TOWARDS A SOFT ECOSYSTEMS METHODOLOGY TO UNDERSTAND DIGITAL ECOSYSTEM CHANGE

TREO Paper

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1 Extended Abstract

Digital innovations are increasingly the result of leveraging resources and interacting with entities beyond a single organisation's boundary (Seo 2017). This has led to a "new organisational form of digital innovation" (Wang 2021) – the digital ecosystem. Such digital ecosystems form a collective aggregate of loosely coupled autonomous actors lacking hierarchical control, but collectively undertaking activities around the development and implementation of digital technologies (ibid).

Existing research has addressed the structuring roles of actors within digital innovation ecosystems leading to an intense firm-centric focus on platform ecosystem dynamics in which one actor (the "platform" or lead firm e.g. Apple or SAP) is dominant (e.g. Parker et al., 2017; Qiu et al., 2017; Schreieck et al., 2021).

Yet the term ecosystem draws upon an ecological metaphor of symbiotic relations between actors (Moore 1993) in which such dominance of an actor is rarely seen. Furthermore, recent research has highlighted a lack of research into integration (the whole) of an ecosystem in contrast to the dominant focus on key actors (the parts) – a focus which inherently overlooks the wider ecosystem dynamics (Wang, 2021). Wang (2021) usefully addresses this gap through an ecosystemic lens that builds upon ecology, and in particular part-whole relations (ibid). Digital ecosystems are thus constituted from parts which interact to form a whole, albeit, we argue, those parts may vary from simple API services, through companies of various forms, to entire digital infrastructures (such as the Internet).

Literature predominantly adopts a static view of ecosystems. While some researchers have studied ecosystems' evolution (Pujadas et al., 2024; Gupta et al., 2023), the collective actions undertaken for that change to happen are understudied. Particularly, how knowledge and the imagined futures about the ecosystem shape both ecosystems and actors' evolution. We believe systems thinking can help address this gap. We introduce and build upon a socio-technical, British and soft systems (Checkland, 1981) perspective to the study of digital innovation ecosystems – one which, we believe, better accounts for digital innovation ecosystems' ontology.

We thus seek to contribute a systems perspective to the study of digital innovation ecosystems and in particular digital ecosystems in flux. From these ideas we intend to build a practical soft ecosystems methodology (based on SSM) which has practical benefit. We are starting to research this empirically through a design science informed study of the insurance industry as it faces the disruption of increasingly digitised (and indeed self-driving) cars and transport – disruption that is seriously affecting many actors within the ecosystem.

In designing our soft ecosystems methodology, we seek to develop a lens by which we can illuminate the emergence and transformation of the actors and the ecosystem they inhabit. Our design activity is informed by Design Science (Hevner et al., 2004) using soft systems thinking as a kernel theory which is elaborated through cycles of empirical research within the insurance industry as we build our theory. Our over-arching aim is to build *"tough, analytic, partly formalizable, partly empirical, partly teachable*

doctrine" (Simon 1996, p.113) to address the strategic challenges of digital innovation ecosystems by creating an artefact that can apply, test, modify, and extend 'kernel theories' (Markus et al. 2002; Walls et al. 1992). Our overarching aim – in keeping with other design science is relevance to practitioners in the field (Straub and Ang 2011) and for this reason we are working closely with an insurance provider facing the challenge of connected cars and digital transformation influencing its digital ecosystem.

Our aim then is to address a broad research question of *"How can practitioners understand the emergence of a digital ecosystem as a sociotechnical process, and how can systems thinking assist in this understanding?"*

Initial study of our case highlights that rapid technological developments in the space of autonomous vehicles and connected cars, changing regulatory environments and a competitive environment with threat of new entrants continues to challenge traditional ways of working and operating business models of insurance firms (McKinsey & Company 2014; Tu et al. 2022). The sense of flux is strongly felt by the incumbent financial firm we are studying, as their future seems uncertain. In trying to make strategic decisions, our firm tries to make sense of the emerging digital ecosystem and based on such 'imagined' future, acts upon it – and thus changes it.

The flux of our case study suggests the need for a systemic tool to be supported with a temporal perspective to aid our understanding of change in such digital ecosystems. Tabulated below is our very early conceptualisation of our strategic tool - soft ecosystems methodology –which we intend to refine through an iterative process of interviews and design science workshops.

Our soft ecosystems concepts	**Our interpretation for digital innovation ecosystems**
Actor (the focus of the analysis).	An element of the ecosystem which is autopoietic – usually a company offering a service within the ecosystem who has humans who learn and imagine. AI/ML models, robots are also considered as actors in this system. We express this (in keeping with Checkland 1981) as an actor who does X by means of Y in order to achieve Z.
Transformation	The perceived intentional action undertaken by an actor (or group of actors) which changes some element of the ecosystem. Transformation is strongly influenced by power within the ecosystem. Transformation can be conceptualised in systems terms as input transformed into output – but remains subjective since, in SSM terms, we are using systems theory as an epistemic device rather than realist model.
Ecosystem-as-is and emergence	The contemporary ecosystem as it is understood by a human actor within it. This is highly subjective as the extent of the ecosystem can never be known and as actors hold differing Weltanschauung. Ecosystems-as-is however emerge over time as various transformations impact upon it moving it into a future (which may or may not reflect imagined ecosystems-to-be).
Ecosystem-to-be	The future ecosystem as it is imagined by a human actor within it. This is highly subjective and based upon actors' Weltanschauung.
Ecosystem-as-was	The roles, norms and structures (Checkland 1999) of the past ecosystem continue to influence the contemporary ecosystem-as-is. Similarly, the installed base of technology (e.g. cars). It is thus necessary to consider history in the analysis.
Weltanschauung/Worldview	The held beliefs of individuals and actors within the ecosystem that makes the actors evolution sensible.

Actor Imagining	The act of making sense of the present and building mental models of the future. The process of imagining is human though it may be collective and sociotechnical (e.g. within a company and using predictive analytics or modelling tools and simulations).
Actor Knowledge	Knowledge can be both tacit and explicit. Explicit knowledge can be digitised and non-digitised. This also includes AI/ML models since knowledge can also be based on predictions.
Actor Feedback	In contrast to the CAS, for us feedback is both action and imagining – it can be the subjective view of what actors think others will do, and the inertia of previous actions combined. Views on feedback's positivity or negativity are somewhat subjective (though companies' failures can obviously be observed).

Table 1. Soft ecosystems concepts for digital ecosystem change

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