & Development Informatics Journal. Vol. 8 No. 4. Pp 35-44
Available online at www.cisdijournal.net

1. INTRODUCTION

Infrastructure is defined as part of a structure; material or economic base of a society or an organization. Therefore, infrastructure can be seen as the basic structure that fosters the good performance of cities', states' or countries' essential services. In this sense, for a country to have a good logistics infrastructure system in the different modes of transportation, good roads, agriculture, healthcare, real estate, power, education, ICT, telecommunications , Oil and Gas industry, security and so on, constant investments from both public and private sectors are needed. Organizations, especially in a competitive and globalized world, require infrastructure compatible with their needs and demands, in order to transmit their products and services to different producers and demand centers in different parts of the globe. Recent studies show that many of these infrastructure projects have 'failed', in the combination of budget and/or schedule overruns and/or for not meeting citizens' requirements. The well-known and now widely quoted Chaos Report by Standish Group (1995) declared that infrastructure projects are in chaos.

Table 1 provides a summarized report card on project outcomes based on the Report. (Tom Clancy, 2014). Type 1 projects are those completed on time and within budget, with all required functions and features initially specified. The "challenged" projects, though completed and operational, suffered budget overruns and/or program slips, and offered fewer functions and features than originally specified. The "impaired" projects are those cancelled or abandoned at some point during the development cycle. It is anticipated that many of the infrastructure projects would continue to be 'challenged' or 'impaired'. The truly 'successful' stories from the outset will be relative rare.

The problem of systems impairment is more serious when projects are terminated or abandoned because of potential damages to country or organizations. Unlike engineering projects, project impairment may not necessarily be due to technical faults. In information system development, an acquired or implemented system, even technically sound with specifications met, may still meet with resistance or rejection by the users or corporate management. The resulting under-utilization or abandonment of a system certainly represents a major failure. The issue of system acceptance may go beyond the usability and technical quality of the final product; extending to other more complex soft issues that are social and cultural in nature, including politics in information management.

It is important that the information technology community together with other stakeholders have a better understanding of the nature of software or information system projects and the special problems of the widespread systems failures. Checkland and Holwell (1998) reckon that the study of information systems remains a crucial but confused field. Lyytinen and Hirschheim (1987) suggested that the study of project failure still suffers from an inadequate conceptual clarity of the information system failure notions.

2. THEORETICAL BACKGROUND

2.1 Infrastructure deficits and challenges of growing Nigerian economy

Human (national) development is about meeting and satisfying basic human needs and aspirations, protecting their freedoms and rights, minimizing risks to their survival, enhancing human security, and empowering them to tap and maximize their potential (Jega, 2010). Infrastructure is central to sustainable development and economic competitiveness of any nation. A nation without infrastructure is like a body without anatomy. Today, inadequate infrastructure is holding back Africa's economic growth per capita by two per cent each year, and reducing firms' productivity by as much as 40 per cent (ICA, 2010). Sub-Saharan Africa is also lagging behind the rest of the world in its level of infrastructure development, thereby blocking the quick movement of goods and people on the continent and increased transport costs to as much as twice that in any typical Asian country (Independent Computing Architecture, ICA 2005).

The largest deficit in infrastructure can be found in the power sector where only one in four Africans have access to electricity with about 30 African countries estimated to be experiencing regular blackouts due to power shortages. Even though firms struggle to cope by installing their own back-up generators and inverters, this costs three to four times as much as the cost of grid electricity. The 48 sub-Saharan African countries including Nigeria, with some 800 million people, produce collectively only about as much power as Spain, which has only 1/18th of the population (USAID, 2009).The lack of affordable and reliable power is cited by investors as the number one constraint to doing business in most African countries, Nigeria inclusive. Despite Africa's great potential which includes clean energy resources such as hydropower, solar, wind, and geothermal, these problems continue to persist because investments in new facilities and maintenance of existing infrastructure have been woefully inadequate, leaving many African countries with degraded and inefficient electricity services; poor quality roads, railways, and ports; and an inadequate ICT backbone (USAID, 2009).

Nigeria by its size and population of about 170 million bears at least 20 per cent of this burden, and the citizens are generally disillusioned with the level of development and distrusting of government because not much has been done in the provision of physical infrastructure 57 years after independence. It is a recurring decimal of pains that the country faces with poor road, water and sanitation conditions, inadequate electricity, gas, and fuel oil supply, leading to high use of solid fuels (fuel woods) especially for domestic chores. As reported by the World Health Organisation, Nigeria has the highest rate of deaths attributable to solid fuel use, at 79,000 annually and four per cent national burden of disease.

The first power station in Nigeria was established by the Public Works Department in Lagos in 1896, with a capacity of 60MW, while the first private electricity company, Nigerian Electricity Supply Company was set up in 1929, with a capacity of 19MW. The scheme, a hydro-electricity plant on Kura Falls was originally meant to supply electricity to the Tin mines in Jos, but later extended its services to Bukuru, Jos Townships and Kafachan. In subsequent years, other exploitable hydro power sites with cumulative potential of over 12,000MW were identified. With 120 years of public sector experience, and 87 years of private sector, what is our story? The National Integrated Power Project scheme was designed as a fast-track Federal Government initiative to resolve the power supply problem in Nigeria, by expanding Generation, Transmission and Distribution capacities. The scheme was conceived in the late 2004 and implementation commenced in 2006 under the administration of President Olusegun Obasanjo, but ran into a hitch shortly after the new administration of President Umaru Yar'Adua came on board in May 2007. The initial contentious issue was the legality of the funding process. The Revenue Mobilisation Allocation and Fiscal Commission had instituted a legal action against the mode of utilisation of the proceeds of the excess crude account for the project. As the argument raged on, another controversy arose as to the actual expenditure on the project up to the time.

Various amounts were bandied by officials of both the old and the new administration and the media was awash with all manner of sensational news and commentaries. The matter however came to a head when via a motion moved by the Minority Leader, the House of Representatives resolved to have its Committee on Power probe the entire project. President Yar'Adua, in deference to the House, ordered a stop to further fund disbursements to the project until the outcome of the probe. This decision created apprehension among the contractors, and work stopped for a long while until the resumption of payment to contractors and grant of a 70 per cent waiver on charges incurred on all longstanding containers belonging to the NIPP that were lying at the terminal for about three years. The NIPP is an amalgam of generation, transmission and distribution projects packaged as Engineering Procurement Construction contracts managed by the Niger Delta Power Holding Company incorporated by government for the purpose.

The project at the outset, according to the Forum of NIPP Consultants and Contractors, engaged the services of a total of 108 consulting and contracting firms, including 34 consulting and 53 contracting Nigerian firms, with about 5000 Nigerian employees as of August 2007. Now, with this array of experts, how did it happen that feedstock, route reconnaissance and delineation issues were not addressed? How did it happen that the construction of Mambilla Dam with an assured 2,600MW, was not commenced immediately since it had a longer completion timeline, and the NIPP did not have all the time in the world? Today, we have quite some turbines that have not been cranked years after installation with attendant repercussions. Could all these and more be due to inadequate planning, negligence and poor management? Could it be due to the fact that the Niger Delta Power Holding Company is managed by a non-engineer? Are the consulting firms, multi-disciplinary partnerships or single family or sole businesses? Are they ACEN firm members? Are these questions even relevant? If not, what are the relevant questions? We engaged a number of important stakeholders and they had so much to say in hush voices. Certainly, engineering, not political questions, as happened in the House of Representatives, need to be asked now as to what really happened that we are where we are at.

The bottom line however is that so much resources have been committed, but of what benefit to the generality of the people? This is the perception among a large segment of the society, and one cannot in good conscience discountenance their opinion. I believe that a technical audit of this project, spearheaded by ACEN is necessary to put paid to the controversies around the projects, learn lessons and develop more sustainable templates for future projects.

There are about 200,000km of roads in Nigeria, and 36,000km belong to the Federal government. Of the latter, only about 30 per cent that are in good condition. The shares of the states and local governments are in terribly worse conditions. The issues here revolve around poor institutional arrangements. The Ministry of Works is combining policy formulation with implementation and this is proving Herculean. It is common knowledge that the ministry is the only one without fully enabled parastatals for implementation. The road sector bills have been on the table since 2008. They were eventually sent to the Seventh National Assembly but there is not enough interest in them yet.

2.2 Basis for the existence of Project

From the systems thinking view, projects exist to serve, help or support people taking action in the real world. The "action" of the real world could mean anything from increasing the efficiency of the workforce to consolidating the resources under the power and control of one person. The objective of project system existence is sometimes mixed with politics which are hard to detect.

Table 1
Project resolution by type

Project outcome	Resolution	%
Type 1	Successful	16.2%
Type 2	"Challenged"	52.7%
Type 3	"Impaired"	31.1%

2.3 Infrastructure Project Failure Notions
Lyytinen and Hirschheim (1998) define four major notions or categories of IS failures as follows:

2.3.1 Correspondence Failure: When the systems design objectives are not met, the infrastructure projects considered a failure. It is generally believed that design goals and requirements can be specified clearly in advance, and that their achievements can be accurately measured. Performance measures mainly based on cost-benefit analysis are employed for managerial control over the systems implementation. Correspondence failure, goal-seeking in outlook, tends not to recognize that users may not necessarily accept systems that meet design objectives and specifications.

2.3.2 Process Failure: A process failure occurs when an infrastructure project cannot be developed within an allocated budget, and/or time schedule. There are two likely outcomes of process failure. Firstly, an outright failure occurs when no workable system can be produced. Secondly, a more common outcome is when an infrastructure project is developed with massive overspending in both cost and time, thus negating the global benefits of the system. This is a project level failure attributed to unsatisfactory project management performance.

2.3.3 Interaction Failure: The level of end-user or citizen usage of the infrastructure project is suggested as a surrogate in project performance measurement. Some related measures of project usage include user attitudes and user satisfaction, the amount of data transferred or the frequency of use. However, heavy usage does not necessarily mean high user satisfaction and improved task performance, and there is little empirical evidence supporting such a claim. Heavy systems usage might be a result of legal compulsion, persuasion, or that there are simply no other alternatives besides using the system.

2.3.4 Expectation Failure:
The notion of expectation failure views infrastructure project failure as the inability of a system to meet its stakeholders' requirements, expectations, or values. Failure, therefore, does not only involve the system's inability to meet design (technical) specifications. Expectation failure is perceived as the difference between the actual and desired situation for the members of a particular stakeholder group. Unlike the other three notions, infrastructure failure is considered holistically in this case, as the views of different stakeholders are taken into account.

2.4 The drivers of systems performance
The four drivers of system performance are context, content, process and outcome. They are the driving forces in initiating a strategic change intervention through system implementation. The purpose of an intervention is to specify and effect the content of change that delivers an outcome that satisfies a strategic intent. A successful intervention requires a process that appropriately integrates and reconciles the content and context in order to achieve the desired outcomes that fulfill the intent of the strategic initiative (Ward and Elvin, 1999). The four drivers can be coherently integrated and represented as a framework, as illustrated in Fig. 1, which is in line with Pettigrew's (1993) framework for strategic change analysis.

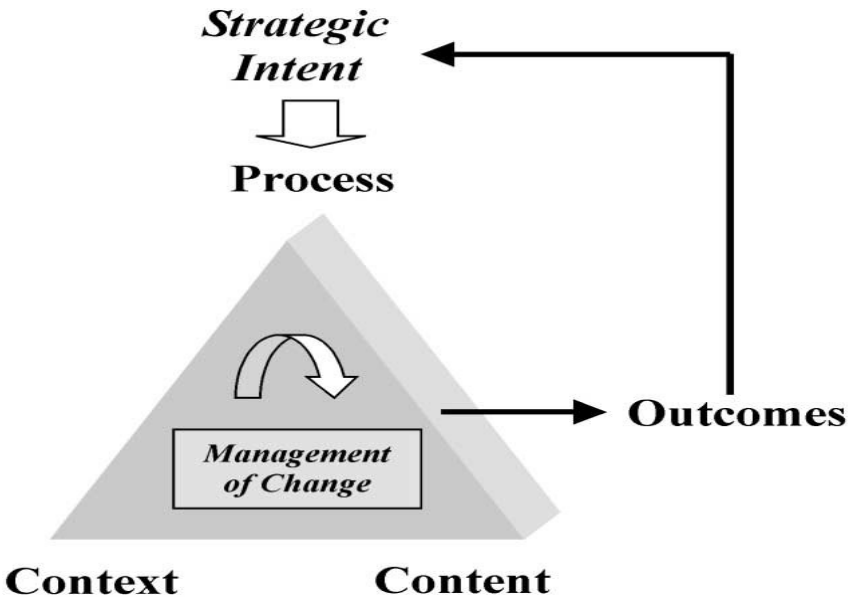

Fig. 1. Framework of Drivers of Change.

2.5 Critical factors in Infrastructure Project Failure

2.5.1 Critical failure factors
Flowers (1996) defines an infrastructure project system as a failure if any of these following situations occurs: (1) when the system as a whole does not operate as expected and its overall performance is sub-optimal; (2) if, on implementation, it does not perform as originally intended or if it is so user-hostile that it is rejected by users and underutilized; (3) if, the cost of the development exceeds any benefits the system may bring throughout its useful life; or (4) due to problems with the complexity of the system, or the management of the project, the infrastructure project development is abandoned before it is completed.

Flowers used large systems failure cases to illustrate the performance of software system projects as a function of managing a range of critical failure factors (CFFs) as in: organizational, financial, technical, human, and political factors, and the interaction among these factors. The failure factors can be broadly grouped in the organizational and managerial contexts and the actual conduct of an infrastructure development project.

Possible failure factors in the organizational and managerial contexts include hostile company culture, improper reporting structure, political pressures, vested interests, influences, and inappropriate level of management commitment. Key influencing factors in the conduct of project itself include pre-occupation with technology in project planning, technology focus over human relations, complexity under-estimated, poor stakeholder management, poor consultation, design by committee, technical fix for a management problem, poor competence of project management and project team, and poor selection decisions.

2.5.2 Termination failure

Sauer, (1993) proposes that systems should be considered as a failure only if there is a development or operation termination. Based on this criterion, the failure model takes the natural systems approach, which explains systems behaviour in terms of the goal of survival. This approach describes the achievement of survival through acting on the environment so as to obtain necessary resources (funding) that in turn support the system's continued operations. A system is not considered a failure as long as it survives and continues to attract support in resources. The concept first considers infrastructure project as a product of a coalition of stakeholders, which includes project organization, which assumes the major part of developing, operating, and maintaining the infrastructure project in question. With support and commitment from the supporters or promoters, the project organization is able to carry out its work, ideally with a view to serve the interest of the supporters. This creates a "triangle of dependences" as illustrated in Fig. 2. Failure occurs when the level of dissatisfaction with a system rises to the extent when there is no longer enough support to sustain it.

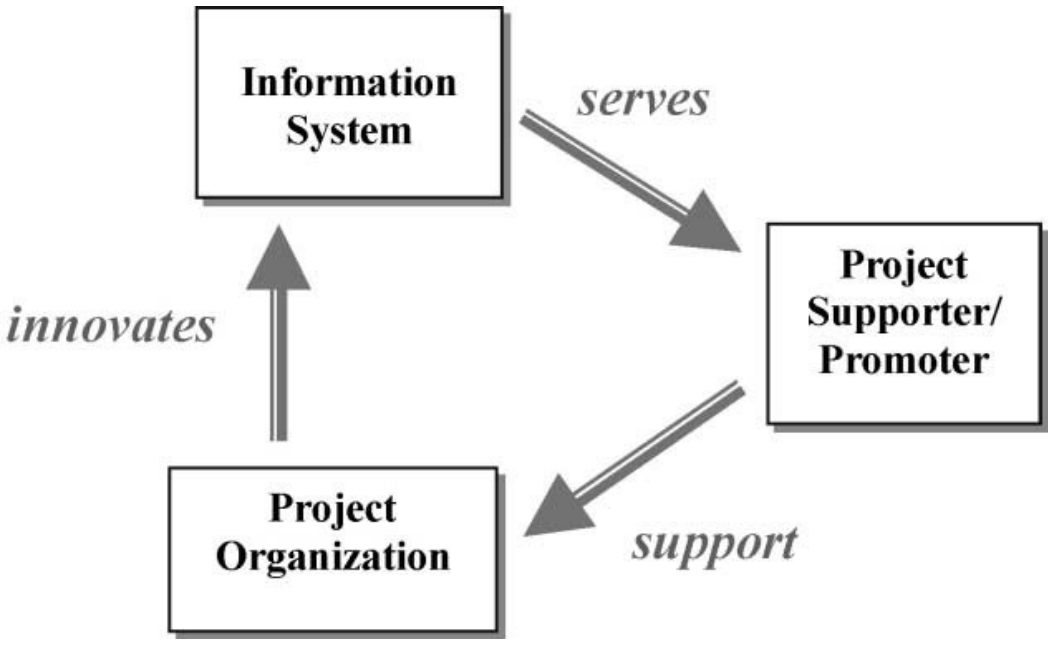

Fig. 2. Triangle of Dependences.

Infrastructure project failure is indicated by the cessation of all the work related to the system. Termination failure thus refers to a total abandonment of the project.

3. RESEARCH METHODOLOGY

To deal with the highly complex field of IS study in general and infrastructure project systems failures in particular, a soft systemic approach is proposed in search of an integrative and generic framework for analysis. The systemic approach simultaneously deals with the logical and cultural or social aspects of systems development and use. The POM (Processes for Organizational Meanings) model developed by Checkland and Holwell (1998) provides an important conceptual reference model to make sense of the studies. The POM model can be represented in three interacting parts of the main "discourse" processes (Part 1) linking and reconciling the "organization" context (Part 2) with the organized "information system" (Part 3) with embedded information technology and business process contents.

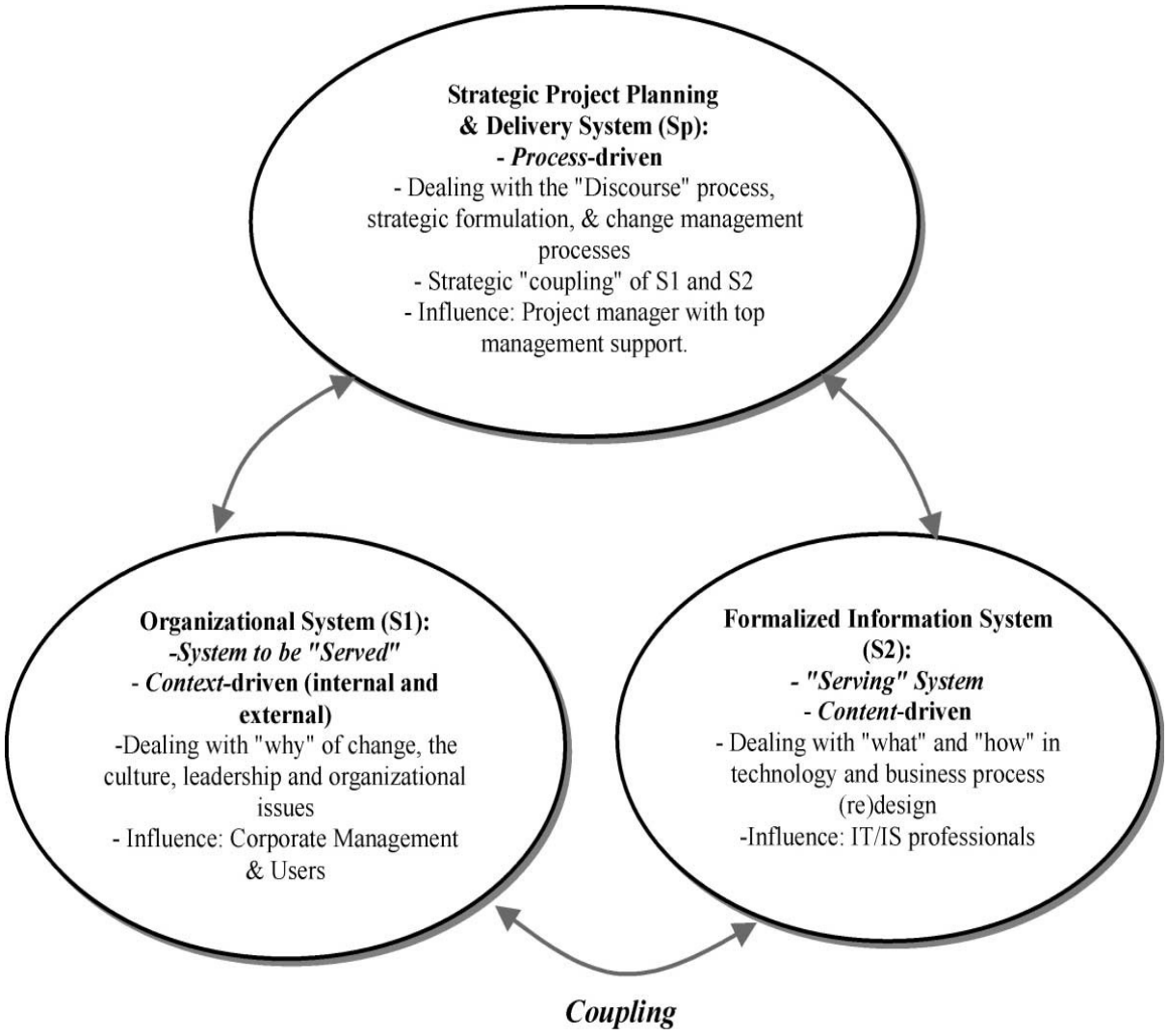

Fig. 3. The Triple-S Framework for IS Planning.

4. DISCUSSION AND RESULTS

Briefly, the POM model represents a social process in the provision of information system that supports people in organization to take purposeful action in the fulfillment of organizational goals. The use of information system can be thought about as entailing a pair of constituent systems: [1.] a system which is "served", denoted as S1, the primary system, in this paper, and [2.] A system that does the "serving", denoted as S2, which is supporting. The serving system which is the formalized information system, contains the processing of selected data and information relevant to people operating in the organization. The twin systems are linked and entailed in the concept of a purposeful "information system," which is more than a computer-based number crunching system.

This paper proposes and gives emphasis to an explicitly expressed third system, the strategic project planning and delivery process system, denoted as Sp, and as illustrated in Fig. 3. Sp is enabled by a deliberate project organization that operates in the organizational context of S1 with the objective to deliver a successful S2. The strategic project planning and delivery (Sp) system assumes the role and responsibility in overseeing the whole process of making preparation for, planning, coordinating and control of the entire strategic formulation, and the associated social and technical processes in information systems development and implementation. The process begins from the initiation of the discourse to the design and acquisition of the formalized information system that supports the organizational members in their accomplishment of tasks. Fig. 3 illustrates the proposed "triple-S" framework. The generic framework is suited for the strategic planning and change management of IS implementation. The Sp system in the triple-S framework includes and goes beyond the traditional project management role and responsibility with pre-occupation with the "how" and "what". The traditional pre-occupation is mainly concerned with technical and business/work process design contents, which characterize the S2 system. The project management must now also be involved in creating the big picture and in thinking about strategic formulation, in making a business case and managing the resulting change processes.

The change processes focus on the thorough process analysis involving the discourses in search of meaning, purposes, accommodation and intents. The IS project manager when dealing with the Sp system, is likely to use the soft systemic approach to deal with the many ill-structured and messy problems to be encountered in the system development process. The discourse processes can be highly political in nature. The traditional project management largely based on "hard" systems engineering approach will be found to be inadequate and incapable of coping with many of the ill-defined 'soft' problem situations. The Sp system, which is under the influence of information system project managers, with the support and commitment of top management, must ensure the proper coupling of the content-driven "serving" system and the context-driven "served" system in the change processes.

5. CONCLUSIONS

The IT/IS industry and community continue to be plagued with extensive problems of systems failure. The field of IT/IS project management remains in "chaos". The gap between theory and practice in IS studies, particular failure studies, remains. The study presented in this paper is another attempt trying to make sense of the somewhat 'confused' field of IS studies in general and infrastructure project management in particular. The emphasis is on adopting a systemic approach in infrastructure project planning and delivery process. The tentative outcome of this study is the proposal of a triple-system(S) framework built on the basis of soft systemic thinking. There is a high degree of congruence and consistency among the previous IS studies and the soft systemic thinking. The idea of coupling the systems "serving" and "served" in a master–servant relationship is a very useful and worthy one and should be considered in-depth. The paper highlights the importance of the third system, Sp, as an explicitly expressed process- and outcome-driven entity that ensures the integration and coupling of the served and serving systems.

6. RECOMMENDATIONS

Infrastructure development is one of major elements of structural reforms in developing economy like Nigeria because of its expected large economic and social impact. As can be inferred from the studies by other researchers, infrastructure investments alone do not have a significant influence on economic growth. The institutional environment is a very important complement, allowing infrastructure investments to be translated into economic growth using system analysis approach such as Research and understand the infrastructure project, Verify that the benefits of solving the problem outweight the costs, Define the requirements for solving the infrastructure problem, Developing a set of possible solutions [alternatives], Decide which solutions best and make a recommendation, Define the details of the chosen solution, Implement the solution and Monitor to make sure that we obtain the desired results.

Based on these, the following are the recommendations of this study: In the area of transportation, more roads should be constructed and the existing one adequately maintained particularly the ones already taken over by gully erosion as it will lead to the reduction of production of firms as well as inability of the firms to evacuate consumables both final and intermediate from rural to urban centers. The government should enhance the competition between and the efficiency in infrastructure industries, (especially power, agriculture, healthcare, real estate, education, ICT, Telecommunication system, Oil and Gas industry, and Poor maintenance and perennially damage have ensured that we are not able to really optimize our potential) and with these, the government can make an indirect contribution to economic development. Demand for infrastructure is said to expand significantly in the decades ahead, driven by major factors such as global economic growth, technology progress, urbanization and growing congestion. The researchers propose that government should as a matter of priority create more favorite institutional policy and regulatory framework to meet up these challenges.

REFERENCES

1. Avison, D.E & Fitzgerald, G. (1995), Information system development: methodologies, technologies, & tools. 2nd ed. London: McGrawHill
2. Checkland P, & Holwell S. (1999), Information, systems and information systems. Chichester, UK: John Wiley.
3. Clancy, T. & Greaney, M. (2014), Command Authority – A Jack Ryan Novel.
4. Fidelis, O.N, Jude, O.O & Ighata, J. A (2014), Infrastructural Development and Economic Growth in Nigeria: Using Simultaneous Equation, Institute of Continuing Education, Benin City, Nigeria.
5. Fiksel, J., Bruins, R., Gatchett, A. et al (2014), The Triple Model: a systems approach to sustainable solutions, Volume 16, Issue 4, pp 691-702.
6. Flowers S. (1996), Software failure: management failure. Chichester, UK: John Wiley.
7. Joseph, F. (2012), A system view of sustainability: The triple value model, Original Research Article Environment Development, Volume 2, pp 138 - 141. Electronic version:http://www.sciencedirect.coms/science/article/pii/s2211464512000541
8. Kashim, A.A (2016), "Opinion on Infrastructure Deficit and Challenge of Growing Nigerian Economy", The Punch Newspaper, Published July 28, 2016. Electronic version: http://punch.com/infrastructure-deficit-challenge-growing-nigerian-economy-1/
9. Lyytinen K, & Hirschheim R. (1987), Information failures—a survey and classification of the empirical literature. Oxford Surveys in Information Technology; 4: 257–309.
10. Pettigrew, A.M (1987), The management of strategic change. Oxford, UK: Basil Blackwell, (Chapter 1).
11. Pettigrew A, & Whipp R. (1993), Managing change for competitive success. Oxford, UK: Blackwell, (Chapter 1).
12. Sauer C. (1993), Why information systems fail: a case study approach, information systems series. Henley-on-Thames, UK: Alfred Waller.
13. The Standish Group. The CHAOS Report (1995), 1995. http://www.standishgroup.com/chaos.html.
14. Ward J, & Elvin R. (1999), A new framework for managing IT-enable business change. Information System Journal; 9:197–221.
15. Yeo, K.T (2002), Critical factor in information system project, Division of Systems and Engineering Management, School of Mechanical & Production Engineering, Nanyang Technological University, Singapore, International Journal of Project Management, 20,241 – 246.