Technology, Social Innovation, and Social Entrepreneurship in the Quadruple Helix

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INTRODUCTION

The article explores the interrelated relationship between technology, social innovation and social entrepreneurship: *what it is, why it matters and how it may be accelerated*. The Quadruple Helix Innovation Model (Carayannis & Campbell, 2009) is employed to frame and elucidate the discussion, reflecting the vital intersection of industry, university, government and citizens. Hybrid organisations, notably hackspaces emerge from the periphery to demonstrate an under-explored yet significant contribution to a creative, cross-disciplinary and citizen-centric "new industrial revolution" (Anderson, 2012, p.17). Indeed, these permeable and improvisational organisational forms echo dimensions of the "experimental laboratory" advocated by Curley and Formica (2013, p. xvi), presenting innovation capabilities for wider application.

Moving from a macro to micro perspective, domain catalysts are introduced which also serve to reflect subject criticality. The evolution of models of innovation is then explicated, leading to a dynamic representation of the Quadruple Helix. Benefiting from this theoretical underpinning, social innovation and social entrepreneurship/intrapreneurship are explored with issues of nebulous nomenclature and lack of conceptual clarity addressed. A focus on open source and social technologies, including digital fabrication and social media, identifies drivers and conduits for change.

Illustration of deliberate interventions to create open and social innovation networks is succeeded by elucidation of organic, self-organising and multi-layered hybrid forms including hackspaces. Highly current cases aid comparative evaluation, with primary research in the creative sector affording rich and underexplored exemplars. The article seeks to promote a critical, interdisciplinary dialogue to aggregate and advance knowledge and surface implications, best practice, future trends and research direction, identifying cross-helix opportunities to catalyse the "co-opportunity" (Grant, 2010, p. 3) of "inclusion innovation" (Ahonen & Hämäläinen, 2012, p. 29).

BACKGROUND

There is an increasing recognition of the socio, technical, environmental and economic value contribution of social innovation and social entrepreneurship, alongside a capacity to support sustainable development (OECD, 2014). This is reflected at a strategic policy level by the focus demonstrated by individual governments, via the Europe 2020 Strategy (OECD, 2010) and through the Global Agenda Council (World Economic Forum, 2013). In the higher education sector, it is evidenced across expanding conference coverage, evolving university, student and community engagement partnerships (Kingma, 2011) and the genesis of specific subject inclusion in postgraduate curriculums (Bhutiani et al., 2012).

Within industry, the role of intrapreneurs has gained prominence (Stewart, 2013), alongside external collaborations with social entrepreneurs (OECD, 2010). Further, the transformational change-making role of the citizen as users and active prosumers, contributes to a transition encapsulated as an emergent new industrial revolution (Anderson, 2012). This continues to attract momentum and acceptance, and moreover, facilitates creative intersectional approaches to solution development, testing and problem-solving for societal benefit. This can range from corporate sponsored Living Labs to grassroots, social innovation networks (Keohane, 2013; Eaves, 2014).

Catalysts for this burgeoning interest span international to local levels and varying stakeholder perspectives. Demographic mega-trends related to fertility, mortality and immigration are impacting public finance and infrastructure, poverty and climate change

(Nugent & Seligman, 2008). Global market challenges, developing country needs and continuing employment and social consequences of the European Economic Crisis remain prevalent (European Commission, 2013). There is also a shift to third-party government (Keohane, 2013) and growing disillusionment with for-profit business operating models, whilst community concerns and capabilities have been brought into sharp focus (Grant, 2010).

Societal trends also stimulate opportunities for innovation, creating economic and social value *alongside* each other, as exemplified by growing ethical markets such as Green products and Fair Trade. Indeed, drawing on Games Theory, cooperation and competition are not polarized opposites; needs realization and optimization increasingly benefits from, and may necessitate cooperation (Grant, 2010). This is evident in the recognition that sustainable technology and profitability can align to advance issues, notably climate change (Ferrari & Fidanboylu, 2013).

Further, a combination of digital society and emergent technology serves as a dynamic enabling influence on innovation (OECD, 2010), as embodied in the impact of social media networks and open source software and hardware (Open Knowledge Foundation, 2014). This supports the globalisation, liberalisation and digitalisation of contemporary cultures; facilitates connectivity between science and community; affords discipline intersection and enables new modes of knowledge co-production and quality control (Grant, 2010; Kera, 2012; Eaves, 2014).

THE QUADRUPLE HELIX INNOVATION MODEL

Perspectives on knowledge creation and models of innovation have progressed significantly, from Mode 1 linear and university based R&D, to Mode 2 approaches which incorporate greater user feedback and emphasise knowledge production in the application context (Füzi, 2013). The Triple Helix lens then overlays Mode 1 and Mode 2, a social structure that connects relationships across university, government and industry, creating a spiral, top-down or expert-led model of trilateral networks (Helms & Heilesen, 2011). Furthermore, a Mode 3 conceptualisation emphasises co-existence, co-evolution and cross-learning (Füzi, 2013).

The Triple Helix is foundational to the development of the Quadruple Helix Innovation Model (Carayannis & Campbell, 2009; Helms & Heilesen, 2011). This is a continuum or space (Arnkil et al. 2010), representative of a move towards increasingly systemic, user-centric, organic, combinational and open models of innovation. It reflects new modes of knowledge production across trans-disciplinary, economic and social dimensions but remains underexplored (Füzi, 2013). Instantiations will be context dependent and Figure 1 affords a dynamic representation for tailored application, considering dependencies, roles and relationships.

This meta-level perspective elucidates the coevolution of the knowledge economy and the knowledge society, within which industry, university, government and citizens, *cooperate to innovate*. The emergent dimension of citizens reflects increasing catalysing roles as users and content-creating prosumers, affording bottom-up change (Helms & Heilesen, 2011). It includes a strong focus on community (Eaves, 2014); civil society and the *creative class* (Carayannis & Campbell, 2009). This lies congruent with growing recognition of creativity and The Arts in particular, as stimuli for social, cultural, economic, political and scientific innovation and development (Springer, 2014).

SOCIAL INNOVATION

Described as an "umbrella concept for inventing and incubating solutions" (European Commission, 2013, p. 5), social innovation can afford a positive, practical, inclusive, sustained and transformational response to diverse and unmet social needs and intractable social problems, or to achieve systemic change, particularly in the areas of inequality and exclusion, underdevelopment, environment, injustice, health and education (OECD, 2014). This process encapsulates the phases of need identification, solution generation, evaluation and scaling-up (European Commission, 2013). Innovation infers newness from an etymological lens but this can take many forms. Drivers centre on idea (products, services, models, execution approach) and value exchange; changes in relationships and role; and the integration of private capital, alongside philanthropic, policymaker, public and non-profit bodies and wider civil society (Murray, Caulier-Grice, & Mulgan, 2010).

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