Actor Network Theory
in Interpretative Research Approach

Tiko Iyamu[1], Tefo Sekgweleo[2], and Sharol Sibongile Mkhomazi[3]

[1] Namibia University of Science and Technology,
Department of Business Computing, Windhoek, Namibia
`connectvilla@gmail.com`
[2] P.O. Box 13121, The Tramshed, Pretoria, South Africa
`ts33ci@gmail.com`
[3] Tshwane University of Technology, Department of Informatics, Pretoria, South Africa
`mkhomaziss@tut.ac.za`

Abstract. The main components of information systems include people, process and technology infrastructure. In many studies, these components are often viewed and examined from socio-technical perspectives. This is primarily because of the criticality of human actions. The complexities and the difference which humans bring in the development and implementation of information systems are not getting easier. Hence the increase studies in the field of information systems.

Many approaches such as using the lens of Actor Network Theory (ANT) has been explored to understand the socio-technical factors in the information systems. Although ANT has been employed in many studies, it is of significant important to establishes and clarifies the factors, from the social perspective, which influences the development and implementation of information systems in organisations.

Keywords: Actor Network Theory, Information Systems, Analysis.

1 Introduction

Information systems are considered vital, and some organisations wholly rely on it. Organisations make use of information systems to support their operations, administrations, processes and competitive advantage. The development and implementation of information systems is not as easy as we are meant to belief. Also, even though it is intended to address challenges, it could be by itself challenging to employ. Tan and Tan [1] argued that the development and implementation of information systems is a challenging task to accomplish, in a various ways.

Technology by itself does not make up an information system, they include both human and non-human actors within a networks. The actors own and share various responsibilities in the development and implementation of systems. For example, Business Analysts (BA) is responsible for gathering business requirements and compiling the functional design specification [2].

Both human and non-human actors work together as a collective to deliver information system as requested by the organisation. Chen et al [3] argued that IS consists of technical components, human activities, and describe processes which are used to manage the organisation's activities. Hence it is most appropriate to gain a good understanding of the processes and activities which are involved in the development and implementation of information systems in organisation. This is the ultimate contribution of the lens of Actor Network Theory (ANT), a theory which focuses on human and non-human factors.

ANT is a theory that integrates both human and non-human actors to form or create a network. Wernick [4] stated that irrespective of whether the actor is human or non-human they are both weighed equally as they offer the same contribution to the formed network. The teams, which constitute a network, have different roles, responsibilities, understanding, and interpretation of the same system. ANT describes a heterogeneous network of technical and non-technical as equal interrelated actors that can form a network of actors at any time and space.

2   Information Systems

Information systems discipline is regarded as a very important role in organisations. This is the belief and interpretation of its capability to enable and support organisations to conduct business and develop new opportunities, as well as remaining profitable and competitive [5]. As result, organisations often have a substantial investment in the implementation of information systems.

As depicted in Figure 1 below, the operations in information systems involves many phases. The phrases include both technical and non-technical factors. These factors are not easy to understand, hence a lens such as ANT is required to underpin things in perspective on what, how and why things happen in the way that they do during the development and implementation of information systems in organisations.

As illustrated in Figure 1, through the lens of ANT the roles, activities and processes which are involved in the development and implementation of information systems could be empirically viewed and understood. Some of the phases such as development and implementation are discussed in the next sections.
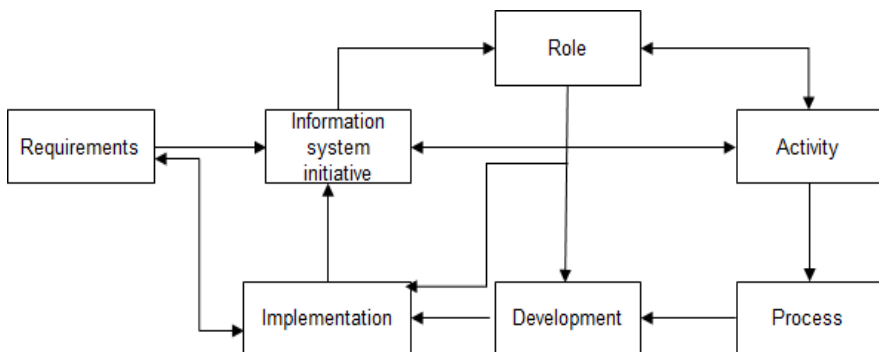
Fig. 1. Operationalisation of Information Systems

Many studies have been conducted in attempts to address the challenges of information systems failure in organisations. Some of the studies, such as Chua [6] vigorously (from different perspectives) argued that information systems failure is caused by many things such as missed schedules, budget overspending, poor planning, the use of unproven technology, organisational changes, and lack of top management involvement.

Some of the factors which are identified as the cause of information systems' failure remain mainly because the rationales (why) behind them have not been appropriately articulated. The social-technical focus of ANT makes the theory appropriate to help investigate the social context, which include the power to make a difference; relationship among the actors, which forms the basis of communication; roles; activities; and processes in the development and implementation of information systems.

i.   Information Systems Development

Information systems are either developed in-house or purchase from the shelves. Companies that choose to develop in-house information systems rely on various approaches to follow. There are tools and techniques available, in conjunction with the methodology to assist in the analysis and design of information systems [7]. However, making use of the appropriate methodologies, tools and techniques does not guarantee successful development or implementation of information systems. According to Chua [6], there are many common factors which influence the failures information systems including lack of user involvement, lack of top management commitment and users rejecting the new system because they feel comfortable with the existing system. In such a case, extra effort to communication, and negotiation, and pursuance is required for the users to show interest.

The activities which are involved in the development phase includes database design and creation, user interface design, application, library and system sources and binary code and the developing and testing of software against the business requirements specification [8]. Each of personnel has their power to negotiate, as well as to make a difference, which is bestowed on the mandate accorded to them.

ii.   Information System Implementation

In the implementation phase, a new system is deployed to production environment, and it is made available to the users, either as an entirely new system or as an upgrade of an existing system. To upgrade or implement a newly developed system, various approaches are followed. Each of the approaches requires interaction, and relationship within the network, which is expected to foster the implementation. Okrent and Vokurka [9] referred to one of the approaches as "big bang". It is described as switch off the old system and instantly moves to the new fully functioning system [10]. Also, there is the pilot approach is usually adopted in multi-department environments. It involves incrementally rolling out the system department. Irrespective of the methodological approach that is employed, the response of the users is often highly a deciding factor.

3   The Lens of Actor Network Theory

Actor network theory (ANT) is social theory that focuses on human and non-human actor, which constitutes networks. The human and non-human components plays vital role in information systems, whether it is in the development or at the implementation stages. Luoma-Aho and Paloviita [11] argued that for an act to occur it is influenced by related or connected factors such as human beings, objects, rules and environment.

Actors within the network have the responsibility of working together as a team with the intention to reach the final goal which is to successfully implement a working information system. Irrespective of whether the actor is human, object or organisation it is equally important to the network. On the understanding of why systems behave in the way that they do allows individuals to provide explanation to other actors, whether in the same network or not.

Many actors are involved in the development, as well as implementation of information systems in organisations. The actors' involvement in the development, and implementation of information systems, inevitably bring about negotiation, in order to reach a common goal in the interest of the organisation. The lens, moments of translation is highly significant from the perspective of ANT, during the process of negotiation. The moments of translation consist of four components, problematisation, interessement, enrolment and mobilisation, and focuses on interaction, negotiation, and transformation of events.

In addition to the four moments of translation, is the obligatory passage point (OPP), which is an entity that is responsible for representing other actors in a way that suits their significance and actions in the world of translation [12]. According to iyamu and Roode [13], ANT does not differentiate human from non-human actors or make division between technical and non technical objects. Thus, ANT brings a different dimension and perspective in viewing the events, processes and activities that are involved in the development and implementation of information systems. The lens of ANT can be used to gain a deeper understanding of how events and activities manifest themselves in the development and implementation of information systems.

4   Information Systems and Actor Network Theory

The development and implementation of information systems involves technical and non-technical factors. The roles of each of the actors are considered important, primarily because their individual action bring a difference, making them more challenging than they portrayed. This could be attributed to the fact that a number of unique skilled personnel, processes and activities are involved, and each of them requires a specific attention. Every individual within a team is assigned tasks which are scheduled to be completed within timeframe. ANT identifies all the personnel involved and objects utilised as actors. Doolin and Lowe [14] argued that actors are regarded as the source of action irrespective of their status whether human or non human.

The main goal of ANT is to create a diverse network which consists of humans and objects with related interests through the moments of translation of the events. The moments of translation involves four stages namely problematisation, interessement, enrolment and mobilization [12]. It is through these stages that diverse networks are formed, and information is shared with those who need it.

The moment of translation explains the roles and responsibilities of actors that are involved in the network. Potts [15] argued that data is translated into information through the extended process of the moment of translation. This encourages actors to share their knowledge with other actors within the network.
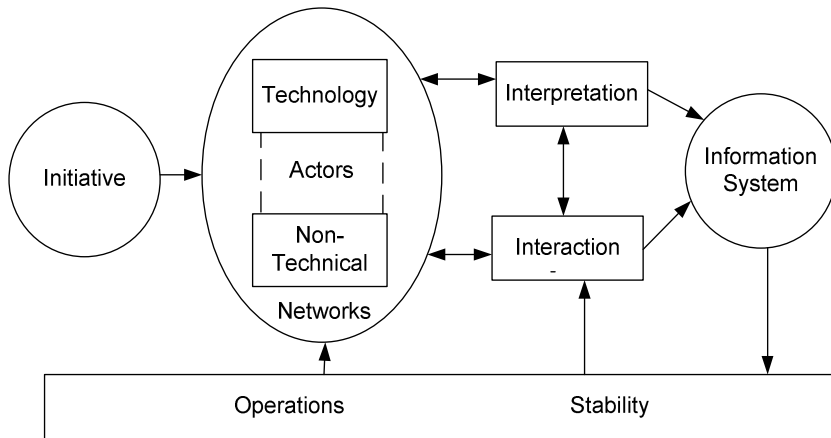

Fig. 2. Social Technical Context in Information Systems

The development and implementation of information systems is a joint effort as it involves multiple participants within social and technical contexts as depict in Figure 3. Participants are also known as actors, they can either be people or technologies [15]. According to Gao [16], the actor network is made up of both human and non-human actors. This network is formed, purposely to accomplish a particular task which in this case is to develop and implement a system.

The interdependency between actors (human and non human) for a common interest and goal within a network, help to provide desired solution to a problematised issue. Currently in business networks, actors are characterised by what they do rather than the positions that they possess. Simply identifying both human and non-human as actor remove individualisation, and foster cooperation and dependence amongst actors within a network.

Technologies are constantly changing for the purpose of making life, processes and activities easier, better, and more flexible. As such, it requires a vibrant network consisting of human and non-human with aligned interest, as opposed to against each other, to comprehend the utilisation of available technologies. Atkinson [17] argued that the use of information systems and technologies plays an essential role in solving problems and supporting decision making in various aspects of organisations. This indicates that organisations and individuals are partly, sometimes wholly dependent on technology to function.

5   Conclusion

The development and implementation of information systems is such a challenging and complex task to accomplish in organisations. It requires a diversified number of

skills, process and tools that complement each other in a network. Since ANT is unbiased, and equally supports the roles and involvement of both human and non-human actors, it examination is essentially important.

The application of ANT is information systems' studies does not only focus on the creation of networks, but it also helps to identify the roles, technologies and the connection between the two, human and non-human actors within networks. Due to the much interdependency between the actors, and the influential nature of some actors, it is of vital importance to consider the employment of OPP at all times.

References

1. Tan, W.K., Tan, C.H.: Teaching information systems development via process variants. Journal of Information Systems Education 21(2), 159–172 (2010)
2. Avison, D., Fitzgerald, G.: Information Systems Development Methodologies, Techniques & Tools, 4th edn. McGraw-Hill, United Kingdom (2006)
3. Chen, D.Q., Mocker, M., Preston, D.S., Teubner, A.: Information systems strategy: Re-conceptualization, measurement, and implications. MIS Quarterly 34(2), 233–259 (2010)
4. Wernick, P., Hall, T., Nehaniv, C.L.: Software evolutionary dynamics modelled as the activity of an actor-network. The Institution of Engineering and Technology 2(4), 321–336 (2008)
5. Bergeron, F., Raymond, L.: Planning of information systems to gain a competitive edge. Journal of Small Business Management 30(1), 21–26 (1992)
6. Chua, A.Y.K.: Exhuming IT projects from their graves: An analysis of eight failure cases and their risk factors. Journal of Computer Information Systems 49(3), 31–39 (2009)
7. Jain, R., Chandrasekaran, A.: Rapid system development (RSD) methodologies: Proposing a selection framework. Engineering Management Journal 21(4), 30–35 (2009)
8. Cervone, H.F.: The system development life cycle and digital library development. International Digital Library Perspectives 23(4), 348–352 (2007)
9. Okrent, M.D., Vokurka, R.J.: Process mapping in successful ERP implementations. Industrial Management & Data Systems 104(8), 637–643 (2004)
10. Capaldo, G., Rippa, P.: A planned-oriented approach for EPR implementation strategy selection. Journal of Enterprise Information Management 22(6), 642–659 (2009)
11. Luoma-Aho, V., Paloviita, A.: Actor-networking stakeholder theory for today's corporate communications. Corporate Communications: An International Journal 15(1), 49–67 (2010)
12. Law, J., Callon, M.: The life and death of an aircraft: a network analysis of technical change. In: Bijker, W.E., Law, J. (eds.) Shaping Technology/Building Society: Studies in Sociotechnical Change, pp. 21–52. MIT Press, Cambridge (1997)
13. Iyamu, T., Roode, D.: The use of structuration theory and actor network theory for analysis: Case study of a financial institution in South Africa. International Journal of Actor Network Theory and Technological Innovation 2(1), 1–26 (2010)
14. Doolin, B., Lowe, A.: To reveal is to critique: actor–network theory and critical information systems research. Journal of Information Technology 17(2), 69–78 (2002)
15. Potts, L.: Using actor network theory to trace and improve multimodal communication design. Technical Communication Quarterly 18(3), 281–301 (2009)
16. Gao, P.: Using actor-network theory to analyse strategy formulation. Information Systems Journal 15(3), 255–275 (2005)
17. Atkinson, C.J.: The multidimensional systemic representation of actor networks: Modelling breast cancer treatment decision-making. In: The Proceedings of the 35th Hawaii International Conference on System Sciences (2002)