



How can entrepreneurs benefit from user knowledge to create innovation in the digital services sector?

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ABSTRACT

The paper focuses attention on the value of user knowledge to entrepreneurs and addresses an important gap in current literature concerning entrepreneurial activity, user knowledge and innovation in digital services. Drawing on the entrepreneurship and innovation literatures, the paper highlights the challenges posed by the application of user knowledge to digital services and outlines a novel unit of analysis for the examination of entrepreneurial activity. The Innovation Opportunity Space framework is introduced and applied to the analysis of giffgaff, a UK-based mobile telephony supplier. This case is employed in order to explore the boundaries of the current understanding of entrepreneurial knowledge networks, user knowledge and innovation. The theoretical contribution of the paper proposes a reappraisal of the notion of spillovers, user knowledge and firm boundaries in the digital services sector. The paper concludes by outlining directions for further research in this area.

1. Introduction

The emergence and widespread adoption of the internet has enabled unparalleled levels of user knowledge distribution and coordination by firms, individuals and on-line communities. Recent data shows that there were estimated to be more than 4.15 billion internet users worldwide with around 90% of the populations of developed countries typically being connected (Internetworldstats, 2018). It is now possible to draw on the knowledge resources possessed by external groups like users in order to both innovate and operate, allowing entrepreneurs to create novel business models.

This paper is a response to the need to generate insights at the interface between the business model and open distributed innovation (von Hippel, 2005). As West and Bogers (2017) put it, firms can go beyond their boundaries not only to source innovations to commercialize but also to source their business models (Vanhaverbeke & Chesbrough, 2014). They make a case for a greater integration of user innovation research (largely focused on individuals), open innovation work (largely focused on organizational actors) and the fast growing research on firms' crowdsourcing of innovations and other value-creation activities. They find these streams have so far been only loosely connected (e.g., Piller & West, 2014) and that a deeper integration between them has the potential to provide significant insights.

This paper argues that our notion of entrepreneurship needs to be further developed in order to better reflect the impact that the internet

has had on access to user knowledge. These changes pose a challenge to traditional understandings of entrepreneurship and innovation and the Innovation Opportunity Space approach outlined below is designed to provide a different lens to observe and analyse this phenomenon and enable a better understanding of the significant changes that are taking place. These significant changes include the entrepreneur being able to better access user knowledge; no longer having to own or control all the resources required to innovate; having access to new ways of doing business; and being able to create new organizational forms (Haskel and Westlake, 2018).

Digital services are typically offered over the internet and the ability of users to easily share their knowledge resources has opened up a new avenue for entrepreneurial activity. Many traditional approaches to entrepreneurship and innovation tend to be framed with a supply-side, internal orientation and overlook the potential contributions of non-firm actors, like users, and the knowledge resources they are able to offer to the processes of innovation and operations. Despite extensive recent literature on the changing nature of innovation and the contribution of crowds and users (e.g. Howe, 2006; Franzoni et al., 2014; de Reuver, Sørensen, & Basole, 2018), there is a gap in the understanding of emerging entrepreneurial opportunities that arise from the ability to access and orchestrate user knowledge resources. This paper directly addresses this gap in our understanding and introduces the Innovation Opportunity Space, an approach designed to supplement traditional framings of industrial activity and throw new light on the

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potential impact of the widespread availability of user knowledge on entrepreneurship and innovation.

The research question that motivates this paper is: ‘How can entrepreneurs benefit from user knowledge in digital services?’ The paper will explore the way in which user knowledge can be deployed to benefit both the innovation and the operation of such services.

Services have been defined as ‘...an activity or series of activities of a more or less intangible nature that normally, but not necessarily, take place in the interaction between customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems’ (Gronroos, 2001). Building on this definition *digital services* can be viewed as services that are provided over the internet using digital technologies and include a wide variety of phenomena including social media, online marketplaces, knowledge sharing and community activity. The case study examined in this paper, giffgaff, is an example of a commercial digital service provider that adopted a novel organisational form in order to benefit from access to the knowledge of its users.

In order to explore the research question outlined above the paper will draw on the entrepreneurship and innovation literatures to explore the role of users and user knowledge in entrepreneurial activity and examine the gaps in our understanding of these phenomena. The Innovation Opportunity Space framework will also be outlined and applied to the analysis of the case study - giffgaff, a relatively new entrant to the UK mobile phone market (and an example of corporate entrepreneurship: Drucker, 1985) whose organisational structure was designed to enable it to benefit from the knowledge of its users.

This paper focuses on the entrepreneurial way in which user knowledge was coopted to provide many of the core processes relating to the provision of a mobile telephone service in the UK. The novel contribution of this paper is threefold: in the broadening of the role of knowledge in entrepreneurial opportunities to include user knowledge; the recognition that, in the context of user knowledge, traditional conceptions of geography and spillover may need to be further developed; and in the ability to focus on external knowledge resources provided by the application of the Innovation Opportunity Space approach.

The Innovation Opportunity Space provides a mechanism for the examination of the context of innovation, together with the impacts of the actions of the others involved. Building on the work of Perez (Perez, 2009) and Meyer (Meyer, 2010), this approach examines innovation from an opportunity rather than a market perspective, and drawing on the work of von Hippel (e.g. von Hippel, 2016) specifically recognizes that the resources required (e.g. knowledge) may be obtained externally. In this paper the Innovation Opportunity Space approach is applied to the analysis of the entrepreneurial orchestration of user knowledge in the context of digital services, it may also be applied to the examination of the use of a broad range of resources in the innovation of commercial offerings.

The Innovation Opportunity Space approach enables the analysis of changes in technology, expectations or practice on consumer behavior. It focuses on the new opportunities that such changes create, exploring how different groups react and examining longer-term interactions. The opportunity focus of this approach provides for a neutral starting point and is of great value to entrepreneurs.

The paper has been structured into six parts, with part 2 providing a review of relevant literature, part 3 exploring user knowledge and the Innovation Opportunity Space framework in more detail, and part 4 outlining the methodology and presenting the giffgaff case study. The discussion forms part 5 with the conclusions, limitations, and directions for future research being contained in part 6.

2. Review of literature

This section is intended to provide a perspective of the key framings employed within the bodies of literature reviewed. The review will focus on the role of user knowledge within the wider discourse of

entrepreneurship and innovation and provide context for the following research question: ‘How can entrepreneurs benefit from user knowledge in digital services?’. In order to approach this question it is important to explore how knowledge and the role of the user has been examined in the entrepreneurship and innovation literatures.

2.1. Entrepreneurial opportunities through user knowledge in the digital services sector

Entrepreneurial opportunity examines how entrepreneurs exploit technological change to create new processes, products, services, markets or firm structures. This literature is concerned with issues like the role of prior knowledge in discovering new opportunities (e.g. Shane, 2000) and the role of bridging organisations in facilitating opportunity recognition (e.g. Sapsed, Grantham, & DeFillippi, 2007). In contrast, the notion of a conceptual space in which innovation opportunities are examined has been outlined in very different contexts and for very different purposes. At the macro level, the innovation opportunity space refers to a technological revolution that facilitates the emergence of a novel techno-economic paradigm that enables novel forms of related technologies and products (Perez, 2009). At the micro level it has been used to refer to the market opportunities perceived by entrepreneurial R & D managers in design firms (Meyer, Tucker, & Marion, 2010). Focusing on the potential value of non-firm actors like users, it has also been proposed as a unit of analysis and managerial framework that may be used to inform innovation decisions (Flowers, Meyer, & Kuusisto, 2017). Although there is an apparent overlap between the notion of entrepreneurial and innovation opportunities, one key difference is the implicit assumption that is often associated with entrepreneurial activity – that it tends to focus on the possibility of entrepreneurs achieving financial returns. An innovation opportunity is more neutral in this respect and whilst it may lead to entrepreneurial activity (as outlined in the case study below), there is no assumption (implicit or explicit) that such activity will take place.

In the field of entrepreneurship it has long been recognised that entrepreneurs may be individuals or organisations (e.g. Drucker, 1985) although much work has been undertaken to better understand characteristics possessed by individual entrepreneurs (e.g. Shane & Eckhardt, 2003; Parker, 2009). In a parallel stream of enquiry the Knowledge Spillover Theory of Entrepreneurship (KSTE) explores how knowledge flows can influence entrepreneurial activity (e.g. Acs, Audretsch, Braunerhjelm, & Carlsson, 2012) and positions entrepreneurial behaviour as a response to profitable opportunities from knowledge spillovers from an incumbent organization (e.g. Acs, Audretsch, & Lehmann, 2013). Within this literature, stakeholders tend to be viewed as important actors in entrepreneurial development as they provide a range of knowledge and other resources, with such stakeholders being perceived as playing an important part of an entrepreneur's network (e.g. Smith & Lohrke, 2008). For certain forms of productive activity such networks are recognised to play an important role both in regional development (e.g. Fritsch & Mueller, 2004) and economic growth (e.g. Freeman, 1987; Asheim, Boschma, & Cooke, 2011; Harris, 2011), with geography and proximity playing an important part in this process (e.g. Audretsch et al, 2005; Zucker, Darby, Furner, Liu, & Ma, 2007).

These approaches tend to be based on long-established, traditional models of innovation and have within them a series of implicit assumptions concerning the nature of knowledge and its transmission. These include the links between universities and innovation (e.g. Fischer & Varga, 2003), the transmission of knowledge in written and spoken form (e.g. Howells, 2002), the commercialisation of ideas created within an incumbent organization by an entrepreneur (Acs et al., 2012), and the nature of the production process (e.g. Godin, 2006). However, the broadening of the actors that may be involved in innovation tends to be overlooked in this literature, although it has been recognised elsewhere that a range of different approaches have

emerged to capture the value that is created in these relationships (e.g. Saebi & Foss, 2015).

2.2. The benefits of user knowledge: Innovation in digital services sector

These are all important contributions to our understanding that are likely to hold true in more traditional contexts but may not be directly relevant when applied to on-line digital contexts. For example, in the context of crowd-based innovation processes, such groups may provide much of the knowledge provided to entrepreneurs but they are not likely to be geographically proximate with the entrepreneur (Howe, 2006). Similarly, such knowledge resources may be those traditionally generated and applied within firms (e.g. Leonard-Barton, 1995), but they may also be a spillover of the actions of those users - in other words, knowledge of what is possible (and how it has been achieved) is transmitted by the manifestation of what has been done.

This is a particular form of knowledge that requires specialised forms of absorptive capacity (Cohen & Levinthal, 2000) in order to benefit from it. Further, it is important to recognise that our understanding of product and service innovation tends to treat them as similar in nature (e.g. Utterback & Abernathy, 1975; Magnusson, Matthing, & Kristensson, 2003), with the innovation process of a product assumed to be an input to its production and diffusion. As a result, it has been argued that users possess a form of knowledge that is hard for firms to access (von Hippel, 1994), and that users may potentially play an important role in various stages of the innovation process (e.g. von Hippel, 2016). However, unlike many products, it is important to note that services tend to be ongoing and firms may draw on user knowledge in their ongoing operation and provision, an issue under-explored in the literature.

One of the main factors driving recent waves of innovation in digital services can be found in the way that some organisations are learning how to create commercial value by drawing on a range of external resources (e.g. Bughin, Chui, & Johnson, 2008), particularly the knowledge that users possess. A challenge for the innovation literature is that it has largely evolved from a strongly supply-side perspective in which users were positioned as a final market. As a result, users were viewed as possessing needs that must be satisfied (e.g. Rothwell et al., 1974), were the ‘tough customers’ that drove innovation (Gardiner & Rothwell, 1985), or were the ‘lead users’ (von Hippel, 1986) that indicated the shape of future markets, all of which may be harnessed to benefit producer firm innovation processes. Despite this predominant framing, one stream of this literature has explored many non-traditional sources of innovation, for example communities (Franke & Shah, 2003), hackers (Flowers, 2008), open-source (Lakhani & von Hippel, 2003) and also explored how firms may actively seek to prevent users from innovating (Braun & Herstatt, 2008).

It is clear that users and others can play a series of important roles in the creation, development, implementation and diffusion of technologies. Arguably, the boundary between producers and consumers of technologies has become less distinct and the boundary between ‘users’ and ‘doers’ (Castells, 1996) has become harder to discern. It has also been argued that some forms of innovation have become far more open (Chesbrough, 2003), and democratised (von Hippel, 2005, 2016). From this perspective the processes of innovation have become increasingly complex. Despite this complexity, work has explored how such resources may be better utilised within firms methods to identify lead users and draw on their ideas (e.g. Herstatt & von Hippel, 1992), the use of toolkits to shift some of the burden of innovation to users (e.g. Franke & Piller, 2004), and the way in which the Internet can be deployed to draw users into product innovation (Sawhney, Verona, & Prandelli, 2005).

More recent literature in this area has also explored utilizing users and others external to the firm to undertake a range of operational and innovation processes (e.g. Keupp et al., 2009; Chatterji et al., 2014; Franzoni et al., 2014), sometimes utilizing specially designed on-line

systems (sometimes referred to as digital platforms) in order to do so (e.g. de Reuver et al., 2018; Boudreau, 2010). Crowdsourcing, defined as ‘...the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call’ (Howe, 2006), is now commonly applied with firms using the crowd for a wide range of tasks including complex work (Kittur, Smus, Khamkar, & Kraut, 2011), collecting geospatial data (Heipke, 2010) and survey research (Behrend, Sharek, Meade, & Wiebe, 2011). The digital platforms often employed enable firms to manage crowd relationships in a selective manner (Henkel, 2006), with such ‘open’ (Chesbrough, 2003, 2006) approaches facilitating the emergence of a number of novel business models that depend of external knowledge (e.g. Chesbrough, 2003, 2006; Van der Meer, 2007; Saebi et al., 2015).

3. User knowledge and the innovation opportunity space

In this section we will introduce the notion of Innovation Opportunity Space in more detail and make the case it offers an inherently neutral starting point to explore and understand how resources can be mobilized and value created, co-created, and appropriated, not focusing on a specific group of actors or one form of value; thereby enabling a broader examination of value creation. As discussed in Section 2.1 above, this is a complementary perspective to entrepreneurial opportunities which tend to focus on the possibility of entrepreneurs achieving financial returns.

The Innovation Opportunity Space approach was introduced to provide a neutral mechanism for analyzing the new entrepreneurial and other opportunities that emerge from technological and behavioural changes (Flowers et al., 2017). This paper seeks to clarify and elaborate these ideas and to apply it to the analysis of an entrepreneurial firm (giffgaff) that developed a commercial business model in order to benefit from user knowledge in the provision of a digital service.

As outlined above, the Innovation Opportunity Space approach draws on ideas that have been explored within the entrepreneurship and innovation literatures and is an attempt to create a neutral unit of analysis to explore knowledge creation and appropriation. The Innovation Opportunity Space framework enables multiple, complementary approaches to the analysis of an innovation opportunity that is not framed around one particular actor or group of actors. It is argued that this small reorientation in our analytical standpoint will enable a shift in our understanding of innovation processes and outcomes.

An innovation opportunity may be defined as the productive gap to create something new – e.g. a new technology or technological application, an organisational innovation, a product, a service, or some combination of these. Developing this idea, an Innovation Opportunity Space is an area of unexploited potential. Such unexploited potential may relate to commercially supplied goods and services and an important factor concerning the notion of an Innovation Opportunity Space is that it is a neutral initial frame of reference that enables the mapping of the actors seeking to obtain value from an area of unexploited potential. Clearly, Innovation Opportunity Spaces are likely vary according to a range of factors and be quite different so it is useful to perceive them as being one of three main forms: stable, unstable and emerging.

A stable Innovation Opportunity Space is likely to be distinguished by mature products and services, a small number of dominant suppliers, and clear and enforced norms and practices around use. In contrast, an unstable Innovation Opportunity Space will occur when the guiding assumptions that make apparently mature products and services attractive are called into question. Finally, an emerging Innovation Opportunity Space occurs when existing norms, practices, standards or regulations are set aside or when new technologies, or novel applications of existing technologies, are created. Incumbents are more likely to benefit from a stable Innovation Opportunity Space as it makes it

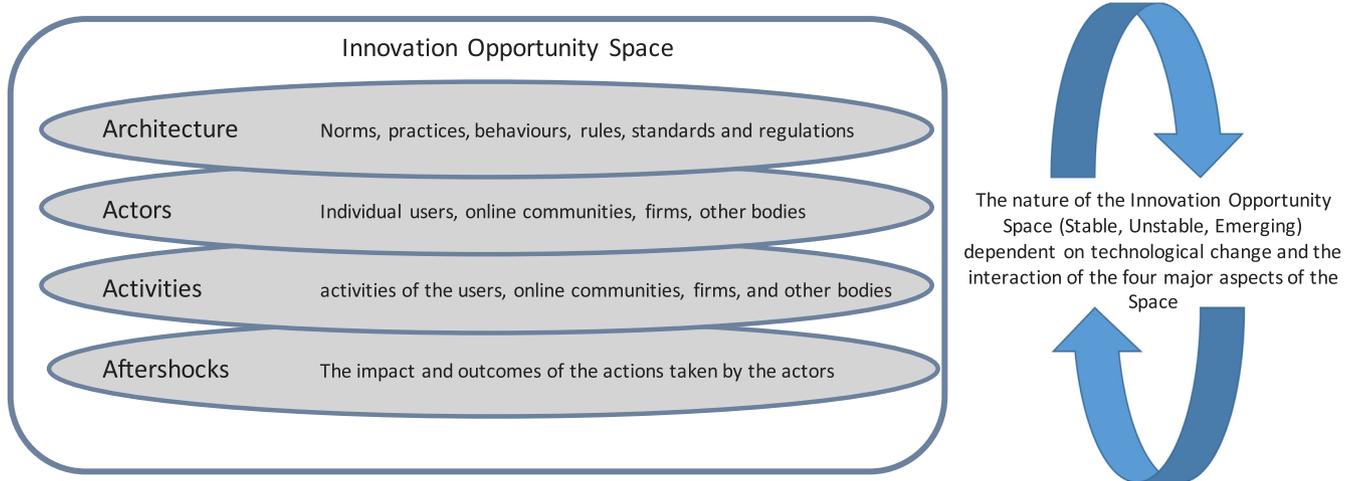


Fig. 1. the main elements of the Innovation Opportunity Space.

harder for new entrants to emerge and change the competitive context.

The Innovation Opportunity Space approach is intended to be an inherently neutral starting point for an examination of how resources can be mobilised and value created, co-created, and appropriated. Unlike many frameworks of this sort it does not focus on one group of actors nor does it focus on one form of value and, as a result, it can enable a broader examination of value creation that can include economic returns. Innovation is often a complex and uncertain process and the structured analysis of an Innovation Opportunity Space focuses on four major aspects: its Architecture, including the accepted norms, practices and rules; the Actors that inhabit the Space; the Actions of the different actors within the Space; and the impact of the actions, termed the Aftershocks. The intention underlying the analysis of an Innovation Opportunity Space is to facilitate a high-level strategic examination of a particular context and enable areas of opportunity for innovation to be identified. In the context of the case study the framework highlights the part played by user knowledge in both the operation and the innovation of a digital mobile telephony service in the UK. Fig. 1 provides a summary of the main elements of the Innovation Opportunity Space.

4. Methodology

4.1. The choice of the qualitative approach

This case study explores how it has become possible for a commercial organisation to create a business model in which its users, or customers are a core part of its day-to-day operations. The qualitative approach was selected as the focus of the research is on an emerging phenomenon – the application of user knowledge to day-to-day operations in a commercial context - and the case is presented as an exploratory study designed to examine key issues and research questions (Yin, 1989) that are intended to form part of future research. As such, the case is not presented as part of a theory-building exercise (Eisenhardt, 1989) but in order to provide a new perspective on the way in which commercial actors seek to draw on user knowledge within their operational activities. In this sense the case aims to provide an account against which researchers in this field can compare their experiences and gain theoretical insights (Dyer & Wilkins, 1991).

4.2. The justification of research context: Giffgaff case

The object of the case study – giffgaff – is an example of a contemporary digital service firm. It was the first UK provider that did not have any call centres, with individual users (referred to as ‘members’) providing the technical and other support required (Howdle, 2019). All non-account support was dealt with by the giffgaff user community,

with other users using their knowledge to respond to the non-account issues raised (Yusuf, 2019) and giffgaff was rated the top mobile network provider in the UK for 2019 by Which, an independent consumer organisation (Reynolds, 2019). What has been termed the ‘giffgaff model’ – enabling users to provide support and other services that would typically be viewed as core operations – has also influenced the establishment of new entrants to banking, energy and mobile phones (Wsjudd, , 2019). In terms of its importance in the market, giffgaff had 2% of the UK market in 2013 (Statista, , 2013), and had around 1 million customers (Titcomb, 2013). The UK mobile phone market has continued to grow, having 88.4 m active mobile phone subscriptions in 2013, increasing to 92 m in 2017 (Ofcom, 2018).

The case was chosen for six main reasons: (i) it was a start-up that was a new entrant to a stable mobile-telephony context that was funded by a large telecommunications organization and, as such, is an example of corporate entrepreneurship (Drucker, 1985); (ii) it was intentionally created to be without a physical market-facing presence and to operate solely in an on-line context; (iii) it is a commercial organisation designed to benefit from the interactive nature of the Internet and relies on its users to utilise their knowledge to undertake many of the tasks typically performed by in-house staff in other parts of the industry; (iv) the organization operates in a highly transparent manner and makes available a very large volume of material on its operational and strategic activities and positioning; (v) the case goes beyond current understandings of the role of users, and the knowledge resources they may make available to firms who seek to utilize them in their operational activities (e.g. Bughin et al., 2008; Saebi & Foss, 2015); (vi) the case provides insights into the way in which a commercial firm incorporates non-firm knowledge resources in the day-to-day provision of a complex technical service and extends current understandings of the sources of knowledge, knowledge spillovers and the impact of geography on certain forms of entrepreneurial activity. A single case study approach was selected as the research focused on the application of user knowledge in day-to-day operational activities in the telecoms industry and giffgaff was unique at the time of its foundation as being the only firm in the UK sector in which user knowledge plays a central part in its ongoing operations. As such it is presented as a critical case (Flyvberg, 2006) that seeks to explore the strategic importance of user knowledge to entrepreneurship.

4.3. Data collection and analysis

Giffgaff is an example of an organization that has inhabited the online space from the outset and the volume of data now available in such contexts offers ‘... important fields for qualitative social science investigation...’ (Kozinets et al., 2014). The approach in developing

Table 1
The role of user knowledge in giffgaff's service and operations model.

<p>Customer Service is managed entirely online and is almost entirely undertaken by the user community, although financial, technical and billing issues are dealt with by giffgaff employees. Users are incentivised to utilise their knowledge to help others by being awarded Payback Points (see below), receiving kudos from other users, and being ranked in terms of the quantity and value of their help.</p> <p>Payback is central to the operation of giffgaff with individual users being rewarded with Payback Points for recruiting new users or by providing help in one of the online forums. Payback is heavily weighted towards recruiting new users and it is possible to convert points to cash, call credit, or make a donation to a charity.</p> <p>giffgaff community knowledge base is a collection of responses to Frequently Asked Questions (FAQs) categorised by topic, author, kudos and date. This is a searchable knowledge resource and enables users to self-help when they have problems or challenges that they need assistance with. Actively curated by giffgaff employees it is a valuable knowledge resource largely created by giffgaff's users.</p> <p>giffgaff labs provides a mechanism for users to contribute to service development and is a structured and systematic approach that opens up the new service development process. Users are able to propose new ideas, which are then voted on, with the number of votes acting as a signal to giffgaff's internal R&D team.</p> <p>giffgaff Unlockapedia is a directory of user-generated technical knowledge required to unlock contract mobile phones from their original service operator.</p> <p>Video Missions and giffgaff TV provides users with the opportunity to utilise their specialist knowledge to create guides (videos) that explain how to deal with specific challenges. Information is provided by the firm on the kind of equipment required to make video tutorials, together with advice on setting up shots and editing.</p> <p>P2P loans and lending. Since its launch in late 2009 as a SIM-only MVNO (Mobile Virtual Network Operator) giffgaff only began to sell mobile phones in late 2013. The company partnered with an online P2P (peer-to-peer) finance company to offer loans to users who wanted to borrow money to fund the purchase of a new phone. Subsequently giffgaff has developed its user community knowledge base to include tips and advice about managing money, loans and borrowing.</p>
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this case study was informed by the application of Netnography for management research (e.g. Kozinets, 2018) and draws on a range of secondary sources including specialist trade articles, giffgaff's own publications and blogs, plus other on-line media. Secondary data (company websites, personal accounts, discussion forums and media reports) was also used to identify issues concerning the development of giffgaff and the creation of a new organizational form that is built on the exploitation of user knowledge. The data for this case was collected between January 2013 and December 2017, with qualitative data analysis being undertaken using NVivo. The data analysis was explorative in nature although grounded in the literature (e.g. Bluhm, Harman, Lee, & Mitchell, 2011; Richards, 1999), with keywords (e.g. opportunity, knowledge, spillover) being drawn from the literature and used as a basis for developing the themes for enquiry. This provided a basis for the development of the coding approach, the identification of relevant quotes, and the development of the overall analysis and interpretation.

4.4. The case organization: Giffgaff

The firm giffgaff is a mobile telephone operator (Mobile Virtual Network Operator or MVNO – termed 'virtual' as it does not own its own mobile phone network infrastructure and rents bandwidth) based in the UK. It has been ranked as the top mobile phone network provider in the UK for 2019 (Reynolds, 2019) and was reportedly the third largest MVNO in the UK Iryna, (2018). The name 'giffgaff' derives from an old Scottish word meaning mutual giving and it was created as a 100% owned subsidiary of Telefonica UK Limited which, at the time of its creation, also owned O2. Launched in late 2009 giffgaff was a new entrant to a mobile phone market dominated by large operators like Vodafone, T-Mobile and O2. The creation of giffgaff was an act of corporate entrepreneurship inspired by Wikipedia and Facebook and grew from an idea by the then Head of Brand Strategy, Gav Thompson (FigaroDigital, 2016).

In simple terms, all we have done with giffgaff is spot a trend and

applied it to a mobile network... We have a live Twitter feed on our home page that shares all views of us, good and bad, and all of our members' views on us are available for all to see on our forum.

Thompson (Thereallymobileproject, 2010)

Giffgaff was built to be an online-only organisation in which the user community, composed of 'young, tech-savvy, digital native people' (FigaroDigital, 2016) played an essential role. This group, which continues to be its target market, now populate its user community and form an important element of its operational structure and provide many of the support and other services that more traditional firms would keep in-house.

Initially, the key initial differentiator in this marketplace was its much lower cost, something achieved by the adoption of a lean organisational structure – enabled by the use of user knowledge in its operations. The ambition behind this business structure was to build a commercial entity in which many of the firm's operational activities are undertaken by the users of the service (referred to as 'members' by giffgaff itself (Giffgaff, 2018)). Although there were many examples of complex services created and operated by users the time of giffgaff's creation there was no clear model for how this could be achieved in a traditionally commercial context. As result, giffgaff's operational model evolved quite rapidly as ideas have been trialled and either adopted or discarded and a viable model has emerged. Indeed, the Chief Executive stated that he was amazed that it had worked at all:

'When we started we were worried about the fact that we were a mobile phone operator that didn't have a call centre ...'

(Fairman, 2015).

However, it is important to see this trial-and-error approach as a strength rather than as a weakness as what was being attempted was the creation of a new type of organisation in which the business relied on the orchestration of the efforts of its users in order to operate. The core idea is that individual giffgaff users are rewarded for participating and sharing their knowledge with the community by helping others, posting videos, suggesting ideas and so on, and that this reward can be translated into things like call credit, cash or charitable donations. The opportunities for user involvement have evolved since giffgaff launched in 2009, and social media platforms are at the heart of how the community interacts. Despite a relatively 'open' impression, this remains an orchestrated user community and giffgaff employs a Community Team to oversee how users interact. An important part of the Community Team are the group of Educators whose main role is to influence user behaviour through 'positive reinforcement, to ensure engagement is in the right tone when contributing' (Giffgaff, 2013). This group are also a major conduit to the user community for company news and decisions and are actively involved in the day-to-day operation of the community. Giffgaff has a number of ways of drawing on the knowledge resources of its users in its operational structure, as shown Table 1.

Giffgaff is an interesting example of an organisation that has successfully based a commercial digital service on a phenomenon previously only observed in contexts like Wikipedia and Facebook. Giffgaff's marketing strapline is 'the mobile service run by you' and one of the items of received wisdom concerning the Internet is that only 1 per cent will be very active in any community, with 9 per cent active only sporadically, and 90 per cent being content to simply make use of the community without contributing (e.g. Lithium, 2017). This profile of use, sometimes termed the 90-9-1 model appears to be quite different in the context of giffgaff, with their community reportedly operating on a 74-25-1 basis (Buchanan, 2010). The implication is that whilst giffgaff have only 1 per cent of highly active users within their community, at 25 per cent they have a much higher volume of occasional contributors. From a customer service perspective the results of this can be impressive and by 2010, a year after it had launched, the average response time for most of the 100,000 questions posed on its help forum was three minutes, with 95 per cent of the questions being answered within

Table 2
The Architecture, Actors, Actions and Aftershocks of giffgaff's Innovation Opportunity Space.

Innovation Opportunity Space category	Context: the UK mobile telephony market
Architecture	High level of mobile phone use Fast internet, 4G Market dominated by a small number of large firms with traditional structures Emergence of group of digital natives that make extensive use of smartphones Presence of powerful sharing norms around on-line behaviour (e.g. social media) Few regulations concerning commercial harnessing of user or customer activity
Actors	Giffgaff Giffgaff users Competitor firms Regulator – OFCOM
Actions	Giffgaff - development and refinement of novel business model - development of novel capabilities around the orchestration of user knowledge - development of new areas for the application of user knowledge giffgaff customers - provision of knowledge-related services - activity orchestrated by giffgaff competitor firms - price and service competition Regulator - continued focus on market issues
Aftershocks	Traditional price competition amongst competitors Limited adoption of giffgaff business model by incumbents in the mobile phone sector Creation of a novel organisational structure by giffgaff Development by giffgaff of new capabilities for day-to-day service operation Users engage in knowledge 'work' outside regulatory framework Influence of 'giffgaff model' on other sectors

one hour (Kite, 2011). However, in order to achieve this form of response it is important to have built and to continually renew an online community so that it retains the critical mass required. What this might mean in the context of mobile telephony remains unclear and although precise figures are hard to obtain and subject to continual fluctuation, giffgaff has well over 1 million users which (if the 74-25-1 community figures continue to apply) means, at a bare minimum, there will be 10,000 highly active, and 250,000 occasional, contributors within their user community.

4.5. Applying the innovation opportunity space

The application of the Innovation Opportunity Space framework outlined in Section 3 above enables the exploration of the way in which giffgaff employed user knowledge within their entrepreneurial approach to be explored. The Innovation Opportunity Space framework also throws new light on the nature and impact of the novel service model that giffgaff introduced to the UK mobile telephone market. At the time of the corporate entrepreneurship that led to the creation of giffgaff in 2009, mobile telephony was dominated by a small number of incumbent firms with traditional structures that relied on in-house knowledge and other structures (e.g. call centres). The four major aspects of the Innovation Opportunity Space approach outlined in Fig. 1 (Architecture, Actors, Actions and Aftershocks) will now be examined for the UK mobile telephony. At the time of giffgaff's creation the Innovation Opportunity Space for UK mobile market was stable and was dominated by a small number of large firms with high existing levels of mobile phone use. However, this market also contained a large number of digital natives (who possessed extensive knowledge relevant to mobile phone use) and powerful new norms had emerged around on-line behavior and the sharing of knowledge with others (as typified by the widespread adoption of social media). The emergence and widespread adoption of the internet resulted in a shift in knowledge sharing behaviours and the Innovation Opportunity Space became unstable, creating the context for previously dominant suppliers to be challenged by a new entrant (giffgaff) that sought to exploit this change in knowledge sharing behavior. These factors meant that Telefonica

identified a mismatch between the Architecture of the current Innovation Space (the norms, practices, rules, standards and regulations governing what takes place) and what had become possible. The small number of large firms that dominated the market were also providing the service using traditional structures (e.g. high-street retail outlets, in-house call centres, mobile phones locked to the supplier). Arguably, Telefonica were entrepreneurially exploring the potential for utilizing user knowledge in order to change the status of the current Innovation Space from stable to unstable.

The Actions of the four main Actors (giffgaff itself, giffgaff users, competitor firms and the UK's communications regulator, Ofcom) will be considered. Giffgaff has continued to develop and refine its novel business model based on the orchestration of user knowledge, created a series of novel organizational capabilities that focus on managing this knowledge, and continued to develop new areas for its application. Giffgaff's users have continued to engage with its novel business model and share their knowledge freely, with sharing being orchestrated by the firm – this can be seen by the range of digital services offered that relied on user knowledge (e.g. customer service, giffgaff labs, unlock-apedia, giffgaff TV). In contrast, competitor firms have responded by engaging in price competition with giffgaff but have not changed their traditional approach, continuing to rely on high-street outlets and in-house call centres and other capabilities. The Aftershocks of this entrepreneurial action have been limited within the UK mobile phone market, resulting in traditional price competition but giffgaff has developed a novel organizational structure, business model, and suite of organizational capabilities concerned with enabling a commercial organization to benefit from user knowledge in the provision of a digital service that has influenced other sectors. It is notable that one of the main Actors, the Regulator (Ofcom) continues to focus solely on communications issues and does not regulate the way in which users may be drawn into firm operations, thereby leaving a key aspect of the Innovation Opportunity Space unaffected. This is summarized in Table 2.

5. Discussion

5.1. Benefitting from user knowledge

This paper has been an exploration of the research question: ‘How can entrepreneurs benefit from user knowledge in digital services?’ and the case study highlights the need for a refocusing of our understanding in order to allow a broader range of stakeholders, particularly users, to become visible as the applications of digital services become more widespread. The creation of commercial entities, like giffgaff, whose organizational structure is specifically designed to benefit from user knowledge is itself novel and poses clear challenges to the theory and practice of entrepreneurship.

The case reinforces the corporate nature of entrepreneurialism (Drucker, 1985), but in terms of the way in which entrepreneurs are able to benefit from user knowledge in digital services, it is clear that there is a mismatch between current conceptions of the role of knowledge in entrepreneurial activity and its practice. For example, the models that tend to conceptualise knowledge spillovers in non-digital contexts (e.g. Acs et al., 2013) need to be extended to reflect new digital contexts. In addition, the notion of knowledge itself needs to be re-examined since the case demonstrates that the knowledge spillover was not a discrete body of knowledge that had not been commercialised, but was knowledge that was encapsulated within a practice observed in an on-line context. This clearly illustrates that conceptions of knowledge, may include, but should no longer be confined to being in written or spoken form (Howells, 2002) and that the users of a digital service should be added to the list of actors that may be a valuable source of spillover knowledge. This also raises issues around the conceptualisation of both knowledge and spillovers as they relate to traditional, geographically-bounded, contexts that appear to apply less well in on-line environments (e.g. Audretsch et al., 2005; Zucker et al., 2007). In the context of digital services this may include knowledge relating to use and, as a result, spillovers may be different since they may appear in on-line contexts in which geographical proximity has little relevance.

Arguably, the nature and range of business models that have been documented to date (e.g. Saebi & Foss, 2015) are likely to be greatly expanded as the inherent uncertainty of linking to external actors, like users, within a business is explored further (e.g. Bughin et al., 2008). Further, some of the activities outlined in the case go beyond traditional conceptions of both knowledge resources and innovation. For example, conceptions of knowledge resources as being producer-focused, firm-based and internally-held (e.g. Leonard-Barton, 1995) need to be extended to include knowledge that is user-focused, user-based and externally-shared in non geographically-bounded contexts. Similarly, conceptions of innovation (e.g. Utterback & Abernathy, 1975; Magnusson et al., 2003) need to be revised in order to recognize that product and service innovation may be very different in nature. In addition, although it is clear that users can play important roles in various stages of the innovation process (von Hippel, 2016) their roles in the processes of ongoing service provision are far less well understood.

The case also illustrates that the entrepreneur faces a new range of choices concerning the nature of the knowledge required to innovate and how it may be obtained - from fully closed to fully open - with each approach being associated with different organizational structures, operational and innovation processes, and managerial approaches (Chesbrough, 2006). Fully closed approaches are likely to be associated with patenting and operational secrecy, with fully open approaches being typified by Open Source developments in which all aspects of the innovation and production process are accessible. Arguably, commercial entrepreneurial approaches that have adopted more open, crowd-based processes (as in the giffgaff case study) will be likely to develop a hybrid approach in which different aspects of the business are open or closed to varying degrees. This is similar to the selective revealing of program code noted in another context, (Henkel, 2006) with the

particular approach adopted by entrepreneurs being likely to vary according to the characteristics of the product or service being offered, the nature of the firm and industry, sectoral norms and expectations, and the willingness of the intended user base to share its knowledge. However, given the novelty of this phenomenon there is relatively little empirical or theoretical guidance on these issues.

From a broader perspective, the case also illustrates how a commercial organization developed a novel digital service that was based on a detailed understanding of the Architecture of the Innovation Opportunity Space – i.e. that users of a digital service would provide a significant input to its ongoing operation. This goes beyond current understanding of users and their role in innovation (e.g. von Hippel, 2016) and raises questions concerning the boundary of the precise nature of ‘Open’ activities that have been explored in the literature (Chesbrough, 2006). An exploration of the Actors and their Activities within an Innovation Opportunity Space fit more neatly into strategic analysis found within the Knowledge Spillover Theory of Entrepreneurship (e.g. Acs et al., 2012). However, the Aftershock element of the Innovation Opportunity Space is more forward looking and provides for the exploration (at a macro level) of the implications of the application of a novel techno-economic paradigm (Perez, 2009) or, at the micro level, the exploration of new market opportunities (Meyer et al., 2010).

6. Conclusions

The theoretical implications of this work are likely to open up a series of new avenues for further research including the extension of concepts like the Knowledge Spillover Theory of Entrepreneurship (KSTE) (e.g. Acs et al., 2012) to extend the notion of a spillover and include the deployment of user knowledge resources within firm innovation processes. Similarly, the notion of the user as an important stakeholder in an entrepreneur’s network (e.g. Smith & Lohrke, 2008) will need to be revised to include the important role that user knowledge is able to play in certain contexts. The relevance of geography and proximity in spillovers (e.g. Zucker et al., 2007) will also need to be further explored to enable a more nuanced understanding of this phenomenon and the emergence of commercial on-line digital services that draw on user knowledge. The role of users in innovation is better understood (e.g. von Hippel, 2016) but theoretically their role as participants in the ongoing operation of a knowledge-based digital service is poorly understood and will need to be further explored in other contexts, with other samples. A range of different methods, including case study and quantitative approaches, could be deployed in this exploration as this would enable the development of a theoretically rigorous and informed understanding of this new phenomenon to be developed.

Further, many of the dominant ideas within management are implicitly based on knowledge being owned and/or controlled by the producer firm and the concept of firm boundaries provide a clear demarcation and overarching framework for these ideas. However, this paper demonstrates that there is a class of firm that operates through the orchestration of user knowledge without owning or controlling it. As a result, the ‘core’ of such firms is likely to look very different to more traditional organisations, as will their innovation and other processes. Similarly, dominant ideas relating to motivation, coordination and resource allocation, developed to reflect internal organisational activities and priorities, will need to be reviewed to reflect new firm structures and processes. An agenda for future work in this area will not be a trivial undertaking but is vitally important as it will enable the development of a more detailed understanding of innovation processes and outcomes in the context of user knowledge.

In this paper we applied the IOS approach at the micro-level. Applying the Innovation Opportunity Space framework allows entrepreneurs and managers to appreciate innovation opportunities in an ecosystem context. As a heuristic or tool, the Innovation Opportunity Space can help practitioners explore, identify and/or potentially

develop opportunities into ‘platforms’. This is particularly relevant in sectors in the economy, such as digital services, where a small number of hub firms provide for a majority complementors (Autio & Thomas, 2014; Weiss & Gangadharan, 2010).

This research suffers from a series of conceptual, theoretical and methodological limitations and its observations and conclusions can only be considered as limited and provisional. Conceptually, the paper makes use of a novel (and largely untested) framework to analyse the emergence of a new mobile telephony supplier in the UK. Theoretically, the paper focuses on the application of user knowledge in the context of entrepreneurship and innovation and seeks to throw new light on its role in the provision of digital services. The theoretical notions and positioning of knowledge and the user are quite distinct in these two bodies of literature and the paper runs the risk of blurring the theoretical distinction that exists. Methodologically, the case study is a digital organization and is based on published secondary sources with limited opportunities for triangulation.

Research questions for further study in this area include the factors that determine the degree of openness that an entrepreneur may adopt including (but not limited to), product or service characteristics, the history, size and pre-existing business model of the firm, sectoral specificities, the ease with which users can share knowledge, and the value of that knowledge to entrepreneurs. It is likely that hybrid approaches (in which the firm boundary is selectively opened to external actors) will prove to be the most valuable area of further enquiry.

This paper also introduced the Innovation Opportunity Space, a framework for analysing the changes that are taking place in many economies. However, although this paper has laid out this novel approach further work will be required to develop the empirical base surrounding this contribution. Such work should include the development of further detailed case studies, but also qualitative and quantitative work concerning the precise composition of innovation spaces, their internal dynamics, and how they develop over time.

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