

**REGULATION OF COMPLEX ADAPTIVE SYSTEMS: OPTIMISING
COMPETITION AND CONSUMER WELFARE OUTCOMES IN NIGERIA'S
CONVERGING TELECOMMUNICATIONS MARKET**

Raymond Onuoha (ronuoha@lbs.edu.ng)

**Nelson Mandela School of Public Governance (NMSPG)
University of Cape Town, South Africa**

Background

- Convergence and complexity
 - *Implications for Telecommunications Policy*
- Thesis objective: shift from instrumental to adaptive competition regulation

Research Problem

- Increasing levels of infrastructure investments and stricter regulatory requirements have not always led to ubiquitous expansion of next-generation-access networks
- The effectiveness of instrumental competition regulation has returned mixed results across countries at varying cycle points of broadband development
- The challenge of demand-side appropriation of the value created in output markets by the suppliers of internet infrastructure
- The key challenge is finding a regulatory model with the correct mix of incentives to boost competition in multi-sided markets so that the social welfare is maximized

Research Question(s)

- How should regulatory policy optimize investment and innovation in Nigeria's converging telecommunications market while maximizing social welfare, within the globalized digital economy?
 - *Which alternative regulatory interventions can achieve the most efficient dynamics of innovation and investment in the two inter-dependent markets - internet infrastructure provision and internet content supply, while maximizing social welfare?*
 - *What institutional arrangements are necessary to sustain this configuration in the short and long terms?*

Literature Review

- Platform competition in the telecommunications industry
 - *pricing structure is dependent on the relative magnitude of positive cross-group externalities, while having potency to reduce the innovative capabilities of new entrants (Sriram et al., 2015; Economides & Salop, 1992)*
- Platform competition models
 - *Two-sided market model (Armstrong, 2006; Economides & Tåg, 2012; Economides & Hermalin, 2012)*
 - *Investment-Innovation model (Njoroge et al., 2013; Becker et al., 2010; Choi et al., 2014; Canón, 2009; Cheng et al., 2011; Guo, 2011; García et al., 2017; Van Schewick, 2006; Caillaud & Jullien, 2003)*
 - *Congestion management model (Garcia, 2016; Lehr & Weiss, 1996; He et al., 2012; MacKie-Mason & Varian, 1995; Krämer & Wiewiorra, 2009; Gupta et al., 2011; Jullien & Sand-Zantman, 2012; Choi & Kim, 2010)*
- Telecommunications ecosystem as a public good

Literature Review: Gaps



SUPPLY SIDE
FOCUS



GLOBAL NORTH
FOCUS



QUANTITATIVE
FOCUS

Theoretical Framework



COMPLEXITY THEORY

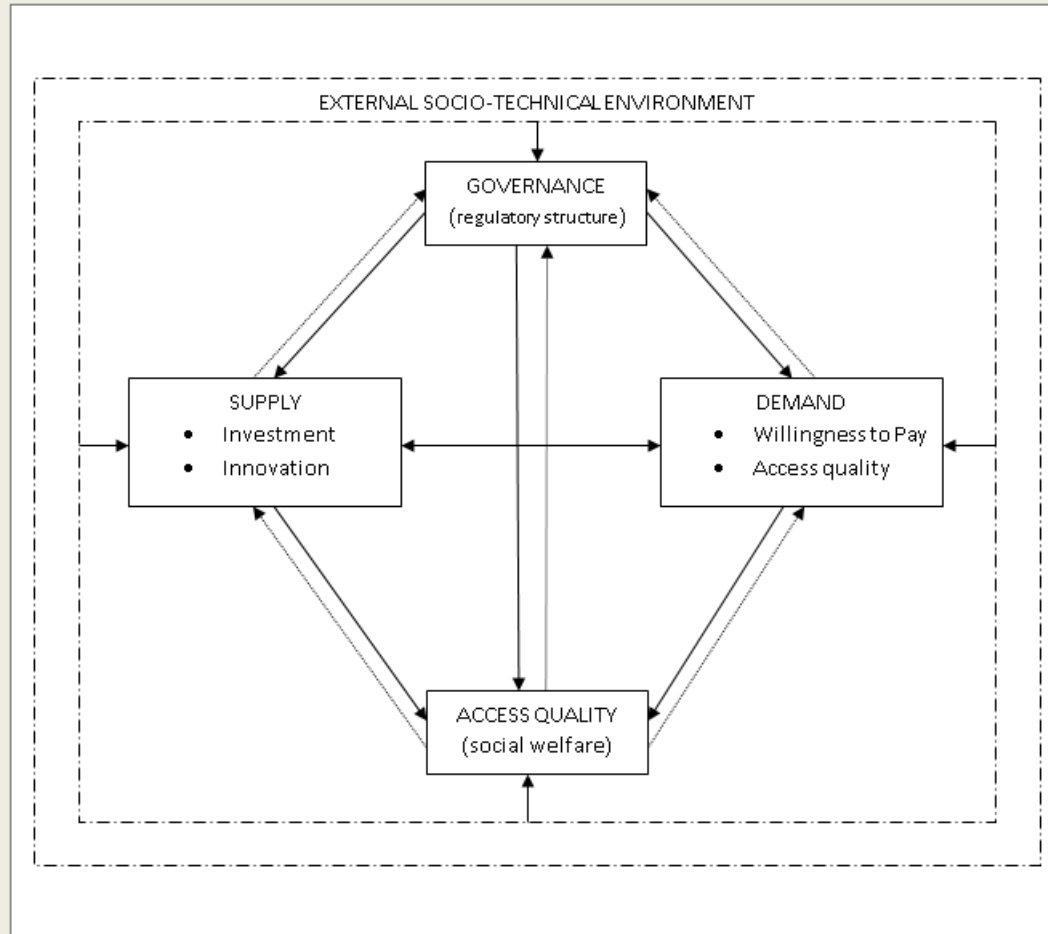


COMPLEX ADAPTIVE
SYSTEMS (CAS)

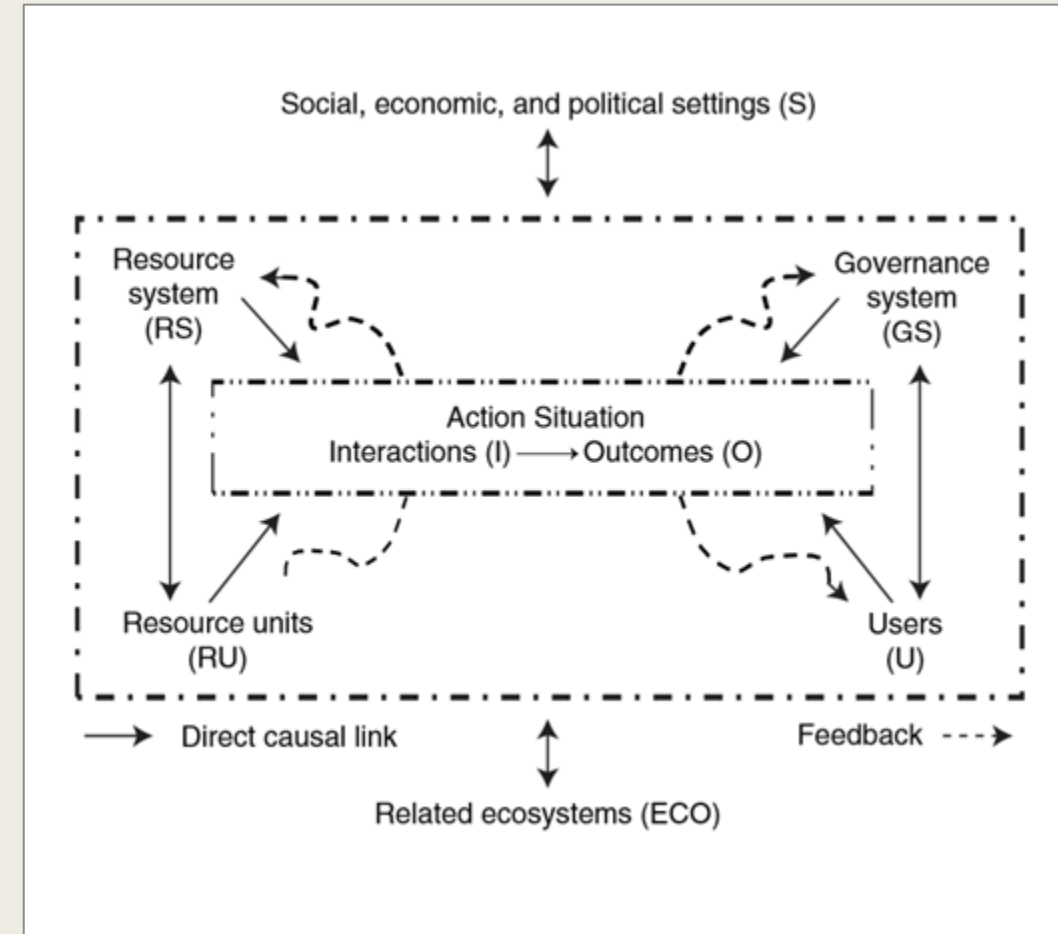


INSTITUTIONAL ANALYSIS
AND DEVELOPMENT (IAD)
FRAMEWORK

Conceptual Model



Broadband governance as a CAS, adapted from Bauer and Tsai (2014)



IAD framework for common pool resource analysis; source: Ostrom (2010)

Methodology and Research Design

Qualitative research methodology

- *Inductive (interpretive constructivism)*

Single case study

Process Tracing

Semi-structured, intensive interviews

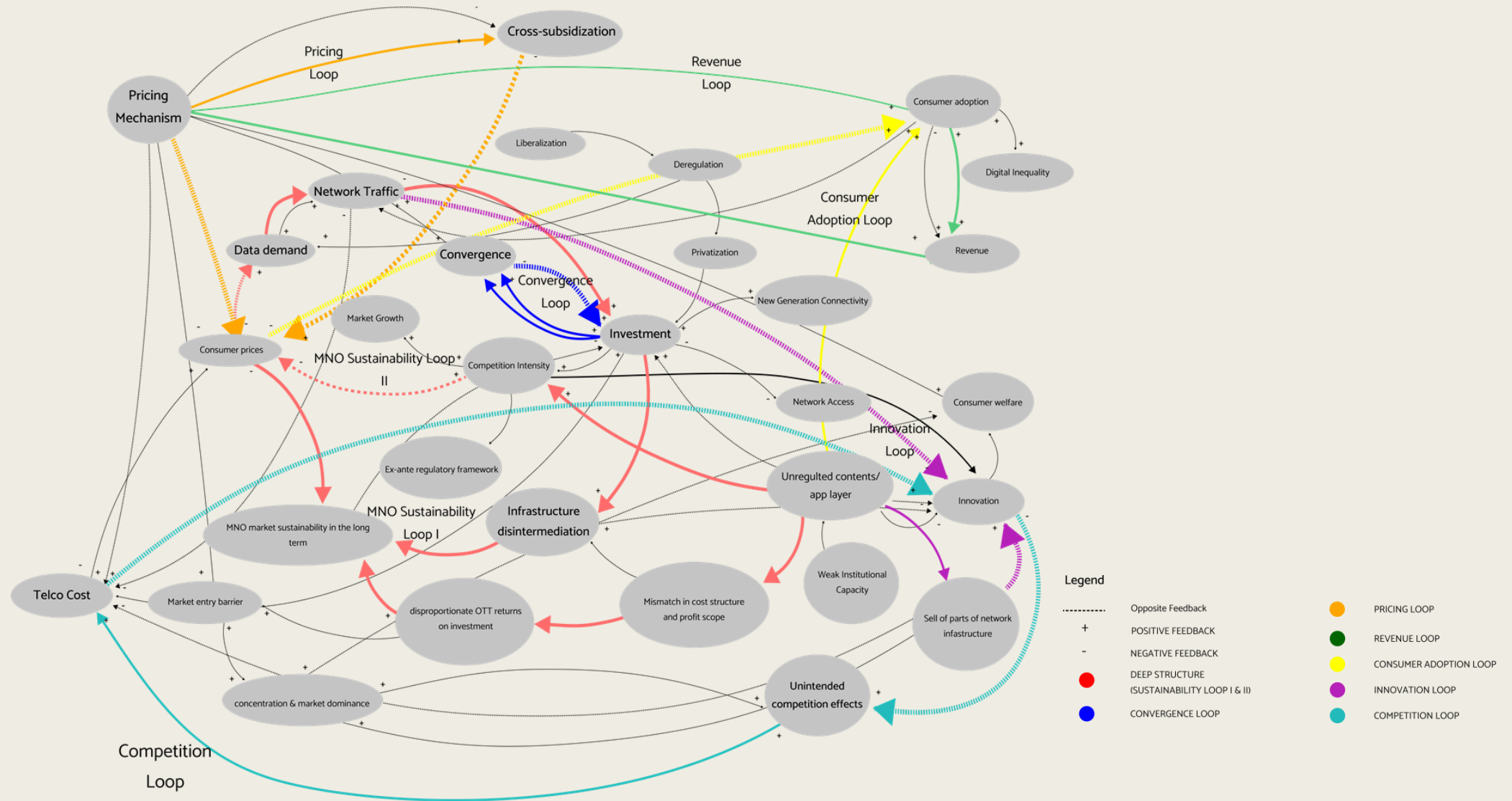
Ethical considerations

Thematic coding

Key Results

- While the infrastructure system of Nigeria's telecommunication industry has expanded as a consequence of the opening up of competition for mobile and fixed telephony and internet services, it has not led to the complimentary development of institutional stakeholder capacity or capabilities of users and many producers from both a user and institutional framework dimensions.
- New generation network infrastructure additions to the Nigeria's evolving telecommunications market are path-dependent and non-linear.
- Complex adaptive regulation of the Nigerian telecommunication market will require investment models that depends on evolving the institutional arrangements in relation to the regulatory capacity of agencies.

Ecosystem mapping



Ecosystem mapping

- Leveraged to identify critical opportunity pathways for regulatory evolution both in the short and long terms
- full interactive visualization available URL: <https://kumu.io/JesoRay/phd-ecosystem-mapping#untitled-map>
- Crystallized the long-term sustainability of the incumbent Mobile Network Operators (MNOs), as the most central component (i.e., the Deep Structure) of Nigeria's telecommunications market
- Ecosystem Leverages:
 - *Regulating Contents/App Layer*
 - *Balancing MNO Costs, Investment, Innovation and Infrastructure Disintermediation*
 - *Managing Network Traffic: Imperatives for Infrastructure Investments, Consumer Prices and Quality of Service (QoS)*

Conclusions

- Digitally less mature ecosystems such as Nigeria's telecommunications market will require greater levels innovative forbearance and unique regulatory adaptiveness to the dynamic global environment within which its converging ecosystem is situated in the long run, rather than a best practice approach with respect to both economic and social outcomes
- In relation to pricing structures, the thesis posits that on the premise of a regulated converged telecommunications market, the optimal price mechanism are more welfare enhancing in the long term when sunk investment costs and technological innovation uncertainties are taken into consideration
- With reference to institutional analysis, the thesis substantiates the notions of social welfare economics, first with respect to appropriate institutional arrangements to foster the realizations of telecommunications policy, specifying within the Nigerian case the requirement for a converged regulator to administer the converging ICT regulatory regime that will incentivize investments in the sector within a fair and competitive market environment.
- The thesis therefore proposes the need for socio-technical infrastructural flexibility and adaptability in overcoming the unplanned scaled capacity requirements as a consequence of OTT services adoption by users.
- Within this purview of complex adaptive regulation, the thesis posits from an institutional dimension, the requirement for investment models that co-evolves in relation to the regulatory capacity and independence of policy agencies
- Finally, the thesis implicates asymmetric reconfiguration of the value boundaries across market layers (both vertical and horizontal) for a functionally-equivalent and technology-neutral regulatory regime that prioritizes the structural separation of both sides of the market (MNO and OTT) in maximizing consumer welfare.