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SHORT COMMUNICATION

Development of a Digital Tool to Overcome the Challenges of Rural Food SMEs

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ABSTRACT *It has been recognised that throughout the UK, rural economies have a significant potential for growth but despite the potential for growth, many rural businesses face barriers that prohibit their expansion. In this study, we focus on one particular group of rural small- to medium-sized enterprises (SMEs): food and drink producers. Through user engagement activities, we identify the issues and needs associated with distributing products to the market, in order to understand the main issues which prevent rural food and drink SMEs from expansion, and to establish the requirements for a digital solution to this challenge.*

KEY WORDS: rural geography, transport geography

Introduction

It has been recognised that throughout the UK, rural economies have a significant potential for growth. The majority of rural businesses are small- to medium-sized enterprises (SMEs) with many of them employing fewer than 10 people.[1] In the UK as a whole, SMEs represent 99.3% of the total number of businesses, provide 58% of all private-sector jobs and generate 51% of the Gross domestic Product (Federation of small businesses 2012). At a larger scale, SMEs are also seen as fundamental pillars of the European economy (Holter *et al*. 2008). Despite the potential for growth, many rural businesses face barriers that prohibit their expansion. One of the distinctive features of SMEs situated in rural environments is the distance to their markets. Although online shopping has decreased the distance between customers and businesses, it raises new challenges in terms of how to deliver their goods to customers and to recover returned products. These challenges are even more pertinent when dealing with perishable goods such as food. For these reasons, this paper focuses on rural food and drink SMEs. As Scotland has the highest per citizen turnover generated

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from the food and drink business in the UK (Karamperidis *et al*. 2014), and has a large number of remote rural areas, it makes it a suitable study area to identify the challenges faced by rural food and drink SMEs. In this study, we identify, through user engagement activities, the issues and needs associated with distributing products to the market, in order to understand the main issues which prevent rural food and drink SMEs from expansion, and to establish the requirements for a digital solution to this challenge.

Previous studies have identified transport cost and accessibility as main barriers to rural business formation in Scotland (Wilson & Edwards 2008). Similarly, food producers from Cornwall highlighted that distribution cost is a key issue for them (Commission for Rural Communities 2013). In a study on Swedish food farm producers, Ljungberg *et al*. (2013) identified several characteristics of local food producers which pose challenges to the development of an efficient logistic system. The food farm producers in this study typically sell premium products with uniqueness rather than cost-cutting standardised products and have small production points located in remote rural areas away from the consumers in urban areas. The small scale of most of the producers also mean that these businesses lack power when purchasing transport services and are not in a position to negotiate competitive services in terms of cost, reliability and service quality (Holter *et al*. 2008).

In addition to transport issues, Gebresenbet and Bosona (2012) identify an increasing demand from consumers to have good information of the origin of food, how it is handled and transported. The recent cultural shift towards local sourcing and short food supply chains has been suggested as a positive economic factor for rural regions (Ilbery *et al*. 2004). Ilbery *et al*. (2004) identifies the importance for food SMEs to produce high quality, locally distinctive and traceable products but recognises the dilemma faced by microbusinesses whether to invest resources on marketing or to concentrate on production. In a recent literature review about food traceability by Bosona and Gebresenbet (2013), it is argued that a better transparency of the food supply chain increases customers confidence and can lead to better market access and product prices, benefitting profitability. However, there are barriers to implementing a food traceability system, which are particularly applicable to SMEs: these include limited resources, lack of required skilled staff and awareness of possibilities.

A preliminary study to the findings reported in this paper (Marqui *et al*. 2013) explores the logistic issues faced by rural food SMEs. For this purpose, four face-to-face interviews were carried out with Scottish food SMEs. The authors found that the logistic requirements highly depend on the nature of the businesses and products produced. For businesses dealing with high-value, perishable goods, on-time delivery and the reliability of the courier are crucial. As a result, for this type of business, it is important to establish long-term relationships with a select group of couriers. The main weakness for these kinds of businesses is the dependency on a single logistic partner which makes it very vulnerable. For businesses dealing with low-value, non-perishable products, cost is a major issue and low volumes leads to inefficient use of transport space. The relative high weight of the products prohibits delivery by the postal service but the low sales volume makes it difficult to fill up a vehicle for each delivery. A strategy adopted by these companies is to operate with a select group of partners and co-ordinate their own deliveries with their partners' deliveries, so they can share transport. The study concludes that in general the distribution of goods for rural businesses suffers from a lack of communication and information sharing that inhibits more efficient collaboration. In the first case, the lack of choice and principal dependency on a single logistic partner can be attributed to the lack of information

about other options available to the business. In the second case, a more elaborate digital platform would allow for more efficient forms of collaborations and expand the number of businesses forming partnerships, both in numbers and geographically.

In the following section, we present the findings of three additional face-to-face interviews and two participatory group discussions that were carried out to further investigate the main logistic issues faced by rural food and drink SMEs in Scotland, to identify the main factors affecting their growth and investigate the possibility of using digital technologies to overcome some of the problems identified.

Research Methods

A qualitative approach of information gathering very similar to the one used in Marqui *et al.* (2013) was used to generate the empirical findings reported in this paper. A further three face-to-face interviews were carried out, and in addition two participatory discussion groups were organised. Digital economy research requires non-academic stakeholders' involvement in research activities to identify and analyse issues with a view to co-creating solutions. Participatory research, as used in this study, involves the participants themselves determining the direction of group discussions, through their answers to some initial questions and the use of a group facilitator. Data was generated in the participatory groups and captured, where possible, immediately and *in situ*. Information points and other thoughts were captured on post-its notes by participants themselves and by the facilitator.

During the interviews and the discussion groups, questions were asked related to the logistic organisation of the business. The following questions were asked:

- If money were no object, what are the top three barriers for your business growth?
- What are the three biggest issues related to transport and logistics for your business?
- I need to move boxes tomorrow, how do I do it?
- What if I could work with other local businesses?

Participants

The database used to contact potential participants was collated using websites of rural SMEs and through attendance at farmers' markets. All the interviews and the two participatory design exercises were carried out in October 2013. For the interviews, a maximum of two researchers travelled to the businesses itself. The group discussions were held in Aberdeen and Edinburgh in locations that were chosen on ease of access. No payment was made to participants for taking part in the participatory discussion groups, but expenses to attend the discussions were paid and refreshments were provided. The first participatory discussion that took place in Aberdeen was attended by three participants, representing two businesses. The second event in Edinburgh was attended by four participants, representing four businesses. The majority (6 out of 9) of the businesses were microbusinesses employing less than 10 peoples[2], while the remaining three were small to medium sized (two small businesses employing less than 50 persons and two medium sized, employing around 100 persons). The majority of the businesses have at least moderate knowledge of digital technology for personal and business use. Similar to the study conducted by Marqui *et al.* (2013), we could distinguish two groups of businesses with distinctive profiles. The first

group consists of microbusinesses (less than three employees), which are relatively recently established and deal with standardised non-perishable goods. The products of these businesses include home bakes, jams and preserves, teas, etc. These are mainly sold via two channels: various farmers' markets and online sales directly to customers across the UK. The second group consists of more established businesses and are dealing in high-quality perishable goods such as organic meat, luxury smoked fish and venison or high-quality home-baking. In addition to farmers' markets and online sales, these producers often supply their products to other businesses through the wholesale market. Each of these two types of businesses has specific issues and needs and will be discussed separately.

Empirical Findings

Findings indicate that the main obstacles faced by the businesses of the first group (micro, not well established and non-perishable goods) are bolstering their on-line presence, access to external information and time issues. The most important issue, however, is to get their products to their customers and the cost of doing this. As local markets are easily saturated, they need to enlarge their geographical area in order to expand their business. To reach new customers, they attend farmers' markets and food festivals, but this is very time consuming and detracts from time needed to produce their goods; this also prevents them from having a healthy work–family balance as one of the producers testifies:

> I direct sell at farmer markets and events or festivals but want to get my wholesale business and direct sales on-line on a larger footing to have a life on week-ends.

For this reason, the preferred way to expand their business is by increasing their on-line presence. On-line sales, while boosting their business without having to attend markets and festivals, require them to deliver their products to their customers. An obvious solution to do this is through the use of couriers. But because of the small volumes, the businesses lack bargaining power to get competitive rates and the cost of the couriers is an important barrier for growth. A producer explains:

> The conundrum with couriers' services is, to get a good rate you have to have volume, but to have a big business you need good rates. For the moment I don't get the good rates.

Moreover, the producers belonging to the first group find it very difficult to find a suitable courier and the search for a courier is very time consuming as information about their services and costs are not transparent. For example, one participant commented that trade couriers are very secretive about their prices and that it takes time to get a quote. Local couriers are hard to find and it would be useful to have a website listing all local couriers that deal with businesses.

The difficulty in finding information about other logistic options was also noted in Marqui *et al.* (2013), where it was seen as one of the reasons why rural SMEs often rely on only one courier. The lack of flat rates and the searching costs mean that small businesses are often confined to using the big logistic services (e.g. Royal Mail) although small couriers are preferred as they are more flexible (they can pick up their parcels from any place) and more personal relationships can be established over time. One business puts it like this:

> The public courier do not care about your products and they make it hard to reclaim when something went wrong. … . is a small courier and works locally. You have a more personal **relationship** with the courier. You can leave parcels unattended when you are not there and leave a note and they will pick it up.

To overcome the problems related to couriers, businesses sometimes choose to deliver their products themselves. This strategy is only applicable at a local scale however and as human resources are scarce in small businesses the time spent making the deliveries would be better spent on core activities. As was the case for the businesses interviewed in Marqui *et al.* (2013), some businesses have established some collaboration with other small businesses when they meet at the farmers market to share deliveries. These networks are, however, very limited, both in numbers and geographically. There is a clear need and interest in increasing these kinds of collaborations but competitiveness between businesses prevents this. More established businesses are worried about losing some of their market share, even if products are not similar.

Some of the above issues, such as costs and reliability of couriers and bolstering on-line sales were also mentioned by the more established businesses of the second group. As these businesses often have been able to negotiate better terms with their couriers, more importance is given to the reliability of the couriers. Something similar was noted in Marqui *et al.* (2013) where the business dealing in high-quality perishable products had selected one specific courier which offers next day delivery and was satisfied with its services. The business mentioned that the cost of this courier did not affect their competitiveness.

The businesses belonging to the second group are much more reluctant to increase collaborations with other businesses in terms of deliveries. Although they sometimes collaborate by delivering each other's goods, these collaborations are very informal and there is a strong wish to keep it that way. One producer explains:

> sometimes we help each other, sometimes someone will need to deliver something along the road I will take it … .but not very often, we don't want to abuse … . There is a lot of informal helping out and we want to keep it like this because as soon as it is formalized you'll need to ask money for it.

They do not want to jeopardise the trust relationship they established with their current courier and are afraid to lose customers to other businesses. In addition, dealing with perishable goods means that they have very particular needs that make collaboration difficult. All in all, the businesses of the second group do not show much interest in new forms of collaboration for deliveries. The strategy used by these businesses to increase their profitability is to specialise in high-quality products with an emphasis on their local character and short supply chain. This strategy is in line with the findings of Ilbery *et al*. (2004). In recent years, there has also been a shift from bringing their products to customers via farmers' markets to working through retailers (mainly deli-shops and farmer shops) and on-line sales. Deli- and farmer- shops, and also on-line customers, require more and more detailed information about provenance as is also noted in Gebresenbet and Bosona (2012). Low-cost technologies that could provide traceability of their products and give information of how and where their products have been produced could and as such improve customer satisfaction are, however, not readily available to small businesses.

A Software Platform for Enhancing Visibility of the Food Supply Chain

In order to address some of the issues identified from our engagement with users and the analysis presented above, we have developed a software platform that aims at improving the visibility of the food supply chain. The software allows producers to generate QR codes that can be used to tag products. These tags can be scanned by consumers using a smartphone and can provide them with a tailored view of the information associated with the supply chain of the product, allow them to share information via social media and engage directly with the producer. These features will potentially increase the customer base of the producer through positive feedback of existing customers on social media and will increase the trust between the customer and the product as a direct link is being created between them and the producer. This in some way mimics the interaction found at a farmer market. It will also allow small food producers to differentiate their products from the products from larger producers when selling via the wholesale market.

A number of additional applications can be defined in our system. To date, we have developed a Web dashboard application for businesses to create and manage information about their products. We have also developed an iPhone mobile app for consumers that can be used to visualise traceability information about food products registered in the system. Our research has shown that the trust relation between the logistic provider and the producers is also crucial, where smaller logistic providers are often preferred. These companies, however, sometimes cannot provide the same level of service as the larger ones, especially at the level of the tracking of individual parcels. For this reason, we are developing a low-cost smartphone tracking application to allow businesses to generate labels for collection of items (i.e. a delivery box) which can be scanned by couriers and provide detailed updates related to the delivery of the products, such as current location, delivery time or pick-up time and location. This will increase the attractiveness of small logistic providers and increase further the trust relationship between them and the businesses.

The platform is built upon the vision of the Internet of Things (IoT) which is a dynamic global network based on standard and interoperable communication protocols where physical and virtual 'things' have identities, physical attributes and capabilities and are seamlessly integrated into the existing Internet infrastructure (Giusto *et al.* 2010). IoT technologies have been used to facilitate real-time monitoring of objects and processes within the supply chain but are almost exclusively used by large organisations due to the costs and effort involved in deployment and are not feasible for SMEs with limited capital and human resources. We, therefore, developed a low-cost and easy-to-use software platform that we believe can be used even by small businesses.

Discussion

In this study, we identified the issues faced by rural food SMEs situated in Scotland to expand their businesses and propose a software platform that could solve some of the issues. A first observation is that the needs depend on the kind of products, the size of the business and how well established they are. The relatively new and micro businesses selling non-perishable goods face barriers similar to those identified in Wilson and Edwards (2008), Ljungberg *et al*. (2013) and Holster *et al.* (2008): their shipping volumes are too low in order to get competitive prices for the services. These companies

would benefit from a software platform that would allow them to track the delivery status and, also, facilitate the collaboration between businesses for the purpose of combining transport activities. Businesses that are more established and deal in perishable goods often have long-standing relationships with logistics service providers at a competitive cost and tailored to their needs. As these businesses often supply their products to other businesses through the wholesale market they would benefit more from a software platform that helps to differentiate their products from other larger, non-local producers, confirming the importance of short supply chains and good traceability of their products as suggested in Ilbery *et al.* (2004) and Gebresenbet and Bosona (2012). To tackle this problem, we propose a user-friendly software system that will increase the visibility of the entire food supply chain. As we deal with businesses with limited resources, special attention is given to the ease of use and facility of maintaining the system. The system will allow producers to provide detailed information about their products to their customers and act as a low-cost tracking device for logistics service providers. The information stored in the system can also potentially be used to facilitate the creation of collaboration amongst businesses and help to inform and guide businesses about compliance with regulation and policies, e.g. compliance with low carbon footprint policies.

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Notes

[1] The European definition of SMEs is as follows: The category of micro-, small- and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro (Enterprise and Industry Publications, Extract of Article 2 of the Annex of Recommendation 2003/361/EC).

[2] As information about the annual turnover of the businesses proved difficult to obtain, we categorise the businesses only according to the number of employees.

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