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Complexity and the emergence of new intermediaries

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1. Introduction

This paper explores the application of complexity theory to understanding the emergence of creativity and innovation within infrastructure provision. Our focus is to develop an approach to understanding the emergence of ‘new intermediaries’ in the water sector. New intermediaries emerge in the spaces created within the infrastructure while also working across boundaries to create new configurations of user-supplier, producer-consumer relations. In this sense intermediaries enable creativity *within infrastructure* but also inbetween different social and technical dynamics while bridging a range of interests into innovative configurations that enable new sustainable practices and the introduction of new technologies. Intermediary organisations pose an interesting example of the location of emergence and change while their hybrid socio-technical constitution raises interesting challenges about what it is we apply complexity to. Complexity and intermediaries raise new challenges for thinking about the management of water infrastructure, in particular in relation to how sustainability can be achieved through the bridging of different interests in surprising and innovative ways.

The paper is set out as follows. The first part of the paper gives an overview of the changing nature of infrastructure, and in particular the water sector, highlighting the emergence of new intermediaries while focusing on a number of emblematic examples of their role in enabling innovative technologies and creative social practices. The second section of the paper identifies the first of two windows through which to apply complexity theory to understanding the emerging role of intermediaries, that is an approach to emergence from within. The third section offers a second window referring to emergence inbetween. The final section draws out some lessons for understanding intermediaries through complexity as well the lessons for complexity of intermediaries.

2. Infrastructure in Transition

In classic monopoly conditions water networks were configured around a powerful supply logic designed to provide clean water to domestic users to ensure wider public health and to industry to support economic development. Water supply passed through a complex range of social, natural and technical intermediaries and these were assembled to narrow the gap between production and consumption interests to ensure the rapid, reliable and continuous flow of water to users. Only at times of water shortage was the relationship between supply and use brought into view and subject to scrutiny as public water providers exhorted users to temporarily reduce demand during a drought before re-establishing normal relations.

Organising infrastructure under classic monopoly conditions meant that the distance between production and consumption interests was deliberately short as the public producer of water was responsible for assembling the complex socio-technical-natural relations required to deliver water to mass markets. Users were assigned a relatively passive role that was to consume sufficient clean water to ensure that wider public health conditions were met. Over the last decade there have been shifts in the social organisation and priorities of the water sector that have significantly reshaped the relations between production and consumption interests and creating an enlarged context in which are emerging new intermediaries. Hence the water sector has been characterised by an un-bundling of integrated infrastructure networks, while intermediaries are selectively re-bundling particular aspects (see Graham and Marvin 2001). These ‘intermediaries’ are deliberately positioned to have mediating roles in relation to developing new practices and innovative technologies to achieve sustainability.

Setting out this context, the paper overviews how, in a context where the relationships between users and providers of water and wastewater services are being reconfigured, new intermediaries are emerging within the producer-consumer nexus. The paper will overview the range of intermediaries that are emerging, noting more traditional intermediaries such as consultants, the paper identifies, for example, forms of networking organisation that bridge the interests between regulators and business, web-based intermediaries creating “infomediary” activity, and organisations bridge the interests of low income groups, sustainability and the water companies. Identifying these intermediaries will involve highlighting how they introduce creative forms of relationship, social practices and innovative contexts for introducing new technologies.

The processes of unbundling mean that the understanding the complexities of creativity and innovation within infrastructural dynamics becomes complex. This raises a particular challenge about identifying the boundaries of the infrastructure as well as the scale of through which it becomes possible to understand it. Paying close attention to the notion of emergence as radical relationality (Dillon 2000, Urry 2002) we suggest there are two windows through which to apply a complexity perspective to understanding the emergence of intermediaries in enabling innovative and creative practices. Each window points towards different explanation and understanding of intermediaries as the location of creativity and we examine the resonances and dissonances between the different perspectives.

3. Emergence from within

The first window is to situate the emergence of intermediaries within the dynamics of the infrastructure itself as a complex network. This approach would consider intermediaries as emergent actors within the infrastructure dynamics, situating them as configuring particular relationships between users and suppliers (consumers and utilities). This approach is the most obvious way to apply complexity theory. It offers an opportunity to examine the ways in which infrastructures have changed to a new attractor space in which new spaces for intermediaries have opened up. In the previous attractor space intermediaries were characterised by closely linked demand and supply logics, an undifferentiated public and integrated systems, the space for

intermediaries took the form mainly of consultants acting as advisors and lawyers, for example. In the new space of 'unbundled infrastructure' there has been a complexification to a new attractor state. This is characterised by new logics of demand side management, publics that have become differentiated into different types of users and the infrastructure has broken up into fragmented networks. In this new space the potential role for innovative intermediaries has proliferated, and include: websites through which particular configurations of suppliers can be linked to differentiated consumer requirements; advice and consultancy to show the benefits of sustainable water management for business users; and, organisations linking low income groups to sustainable technologies for low cost homes. This window therefore suggests that as a complex evolving system, the water sector transformation has opened up new spaces for the emergence of new actors – intermediaries – that enable creative opportunities within the infrastructural dynamic. While the new phase of infrastructure is usually mapped in relation to suppliers, regulators, customers and user organisations, new intermediaries show the water sector as an emergent network that involves particular configurations and dynamics of user, supplier and regulation. There is in effect an active “re-bundling” between these different logics and formation of new complex entities within the infrastructure.

This perspective is important and highlights the importance of the internal dynamics of infrastructure for transformation in nonlinear ways, however, it says little about how we understand the specific characteristics of the intermediaries and how they manage to bridge interests in innovative ways. The emphasis on explaining innovation through emergence within gives little account of the environment of infrastructure nor the strategic capabilities of the intermediaries.

4. Emergence In-between

The second window, instead of looking to emergence within, looking at emergence in-between examines the new intermediaries by looking at the detail of their constitution and operation and they ability at generating contexts to enable innovative technology and new social practices. It means seeing intermediaries as complex networks with the water sector as environment. This approach means seeing intermediaries – even in their most simple form – as acting both within but also outside the infrastructural dynamic. It emphasises the way in which intermediaries work *in-between* various logics (economic, political, social), scales (from the dynamic of a household to global networks), social domains (social groups, politic interests, management interests) and technologies, all of which stretch beyond the normal analysis of infrastructure dynamics. This draws together the strategic role of intermediaries in stretching across and weaving together different networks of logics, scales, social domains and technologies to enable creative social practices and creative contexts for innovative technology. The challenge for complexity of this approach is to examine the emergence of creativity and innovation through the complex interplay of various network forms. A model of the transformation of infrastructure in which innovation and creativity are an emergent from within the dynamics of the infrastructure becomes inadequate. What is required is a window into the ecology of complexity in which creativity and innovation are distributed across spaces and are embedded within a variety of different, and even competing, network relations.

5. Complexity, Intermediaries and Innovation

The final section of the paper examines how we makes sense of these two different explanatory viewpoints drawing out some of the lessons for understanding intermediaries through complexity, as well as what intermediaries have to say about how we understand complexity. The argument has been that the two perspectives point in different directions for understanding the emergence of creativity and innovation. Emergence within points to the internal dynamics of the water infrastructure while emergence inbetween points to the locus of change being in the nested interconnections that are actively reconfigured through the strategic intentions of intermediary actors. The paper will conclude by reflecting on the ways in which a hybrid approach to intermediaries that emphasises their multiplicity through relationality can enable the possibility of locating intermediaries as emergent both within and inbetween and that this is key to understanding the innovation and creativity they enable.

