Institution: Anglia Ruskin University

Unit of Assessment: C17 (Business and Management Studies)

Title of case study:
Influencing Innovation Policy and Practice in the Digital Telecommunications Sector

Period when the underpinning research was undertaken:
2013-2018

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Emanuele Giovannetti	Professor of Economics	2011-present

Period when the claimed impact occurred: August 2013-2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact (indicative maximum 100 words)

Giovannetti's research on competitors' cooperation and networks has led to:

- The United Nations' International Telecommunication Union (ITU) adopting new practices for collecting and analysing data on 125 countries' cooperative platforms, and using this data to inform their global ICT policies and governance.
- A set of new policy recommendations, published by the ITU, on the impact of collaboration in innovation ecosystems detailing how best to bring connectivity to the 50% of the world population that has no internet access.
- A set of recommendations published by the UK's Department of Business Innovation and Skills (BIS), for improving productivity. These were endorsed by the Organization for Economic Cooperation and Development (OECD).
- The drafting and adoption of the Digital Sector Strategy of the Cambridgeshire and Peterborough Combined Authority (CPCA).

2. Underpinning research (indicative maximum 500 words)

Giovannetti's research focuses on internet market power and the adoption of new technologies. Two sub-themes of this research, conducted at Anglia Ruskin University since 2011, have focused on:

a) the innovation outcomes of cooperation between otherwise competing organizations (**R1, R2**), and
b) new indicators to assess the market power and success of organisations in the digital sector (**R3-6**).

These areas of research are deeply interconnected. The internet and related information and communications technologies (ICTs) foster technological adoption and the diffusion of innovations, which are necessary for sustainable economic development, both locally and nationally. Both sub-themes are discussed separately as they have led to distinct impact with global reach and significance (Section 4).

The first area of impact is underpinned by results obtained in **R1** and **R2**. These publications provide:

- an empirical analysis of the impact of cooperation in innovative activities on innovation rates and productivity (**R1,** with Piga, Keele University)
- a theoretical analysis of the incentives for market competitors in their adoption of new technologies (**R2**).

Empirical findings in **R1** stem from a research project led by Giovannetti (PI): "Investigating external and private benefits of investments in UK skills & training". This research was funded by

the UK Department for Business Innovation and Skills (BIS) (BIS/RBU/025/2012**; S1**) to develop an econometric model using data from multiple UK Innovation Surveys. The analysis shows that collaboration in innovative activities among non-competing organisations, including customers and suppliers, is an essential element for success. Having said that, the research did also show that inter-competitor cooperation could also slow innovation, as competitors either agree to stall innovations or waste resources on duplicating innovation. Hence, regulatory authorities should seek to set incentives and policies that only support productive collaboration within innovation ecosystems.

These empirical results complement theoretical insights obtained in **R2,** which applies game theory to identify the incentives that lead to different levels of technological adoption among regional neighbouring market competitors. This framework shows that global adoption of a new technology does not emerge where there is strong market competition between firms, especially when there is a high level of market integration facilitated by ICTs. The disincentives to adopt innovations provoked by strong competition should be addressed when designing innovation and sector policies, which would facilitate greater levels of innovation diffusion and reduce the persistence of regional technological inequalities.

The second area of research, drawing from results analysing complex network features in underpinning publications **R3-6**, has led to the development of novel empirical indicators for predicting crowdfunding success and in identifying market power within ICT platforms. These publications showed:

- The key role played by *network centrality* in capturing market power in Mobile Internet connectivity (**R3**, with Sigloch, PhD student at ARU) and within Internet exchange facilities (**R4**, with D'Ignazio, Bank of Italy)
- The positive impact on the success of digital crowdfunding platforms from investing in *digital social capital*, through reciprocal support and shared social networks amongst crowdfunding projects (**R5**, with Davies, PhD student at ARU)
- The positive impact of levels of *trust* on the technical stability of the global Internet, whereby trust is built by maintaining long-lasting interconnections among Internet operators (**R6**, with D'Ignazio, Bank of Italy).

3. References to the research (indicative maximum of six references)

R1. Giovannetti, E. & Piga, C. (2017). The contrasting effects of active and passive cooperation on innovation and productivity: Evidence from British local innovation networks. *International Journal of Production Economics*, 187: 102–112. https://doi.org/10.1016/j.ijpe.2017.02.013
R2. Giovannetti, E. (2013). Catching up, leapfrogging or forging ahead? Exploring the effects of integration and history on spatial technological adoptions". *Environment and Planning A: Economy and Space*. 45(4): 930–946. https://doi.org/10.1068/a4572
R3. Giovannetti, E. & Sigloch S. (2015). An internet periphery study: Network centrality and clustering for mobile access in Bhutan." *Telecommunications Policy*, 39(7): 608–622. https://doi.org/10.1016/j.telpol.2014.11.006
R4. D'Ignazio, A. & Giovannetti E. (2014). Continental differences in the clusters of integration: Empirical evidence from the digital commodities global supply chain networks. *International Journal of Production Economics*, 147-B: 486-497. https://doi.org/10.1016/j.ijpe.2013.06.029
R5. Davies, W. & Giovannetti, E. (2018). Signalling experience & reciprocity to temper asymmetric information in crowdfunding, evidence from 10,000 projects. *Technological Forecasting and Social Change*, 133: 118-31. https://doi.org/10.1016/j.techfore.2018.03.011
R6. D'Ignazio, A. & Giovannetti E. (2015). Predicting internet commercial connectivity wars: The impact of trust and operators' asymmetry. *International Journal of Forecasting* 31(4): 1127–1137. https://doi.org/10.1016/j.ijforecast.2015.03.007

4. Details of the impact (indicative maximum 750 words)

Giovannetti's research on the innovation outcomes of cooperation between competing organizations, and on indicators of market power and success of organisations in the digital sector have resulted in impact with global reach and significance across four main domains:

Developing and facilitating global ICT policy

New data on the cooperative platforms of 125 countries were collected, analysed and used to inform global ICTs policies and governance by the UN's International Telecommunication Union (ITU). Founded in 1865 to facilitate international connectivity in communications networks, the ITU is now the UN agency dedicated to ICTs. The ITU includes 193 Member States as well as some 900 companies, universities, and international and regional organizations. The ITU allocates global radio spectrum and satellite orbits, develops the technical standards that ensure networks and technologies seamlessly interconnect, and strives to improve access to ICTs for underserved communities worldwide under the UN mandate to 'bridge the digital divide'. To this aim, the ITU works with public and private sector partners to ensure that ICT access and services are affordable, equitable and universal and are empowering people around the world through technology education and training. The ITU also regularly publishes the industry's most comprehensive and reliable ICT international statistics.

Much of the work at ITU is done in study groups. The main output of a study group is the establishment of technical standards or guidelines and recommendations. Giovannetti's underpinning research (**R1-6**) led to his election as Vice-rapporteur of the ITU's Telecommunication Development Sector's (ITU-D) *Study Group 1*. In this role, he revised the ITU *Annual Tariff Policies Survey,* proposing the inclusion of a set of new questions on countries' modes of access to, and governance of, Internet Exchange Points (IXPs) and National Research and Education Networks (NREs). These were two further types of Digital Exchange Platforms used for enhancing cooperation among Internet Service Providers and Universities and research centres, that form an essential component of strategies aimed at lowering costs and increasing the affordability of internet access in developing countries **(S3)**.

The resulting datasets are now available on the ITU Statistics website, ICT-Eye, and have been used in global and regional level forums, to discuss global trends in regulation for Sector Members and other national and international stakeholders. For the year 2019, more than 125 datapoints have been collected world-wide, based on the member states' answers to these new questions **(S2)** and this data is now referenced and used in ITU's Study Group official reports informing and advising member states on best practice for lowering the costs of interconnection policies **(S3)**. Elaborations, visualisations and guidelines on interconnection through shared infrastructures such as IXPs and NREs, based on these new survey data, are included in the ITU-D Study Group 1 Report on "Question 4/1: Economic policies and methods of determining the costs of services related to national telecommunication/ICT networks." This report, co-edited by Professor Giovannetti in his role as Vice-Rapporteur of the ITU-D Study Group1, referring to **(R4)** regarding the relevance of IXPs in lowering connectivity costs in developing countries, was submitted and approved as *ITU-D Document 1/355-E* **(S3)** during the 3rd Plenary meeting of Study Group 1 (Geneva, 19 February 2020 - attended by 182 delegates from 62 countries) and is being translated into the six official UN languages for final publication, after being finalised at the Plenary Study Group 1, Rapporteurs virtual meeting, (hosted in Geneva, 21 September 2020, *ITU-D Document SG1RGQ/325* **(S3)**).

Improving global connectivity

Giovannetti's research has led to a new set of policy recommendations published by the ITU. These have informed global public debates on the impact of collaboration in innovation ecosystems and how best to bring connectivity to the 50% of the world population without internet access **(R1-4)**.

In 2016, Giovannetti was invited by the then ITU-D Director, Mr Sanou **(S4)** to join the expert academic group and write a chapter ("Digital Divide and Digital Multiplier: A Paradigm Shift through Innovation**" (S4)**) for an ITU volume setting out a roadmap to achieve the ICT-related targets of the United Nations' Sustainable Development Goals (SDGs). The volume was launched at the Buenos Aires Ministerial Roundtable, held at the 2017 World Telecommunication Development Conference (WTDC-17) on "ICT for Sustainable Development Goals (ICT4SDG)". This conference was attended by more than 1,360 participants, including 1,010 government delegates representing more than 130 countries **(S4).** Drawing on his underpinning research **(R1-4)**, Giovannetti's chapter **(S4)** provides a new set of policy recommendations for how best to support sustainable ICT-centric innovation ecosystems. These recommendations were republished in the *ITU-News* Magazine **(S5)**, emphasising their potential to inform policies for reducing the digital divide. In addition, the World Economic Forum published an article on the specific recommendations focussing on crowdfunding success titled "These are the things that successful crowdfunding projects do" **(S6)** based on Giovannetti and Davies' underpinning research **(R5)**.

Evidence of the reach of this ITU published volume, that includes Giovannetti's policy recommendations **(S4),** is provided by it being referenced in:

- Jordan's ICT Sectorial Strategy (Gedeon and Al-Qasem, 2019), prepared by The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) for the Jordanian Ministry of Industry, Trade and Supply
- the UNESCO Policy Paper (2019) "ICT for Sustainable Development. Recommendations for Public Policies that Guarantee Rights".

As a follow-up on the regulatory implications of Giovannetti's underpinning research (**R1-6),** he also co-chaired the ITU-D workshop on the "Economic Impact of the Over the Top applications (OTT)" (Geneva September 2019). This workshop led to a dedicated report published as official *ITU-D Document 1/339-E* - "Economic impact of OTTs on national telecommunication/ ICT markets" **(S3).** This report, co-edited by Giovannetti and formally adopted at the Plenary assembly on 22 February 2020 **(S3)** has been published by the ITU in the six official UN languages. The document draws together lessons learned from the research to inform the development of regulatory guidelines internationally.

Improving UK productivity

Giovannetti's research has led to a set of recommendations for the UK Department of Business Innovation and Skills (BIS), subsequently endorsed by the OECD, for improving UK productivity.

The results and policy recommendations explored in the BIS funded project were published in December 2014 as a *BIS Research paper n 203* **(S1)**. This examined innovation enablers, with a focus on targeted subsidies and incentives for R&D and training activities in key sectors. Giovannetti was involved, as Principal investigator, in the design of the project, and, according to Simon McKee of the BIS Skills and Policy Analysis unit, "Giovannetti worked closely with myself and other colleagues to define the scope of work, to ensure that it was useful from the perspective of government policymakers" (BIS 2014**, S1**).

The report and its results filled an important gap in understanding and enabled new capabilities for modelling innovation data and their impact on productivity. This was shown by the highly influential "OECD UK Productivity Report" **(S7)** presenting a set of recommendations on how to improve UK productivity. This cited Giovannetti's *BIS Research paper n 203* **(S1)** as one of only four publications considered ***key references*** underpinning their policy recommendations on UK productivity. The results of the BIS model showing the potential negative impact of cooperation in innovative activities among product competitors, were also presented at a dedicated meeting with the BIS Skills & Training team on 12 May 2014, and to the *UK Innovation Survey User Group* at BEIS on 20 March 2017. The findings were also discussed through ten separate one-to-one meetings between 2015 and 2017 held by Giovannetti with key policymakers, facilitated

by Giovannetti's participation in the University of Cambridge *Centre for Science and Policy's* Policy Fellows Network **(S8).**

Introducing local digital strategy

Giovannetti's research has contributed to the writing and adoption of the 2019 Digital Sector Strategy (DSS) by the Cambridgeshire and Peterborough Combined Authority (CPCA).

The DSS is a central component of the Local Industrial Strategy (LIS) adopted by the CPCA. The role of the DSS is to ensure that the area continues to be economically competitive through the success of the digital sector and through the adoption and diffusion of smart technologies. Giovannetti's input was through two distinct leading roles:

- as a member of the Steering Commission for the DSS, and,
- as the academic lead for the Anglia Ruskin University and Cambridge Wireless strategy team that won the bid to write the DSS.

The DSS report is based on consultation with, and a survey of, multiple organisations and businesses involved in the Digital sector. The design of the consultation and survey were informed by Giovannetti's previous research (**R1, R4 and R5**). The DSS **(S9)** recommendations were also directly informed by Giovannetti's underpinning research; his previous research being explicitly cited in them. The DSS was adopted by the CPCA on 15 March 2019 and was then integrated into the wider CPCA LIS in September 2019 **(S9).** The importance of this work is emphasised by the Mayor of CPCA, James Palmer, who said that "The first Local Industrial Strategy for Cambridgeshire and Peterborough will help create the conditions to achieve our ambition of doubling economic output and ensuring future prosperity" **(S10).**

The report is directly shaping regional policy. Acting on the report's recommendations, the CPCA is investing, through the programme CambWifi, in providing free public access Wifi in market towns across Huntingdonshire to help residents keep connected and bolster local businesses through the Covid pandemic. On 8 October 2020, CambWifi went live in St Neots, and is being extended to St Ives, Ramsey and Huntingdon town centres. The secure public access Wifi network is being rolled out as part of the Connecting Cambridgeshire programme through the collaboration and investment of local authorities, Cambridgeshire County Council with the support of Huntingdonshire District Council, and additional funding for market towns from Cambridgeshire & Peterborough Combined Authority. Welcoming the launch of free CambWifi, CPCA's Mayor James Palmer said: "Public access Wifi has an important part to play in supporting struggling high streets and will help to bolster economic recovery from Covid-19 by encouraging people to shop locally and to support local businesses. The Combined Authority is investing in digital connectivity for our market towns now and for the future."

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. BIS Research Paper Number 203 and letter from BIS Officer on the Project
2. Letter from Ms Prado ITU Senior Regulatory Officer on the Annual Tariff Survey
3. Collated ITU-D Documents: (a) n:*1/355-E*; (b) SG1RGQ/325; (c) *1/339-E*; (d) SG1 Attendance Statistics and Minutes from SG1 meeting held 17-21 February 2020.
4. Collated ITU-D Director's letter, ITU book launch slides & WDTC 17 Ministerial Roundtable agenda with book launch
5. Article in ITU News Magazine (21 December 2018)
6. World Economic Forum article on Crowdfunding recommendations (18 November 2016)
7. OECD Country Profiles, UK Productivity Outlook (2018)
8. Meetings at BIS/BEIS and via the C-SAP Fellows Network
9. The CPCA's Digital Sector Strategy (2019) & CPCA paper incorporating it into the LIS
10. Statements of CPCA Mayor: (a) on the LIS from a Cambridge Wireless press release (19 July 2019) (b) on CamWifi from the CPCA website (8 October 2020)