

Impact of Information and Communication Technologies on Trust Theory and Economic Development

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Abstract

The aim of this article is to present a conceptual model for Information and Communication Technologies by converging theories in development. The Complex Adaptive System theory is presented as an underlying theory for Information and Communication Technologies for economic development. The conceptual model which is presented in this research represents a point of convergence on the theory of development. A model would be introduced inside which the variables recognized by the distinctive hypotheses interrelate dynamically, impact one another and showcase another idea inside which allows you to analyze Information and Communication Technologies for economic development. It would also be emphasized that Information and Communication Technologies is playing its role in developing trust theory and its branches including both the organizational trust and the institutional trust and their factors too, which are an essential part of social contingency mechanism which contributes directly towards the economic development.

***Key Words:** Information and Communication Technologies, Economic development, Complex Adaptive System theory, Trust theory*

Resumen

El objetivo de este artículo es presentar un modelo conceptual de Tecnologías de la Información y de la Comunicación por la convergencia de las teorías en desarrollo. La teoría del sistema adaptativo complejo se presenta como una teoría subyacente para las Tecnologías de Información y Comunicación para desarrollo económico. El modelo conceptual que se presenta en esta investigación representa un punto de convergencia en la teoría del desarrollo. Un modelo fue introducido dentro del cual las variables reconocidas por las hipótesis distintivas se interrelacionan de forma dinámica, se impactan entre sí y muestran otra idea dentro de la cual le permite analizar las Tecnologías de Información y Comunicación para el desarrollo económico. También se hace hincapié en que las Tecnologías de la Información y Comunicación está jugando su papel en el desarrollo de la teoría de confianza y sus ramas incluyendo tanto la confianza en la organización y la confianza en las instituciones y sus factores también, que son una parte esencial del mecanismo de contingencia social que contribuye directamente hacia el desarrollo económico.

***Palabras clave:** Tecnologías de Información y Comunicación, Desarrollo económico, teoría del sistema adaptativo complejo, teoría de confianza*

Introduction:

Information and Communication Technologies have been receiving a lot of appreciation for being an essential ingredient for the social and economic development around the globe. Different studies confirm that the Information and Communication Technologies have a major impact on the social, political and the economic growth of a country. Information and Communication Technologies has the strength to develop a new human society, encourage the ascent of human capacities to new statures, and to boost economic growth and diminish poverty as well.

In this research, Complex Adaptive System is presented as an underlying theory for Information and Communication Technologies. Complex Adaptive System offers an interdisciplinary approach which is holistic. First, each component is presented individually before their interaction is studied and then, a conceptual model would be presented which shows the point of convergence of different development theories.

Information and Communication Technologies

“Information and Communication Technologies has the power to create a new human society, facilitate the rise of human capabilities to new heights, and to generate economic growth and reduce poverty as well” (Torero & Braun, 2006).

The Governments in the developing countries have facilitated their people and improved the services within the country using the Information and Communication Technology. Different firms have improved their standards and some developing countries are increasing their exports by strengthening their Information and Communication Technologies sector.

Yahya (1993) states that “*Information technology has a great potential for the economic development of third world countries.*”

Complexity Theory and Complex Adaptive System

Complex Adaptive Systems has emerged from many disciplines. It surfaced as an ideology in the 1980's when a research organization called ‘Santa Fe Institute’ was made by the former members of Los Alamos National Laboratory, in New Mexico. Since the participants belonged to the different disciplines, therefore the aim was to cross the traditional disciplinary boundaries and create a fruitful thinking on the issue of complexity.

Waldrop (1992) mentions that the members of Santa Fe institute strived to develop a “common theoretical framework for complexity” which was founded, based on the work in the different fields like neural systems and networks, artificial intelligence, nature/ecology, economics, chaos theory and cybernetics.

Author M. Mitchell Waldrop stated the process of development and the objectives associated with development and the use of Complex Adaptive System's concepts in his book, "Complexity: the Emerging Science at the Edge of Order and Chaos".

Development is an emergent property of successful economic and social systems, so the characteristics of successful adaptive systems would be considered.

Joshua Epstein and Robert Axtell (1996) take a considerably more encompassing perspective of complex systems as being open and exceptionally interconnected. "The broad aim of this research is to begin the development of a more unified social science, one that embeds evolutionary processes in a computational environment....Artificial society-type models may change the way we think about explanation in the social sciences."

In the following section the Complex Adaptive System would be depicted as the basic theory for Information and Communication Technologies for economic growth.

Information and Communication Technologies as Complex Adaptive System for the economic growth

As explained by Holland (1992), a Complex Adaptive System depicts an evolving structure which has the ability to change and reorganize itself in order to adapt to its surroundings. Therefore, Information and Communication Technologies for economic development as Complex Adaptive System would mean that a system is considered with many elements involved in simultaneous interactions.

Robert Solow introduced an economic model back in late fifties which is now known as 'Neoclassical Growth Model'. In his model, he introduced a third component apart from labor and capital and that was the 'technical change.'

Also Todaro and Smith (2006) argue that development is a field which is consisted of emerging theories and data that challenge the traditional thinking.

Information and Communication Technologies is a crossroad of restructuring and development processes where one can contribute towards the development through realizing change, transformation and structural change.

Although Information and Communication Technologies perform a critical part in economic development, but the change in the economic activity due to the Information Communication Technologies factors, is the thing which is causing the economic growth as it enables transformation and restructuring of economic agents (Asia Pacific Economic Cooperation Secretariat 2001).

"The difficult in methodologies and analysis are a great setback, yet if we are to talk about economic development then we cannot avoid the entire social system which is usually characterized

by social capital, institutions, interactions, cultural issues, learning and innovations (Piasecki and Wolnicki, 2004) and its change.” (MINDILA A. N†., RODRIGUES A.J., MCORMICK D., MWANGI, 2013).

THEORY AND METHODOLOGY

This research would first present a conceptual model of Information and Communication Technologies for the economic development which is based on the theory of Complex Adaptive System. Such model was first formally put forward by John H. Holland (Li-qing and Shao-Rong 2007), where Complex Adaptive System offers an interdisciplinary approach which is holistic.

Information and Communication Technologies for economic development as a Complex Adaptive System would mean that we are considering a framework with the simultaneous interaction of numerous components. This interaction would allow them to adapt, learn, evolve, change, advance and rebuild in response to the internal and external inputs. A Complex Adaptive System is a non linear and causal system which can be analyzed by the complexity of the interconnections of the different system parameters. (Holland 1992; Mendenhall and Macomber 1997; Capra 1996; Mendenhall et al. 2000; Lichtenstein 1997; Rihani and Geyer 2001).

To prove this theory, a model based on the convergence of development theories is presented (MINDILA A. N†., RODRIGUES A.J., MCORMICK D., MWANGI, 2013). In this relationship/sociology model, it presents four sub-models that are considered under the Complex Adaptive System for economic development namely; Social Contingencies, Knowledge Identification and Management, Strategic Flexibility and Institutional Arrangement and change. It must be taken into account that these sub-models are supported by theories which have already been developed by researchers. The underlying theories supporting these sub models would help in acquiring the parameters to consider the creation of the Complex Adaptive System conceptual model for economic development it is covered under the social contingency sub-model, which is then considered a key to economic development especially in the case of Small and Medium Enterprises (SMEs) and the underlying theories under Social contingency Mechanism are drawn from network and cluster theories, social capital theories and trust.

If we consider trust for example, we have seven parameters which are; competence, credibility, benevolence and openness on one side and situational

Normalcy, structural assurance and facilitating conditions on another hand. These are the parameters considered under Social Contingency Mechanism.

For example, using system dynamics models the argument is that for relational social capital to accumulate, the parameters like competence, credibility, benevolence, openness, structural social capital and cognitive social capital contribute in the development.

However in trust, there are two categories, one is organizational which has sub models like competence, credibility, benevolence , openness and the other is institutional trust which has sub models like situational normalcy, structural assurance.

From literature, organizational trust positively affects organizational trust. Therefore keeping the above view in mind, Information and Communication Technologies is viewed as an intervention in trust for both organizational and institutional trust which are key factors for Social Contingency Mechanism and hence the economic development.

The Conceptual Model

Economic Development as a Complex Adaptive System:

Rihani (2002) reports that while analyzing Information and Communication Technologies as a tool of economic development, it is viewed in the frame of a theoretical model named as Complex Adaptive System and Complex Adaptive System according to Rihani are the intervening factors permitting open and free access within and outside the agents. Even the smallest intercession within the Complex Adaptive System framework can cause changes to the patterns in Complex Adaptive System.

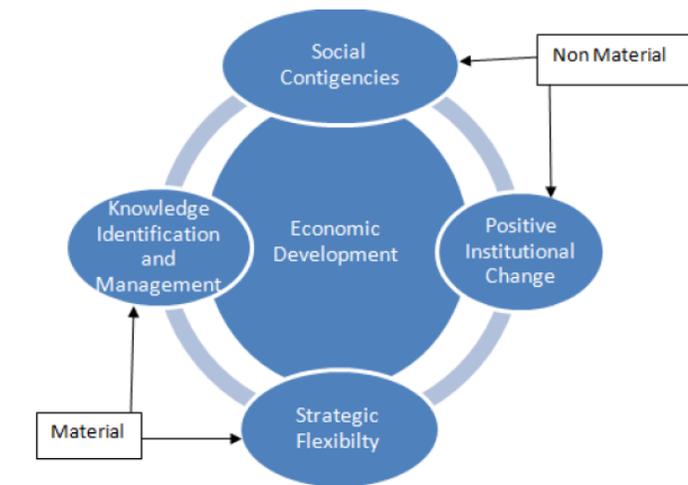
According to Parsons and Hargreaves (2009), that Complex Adaptive System can be affected from different access points and identifying each of the points broadens the range of choices. While performing an analysis to find the points to intercede, possible differences in levels of energy and relationships has to be considered. The boundary conditions are also intercession points in this case. Therefore identifying boundary conditions is vital understand the dynamics of a system.

If economic development is the Complex Adaptive System for the study, the intercession points have to be carefully recognized basing the judgment on the concepts of influencing a Complex Adaptive System which is the only way to intercede the Complex Adaptive System. So, these studies reveal Information and Communication Technologies to be the useful instruments of

intervention so as to understand and achieve economic development through Information and Communication Technologies.

The Complex Adaptive System model for economic development includes theories like institutional change, strategic flexibility, social contingencies mechanism and knowledge identification and management. network and cluster theories, learning and knowledge theories and strategic management theories. The way in which these theories interrelate is captured in Figure 1.

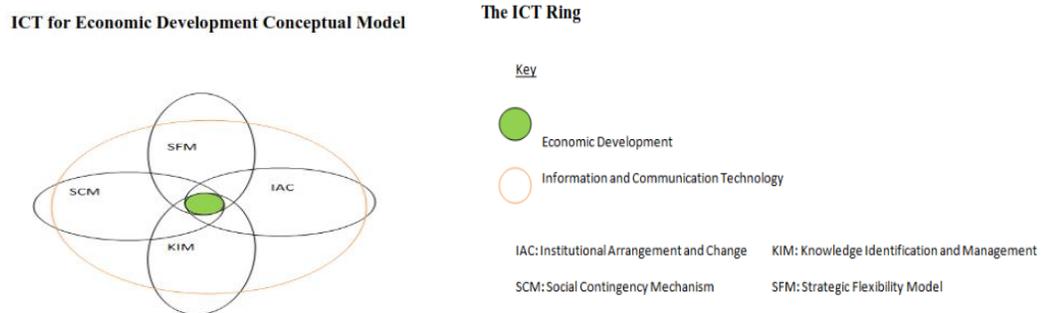
Fig 1. the interaction and convergence of development theories in a Complex Adaptive System for economic development:



Source: *A Conceptual Model for ICT for Economic Development Using Complex Adaptive System Approach: Case of a Micro and Small Enterprise (MSE) Association*

In Figure 1, the economic development is considered as a Complex Adaptive System which turns out to be the result of the interaction of elements like institutional change, strategic flexibility, social contingencies mechanism and knowledge identification and management. Parsons and Hangreaves (2009) argue that Information and Communication Technologies is an intervention which reshapes the structures or processes which hold these four basic models. Hence, Figure 2 which was drawn in 2 dimensions, would let us have a better idea how the Information and Communication Technologies is a point of intervention between these elements. (Mindila A. N., Rodrigues A.J., McCormick D., Mwangi, 2013).

Fig 2. The ICT Ring:



Source: A Conceptual Model for ICT for Economic Development Using Complex Adaptive System Approach: Case of a Micro and Small Enterprise (MSE) Association

After proving that Information and Communication Technologies is a point of intervention of four basic models, this research is going to focus more on the role of Information and Communication Technologies in developing trust which is an essential part of Social Contingency Mechanism which is a key element for the economic development, as discussed earlier.

Social Contingencies Mechanism and Trust

Social contingencies model depicts interaction and elements in a Complex Adaptive System. According to (Marshall, 2004), an important source of innovation is the use of collaborative inter-organizational relationships. Innovation, however, can be viewed with two different prospects, one that enables enterprises preferably Small and Medium Enterprises (SME) to develop new products and the other one which enables entrepreneurs to be on the spot and ad-lib which will promise an institutional change (Campbell, 2004). Therefore, the economic development would be the result of consolidation of the economic growth and institutional change. The above mentioned innovations both contribute towards the economic development.

However, according to (Marshall 2004) , the long lasting relations require obligation and trust and that the economic activities are conducted via a strong network of continuous networks of relationship. It proves that a strong relationship is one of the key factors for the economic development at any level. However, relationships are based on trust which is acquired through proper interaction.

These days, distances and locations don't matter any longer. The World has been turned into one small global village where interaction can still be done while sitting at the two different corners of the world. The experts agree that a face to face interaction is not a requirement to build trust or relationship. The World is digitally linked together and all kind of interaction including, social, political, public and institutional researches can be done by virtue of Information and Communication Technologies components.

Bellussi (2004) states, while speaking on technology “if Information and Communication Technologies adoption and implementation are aimed at reinforcing intra-cluster and inter-organizational relationships then they contribute towards integration of the economic actors operating along global supply chains”. *This integration is only possible if there is trust. How to measure the contribution of Information and Communication Technologies on networks and social capital of which trust is part, has been the greatest challenge for researchers.*” (Mindila, McCormick, Rodrigues & Mwangi, 2013) .

In view of the above, it is clear that economic development depends on Social Contingencies Mechanism (SCM) which depends on trust, which demands strong relationships which demands proper interaction which can be achieved through Information and Communication Technologies only. This is another strong contribution of Information and Communication Technologies in economic development. The following diagram would help us understand this idea in a flow which is represented in figure 3.

Fig. 3. The flow of theories that enhances the economic development and their dependency on Information and Communication Technologies:



Influence of information and communication technologies on the components of trust

Gefen (2002), Areniurs & Antro (2002), Erden & Ozen (2003) clearly state that trust is multidimensional and it has 2 major classifications:

1. Institutional Trust: The parts of Institutional trust are Situational Normality, promising structure and helping conditions.
2. Inter-organizational trust: The important instruments of Inter-Organizational trust are distinguished ability, recognised integrity and perceived benevolence. (Agnes Mindila, Dorothy McCormick, Anthony Rodrigues and Ronald Waweru Mwangi , 2013)

Researchers like (Mcknight et al, 2002) define the Institutional trust as “the organizations belief that favorable conditions are in place that are beneficial to outcome success.” As defined earlier that the components of the Institutional Trust include 3 different parameters which are Situational Normality, Structural assurances and facilitating conditions.

Concepts of structural assurances are in favor of structures of contexts like contracts, regulation and guarantees. While Normality beliefs on the other hand state that success is a likely outcome since the conditions (common beliefs, goals and standards) had been normal given the conditions as stated by Pavlou, et.al, (2003). Inter-organizational trust have been reported as:

- 1) Competence; the ability to deliver assignments, fulfill contracts and agreements
- 2) Credibility; delivering contracts with reliability, honesty and as predicted,
- 3) Benevolence; the trusted party will continue to be fair and will not break the trust of the trustor. (Ridings, et.al., 2002, Stoutland S.E, 2001)
- 4) Openness is providing the complete information and keeping no discretion as by (Ibrahim M. and Ribbers P., 2006).

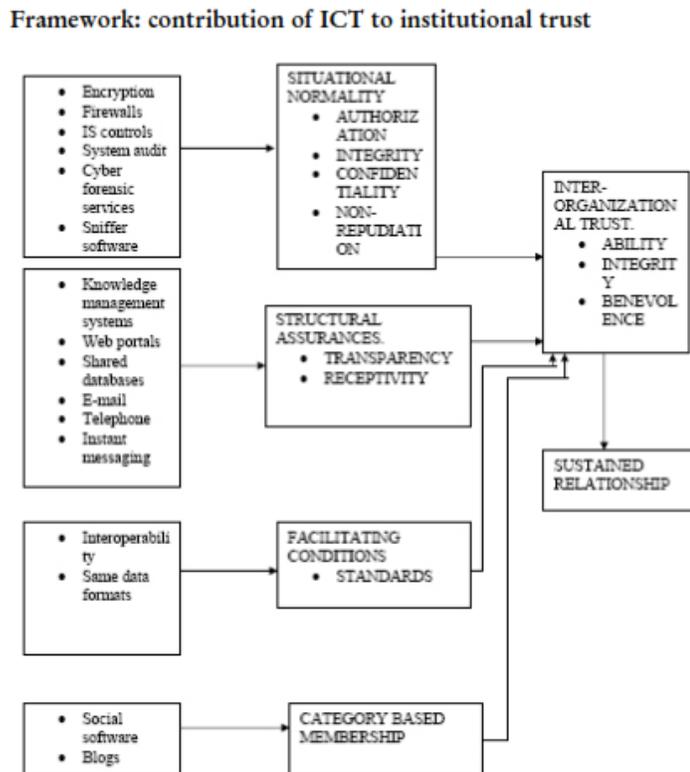
Conclusion

It is vital to notice the role of trust in all working and inter organizational environments where systems are supported by computer networks and Information and Communication Technologies ambience which does not follow the usual concept of ethical and social trust norms and is basically institutional. Relation (either direct or inverse) between institutional and inter-organizational trust as had been studied many researchers. Pavlou,et.al (2002 & 2003) report that Institutional trust has a positive impact on inter-organizational trust which in turn brings about positivity in the inter-organizational relationships. (Mindila, McCormick, Rodrigues & Mwangi , 2013)

Many researchers have studied the relationship between institutional and inter-organizational trust. Knowledge of Information and Communication Technologies accomplishes both factors because by deploying management systems embedding techniques and technologies and reward systems and also by making use of IOS concepts, individuals are able to share their knowledge. This is also achieved at organizational level through software, email, telephone, groupware, shared databases, instant messaging,

all of which provide a higher level of transparency. The framework in Figure 4 (Mindila, McCormick, Rodrigues & Mwangi , 2013) summarizes the contribution of Information and Communication Technologies to institutional trust.

Fig 4. the contribution of ICT to institutional trust.



However, further research to investigate the impact of Information and Communication Technologies and its components on Inter-Organizational trust in particular, would be interesting.

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