Postgraduate Research Conference, School of Management, Swansea University

Resilience through the COVID Pandemic: Welsh Academia-Industry Collaboration for Life Science Small-to-Medium Enterprises (SMEs)

Michael Winn

June, 2021

Abstract

The aim of this literature review is to establish the role of academic-industry collaboration, particularly in relation to SME resilience in the Life Science sector, against the economic threat of the COVID pandemic. The significance of this paper is to introduce relevant themes by synthesising the current literature to influence future research and policy-development, under the domain of business management. The paper will first introduce the modern problem of fragmentation of the sector, and then move onto the three key themes established within the current literature that are integral to academia-industry collaboration and SME resilience to help bond the Life Sciences through (a) government support, (b) knowledge transfer, and (c) network facilitation. The results were mainly positive, with many of the social actors encouraging collaboration in Wales; however, not all enterprises in the university-led networks were satisfied with the effectiveness of supported communication or collaboration, which provides an ongoing and unanswered question about how universities can best facilitate such openly innovative activities.

Keywords

Open innovation; life science; small business; SMEs; resilience; academia; collaboration; knowledge.

Introduction

The aim of this short literature review is to discover the impact the phenomena of the COVID pandemic has had upon openly innovative activities, between Welsh academia (specifically Swansea University) and the Welsh Life Science sector. The objective is to contribute a concise and synthesised overview of knowledge, whereby unanswered and ongoing questions can be recommended for future research. This literature review uses a more specific, but complementary, ontology of a wider piece of doctoral research, but the epistemology remains the same, as it uses a cross-discipline approach to study the Life Science sector from a business

management perspective. Only qualitative sources have been reviewed, covering both academic literature (which includes peer-reviewed and/or open-access articles and conference papers) and grey literature (which includes university, industry, and government reports). These sources have mainly been identified through the wider literature review of the related doctoral thesis.

Literature Review

Fragmentation of the Life Sciences against COVID Pandemic

During any pandemic, the Life Sciences are in a unique economic position, as they are responsible for creating diagnostics and treatments for the very viruses which are causing an economic impact upon their enterprises. Published just before the COVID outbreak, Smietana et al. (2020) released a peer-reviewed, but corporately-funded, article blaming a lack of interconnection for the vulnerability of the biopharmaceutical industry, which has an implication of a decline in Research and Development productivity across the breadth of the Life Sciences, which was later discussed to impact "expertise, global reach, regulatory capability and reputation …[to] create a substantial advantage" (p. 18) and, therefore, resilience. Resilience itself is considered a poorly-defined concept by Korber and McNaughton (2018) and following their own systematic review of resilience literature, they came to the conclusion that it is a "used to connote a wide range of concepts… [including] success, survival, persistence, and optimism" (p. 1130).

In a co-authored article from 23 international academics, Mohamed et al. (2020) recommend a borderless approach for global scientific collaboration between Life Science students (academia) and enterprises (industry) to build resilience against the COVID pandemic. As the open-access and peer-reviewed article suggests, borderless-ness not only applies to national borders, but it could also be argued to include individual enterprise borders or across sectors, as demonstrated through 'open innovation' in the next section.

The Role of Academia in Life Science Sector Resilience

Government Support for Academia-Industry Collaboration

Founded by Chesbrough (2019) at the start of the millennium, the concept of 'open innovation' characterises an enterprise's use of "external ideas and technologies as a common practice in

their own business (outside-in Open Innovation) and [the allowance of] unused internal ideas and technologies to go to the outside for others to use in their respective businesses (inside-out Open Innovation)" (pp. 28-29). Such innovation is supported by the Welsh Government (2017) who published the 'Prosperity for All' economic action plan, committing to "develop engagement between universities, industry and the NHS… to drive economic growth through applied research and innovation …for transformational partnerships to develop and thrive" (p. 34), for the purposes of open innovation, and more widely, to boost the Welsh economy. On a continental-level, open innovation has also been applied by the European Commission (2013) who, during the UK's (United Kingdom) membership, also implemented an entrepreneurship action plan, whereby open innovation with higher education was encouraged, as such universities go beyond just transferring knowledge, but actual participate in alliances with industry. So, they created a framework with the aim to endorse "successful mechanisms of university-driven business creation …and emerging university-business ecosystems around key societal challenges" (pp. 7, 29), of which COVID is undoubtedly one.

Academic Spin-offs and Spillovers

As a Doctor of Medicine, Cohen (2019) wrote in an editorial introducing the increasing flow of knowledge from academia (listed as students and fellows) and professionals (listed as practicing surgeons and resident physicians) "engaging in the development of novel devices, diagnostics, therapeutics, digital health solutions, and process or policy innovations to improve care of surgical patients" (p. 142). This flow of academic knowledge into industry can be categorised as: (a) purposeful - a spin-off entrepreneurial venture by an alumnus or current academic, or (b) accidental - a spill-over, utilising otherwise-unused knowledge by enterprises.

Both categories unify the enterprises which use universities as a centralised knowledge hub, to interconnect and absorb information for the purposes of assimilation, innovation, and commercialisation. Although a now somewhat-dated article, Rothaermel and Deeds (2006) investigated the strategic alliances between biotechnology enterprises and academia, and asserted caution that this upstream knowledge transfer was "characterized by high uncertainty and frequently involve the transfer of tacit, ambiguous and complex knowledge of uncertain value … [and yet] embody leading-edge scientific discoveries" (p. 437) to be commercialised upon by Life Science enterprise, despite the risk. For the European Conference on Innovation and Entrepreneurship, Davies et al. (2017) upheld the strong tradition of academia-industry collaboration in Swansea, whereby the city's universities have played a vital role in their

region's development of (openly) innovative ecosystems, and so have well-established support mechanisms in place for local economic activity. In recognition of the benefits of this, the recent Swansea Bay City Deal has invested in the development of a Life Science village and campuses to encourage such interconnection and innovation. Next, the literature will be reviewed regarding how Welsh academia facilitate Life Science industry networks, encouraging resilience during the COVID pandemic.

University-Facilitated Life Science Networks

In an open-access paper published by Oxford University, Morrison (2019) investigated the 'promises and challenges' of the UK Life Sciences, and described the sector as being effective due to a triple helix model of innovation: (a) government via the National Health Service (NHS), (b) academia via "world-class academic research", and (c) industry via "a commercial sector that ranges from pharmaceuticals to data analysis" - making the country an "advantageous location for developing new regenerative medicines" (p. 1).

Through the application of this helix model, Pugh (2017) examined the support for Welsh enterprise by academia, and found that despite their voluntary participation, such support did not always provide positive feedback, with one Life Science entrepreneur responding that: "university–industry programmes are a waste of time and not valued at all by businesses" (p. 989). Previously, and published in the Industry and Higher Education journal, Jones et al. (2014) studied Welsh tech-enterprises, and similarly discovered that not all entrepreneurs had a positive experience of working with other enterprises in such academia-facilitated networks, naming a loss of control and difficulty in communication, resulting in prospects for future closed, rather than open innovation, which was defended by universities having a "different agenda …compared to commercial organisations" (p. 47). Conversely, some did have positive experiences with the networks, due to the universities keeping a "finger on the pulse" (p. 47) for funding opportunities and relevant contacts, promoting interconnectedness.

Such positive and negative perspectives provide unanswered and ongoing questions around the effective facilitation of networks to increase value (and resilience) for their Life Science partners. Amongst the current Welsh Life Science networks supporting enterprises in the region, such as those hosted by the Life Science Hub Wales, Swansea University also facilitates industrial networks to encourage knowledge transfer between otherwise-competing enterprises, commonly known as co-opetition; three examples follow next. Swansea University

has both recently hosted, and is currently hosting, such Life Science industry networks; the first two providing cross-border support in Wales in the UK, and the Republic of Ireland in the European Union (EU), and the last facilitating truly international open innovation:

Firstly, although closed in January 2021, 'Building Clusters and Networks in Innovation Enterprise and Research' (BUCANIER) was extended by six months for their partners to be supported in building resilience during the pandemic, through innovation and transition to online trading. For the same conference as cited above, Davies et al. (2020) evaluated BUCANIER and found that a key outcome was the sheer "strength of ties and ecosystem structure" (p. 210), citing 72% of their industry partners repeatedly interconnecting and transferring knowledge through open innovation. Secondly, 'Celtic Advanced Life Science Innovation Network' (CALIN) is a live project, which has had a mid-term evaluation conducted by James and Stevens (2019), prior to COVID. Their report cited the UK leaving the EU as the primary threat to sustainability (and therefore, resilience) at the time; this external force can arguably now be replaced with the bigger economic threat of COVID lockdown restrictions upon the Life Science sector. It is therefore conceivable that the goal of CALIN to "unite …to expand the economy" (p. 22) through building close academic and industrial relationships, is now more relevant than ever to build resilience against such a threat as COVID. Thirdly, 'Physiologically Anchored Tools for Realistic Nanomaterial Hazard Assessment' (PATROLS) facilitates intersectoral open innovation, utilising all three of the helices cited above: academia, industry, and government. Despite being EU funded, PATROLS (N.D.) operates internationally, and their strategy is to "ensure their data [knowledge] is accessible to the various PATROLS stakeholders" (p. 1) for their use to openly innovate with and commercialise; however there has been no mention in regard to building resilience for the sector, especially during COVID.

Conclusion

This short literature review asked if collaboration between academia and industry, can help build the resilience of the Life Science sector, using the context of Wales during the COVID pandemic. To answer this research question, this paper provided a brief overview of the themes considered, through a concise synthesis of knowledge. This paper is unable to provide an in-depth analysis of the topics, however but it does provide recommendations for future research, which would be extendable to a wider ontology.

Firstly, this review considered how governments can support such collaboration, which was evidenced at all levels of government, through open access and grey literature, which not only proved comprehensive support for interconnecting the Welsh Life Science sector, but also provided scope for future academic research into economic policies and initiatives, in a post COVID era. Secondly, the paper considered how academic knowledge can be transferred into industry. It argued that such knowledge flow can be challenging for industry to interpret, as it is so complex and technical. However, it could also be argued that improved interconnectedness can be achieved using universities as open and centralised hubs that promote knowledge transfer and resilience, and so future research would be beneficial as to how the knowledge flow can be more-easily communicated and interpreted for effective commercialisation in the industry. Finally, it was contemplated how Swansea University facilitates Life Science industry networks, using the examples of BUCANIER, CALIN and PATROLS. Through evaluation of their efforts, future research could investigate how effectiveness regarding encouraging communication and collaboration could be increased, regarding support for their Life Science collaborations, through academic policy and procedures.

To address the issue of a fragmented, and therefore vulnerable, Life Science sector, this review of literature has accomplished giving a brief appraisal of some of the methods used by the social actors in the triple helix model: (a) government, (b) academia, and (c) the Life Science industry. Swansea University has evidenced their role in increasing effective interconnection and resilience across the Life Science sector, however it does raise the ongoing and unanswered question of how universities can best facilitate these networks effectively, which should be addressed in future research. This is for the wider benefit of increasing the Welsh economy and social health outcomes of the nation, post COVID; with the ontology used being extendable for future research.

References

Chesbrough, H. W. (2019). Open Innovation Results: Going Beyond the Hype and Getting Down to Business (1st ed.). Oxford University Press. https://doi.org/10.1093/oso/9780198841906.001.0001

Cohen, M. S. (2019). Innovation Series. Surgery, 166(2), 1. https://doi.org/10.1016/j.surg.2018.04.060

Davies, F., Howson, T., Boy, F., Joyce, N., & Davies, G. (2020, September). BUCANIER: A Cross-Border Innovation Ecosystem. European Conference on Innovation and Entrepreneurship, Reading.

Davies, G., Roderick, S., & Williams, M. (2018, September). A Sub-Regional Innovation Ecosystem? Life Sciences and Health in the Swansea Bay City Region. European Conference on Innovation and Entrepreneurship, Reading.

European Commission. (2013). Entrepreneurship 2020 Action Plan. (795). Brussels: European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0795

James, C., & Stevens, S. (2019). Mid-Term Evaluation of the CALIN Project [External Evaluation]. Celtic Advanced Life Science Innovation Network.

Jones, P., Patz, R., Thomas, B., & McCarthy, S. (2014). Micro-Sized Enterprises, Innovation and Universities: A Welsh Perspective. Industry and Higher Education, 28(1), 39-49. https://doi.org/10.5367/ihe.2014.0192

Korber, S., & McNaughton, R. B. (2018). Resilience and Entrepreneurship: A Systematic Literature Review. International Journal of Entrepreneurial Behaviour & Research, 24(7), 1129-1154. https://doi.org/10.1108/IJEBR-10-2016-0356

Mohamed, K., Rodríguez-Román, E., Rahmani, F., Zhang, H., Ivanovska, M., Makka, S. A., Joya, M., Makuku, R., Islam, M. S., Radwan, N., Rahmah, L., Goda, R., Abarikwu, S. O., Shaw, M., Zoghi, S., Irtsyan, S., Ling, I., Cseprekal, O., Faten, A.-B., Hazar Sayar, E., Soloukey, C., Grancini, G., & Rezaei, N. (2020). Borderless Collaboration is Needed for COVID-19: A Disease that Knows No Borders. Infection Control & Hospital Epidemiology, 41(10), 1245-1246. https://doi.org/10.1017/ice.2020.162

Morrison, M. (2019). The Promises and Challenges of Biomodifying Technologies for the UK [Profile]. Oxford University Research Archive, 1-2. https://www.openaccessgovernment.org/biomodifying-technologies/68041/

PATROLS. (N.D.). Overview. [Academic Poster]. European Union. https://www.patrols-h2020.eu/PATROLS-Overview-Poster-003.pdf

Pugh, R. (2017). Universities and Economic Development in Lagging Regions: 'Triple Helix' Policy in Wales. Regional Studies, 51(7), 982-993. https://doi.org/10.1080/00343404.2016.1171306

Rothaermel, F. T., & Deeds, D. L. (2006). Alliance Type, Alliance Experience and Alliance Management Capability in High-Technology Ventures. Journal of Business Venturing, 21(4), 429-460. https://doi.org/10.1016/j.jbusvent.2005.02.006

Smietana, K., Quigley, D., Van de Vyver, B., & Møller, M. (2020). The Fragmentation of Biopharmaceutical Innovation [News and Analysis]. Nature Reviews: Drug Discovery, 19(1), 17-18. https://doi.org/http://dx.doi.org/10.1038/d41573-019-00046-3

Welsh Government. (2017). Prosperity for All: Economic Action Plan. Crown. https://gov.wales/prosperity-all-economic-action-plan