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RESEARCH ARTICLE

Social commerce Open Innovation in healthcare management: an exploration from a novel technology transfer approach

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Abstract

This paper presents an Open Innovation approach, *AgorIP*, for commercialisation of opportunities within Health & Social Care and Life Sciences, piloted in south west Wales. This approach, supported by Welsh Government, NHS Wales, universities and private sector aims to develop new markets and innovations, where all opportunities are rigorously assessed for existing and/or new market potential. In parallel, the empowerment of citizens to manage their personal and collective health, and to access information and services has become an important driver, becoming a disruptive development within the state-centric integrated health economy. This paper examines the relevant policy context and emerging portfolio of innovations within AgorIP to explore emergence of social commerce innovation in Healthcare management. Findings reflect the above dynamics and constraints, with innovations showing segmentation across geographic, demographic and disease-sufferer groups. The authors therefore offer the AgorIP initiative as an interesting space to observe the potential for Open Innovation of social commerce within the health sector.

Keywords; Social Commerce, Open Innovation, Health, Technology Transfer

Introduction

The precursor to the UK National Health Service (NHS), with Welsh miners contributing to a collective welfare and health scheme purchasing services from then exclusively private-sector health practitioners, could be regarded as a form of 'pre-Internet' social commerce. However, its modern form is now struggling with growing demand and expectations including notable pressures from demographic change, while also grappling to benefit from digital and social revolutions.

The potential for innovation to transform healthcare is well-established (Ferlie and Shortell, 2001), while more recently the opportunities for Open Innovation (Chesbrough, 2003) in the sector, and potential approaches for its application have been proposed by NESTA (2017). However, public-sector healthcare systems have not yet embraced the paradigm as effectively as, for example, the private sector drug development that supplies them (Talaga, 2009). Within this agenda, E-health is a long-standing term, the roots of which are helpfully defined by Eysenbach (2001) as including *Empowerment*, *Equity* and *Enablement* for patients, though in a pre-Web 2.0 era this applied more-so to provision of information than service delivery. However, the implied transfer of power from health service provider to patient has already established clear parallels with the more recent Web2.0-enabled social commerce power transfer "from sellers to buyers" described by Hajli and Sims (2015).

While NHS Wales may not exhibit the challenging fragmented nature of the US system described by Herzlinger (2006), it does still involve; significant regulation; a fixed (not just rigid) business model (Hwang and Christensen, 2008); public procurement constraints (Uyarra et al., 2014); and stringent patient confidentiality. It certainly poses some tougher questions with regard to market orientation than those facing other public services (Hodgkinson et al., 2012). These are all challenges which act to reduce absorptive capacity and the ‘porousness’ of walls for innovation into the public healthcare system.

However, the inherent potential for digital technologies to support innovation in health and social care is central to Welsh Government (WG) policy (WG, 2015), with ‘co-production’ of health outcomes at its centre. This co-production approach is described as being *‘at an individual and population level where patients and the NHS each make a contribution to improve health and wellbeing’* where *‘service providers and users, work together to create and deliver services’* (Bevan, 2015). These ambitions, together with national (WG, 2015) and local (Abertawe Bro Morgannwg University Health Board) (ABMUHB, 2017) strategies include planned engagement of patients through social networks, both as individuals and groups. This WG policy agenda focuses on digitization of NHS services and patient information, though with limited ‘social’ scope beyond that of enabling discussion within patient groups. In this regard, its ambition misses the scope of social commerce. Indeed, stated within the Strategy is that, *“People will use digital channels, such as social media and apps, to share their knowledge and experiences and, if desired, engage with a wider social network”*, though not explicitly to commission their own care or provide care to others.

In the above state-centric context, the social commerce concept may not readily align with the public-sector-supply dominated health sector, however, its ‘co-production’ ambition resonates with the cocreation of value and relationships described by Vargo and Lusch (2004), and the transfer of power from sellers (medics) to buyers (patients) presented by Hajli and Sims (2015). It also echoes the description of value co-creation provided by Prahalad and Ramaswamy (2004), which includes the example of patient-doctor interaction. The co-production concept, from service design to delivery is also reflected in the aforementioned health service strategies (WG, 2015) (NHS, 2015). This healthcare application of the term implies both the co-creation of value (in this case health outcomes) and the process of their co-production, which relates to the debate presented by Lusch and Vargo (2006). This debate sits alongside broader challenges, including definition of the co-production term within its wider application noted by Boyle and Harris (2009). This is reflected in its local use within the Healthcare domain, where for example the independent Welsh Health think-tank (Bevan, 2015) has combined its original co-production goals with those of equality of access and effectiveness of practice.

In parallel with the above evolving health system context, social marketing (Grier and Bryant, 2005, Craig Lefebvre and Flora, 1988) through digital media has long been established in promotion of public health agendas, though e-commerce remains limited to transactions within/amongst provider organisations. The prospect for citizens establishing themselves as health providers akin to the sellers suggested by Stephen and Toubia (2010), may understandably be somewhat less anticipated than for retail and other services. The importance of trust in online health advice and other services provides bias towards established sources/providers with trustworthy provenance, with credible presentation of information among key factors in its adoption (Sillence et al., 2006) (Lederman et al., 2014). Again, this echoes the observation of social commerce adoption consistently centring upon trust (Hajli, 2013, Hajli, 2015, Lu et al., 2016, Shanmugam et al., 2016).

While not attempting to simply map health co-production, from diagnosis to treatment and aftercare, against the stages of Co-production described by Etgar (2008), it is clear that the broader value co-

creation reflects the basic concept presented by Prahalad and Ramaswamy (2004) (below), albeit with health outcomes rather than economic value as its purpose.

Fig.1 : Co-creation market concept (Prahalad and Ramaswamy, 2004) here

South west Wales: life sciences & health

Harnessing the potential of Life Sciences & Health innovation, particularly for the combined goals of improved population health and economic development has been a long-standing ambition in south west Wales (Davies et al., 2018). The region was at the epicentre of the first industrial revolution through its vast coal and steel industries (Mathias, 2013). However, these sectors declined over time with major contraction during the 1970s/80s (Morgan, 2001). In response to employment loss, this led to a concerted, and initially highly successful strategy (Heidenreich et al., 1998) of targeting and attracting significant inward-investment, primarily for multinational manufacturing facilities. International competition eroded this success, and the attention of the recently formed Welsh Assembly Government turned to development of an indigenous knowledge-based economy (WAG, 2004b). This strategy became increasingly sectors-focused, targeting high-growth areas, including ICT, Advanced Manufacturing, and Life Sciences & Health (WG, 2013).

The Life Sciences sector in Wales employs ~10,000 people contributing £2bn GVA though in comparison, the local National Health Service (NHS) providers, Abertawe Bro Morgannwg (ABMUHB) and Hywel Dda University Health Boards (as part of the ARCH A Regional Collaboration for Health initiative) employ some 30,000 individuals across a broad range of professions (ARCH, 2017), in addition to wider general practice, pharmacy and other health services. This regional imbalance towards public-sector employment does though reflect in innovation potential from Life Sciences & Health noted within the Regional Innovation System by Cooke (2004a), (2004b), and explicitly in the context of the Regional Innovation System (Davies et al., 2015).

Recent years have seen significant investment into Life Sciences & Health within the region (WEFO, 2014), including specific focus on health & bio-informatics, and medical devices, reflecting regional 'smart specialisations' (Commission, 2017). Previous study of the regional sector has also demonstrated how Life Science & Health innovation can benefit wider sectors, including specifically ICT and Advanced Manufacturing (Davies et al., 2017). This activity has aimed to develop a cluster originally identified in 2001 (DTI, 2001). The recently approved Swansea Bay City Region City Deal refers to these endeavours and the associated infrastructure as a foundation for its planned 'Internet of Health and Wellbeing', which includes development of a 'Campuses and Villages' network across the region. The aim of this network is to provide nodes specialising as follows (SU, 2017);

- *A Singleton Campus (at the Swansea University Singleton Campus / ILS 1&2 / Singleton Hospital site) focusing on low TRL (Technology Readiness Level) activity in a range of Life Science & Health innovations, including eHealth and telemedicine, making use of unique datasets/connectivity. This sits alongside core ILS incubation and business facilities, which aims to expand through the planned Healthcare Technology Centre for low-volume pilot and specialist manufacture.*
- *A Morriston Campus (at the Morriston Hospital site) which is intended to support innovation in acute and hospital-based applications with focus on high TRL translational activity for both indigenous and inward-investing activities. Technology transfer through ILS is to be supported through a pan-Wales service (AgorIP) for which Morriston is identified as offering greater potential clinical engagement.*

These nodes sit within the broader regional ambition to create an 'Internet Coast' centred on development of next generation services including in the field of Health & Social Care (SU, 2017). Such planned, rather than spontaneous cluster development including specifically in life sciences, has been examined by Chiaroni and Chiesa (2006) and (Su and Hung, 2009), with some researchers questioning the effectiveness of such approaches (Swords, 2013), or at least understandings thereof (Ketels, 2013).

In this regional and sectoral context, ABMUHB recently launched a Digital Strategy (ABMUHB, 2017), which includes further digitization of the organization, though centred upon an ostensibly co-production platform, with user journeys structured by *Support Me, Assess Me, Treat Me, and Coach Me*, with emphasis on patient involvement/action. The ABMUHB Digital strategy explicitly describes involving patients individually and collectively creating, sharing and utilizing content related to health and care with emphasis on co-creation, including services "*brought into public use by other (read private and third sector) organisations*". This points to ambition for strategic co-creation of the manner suggested by Mostafa (2016), albeit in a different sector to that involved in their research. The relative monopoly of the public health service in this context does though suggest ambition for efficiency and effectiveness rather than competitive advantage.

The ABMU Digital Strategy (ABMUHB, 2017) has embraced the development and application of patient-centric tools such as 'Patient Knows Best' as part of its delivery. However, at this stage, such endeavours remain focused upon internal workflows and interaction with individual patients. Therefore, the strategy looks beyond the organisation to identify sources of innovation to create further digital services. One such source, embedded within the Internet Coast is AgorIP (SU, 2016), an initiative which aims to support commercialisation of ideas from academia and University Health Boards.

AgorIP

This study reviews the AgorIP portfolio for development of social commerce innovation, using the approach presented below adapted from Stake (1995), and applied by Huxtable-Thomas et al. (2015) to examine an ESF-supported project. This approach allows further development, including through a planned longitudinal study.

Fig. 2: AgorIP Model and Review - here

The study exists in the relevant contexts of Technology Transfer, Social Commerce, Regional Innovation Systems and Welsh Government Economic and Health Policies, applying mixed methods (Creswell and Clark, 2007) involving;

- Review of the original AgorIP project proposal/model in the context of Technology Transfer; and
- Review of current and emerging AgorIP project portfolio

The above framework also supports integration of further data and methods to build upon the study, including longitudinally, as well as providing a basis for planned examination of the cases of individual innovations emerging from the initiative.

As a European Regional Development Fund (ERDF)-supported project (WEFO, 2013), AgorIP maintains detailed records of its activities. These records, together with the project business case and supporting documentation provide the basis of this study.

AgorIP: Open Access Open Innovation Technology Transfer

Universities, globally and specifically in the UK and Wales, have long been recognised as important economic actors, with continued discussion as to how University-Industry interaction and impact can be optimised (Youtie and Shapira, 2008, Lambert, 2003) (WAG, 2004a), though sometimes challenging the extent to which universities are relevant (Power and Malmberg, 2008). University-Industry relations, including through networks of enterprises large and small, and research hospitals have been shown as important drivers of innovation in Life Sciences & Health (Owen-Smith et al., 2002). This has greater importance in south west Wales with comparatively low levels of local Business Expenditure on R&D (Rogers, 2006). Such relationships are complex with one type of linkage relating to or resulting in another (Dechenaux et al., 2011).

Technology transfer exists in this broader context of University-Industry engagement, and has been demonstrated as an important part of this contribution (Tornatzky and Association, 2000), spurred in the US by the Bayh-Dole Act (Henderson et al., 1998, Jensen and Thursby, 1998), along with a range of other factors (Mowery et al., 2001). In the UK the agenda has received particular interest from a government policy context since reviews by UK (Lambert, 2003) and regional Welsh (WAG, 2004a) Governments.

A comprehensive review of university Technology Transfer practice and literature is provided by Bradley et al. (2013), including the observation that oversimplification of the processes involved fail to account for many key factors. The process of technology transfer has historically been considered as unidirectional and linear (D'Este and Patel, 2007), and reflected as such in models such as that presented by Siegel et al. (2004) in Fig.3 below.

Fig. 3: Linear Technology Transfer Process (Siegel et al., 2004) - here

The greater complexity of Technology Transfer presented in Bradley's Alternative model (2013), echoes the trend towards recognition of increasing complexity seen in other models such as the triple helix (Etzkowitz and Leydesdorff, 1995), which is now accompanied by quadruple and n-tuple (Leydesdorff, 2012) models. This complexity and greater interplay of actors represents the broader Open Innovation space within which AgorIP aims to nurture innovation through technology transfer within south west Wales. The Open Innovation (Chesbrough, 2003) dynamics between universities and industries are discussed as being within a complex mix of mechanisms supporting and enabling University-Industry relationships (Perkmann and Walsh, 2007), while Bradley et al. (2013) describes this with particular respect to Technology Transfer.

Delivering efficiency in Technology Transfer Offices (TTOs) has been examined by Anderson et al. (2007), observing significant variation in performance, and suggesting a number of factors for consideration, including scale, variation in policies and incentive structures. In line with this, over the past decade it has been proposed by both researchers (Siegel et al., 2003) and policy-makers (WAG, 2004a) that UK (including Welsh) TTOs would benefit from greater regional and sector focus, while also recognising the challenge of achieving effective and sustainable scale of activities.

Responding to the challenges and opportunities of healthcare innovation and technology transfer, Welsh Government and NHS (ARCH, 2017 #267) partners have worked to develop the 'AgorIP' initiative. The Agor (Welsh language for 'Open') Intellectual Property initiative, AgorIP, has been developed as an

'Open Access Open Innovation' model to create a pan-Wales Technology Transfer Office for Life Sciences & Health innovation drawn from sources including Higher Education, NHS Wales and the private sector (SU, 2016). Co-funded by Welsh Government Department for Health and Social Services, the initiative is targeting 50% of its innovations to be realised in the sectors of Life Sciences, and Health & Social Care.

The AgorIP model reflects the Alternative Model of Technology Transfer proposed by Bradley et al. (2013), though with a 'zero waste' approach that aims to reduce the parallel channel outside the TTO and to maximise return from all opportunities. It also explicitly incorporates the function of the TTO into a wider set of organisations in providing service to research and innovation activities within the regional public health system. The zero-waste philosophy proposes that all disclosures are progressed with resource invested proportionate to the opportunity identified, along the most appropriate pathway (SU, 2016) (fig. 4 below).

Fig. 4: AgorIP Commercialisation Pathways - here

The multiple pathways aim to accommodate the targeted Open Innovation dynamics, drawing opportunities from diverse sources (academia, health service and private sector), at a range of stages (presented by TRLs), and arriving at diverse planned and anticipated markets. Pathways are identified and developed collaboratively between stakeholders as a Co-production process (SU, 2016). D'Este and Patel (2007) suggest that TTO mechanisms of patenting and spin-out may attract disproportionate attention, though AgorIP aims to avoid such bias by integrating with wider University-Industry engagement mechanisms such as consultancy and knowledge transfer offerings.

Further features that claim to support greater potential Open Innovation and Co-production activity include harmonisation of organisational policies, including for management of Intellectual Property between NHS Bodies (including Health Boards) and Swansea University (SU, 2016). Such an arrangement partially responds to one of the more UK-specific challenges identified by Decter et al. (2007) where variation of policies between organisations presents a challenge to industry engagement.

Project portfolio

The case reviewed the AgorIP project at September 2017 when it had been underway for 12 months, including its initial 'mobilisation'. At this point it had developed a portfolio of 111 opportunities across a range of sectors. Clearly, as opportunities take time to develop this portfolio relates to the input, rather than successful innovation. 5 opportunities had already progressed to become spin-out companies attracting external investment, with a further 15 resulting in licensing arrangements.

From this portfolio, 46 opportunities (41%) related to Health & Life Sciences, with 14 (13%) in the E-Health domain. These opportunities included a broad variety of disease diagnostic technologies and medical device inventions, reflecting academic research strengths in Swansea University. Just over half, (8 of 14) opportunities within the E-Health domain exhibited the dual social commerce elements of social media and e-commerce. Of these, almost all (7 of 8) originated from individuals/groups outside the health service.

As the project and therefore the pipeline is still at an early stage, most opportunities had not matured to 'success' or 'failure', or at least to any extent beyond noting those which have been licensed or spun-out. While significance of origins, pathways and success cannot be statistically tested, the emergent

portfolio does suggest a preponderance towards health economy social commerce opportunities emerging from outside the health system.

Due to the nature of many opportunities there are commercial sensitivities that require confidentiality, governed by Non-Disclosure Agreements between stakeholders. Therefore, not all further details available within AgorIP records cannot be disclosed. However, examples of opportunities providing non-confidential information include;

'Diet or Disorder' An App which is one of the first innovations to emerge from AgorIP, with the aim of empowering members of the public to seek diagnosis and other support for eating disorders. The App is an example of 'co-production' with the user engaged in their diagnosis, and management of conditions including through social (patient) networks. Developed with clinicians from Aneurin Bevan University Health Board, the App adheres to national guidelines and has been launched on the Apple iTunes store.

'Yada' A platform to promote social inclusion which has been developed with a social entrepreneur aiming to enhance accessibility to tourism and leisure venues ranging from individual restaurants to entire towns, for individuals living with conditions. Engaging disability groups through social media, the platform will allow users to share information and reviews on how destinations cater for users' needs. Initially focused on the south west Wales region, the App brings together Health & Wellbeing and Leisure & Tourism sectors.

This adds to existing innovations developed with the ABMU Health Board such as PocketMedic, which provides 'social prescribing' of videos and other resources to support patients. However, at present this and other local e-Health innovations remain relatively transactional between health service and individual patient, reflecting more traditional e-commerce rather than social commerce.

Other, non-Life Sciences & Health social commerce innovations are also emerging through AgorIP. These include;

'DigiCat', an online portal for course and module selection. The portal provides a marketplace for modules/courses amongst students, lecturers and support staff. The portal is used for presenting information, sharing student experiences, and allowing selection of modules. This clearly does not involve the regulatory or other challenges faced within healthcare, and has already been launched.

Conclusion

While still at an early stage, the AgorIP portfolio already presents ICT-driven innovations relating to health and social care, including a number with patient-focus and examples of social commerce. This demonstrates the potential for social commerce innovation in health to emerge from the Technology Transfer approach. However, it remains to be seen whether, or at least how, the state-centric market structure for health innovation will allow significant social commerce innovation to emerge. The 'marketplace' proposed by the ABMUHB Digital Strategy provides a potential location for social commerce where trust stems from the NHS Wales involvement, and would involve moving beyond digitisation of existing service models.

AgorIP presents a novel mechanism for commercialisation through co-creation of innovation, and provides an interesting testbed for future study. It demonstrates Open Innovation as an approach to orchestrating opportunities emerging from a variety of sources and also highlights a route to tackling

the perennial challenge of absorptive capacity in core components of the health system. Developing this approach could therefore provide benefit to policy-makers and practitioners keen to realise the dual ambitions of improved health and prosperity, as embodied in the Internet Coast.

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