A Sub-Regional Innovation Ecosystem? Life Sciences & Health in the Swansea Bay City Region

Abstract: This paper presents the case of 'AgorIP', a novel technology transfer approach to support knowledge-based regional economic development in the post-industrial region of south west Wales, UK centred upon an entrepreneurial learning university applying smart specialisation in a Regional Innovation System (RIS). In this context, West Wales and the Valleys has been working to develop a nascent Life Sciences & Health cluster through efforts of private sector, health service, academia and government.

A central part of this agenda is driving technology transfer within the recently-approved Swansea Bay City Region. This associated *Internet Coast* City Deal combines efforts of UK, Welsh & Local Governments together with wider partners to exploit identified strengths in Life Sciences & Health. Through analysis of regional sector survey data and case study review of key regional initiatives, this paper examines the opportunities and challenges for the region to flourish in uncertain changing times.

Keywords: Smart specialisation, Life Sciences, Regional Innovation Systems, Technology Transfer, City Regions

1. Introduction

South west Wales, as a peripheral region of UK and Europe has been challenged by a post-industrial economy that despite significant investment, including that of EU Structural Funds, has struggled in its transformation to a vibrant knowledge economy. A successful period during the 1980s/early 90s attracted significant manufacturing inward investment (Heidenreich et al., 1998), though since then Wales has lost out to 'cheaper' destinations around the world (Chen, 1996).

More recently, growing global knowledge-based sectors have been targeted as an opportunity to harness regional strengths (WAG, 2004c). On this basis, the Life Sciences & Health sector in south west Wales has received investment from Welsh and UK Governments and private sector over recent years. This includes recent announcement of an '*Internet of Health & Wellbeing*' as part of the Swansea Bay City Region *Internet Coast* City Deal, aimed at the development of ICT-enabled product and service opportunities (SU, 2017). This sits within the context of Swansea being recognised as a UNESCO Entrepreneurial Learning City, with the Life Sciences and Health agenda and role of the university at its centre (Davies et al., 2018), reflecting the academic and regional transitions to a more entrepreneurial networked mode of working presented by Etzkowitz (2004)

This ambition links with the concept of Territorial Innovation Systems which started with the initial idea of national systems presented by Lundvall (1992) and Nelson (1993), followed by development at regional level (RIS) (Cooke, 2001b), including specifically the case of Wales. Abbey et al. (2008) took this further to the sub-regional level within south west Wales. This paper further examines this concept using the five key, linked concepts within RIS identified by Cooke (2001b) of *Region*, *Innovation*, *Network*, *Learning*, and *Interaction*, using the Institute of Life Science and AgorIP Technology Transfer initiatives as central cases.

The consideration of SBCR in the context of RIS also leads into the more recent concept of Smart Specialisation (Foray et al., 2009) where the Internet Coast can in itself be viewed as "*an entrepreneurial process of discovery*" with Internet Technologies as a facilitating "*General Purpose Technology*". This echoes an approach which Henderson (2000) described as a long-standing 'experimental' approach in Wales to economic development. Building on identified regional strengths across industry and academia (Commission, 2017), Internet Coast aims to develop these Smart Specialisations through provision of enabling infrastructure.

This paper examines the case of Life Sciences & Health within the region from the perspective of key cluster-forming initiatives, AgorIP and the Institute of Life Science (ILS), which focus upon the Life Sciences & Health sectors. Through review of the development context and data drawn from major projects, the prospects and challenges for the City

Region and the role of its entrepreneurial learning university are discussed. The paper starts with a brief context of south west Wales, followed by discussion of initiatives with their stated intentions of developing the *Internet of Life Sciences & Health*, presented primarily through the key, linked concepts within Regional Innovation Systems described by Cooke (2001b).

2. Economic development in south west Wales

The Swansea Bay City Region (SBCR, 2013) and its *Internet Coast* City Deal (SU, 2017) exist in the context of the region's broad economic history, along with the range of existing initiatives which relate to the regional Life Sciences and Health cluster. The region's, sometimes difficult, transition to a knowledge-based economy from a post-industrial one via a period of successful inward investment is noted in the *Internet Coast* proposal (SU, 2017).

The region remains affected by its industrial heritage and legacy, parts of which continue to underpin major parts of its economy. South west Wales was at the forefront of the industrial revolution (Mathias, 2013), though by the 1970s-80s the coal and steel sectors had declined to a shadow of the industries which had powered an Empire (Morgan, 2001). Part of the response to this contraction was the establishment of the Welsh Development Agency (WDA) which aggressively pursued Foreign Direct Investment opportunities, many of which were manufacturing activities attracted from the US and Asia. These efforts secured over two thousand inward-investment projects during 1983-2000 (Salvador and Harding, 2006), representing 15-20% of UK inward-investment throughout the period (Cooke et al., 2004).

However, continued industrial decline, and globalisation led to relocation of branch plants attracted by lower wages elsewhere (Chen, 1996) with weak embeddedness of firms (Phelps et al., 2003) resulting in an erosion of this success achieved during the 1990s. Compounded by persistently low levels of regional Business Expenditure on Research & Development (Mom et al., 2012), and a lack of focus entrepreneurship and endogenous growth (Cooke and Clifton, 2005) this led to a new period of economic difficulty.

Policies and initiatives to address this challenge, centred around innovation and the knowledge-based economy, have been developed by the Welsh Government, including through use of EU Structural Funds. This became increasingly sector-focused, including Life Sciences (and Health) (WG, 2013) in contrast with earlier broader Welsh Assembly Government plans (WAG, 2003, WAG, 2004c). These strategies also became more spatial pointing to a diversity of challenges and opportunities at a sub-regional level (WAG, 2004b).

The Swansea Bay City Region (SBCR) embraces the Local Authorities of City and County of Swansea, Neath Port Talbot County Borough, Carmarthenshire County, and Pembrokeshire County, encompassing 688,000 residents, 302,000 jobs and 22,000 businesses (SBCR, 2013). This geography broadly reflects the combined 'Swansea Bay and Western Valleys' and 'Pembrokeshire' regions defined within the '*fuzzy boundaries'* of the Wales Spatial Plan (WAG, 2004b), overlaying the areas covered by Abertawe Bro Morgannwg and Hywel Dda University Health Boards within the ARCH (A Regional Collaboration for Health) Programme (ARCH, 2017).

Analysis undertaken for SBCR by consultancy firm SQW provides a summary of regional economic performance. Both employment and GVA growth in the region have struggled over the past decade, diverging further from UK and Wales average performances (SBCR, 2013) despite major investments including those delivered through EU Structural Funds. The report cited the region's inability to recover from job losses during the 1990/91 and recent recessions, as echoed by Sensier and Artis (2014), with those jobs created since the recessions being in lower value sectors and occupations.

The recently approved SBCR City Deal aims to support restructuring of the regional economy towards higher value sectors and has been developed around four 'Internet Themes' containing eleven projects with the following stated ambitions;

- *Internet of Health & Wellbeing*: to support commercialisation of IP from the Health Service, along with indigenous and inward-investing Life Sciences & healthcare activities.
- *Internet of Energy*: to create renewable energy technology for homes and buildings as part of a developing cluster around SPECIFIC photovoltaic technology.
- *Internet of Economic Acceleration*: to develop ICT-driven services and infrastructure, along with major initiatives embedded in urban regeneration projects.
- *Smart Manufacturing*: to support product and process innovation in the regionally/UK-important steel sector, along with efforts to develop Industry 4.0 practice in south west Wales manufacturing.

These themes resonate with sectors targeted in earlier WG strategies, though as a smaller number reflecting identified smart specialisations (Commission, 2017), including Energy as discussed by Morgan (2013). In this context, universities play a role with 'co-specialised assets' and are worthy of specific consideration (Foray et al., 2009) in the endeavour to realise structural change in the sub-regional economy (Foray, 2014).

3. University role in south west Wales knowledge economy

The south west Wales region has a tradition of University-Industry collaboration, underpinning its role in the *Internet Coast* projects (SU, 2017), aiming to fulfil a part similar to the of a 'Knowledge Hub' of the nature described by Youtie and Shapira (2008).

This activity predates interest at UK Government level (Lambert, 2003), and even that which has surrounded the emergence of interest in US Technology Transfer following the 1980 Bayh-Dole Act (Henderson et al., 1998). In the context of Wales this was reflected in the Welsh Government's Knowledge Economy Nexus (WAG, 2004a) review highlighting *inter alia* the importance of activities relating to Skills Development, Technology/Knowledge Transfer, and Spin-out, discussed below;

Technology/Knowledge Transfer: The role of universities in regional economic development through technology transfer has been well-established (Tornatzky and Association, 2000) and Technology Transfer Offices have been shown to be able to play a critical role for developing ecosystems around mid-sized universities (Sadek et al., 2015). The research base provided by Swansea University (REF 2014) presents well (Huggins and Kitagawa, 2012) for technology transfer in the region, as scientific excellence has been shown to correlate with commercial output (Di Gregorio and Shane, 2003). However, the relatively weak industrial base raises the challenge noted within peripheral regions of linking high research intensity with weak local firm absorptive capacity (Hewitt-Dundas, 2012). This emphasises the need to develop absorptive capacity amongst indigenous firms and maximise embeddedness of inward-investing ones, through 'co-specialised assets' (Foray et al., 2009).

This context has led to development of the AgorIP (Agor being Welsh language for 'Open') technology transfer and commercialisation approach (SU, 2016). The approach involves a 'zero-waste' Open Access Open Innovation philosophy processing opportunities from diverse sources, though primarily university and health board research, but ranging in maturity (by Technology Readiness Level – TRL). As shown in Figure 1 below, these are then aligned with a commercialisation channel (e.g. spin-out, license) and a level of investment commensurate with the appraised value of the opportunity. The involvement of co-investors and other partners, completes the Open Innovation dynamic.

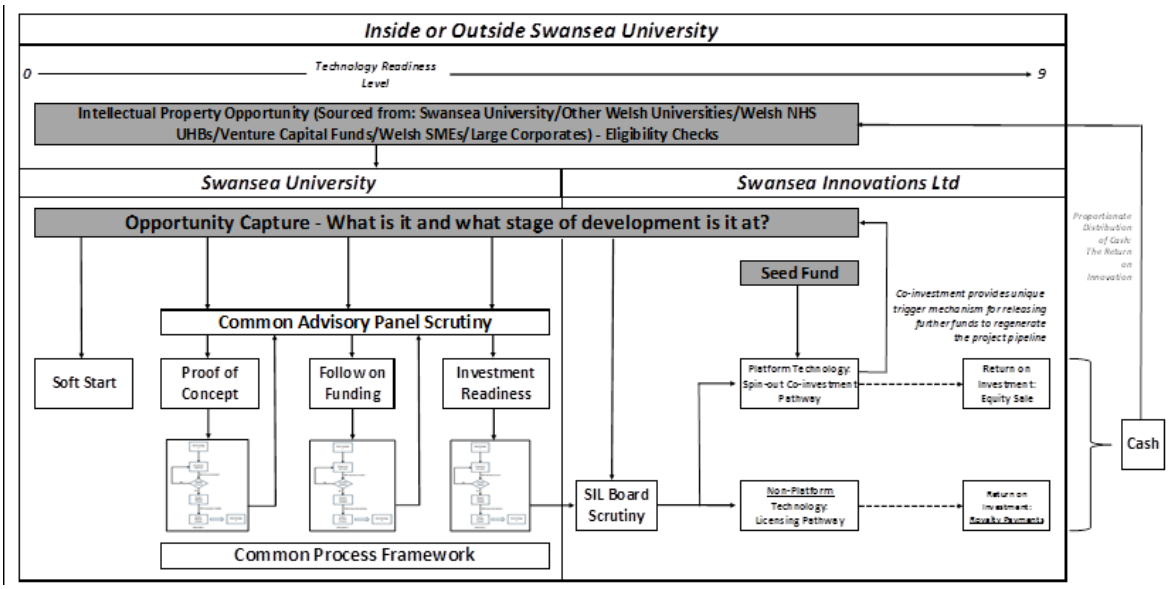

Fig. 1 AgorIP Technology Transfer Framework (SU, 2016)

Integrated with delivery of knowledge transfer mechanisms such as consultancy arrangements, AgorIP aims to protect against potential overemphasis on patenting and spin-out suggested by D'Este and Patel (2007) through absence of internal competition to separately pursue knowledge transfer and commercialisation pathways.

The AgorIP approach also applies intensive external professional mentoring, to the point of surrogate entrepreneurs driving spin-outs, supported by strong networks across sector fora, as suggested by Wright et al. (2006). The approach has been embraced by Welsh Government, positioning AgorIP along with the Internet Coast and ARCH, as core components within forthcoming pan-Wales Life Sciences & Health innovation initiatives.

Skills: The focus of AgorIP and Internet Coast on high-value sectors aims to align with graduate output in the region, though noting a diversity of required skills, with an importance of commercial skills alongside the scientific and technical (RLP, 2013). The SBCR has stated its ambition to address this through a dedicated industry-led initiative delivered with Higher and Further Education (SU, 2017) supporting STEM (Science, Technology, Engineering & Mathematics) and other skills relating to the *Internet Themes*.

Spin-out: A rapid proliferation of business incubators and science parks occurred in the UK since the 1980s, though with relatively little private sector investment for such activities outside of south east England. Therefore, the role of regional/local government and universities has supported developments in the wider UK (Edmonds, 2000). This is particularly relevant to the Technology Transfer agenda as Wales has a higher than UK average rate of producing and nurturing (by survival of at least three years) of staff spin-outs and graduate start-ups (HEFCW, 2014). Regionally, this has been of particular interest where incubator initiatives have had mixed success and reception, with vibrant debate around major initiatives (Cooke and Clifton, 2005, Abbey et al., 2008, Morgan, 2013, Huggins and Kitagawa, 2012). A central concern has been the scale of opportunity available to realise regional development ambitions (Cooke et al., 2004), which sits alongside the Hewitt-Dundas (2012) observation of potential tension in peripheral regions of mismatching high research intensity with weak absorptive capacity in local firms.

However, the challenge of enhancing the quantity and quality of spin-outs into the region relates back to the AgorIP approach as a technology transfer mechanism to develop knowledge-based enterprise, though not at the expense or neglect of other technology transfer mechanisms for cases where they are more appropriate.

It also represents the paradigm change in incubation described by Etzkowitz (2004) bringing together technology commercialisation, business incubation and economic development activities. Swansea University, in particular

through its Institute of Life Science (ILS) has worked to become a Knowledge Hub, of the nature described by Youtie and Shapira (2008), working to develop a networked approach of capacity building and local innovation system leadership. The following section examines the ILS and AgorIP roles within the regional cluster, in their work alongside other cluster development initiatives.

4. South west Wales Life Sciences & Health Cluster

A nascent life sciences cluster, centred around medical technology was identified by UK Government in 2001 (DTI, 2001) reflecting what Cooke (2001a) noted as 'mini-agglomerations' of biotechnology companies in Cardiff and Swansea, though which were relatively small in comparison with clusters elsewhere in the UK. This Swansea 'mini-agglomeration' presented the origins of the ecosystem and associated interventions discussed in this section.

Over 10,000 people are employed in the Life Sciences sector in Wales, contributing £2bn GVA to the economy. This is small though in comparison with other sectors including Health, where in south west Wales alone the public healthcare system employs ~17,000 people, when combining activity across ABM and Hywel Dda University Health Boards. This is in addition to wider GP, pharmacy and other regional primary care activities (ARCH, 2017).

The following cluster map below, Figure 2 (Davies et al., 2015), adapted from that developed by Porter (2007) for the Munich/Germany cluster, presents the activity across south west Wales, reflecting regional activity in medical technology/devices and clinical research (RLP, 2013). Other notable 'Internet Coast' linkages include those with ICT and Advanced Manufacturing sectors.

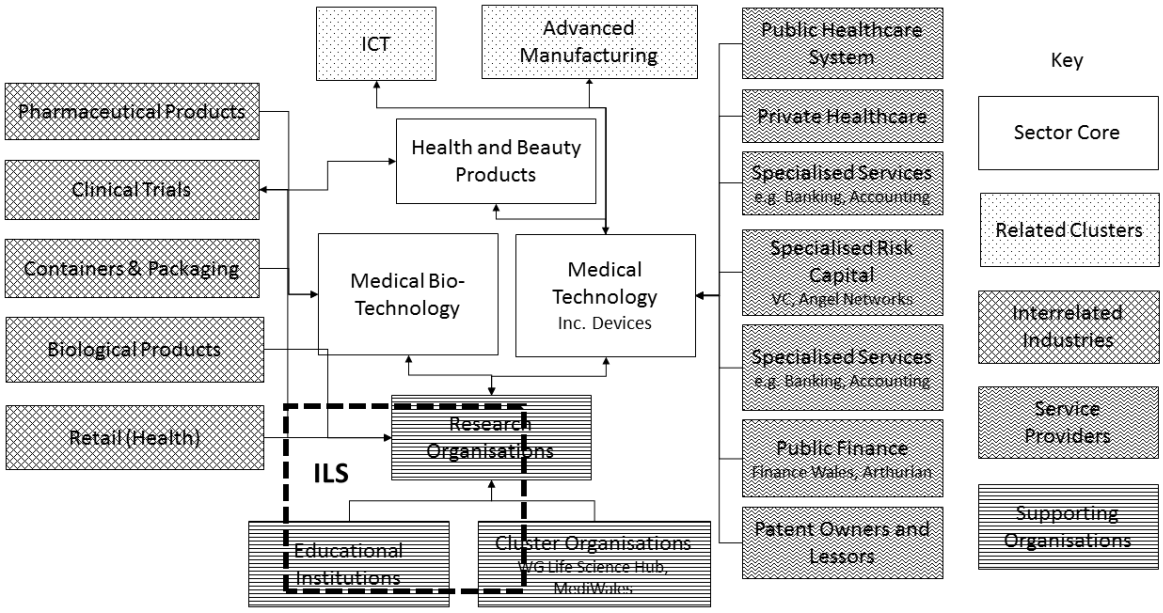

Figure 2: South west Wales Life Sciences & Health Ecosystem

To support the development of the cluster and promote its function as a Regional Innovation System a number of initiatives have been developed by industry, government and academia. The next section presents key sector-specific and cross-cutting interventions delivered within the region, outlining their activities and intended purpose.

5. Examples of cluster forming/development initiatives

The region has been the target of numerous knowledge-based economic development initiatives, including many supported by European Union Structural Funds (Abbey et al., 2008). The following table outlines some of the key current sector-specific and cross-sector initiatives which relate to the south west Wales sector;

Initiative	**Description**	**Intended Cluster/Ecosystem Contribution**
Sector-specific		
Institute of Life Science	Research and innovation infrastructure for academic research and industrial collaboration	To provide research output and collaboration facilities, along with incubation/business space.
Initiative	**Description**	**Intended Cluster/Ecosystem Contribution**
MediWales	Independent Membership-based Pan-Wales sector forum / network	To provide interaction, lobbying and learning opportunities across the regional sector and further afield
Life Sciences Hub	Cardiff-based Business collaboration and hotdesk facility providing meeting venues, business support, networking opportunities and events for Health and Life Sciences sectors in Wales	To host Welsh Government support and other initiatives such as the Arthurian investment fund. To provide learning and interaction opportunities through events
Arthurian Fund	Welsh Government co-investment fund to attract venture capital for support of indigenous firms and inward-investment into the Welsh Life Sciences sector	To provide co-investment for major opportunities, and create dealflow/critical mass for private sector investment
Cross-sector		
Technium	Former pan-Wales network of business innovation/incubation sectors, which now operate independently, supporting companies across a range of sectors	To provide facilities, both generic and sector-specific for incubation and inward-investing innovation activities. Specific roles in start-up/spin-out support and local regeneration
SMART / A4B	Welsh Government/EU-supported programmes to support SME/MNE innovation across Technology Readiness Levels. Facilitation of academic-industrial engagement and technology transfer	To deliver innovation projects / programmes within firms / collaboration with academia, and development of absorptive capacity
Knowledge Economy Skills Scholarships	Industry/EU co-sponsored research degrees (Masters/Doctoral) programme	To develop new knowledge and skills, enhancing absorptive capacity within partner firms

Table 1: South west Wales cluster-development initiatives

The above, albeit non-exhaustive list shown in Table 1, shows a range of efforts from government, academia and industry with stated intention to promote interaction, support technology/knowledge transfer and stimulate innovation. These activities sit within a broader context of national (UK, Wales) research funding programmes and other initiatives, though with region-specific activity that is referenced by the SBCR *Internet of Health & Wellbeing* (SU, 2017).

6. Internet of Health & Wellbeing: Campuses and Villages Network

Building upon the infrastructure described in the previous section, the proposed *Internet of Health and Wellbeing* 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);

- The *Singleton Campus* (at the Swansea University Singleton Campus / ILS 1&2 / Singleton Hospital site) focusing on low TRL 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. It provides a major source of academic and health board research output to deliver technology transfer opportunities.
- The *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 the Morriston site is anticipated to reflect acute hospital nature of activities undertaken there, offering greater potential clinical engagement.
- The *Village* network, starting with a £200m development in Llanelli is conceived to support development of community/residential technologies and services supporting out-of-hospital care innovation, both preventative and post-intervention. Therefore, technology transfer activity is expected to focus on primary and community care applications.

The planned activity across the Campuses and Villages is facilitated by harmonisation of IP and commercialisation policies between Swansea University and Hywel Dda and Abertawe Bro Morgannwg University Health Boards. This aims to facilitate AgorIP in commercialising research output by providing a level integrated activity across academia and health service partners. This represents effort to deliver upon the opportunity described by Cooke (2004a) who noted the impact of effective exploitation of combined research and health spending within clusters elsewhere.

The Internet of Health and Wellbeing activity builds upon existing ILS economic development activity along with efforts to develop the regional Health Economy working across the University Health Boards of Abertawe Bro Morgannwg and Hywel Dda (comprising ~1m patient population). Initial economic appraisal of the Campuses and Villages activities projects ~3,000 jobs to be created by 2031 contributing ~£620m of GVA to the regional economy (SU, 2017).

7. Analysis

The following analysis of ILS activity in the south west Wales Life Sciences & Health sector activity draws primarily upon monitoring data from the ILS Phase 2 project, Regional Learning and Skills Partnership sector research (RLP, 2013), and the SBCR City Deal (SU, 2017), applying the five key, linked concepts identified by Cooke (2001b) of *Region*, *Innovation*, *Network*, *Learning*, and *Interaction*.

Region: The Swansea Bay City Region, with governance provided through the structures created via the City Deal provides a clear definition of the region as a meso-political unit, in contrast with the era examined by Abbey et al. (2008) when the then Wales Spatial Plan simply presented 'fuzzy boundaries' (WAG, 2004b). The SBCR model differs from the elected mayor City Deal approach for English UK City Regions. Due to the devolved nation context, the SBCR City Deal also involves Welsh Government, and is delivered through a Joint (Local Authority) Cabinet Organisation with associated support infrastructure (SU, 2017). The aim of this political unit is predominantly one of economic development, though pursuing wider societal benefits including improved and more equal health and wellbeing. However, as a new construct the operation of this governance and its ability to avoid the potential pitfalls identified by Cooke (2004b) and Morgan (2013) remains to be proven.

Innovation: The City Region foci of *Internet Themes* relating to regional industrial and academic strengths aligns with the smart specialisation principle of *entrepreneurial discovery* to drive innovation (Foray, 2014). For example, the '*Internet of Energy*', is centred around the SPECIFIC photovoltaic technology initiative building upon capability noted by Morgan (2013) discussion relating to smart specialisation in the region.

In the context of Health & Wellbeing the specialisation relates to Medical Technology/Devices, and ICT-related innovation as identified by Welsh Government on the European Commission Smart Specialisation Platform (Commission, 2017). ILS Phase 2 project data captured 216 new or improved products, processes or services realised with the project's support during the period 2010-15. These innovations will only capture a subset of cluster activity and while they vary in scale and impact, when coupled with case studies and insight from regional survey data (RLP, 2013) it presents a throughput of innovation. However, its ability to supply a broader regional pipeline of Campus/Village presents a supply challenge echoing that noted by Cooke (2004b) for previous regional initiatives. This capacity challenge is coupled with one of developing activity in step with demand/absorptive capacity amongst regional firms to develop smart specialisation in the form Morgan (2013) describes within the region for Energy.

The cluster activity around this ILS innovation activity has translated into job creation as presented in Figure 3 below. Of particular note is how this employment is distributed throughout the cluster. For example, as shown by Davies et al. (2015), two ILS collaborations created 56 jobs in the partner companies, though with an additional 70 jobs at a third-party manufacturing site. Both collaborations also involved with local clinical trials and professional services support, demonstrating wider cluster activity, as presented earlier in Figure 2.

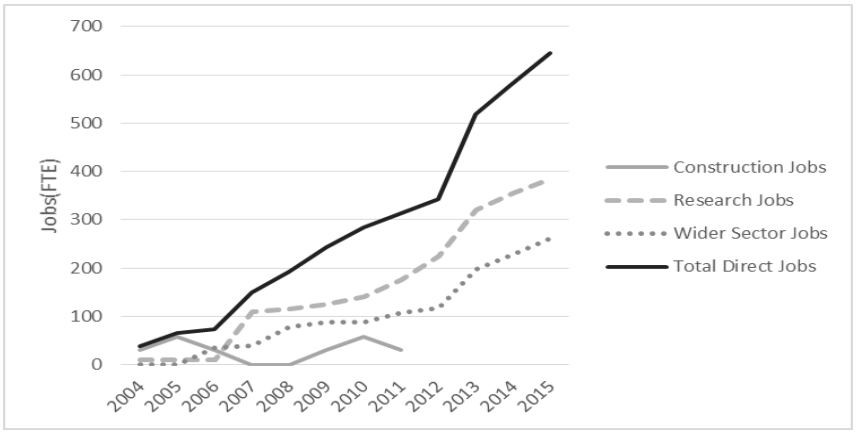

Figure 3: ILS cumulative employment growth by job type

Of the above employment there is further indication of a sub-regional innovation system in action, as suggested by Abbey et al. (2008), for 68% of wider sector employment created is through external collaboration, 26% of which relates to companies based in former Techniums.

While the ILS initiative has created research capacity and business infrastructure, the AgorIP approach provides a technology transfer that embraces wider stakeholders, as called for by both academic observers (Gibb and Hannon, 2006) and policy-makers (WAG, 2004a). Since 2016, it has received 216 disclosures with 94 progressed to active projects. In terms of outcomes, at February 2018 this had resulted in 61 ongoing proof of concept projects, 8 spin-outs and 15 licence agreements with collaborations involving private sector, health service and academia.

Network: Organisations such as MediWales and the WG Life Sciences Hub provide extra-regional engagement. However, it is the numerous relationships between individuals and organisations within the region/cluster which creates the 'Ecosystem' network. However, lacking major sector enterprises the nature of the region/cluster involves the University playing the role of 'anchor tenant' (Agrawal and Cockburn, 2003) within the ecosystem. The linkages between firms within the ILS community and broader cluster observed by Davies et al. (2015) and RLP (2013) helps demonstrate that a network condition exists, while the volume of collaborations observed show that it is an active network, further evidenced by the co-produced innovations. The criticality of this systemic network, and prior absence thereof was identified by (Cooke, 2001a) as a limiting factor within Wales. Importantly, this network activity is also exhibiting extra-regional and international reach regarded as critical by many observers (Cooke, 2001a, Cooke et al., 2006) (Huggins and Kitagawa, 2012). Within the AgorIP context, this presents the University expanding into

spill-over and absorptive capacity mechanisms described by Audretsch (2014), offering support into a wider network of University Health Boards and other stakeholders.

Learning: Behaviours such as the repeated adoption of local subcontract manufacturing in partnership with a 'local' multinational enterprise demonstrates systemic learning across the cluster, promulgated through ILS (Davies et al., 2015). Rather than re-inventing capabilities, often with public support, this approach of re-purposing private sector assets to new collaboration-based productivity is a clear case of learning and evolution. Also, the collaboration of numerous cluster firms with the ILS-based Clinical Research Facility (Davies et al., 2015) shows skills, knowledge and practice becoming embedded in firms and networks. In addition, the recent harmonisation of intellectual property and commercialisation policies between Swansea University and the local University Health Boards demonstrate learning and enhanced practice across wider cluster organisations. Importantly though, the cluster as a whole and SBCR governance needs to embed learning, to avoid slipping into the overly hierarchical and linear thinking of years prior (Cooke, 2001a).

Interaction: The networks developed by organisations including MediWales and ILS provide opportunities for interaction. These networks promote regular meetings such as 'BioBreakfasts' along with informal introductions and brokering of opportunities amongst their communities. Furthermore, the regionally-focused annual Collaborate conference has become a major event bringing together industrial, academic and clinical representatives. Indeed, the genesis of MediPark, ARCH and the City Deal *Internet of Health & Wellbeing* initiatives can be traced back through its proceedings of the past three years. Extra-regional engagement is also served through the MediWales network, Life Sciences Hub community, and of course the individual firm, academic and clinical networks of cluster participants. The broader innovation landscape is also supported through engagement with 'Catapults' and other InnovateUK efforts showing linkages with National Innovation System (Cooke, 2001b).

8. Conclusion

The case of AgorIP and ILS within the Swansea Bay City Region and its associated City Deal helps provide insight to the challenges and opportunities of this economic development approach that relate to many post-industrial regions, though with added context of devolved government and a backdrop of prior EU Structural Funds investments. The importance of learning from previous experiences at regional and organisational levels echoes observations from Cooke (2004b), Huggins and Kitagawa (2012) and Morgan (2013).

ILS has contributed to both the Life Sciences & Health sectors, along with the wider economy while in parallel, the growing spin-out and licensing activity from AgorIP suggests technology transfer is working to address some of the historic challenges and opportunities noted by observers such as Cooke et al. (2004). However, in the broader context the intertwined roles of the University, facilitating Internet Coast projects and providing a technology transfer for IP originating beyond its walls, certainly suggests it is fulfilling the wider entrepreneurial society role described by Audretsch (2014)

The case, while focusing on Life Sciences & Health has highlighted inextricable links across technology sectors within the region. This reflects the broader *Internet Coast* themes, including ICT and Advanced Manufacturing. It also resonates with the approach described by Morgan (2013) for development of smart specialisation rather than sectors per se, as previously targeted by Welsh Government (WG, 2013). In this context, the case shows how the SBCR approach aligns with Smart Specialisation Policy design principles proposed by Foray (2014), including importantly the *inclusive* and *progressive* elements of the Internet Coast themes.

Of further note, the timescale for development since the original cluster was identified is approaching two decades (DTI, 2001). Indeed, the first three years of ILS activity witnessed relatively modest job growth though this grew as the initiative gained mass and momentum. Together with the complexity of the Ecosystem spanning diverse sectors this requires patience from policy-makers and practitioners alike, and as highlighted by Morgan (2013), stresses the importance in learning from and building upon past efforts.

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