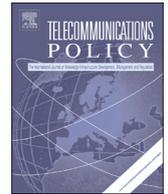




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Coopetition and convergence in the ICT ecosystem

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ABSTRACT

This study focuses on quantifying and visualizing the competitive dynamics shaping the ICT ecosystem. We ground our study in theories of complex systems, strategy dynamics, and industry life cycle. Using a unique longitudinal dataset, we define and develop graph and information theoretic measures of coopetition, convergence, complexity, and velocity of the ICT ecosystem. We frame the “transformation path” of the ICT ecosystem using these proposed metrics and map the trajectory using complex network visualizations. Our results show that while segments in the ICT ecosystem have converged, the rate of convergence is decreasing. This suggests a growing maturity of the ecosystem and decreasing importance on formal interfirm relationships. At the same time, we find that coopetition is increasing at a decreasing rate. We also find evidence of a declining engagement in interfirm R&D and a growing number of technology transfer relationships, indicating a possible shift from value exploration to value capturing. Our novel data-based metrics provide a foundation for strategic analysis of new business opportunities that is not possible using traditional market analysis tools. We conclude with a discussion of policy implications and future research opportunities.

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1. Introduction

It is well known that the information and communications technology (ICT) ecosystem has experienced a significant transformation over the past two decades (Christensen & Anthony, 2004; Fransman, 2010). Driven by rapid technological advances, changing societal preferences, and shifting economic and regulatory conditions, firms had to continuously seek ways to improve existing and create and deliver new value propositions in order to grow and survive (Iansiti & Richards, 2006). These complex dynamics continue to persist and have led the ICT ecosystem to become one of the most dynamic and fiercely competitive business environments.

While the evolution of the ICT ecosystem has been an important line of inquiry for scholars (Agarwal & Bayus, 2004; Moore, 1993; Malerba, Nelson, Orsenigo, & Winter, 1999), some issues remain unanswered. Particularly limited work has been done in quantifying and visualizing the competitive dynamics shaping the ICT ecosystem. Rather than using perceptual measures, a quantitative visual approach provides a more objective foundation critical for managerial sense and decision making. Moreover, it also enables a comparative analysis of patterns within and across industries as well as a way to answer foundational business ecosystem strategy and policy questions.

We concentrate our study on two competitive dynamics: coopetition and convergence. Coopetition refers to the cooperation between competing firms leading to possible win-win conditions. Convergence refers to the blurring of

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industry boundaries. Both of these dynamics have been shown to be prevalent in the ICT ecosystem, as firms are continuously searching for new ways of creating and delivering value (Basole & Rouse, 2008).

The ICT ecosystem is a particularly suitable domain to study cooptation and convergence as it is highly dynamic and brings together a variety of different market segments globally (Basole, 2009). At the same time, the role and power of existing players is challenged by continuously emerging new players, creating an interesting dynamic and tension of who will ultimately emerge as leaders. Previous studies have analyzed the nature and dynamics of interfirm relationships (Basole, 2009; Basole, Russel, Huhtamäki, & Rubens, 2012; Rosenkopf & Padula, 2008), investigated the role of platforms (Basole & Karla, 2011), and evaluated different business models and strategies (Bouwman, DeVos, & Haaker, 2008; Li & Whalley, 2002; Peppard & Rylander, 2006).

We build on this prior work and quantify and visualize the cooptation and convergence shaping the ICT ecosystem. We ground our inquiry of ecosystem cooptation and convergence in theories of complex systems, strategy dynamics, and industry life cycle. Using a unique longitudinal dataset, we define and develop graph and information theoretic measures of cooptation, convergence, complexity, and velocity of the ICT ecosystem. We frame the “transformation path” of the ICT ecosystem using these novel metrics and map the trajectory using advanced visualization approaches. In doing so, we address the call of developing new ecosystem metrics, identifying competitive characteristics shaping the ICT ecosystem, and visualizing the expanding ICT ecosystem.

The remainder of the study is organized as follows. Section 2 reviews the theoretical foundations. Section 3 presents our data and methodology. Analysis and visualization of results are presented and discussed in Section 4. Section 5 concludes with a discussion of implications and future research opportunities.

2. Theoretical foundation

Our paper draws on four interrelated literature streams: ecosystems as complex systems, cooptation, convergence, and industry life cycle.

2.1. Ecosystems as complex systems

The conceptualization of industries and markets as business ecosystems has been gaining traction in the management, strategy, and policy literature (Iansiti & Richards, 2006; Moore, 1996). The ecosystem perspective, adapted from the biological and ecological sciences, is based on the premise that industries consist of a heterogeneous and continuously evolving set of constituents that co-create value and are co-dependent for survival (Iansiti & Levien, 2004).

The complex systems lens posits that constituents are interconnected through a complex, global network of relationships (Basole & Rouse, 2008), allowing them to share risks, have access to synergistic knowledge, and be responsive to changes in the institutional environment (Basole & Karla, 2011; Eisenhardt & Schoonhoven, 1996; Russell et al., 2011). Scholars have shown that these interfirm networks are a particularly effective organizational form to improve firm performance, speed of innovation, and organizational learning (Ahuja, 2000; Zaheer, Gulati, & Nohria, 2000). Ecosystem players come from a variety of market segments and fill particular roles (e.g. keystones, dominators, niche) (Basole, 2009; Iansiti & Levien, 2004). As it is quite unlikely for a single market segment to deliver all products or services to end-consumers, successful value creation and delivery requires a careful orchestration between firms across these segments (Basole et al., 2012; Dhanarag & Parkhe, 2006).

Furthermore, research has shown that ecosystems are shaped and driven by a broader societal, technological, economic and regulatory context (Basole & Rouse, 2008). This argument is rooted in the idea of “embeddedness” presented in Granovetter's (1985) seminal article on economic activities. Specifically, it states that economic activities cannot be viewed in isolation from other institutions or from the technological, political, and social contexts in which firms exist. The initiatives in the Telecommunications Act of 1996, for instance, fundamentally transformed the structure of the ICT industry. The launch of the iPhone in 2007 triggered enormous new activities in the technology industry (Basole et al., 2012). Much more subtle are people's social and cultural norms and expectations where, over time, changes enable new businesses and approaches to business. The extent and the level of service expectations have undoubtedly been influenced by the immediacy of instantaneous and constant connectivity (Basole & Rouse, 2008). These vignettes illustrate that these contextual influences can have a deep impact on economic activities and must therefore be considered when conceptualizing the structure and dynamics of business ecosystems.

The evolving complexity of ecosystems presents both challenges and opportunities (Basole & Rouse, 2008). As ecosystems become increasingly complex, firms must be capable of identifying and appropriately managing this complexity in order to remain competitive and survive. On the other hand, ecosystem complexity can expand the opportunity space enabling firms to create new value propositions. Successful firms find ways to navigate this complexity by monitoring their relative position in the ecosystem and identifying opportunities they are exposed to. Understanding and managing ecosystem complexity is also an important task for policy makers as it enables them to formulate effective systemic policies and avoid unintended and potentially negative consequences.

This study builds on this existing work and applies a complex networked systems lens to identify, quantitatively assess, and visualize the evolution of two orthogonal forces shaping the mobile ecosystem: cooptation and convergence.

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