



Institutional Arrangement and Change Dynamics for Economic Development in an ICT Enabled Environment

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ABSTRACT

The literature on development provides evidence of a continuous effort by economists to gain a deeper understanding of the theoretical relationship between institutions and the process of economic development. It is widely agreed by social scientists and economists that continual institutional change is important for development. Designers of institutional change put much effort in coming up with effective programs that guarantee positive institutional change. However this is only achievable if the underlying process of institutional change is understood. This paper makes a contribution towards this effort by bringing to understanding the structural, quantitative and operational representation of institutional arrangement and change which provides researchers and practitioners an opportunity to be able make interventions and enhance institutional change that brings about development. The paper presents a conceptual model for institutional arrangement and change. The paper further presents a system dynamic institutional arrangement and change model that exposes influence points where interventions can be made. The paper presents ICTs as interventions to enhance the institutional arrangement and change in a real world scenario.

Keywords: *Institutional Arrangement, Institutional Change, Economic Development, Information and Communication Technology (ICT), Complex Adaptive Systems (CAS) and System Dynamics (SD).*

1. INTRODUCTION

The literature on development provides evidence of a continuous effort by economists to gain a deeper understanding of the theoretical relationship between institutions and the process of economic development [1][2][3][4][5]. It is widely agreed by social scientists and economists that continual institutional change is important for development [6]. Designers of institutional change put much effort in coming up with effective programs that guarantee positive institutional change. However this is only achievable if the underlying process of institutional change is understood.

This paper seeks to bring to understanding the structural, quantitative and operational representation of institutional arrangement and change which provides researchers and practitioners an opportunity to be able make interventions and enhance institutional change that brings about development.

This paper takes on the organizational institutionalism which considers organizations as agents of institutional change where their actions affect how institutional framework evolve and similarly the institutional framework in existence determine what organization come into existence and how they evolve[3][4][5].

The organizational perspective defines institutions as the formal and informal rules and the enforcement of the rules. Institutional framework is a continuum that runs from taboos, customs and tradition on one end and on the other end written constitutions accompanied by means of enforcement at every stage in the continuum. Informal Rules/Constraints could include internally enforced standards of conduct, socially sanctioned norms of

behaviour and elaboration and modification of formal rules [5].

They are a framework within which human interaction take place. On the other hand organizations are modeled as the players within a given institutional framework. The interaction between organizations and institutions shapes the direction of institutional change hence the term organizational institutional change [3]. Rules are always devised with compliance costs in mind, which are methods to ascertain that a rule has been violated, to measure the extent of the violation and to apprehend the violation. The costs of compliance include measuring multiple attributes of goods and services being exchanged and measuring performance of agents. The inability of societies to develop effective, low cost enforcement of contracts is the most important source of both historical stagnation and contemporary underdevelopment [3][4][5].

Institutional change is often attributed to organizations and their entrepreneurs who engage in purposive activity and as they do that are agents of institutional change and shape the direction of institutional change. Campell [5] attributes institutional change to a mechanism called bricolage.

This concept of bricolage focuses attention on a creative process in which actors, referred to as institutional entrepreneurs or bricoleurs, make decisions about how to improve and recombine the institutional elements at their disposal. These are described as creative and innovative persons who are strategically positioned within a set of relations and institutions. Having institutional entrepreneurs with ties beyond their immediate social, organizational and institutional locations makes them have a broader repertoire with which to work and hence enables them to be creative, innovative and revolutionary.

Buitelaar [7] presents three major sources of pressure for institutional change and describes them as being responsible for a first window of opportunity. First is the institutional arrangement that exists at any particular instance, which would represent a situation where performance lags behind expectation and goals. Such a situation creates a window where entrepreneurs and stake holders in any population would agitate for change. Second there could exist external societal development, which entails new ideas, new technologies, which may diffuse itself into the population thereby offering alternatives. Third institutional reflection by institutional bricoleurs would challenge present stable situations [8].

In the second window of opportunity Buitelaar [7] argues that change occurs when the parties engage into a discursive mode and make choices. What is accepted and enacted finally would depend on the capacity of agents and organizations driving institutional change. Ideas enacted also depend on the capacity of the system to learn and act upon the learning [9].

This paper posits that the institutional change theories for development explain what Complex Adaptive System(CAS) theory refers to as a systems ability to evolve where it is able to learn, adapt, change, and reconstruct itself in response to external and internal environmental inputs. CAS theory further argues that a system evolves by credit assignment and rule discovery [10][11][12]. The system continually revises its rules of interaction because each element is embedded in perpetually novel surroundings arising from the changing behavior of the other elements [12][13]. The rules are made up of smaller pieces or building blocks, the way the building blocks are discovered and recombined bring about newly invented rules that are better. This description depicts similarities with institutional change theories.

Combining institutional change theories and CAS theory the paper in section 3 presents a system dynamic model for institutional change. Fuller and Moran [14] argue that the application of complexity in social science and management has been in the form of metaphorical descriptions that lack theoretical adequacy. Burnes [15] similarly notes that complexity concepts in social science are used to create metaphorical language for change and development rather than computational modeling. Yet methodologically, complexity is systemic in principle where theorizing and abstracting meaning is model centered and where synthesis with dynamics rather than analysis is required [16].

The paper in section 3 brings to light the control parameters in the institutional change system dynamic model which are used as influence points [17] for ICT interventions. CAS theory posits that a complex system has states of control parameters which include information flow rate, diversity degree, contact degree, level of anxiety inhibition and difference in degree of power [8]. This implies that when one needs to control the system the five

items mentioned should be identified. Institutional change and CAS perspective offers ICT researchers a more structural and systematic understanding of how technologies are embedded in complex interdependent social, economic and political networks [18].

2. INSTITUTIONAL ARRANGEMENT AND CHANGE CONCEPTUAL MODEL

2.1 Institutional Arrangement and Change

Institutional arrangement in any community of practice would be represented by figure 1. It includes the formal and informal rules and the process of enforcement. Compliance to rules involves measuring of extent of violence, apprehending violation, policing and enforcing and measuring of performance of agents.

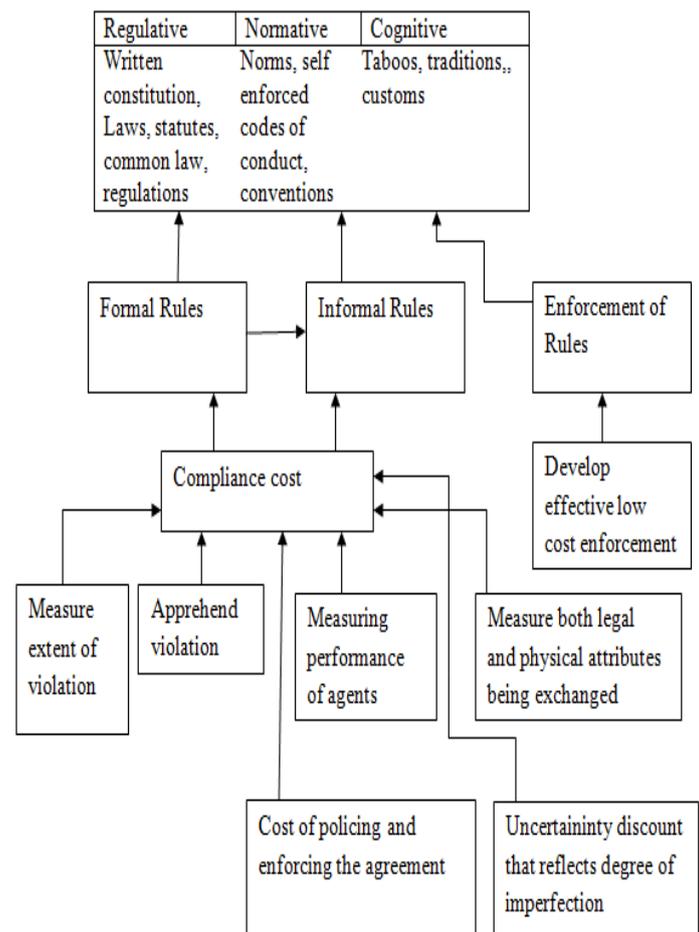


Figure 1: Institutional Arrangement

Figure 2 captures institutional change process. Institutional change will occur due to the disparity between the Institutional Arrangement (IA), which represents the legitimate system, the expectation and goals, the performance of the current IA, and the state of the Institutional entrepreneur for this case the shadow

system [8][19] which may not be very visible. The shadow system is one that represents the aggregate of the psychological activities of individual institutional entrepreneurs. The state of the shadow system is affected by the knowledge management system and learning mechanism in place and the societal changes that are basically represented at the economic and political level and organizational level [5][8]. What is finally enacted depends on the resources and capability of the

organization and the signification, how the institutional elements are communicated across. It also depends on the structural contingencies that dictate the authority and power networks that exist. The nature of authority and power networks will dictate the freedom of opinions and engagement in the issues being discussed and hence what will finally be enacted [20][21].

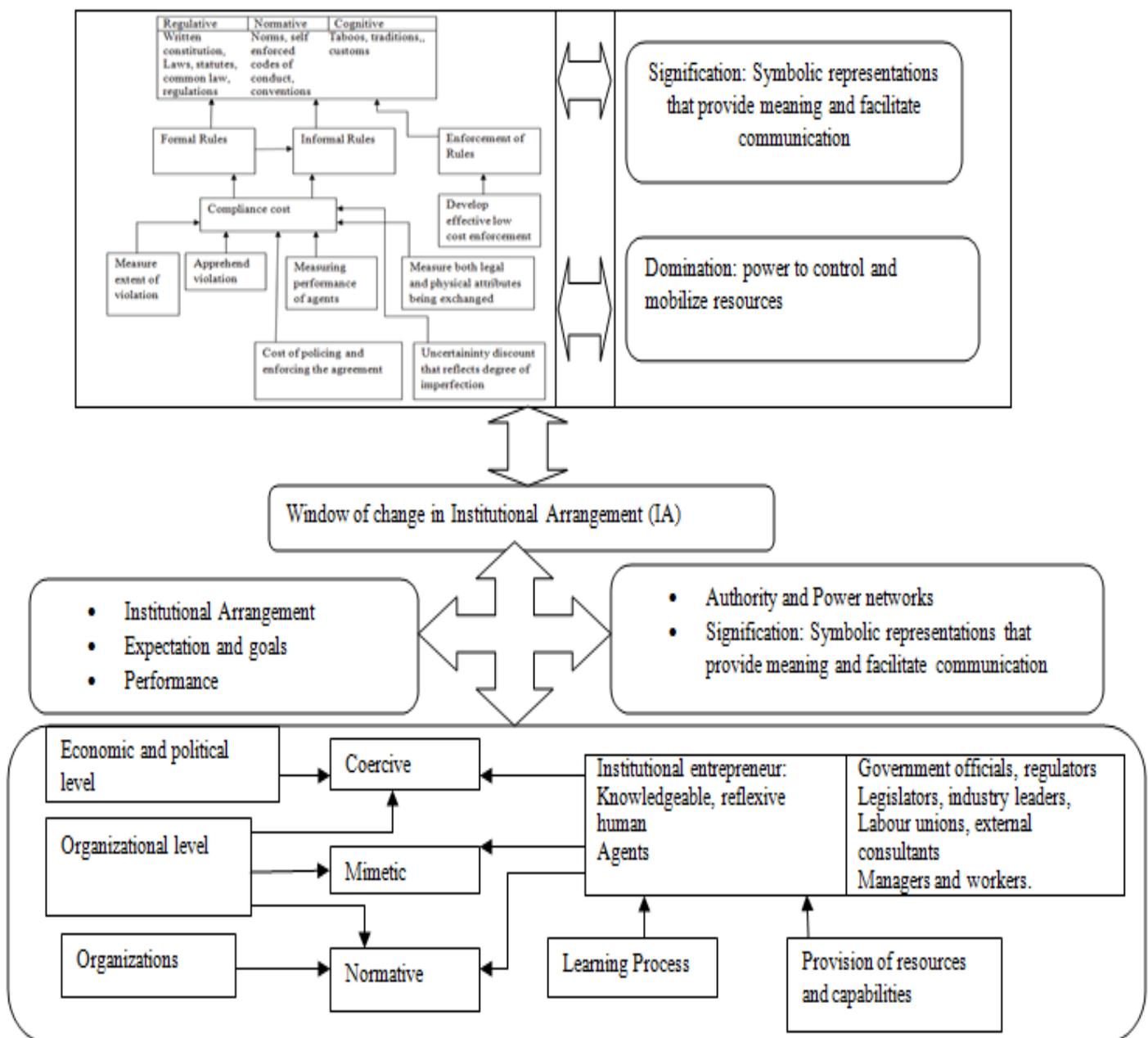


Figure 2: Institutional Change Process



The power networks that exist are very important in what institutional arrangements are enacted. Existence of balance of power is a necessary component that ensures that institutional enactment is a participatory process. Without this balance one can find in any community imbalances between the civil societies or unions and the government of the day. Therefore to ensure democracy and proper power sharing there has to be put in place systems that ensure communities participate in deliberative, self governing of their own settings [22]. Civil society and unions act as channels of public voice and accountability and a way of challenging and checking the power of authoritarian regimes, Lucio and Walker [22] state that

“Democracy entails active citizen participation, good governance, accountability, power sharing, balance of power and rule of law. Rule of law being the perception of the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, the courts as well as the likelihood of crime and violence”.

The interplay of the issues concerned during institutionalization will bring change in the IA, resources and capabilities, the power structures and Signification.

2.2 ICT Interventions in Institutional Arrangement and Change

ICTs act as interventions at control points altering information flow rate, diversity degree, contact degree, level of anxiety inhibition and difference in degree of power [8].

First, ICTs create socio-technical conditions for democratic action which is manifested in online discussion achieved through websites, discussion forums, blogs and formation of issue networks that cut across different actors (public sphere involving civil society and the administrative and legislative institutions of democracy). This helps in establishing deliberative democracy [23]. In so doing information flow rate is increased and level of anxiety inhibition is enhanced.

Second, ICTs support the process of democracy by assisting the circulation of an issue among actors and allowing for the transformation of an issue into a political matter. ICTs allow different sets of actors, located in different settings to participate in the formation of issues giving rise to what could be called trajectories of politicization among settings [24]. ICT enables traceability of social interactions for example the minutes, plans and deliberations on specific issues. Issue networks are enhanced through linkage and circulation of critical

documents, identification of actors to be held accountable and formatting of issues. ICT offers great opportunities to frame capture and visualize political processes. Web based ethnography of issue politics allow the shifting of the stagings of distributed politics to be captured which would further be of great use to deliberative democracy. Electronic brainstorming (EBS) using a group argumentation support system to support group decision, task generation and identification are some of the ICTs that support the process of democracy [24].

Third, ICTs enable constraints in terms of space and time which limit the possibility of meetings and coordinating activities to be overcome [22].

Fourth ICTs make possible the emergence of parallel trade unionists and spokespeople drawn from diverse sources including practitioners, political activists and academicians can be achieved [22]. In essence this enhances the diversity and contact degree in the institutional change process.

Fifth, ICTs have democratic relevance in that they can equalize the balance of power between citizens and power barons. The Internet serves as a mass audience and will politicize people in a certain way. ICT leads to increased participation in discussion, decision making and task processes to those who are politically or economically disadvantaged. From network to coalition, turning to outsiders who can help them envision, chat, and plan the work that must be done. Attract political patrons. Several coalitions emerge from a single issue-network and the winning coalition emerges [20]. ICTs accelerate the process of issue-group formation and action. It has a transformative potential because it facilitates a kind of one-to-one interaction among citizens and between citizens and government. ICTs can be used to organize collectively to effect social and political change around the world. The salient point here is that groups and individuals can far more efficiently form coalitions of consequence with a range of powerful collectives [23]. ICTs can challenge passivity, enhance information equality, overcome sectarianism and prejudice and help facilitate participation in deliberate political processes. Use of internet, online mailing lists and websites provide the support needed for issue engagement among possible participants [22].

Sixth, ICTs can be used for advancement of the state of public affairs through teledemocracy [25]. ICTs enhance local democracy, promote public policy making and rule enforcement. ICTs act as change agents have potential to alter the fundamental relationship between government and state [26].



3. SYSTEM DYNAMIC ICT ENABLED INSTITUTIONAL ARRANGEMENT AND CHANGE MODEL

3.1 The Generic Institutional and Change model

Figure 3's main structure is a delay structure, where it takes time to make decisions and it takes time for decisions to affect the state of the system. The stocks institutional arrangement, institutional arrangement requiring change, institutional requirement expecting change and institutional arrangement undergoing change represent an updating of norms, beliefs, procedures, habits and regulations. All the four stocks are based on information available to the people involved at the time. It takes time to gather the information needed to form judgements, and people don't change their minds immediately on the receipt of new information [27].

The perceived value of each stage is the input to the next stage and the output of the delay is the perceived value of the final stage. In figure 3 the first stage is institutional arrangement and as it moves to second stage which is institutional arrangement requiring change it has been affected by new information in this case *external societal developments*. When the output of stage two moves to stage three which is institutional arrangement expecting change it has been affected by *pressure to change* and *political will*. When it progresses to institutional arrangement undergoing change it is affected by

knowledge and experience, resources and capabilities, existing institutional arrangement, and bricoleurs capacity. From institutional arrangement undergoing change to the actual output into institutional arrangement its affected by resources and capabilities and political will.

The intermediate stocks institutional arrangement requiring change, institutional arrangement expecting change and institutional arrangement undergoing changes are the delays in the process of institutional change, making the output differ from the input. The three stocks hold up the difference between the input and output. The delay is decomposed into the three for the purpose of judgemental estimation of the rates that are involved and capturing of attributes that affect the different stages.

Compliance is important for institutions to be established and for this reason it is modelled as an external resource to institutional arrangement. Compliance itself is accumulated in a co-flow structure where the primary flows are *measuring*, *apprehending* and *enforcing* which belong to *measure extent of violation*, *violation apprehension* and *enforcement* stocks respectively. As the primary flows increase the compliance coincidence flow also increases. The values of the primary flows are affected by an exogenous factor *compliance gap* the argument being that so long as there is a discrepancy between the actual compliance and the desired compliance then the people involved will seek to increase enforcement, violation apprehension and measuring extent of violation.

<http://www.esjournals.org>

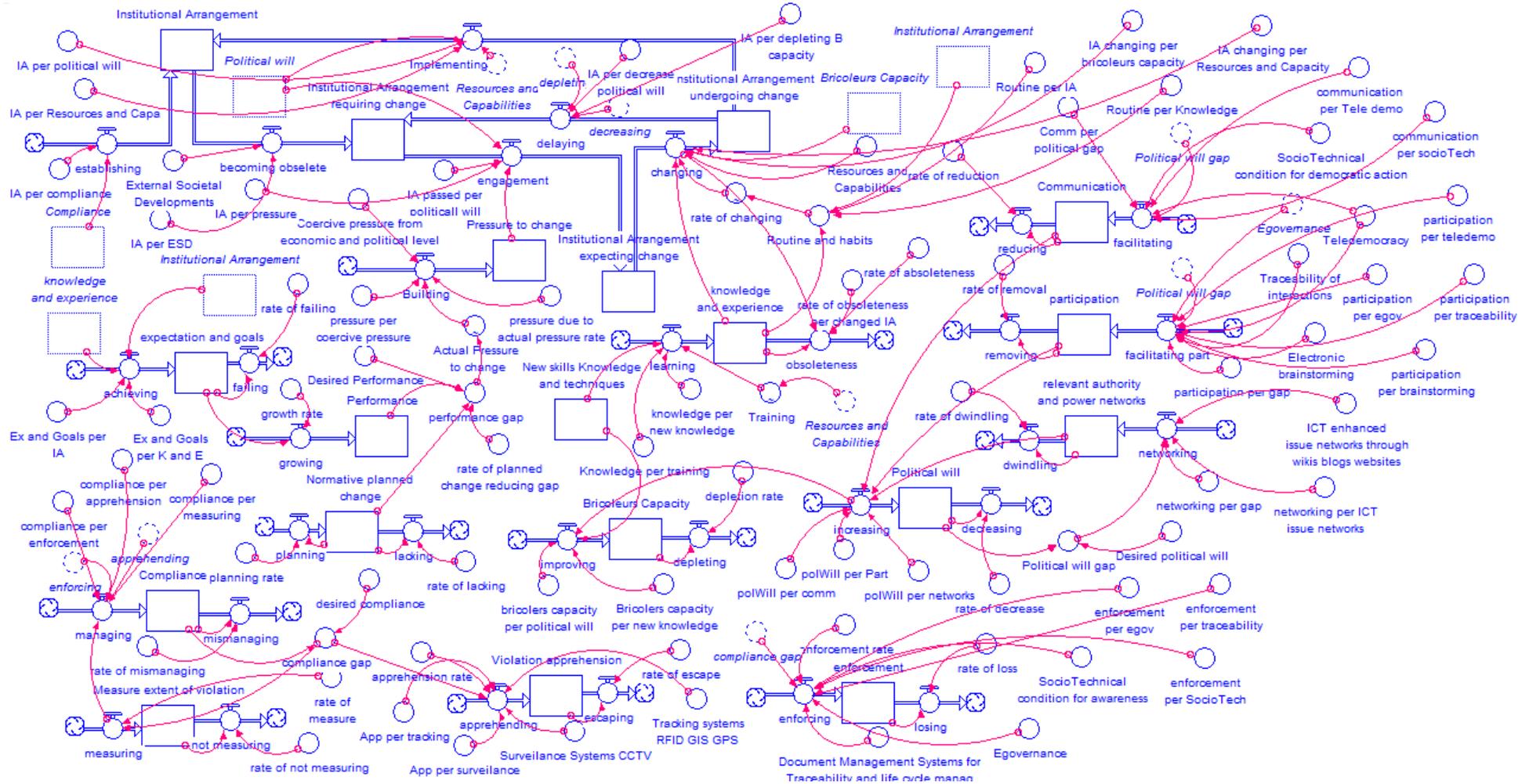


Figure 3: System Dynamic ICT enabled Institutional Arrangement and Change Model.



Table 1: Key for abbreviations in Figure 3

IA	Institutional Arrangement
ESD	External Societal Developments
Ex	Expectation
K and E	Knowledge and Experience
App	Apprehension
CCTV	CCTV
GIS	Geospatial Information systems
GPS	Geospatial Positioning Systems
RFID	Radio Frequency Identification
poWill	Political Will
Part	Participation
Comm	Communication

Pressure to change is modelled as one the attributes that contributes to the second phase of delay. Pressure to change stock accumulates due to external stocks coercive pressure from economic and political level and actual pressure to change which is as result of the performance gap.

The performance gap is the difference between desired performance, performance and the performance due to the normative planned change. Performance itself is an external resource structure with expectation and goals acting as a catalyst of generating the flow to performance. Expectation and goals is also an external resource structure with *knowledge and experience* and *institutional arrangement* as catalysts.

The attributes causing delay in the third stage of institutional change structure are knowledge and experience, routine and habits, resources and capabilities and bricoleurs capacity. Bricoleurs capacity employs a co-flow structure and an external resource structure. The primary flow is increasing which belongs to the stock political will, meaning that as the political will increases the bricoleurs capacity continues to improve. The external resource is *new skills, knowledge and techniques* which act as catalysts to improving bricoleurs capacity. The transition rate from one stock to another is given by equation 1

$$T(i, i + 1) = C_i / tc_i$$

Equation 1

Where T (i, i+1) is the transition rate from stock i to stock i+1, C_i is the stock i and tc_i is the average residence time before exiting.

In figure 3 the transition rate from institutional arrangement stock to Institutional arrangement requiring change is given in equation 2.

$$\begin{aligned} & \text{becoming obsolete} \\ & = ((\text{Institutional Arrangement}) \\ & / (\text{ResTime}) \\ & \times (\text{External Societal Developments} \\ & \times \text{IA per ESD})) \end{aligned}$$

Equation 2

ResTime is the average residence time before institutional arrangement exits to the next stock institutional arrangement expecting change. External_Societal_Developments*IA_per_ESD is the productivity of external societal developments which would accelerate the exit from institutional arrangement to institutional arrangement expecting change.

Political will employs an external resource structure where *communication, participation* and *relevant authority and power networks* are responsible for the build up of political will.

The ICT influence points in the institutional arrangement and change occur at the external resources that build up political will and at the primary flows that cause the coincidence flow in the compliance stock. In the inflow to communication, *facilitating*, the ICT interventions are teledemocracy and socio technical condition. Teledemocracy here referring to ICTs supporting the process of democracy as explained in the subsequent paragraphs. Socio technical conditions refer to blogs, wikis, discussion forums and websites again this is expounded in the later paragraphs. In the inflow to participation, *facilitating participation*, the ICT interventions are e-governance, traceability of interactions and electronic brainstorming. In the inflow to relevant authority and power networks, *networking*, the ICT interventions are ICT enhanced issue networks through wikis, blogs and websites.

ICTs on the *enforcing* primary flow are e-governance, document management systems for traceability and life cycle management and socio technical condition for awareness. ICTs on the apprehending primary flow are tracking systems using Radio Frequency Identification (RFID), GIS and GPS and surveillance systems using CCTV.

The figures 4 figure 5, figure 6 illustrate some of the preliminary simulation results of institutional arrangement and change

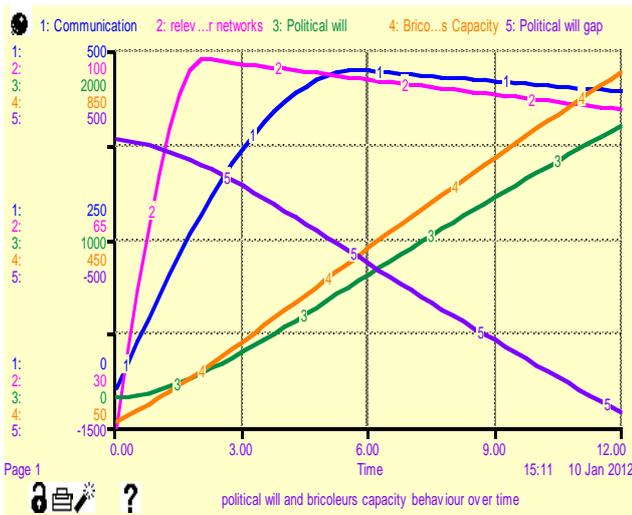


Figure 4: Bricoleurs Capacity and political will behavior over time

Figure 4 reveals that bricoleurs capacity rises as political will rises being a co-flow structure. The values of communication and relevant authority and power networks have a steady increase up to time three but later is stabilized by the political will gap.

Figure 5 shows that institutional arrangement expecting change takes on a very steep decline a behaviour that is a response to a rising bricoleurs capacity and initial high value of the rate of changing. The delay at this second stage is low, institutional arrangement expecting change is not held for long.



Figure 5: Delay attributes on Institutional Arrangement

In figure 6 as compliance rises over time institutional arrangement also rises because compliance is a catalyst to institutional arrangement. The value of compliance increases in tandem with increase in violation apprehension, enforcement and measuring extent of violation. The behaviour of measuring extent of violation drops due to the reducing compliance gap since it has no

ICTs at the point of influence unlike enforcement and apprehension which respond to the reducing compliance gap by a drop in the gradient of increase.

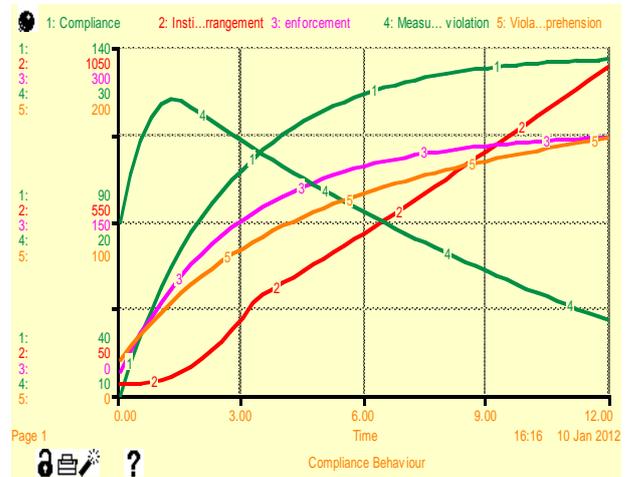


Figure 6: Behavior of Compliance over time

As time moves by the routine and habits tend to increase, as this increases it competes with the bricoleurs capacity and resources and capabilities that are responsible for institutional arrangement undergoing change. The institutional arrangement undergoing change oscillate between high and low values, routine and habits being responsible for the lows and bricolers capacity and resources and capabilities being responsible for the highs.

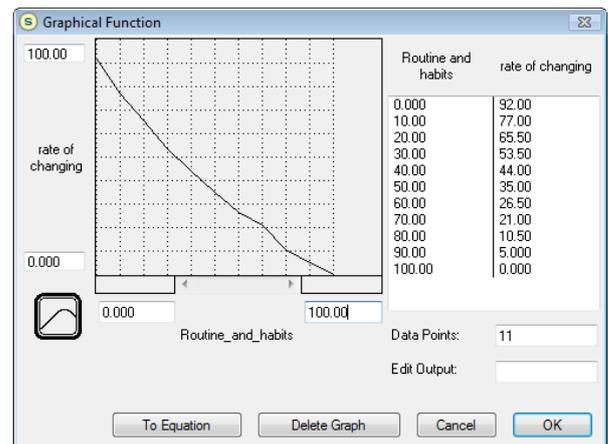


Figure 7: relationship between routine and habits and rate of changing

Figure 7 further helps to explain the effect of routines and habits to institutional arrangement undergoing change. As routines and habits increase the rate of changing decreases meaning that the value of institutional arrangement undergoing change reduces. This is so because the equation for *changing* is given equation 3

$$Changing = \frac{((Institutional\ Arrangement\ expecting\ change))}{}$$



$$\begin{aligned} & (\text{ResiTime}) \times (\text{Bricoleurs Capacity} \times \\ & \text{IA changing per bricoleurs capacity}) \times \\ & (\text{knowledge and experience} \times \text{rate of changing}) \times \\ & (\text{Resources and Capabilities} \times \\ & \text{IA changing per Resources and Capacity}) \end{aligned}$$

Equation 3

Where ResiTime is the average delay time

4. CONCLUSION

Taking a dynamic view of institutional arrangement and change exposes the structural, quantitative and operational representations that make it possible for specific programs to be designed targeting specific portions of the dynamic. This gives a clear roadmap to ICT for development researchers and practitioners who take the institutional change route to hit on target and provide achievable interventions whose results are clear. Flight tests of the dynamic model can be run and real world scenarios studied in detail to enable appropriateness of interventions for the scenarios under consideration. This allows for unique interventions that are not 'one fits all'.

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