Spring 3-20-2018

Exploring The Collaborative Activities Of Home-Based Businesses In OECD Countries

David Hastings
d.p.hastings@northumbria.ac.uk

Muhammad Naveed Anwar
naveed.anwar@northumbria.ac.uk

Gobinda Chowdhury
gobinda.chowdhury@northumbria.ac.uk

EXPLORING THE COLLABORATIVE ACTIVITIES OF HOME-BASED BUSINESSES IN OECD COUNTRIES

David P. Hastings, Muhammad Naveed Anwar & Gobinda Chowdhury

Northumbria University, 2 Ellison Place, Newcastle upon Tyne, United Kingdom, NE1 8ST

EXPLORING THE COLLABORATIVE ACTIVITIES OF HOME-BASED BUSINESSES IN OECD COUNTRIES

David P. Hastings
Northumbria University, 2 Ellison Place, Newcastle upon Tyne, United Kingdom, NE1 8ST
Email: d.p.hastings@northumbria.ac.uk

Muhammad Naveed Anwar
Northumbria University, 2 Ellison Place, Newcastle upon Tyne, United Kingdom, NE1 8ST
Email: naveed.anwar@northumbria.ac.uk

Gobinda Chowdhury
Northumbria University, 2 Ellison Place, Newcastle upon Tyne, United Kingdom, NE1 8ST
Email: gobinda.chowdhury@northumbria.ac.uk

Abstract

Collaboration is frequently cited as a driver for sustainable success, and yet despite over half of all small businesses in OECD countries being run from the home, within the existing literature little attention is paid to how these businesses work with others. This article therefore presents a quantitative study into the collaborative behaviours exhibited by home-based businesses located within OECD countries. Based on a large, cross sectional data set collected by the Global Entrepreneurship Monitor, this exploratory study outlines the extent of collaboration among home-based businesses, the nature of their collaborative activities and the relationships which exist between the different behaviours that are exhibited.

The study finds that collaboration is a widespread occurrence among home-based businesses, with over 75% of home-based businesses collaborating in some way. Furthermore, home-based business collaboration is diverse in its nature and is present across all industries. Moreover, it is found that collaboration among home-based businesses is distinct enough from the current findings of collaboration among SMEs that it warrants further investigation.

Keywords: Home-based business, business collaboration, Global Entrepreneurship Monitor, OECD countries

1.0 Introduction

1.1 Background to the Research

In order to facilitate expansion and to attain competitiveness in a market, small businesses frequently develop cooperative and collaborative relationships with other organizations (Casals, 2011). The benefits offered by such relationships are numerous,

extending from a reduction in transaction costs through to the acquisition of hitherto unavailable resources and the sharing of knowledge between businesses (Camarinha-Matos & Abreu, 2007). One particular sector - home-based businesses - is able to gain considerable benefits from these forms of collaborative relationships owing to the scarcity of available financial, physical and knowledge based resources. By utilizing data analytics techniques this study will offer insight into the extent of these collaborations, the form which the take and the patterns in which they occur.

A home-based business (HBB), while often included as a form of small to medium enterprise (SME) can be more specifically defined as "any business entity engaged in selling products or services…operated by a self-employed person…that uses residential property as a base from which the operation is run" (Mason, Carter & Tagg, 2011, p.12). In this study, the term HBB is inclusive of mobile businesses and businesses based from but not operated at the home, in line with the definition used in contemporaneous research (Clark & Douglas, 2014). Further to this, collaboration in the domain of SMEs and HBBs does not always rely upon formalized agreements and may instead involve word of mouth agreements and tacit commitments (Johannisson, 1987). Thus the term "collaboration", when used in this study, is inclusive of all working relationships between organizations as indicated within the data.

In the UK, over 50% of SMEs are also HBBs, a sector with an annual turnover of over £300bn, and which contributes around £40bn per year to local economies (Enterprise Nation, 2014). Moreover, this trend is not exclusive to the UK, with studies indicating that over 50% of small businesses are based from the home across most OECD countries (Mason, 2010). Despite this, in many countries there is a lack of policy level support for HBBs, with some in the literature arguing that research into the "real world" of HBBs – including the extent of their collaborative activities – is required for them to be perceived as important economic actors engaged in joint enterprise, and to engender positive action among policy makers (Mason, Carter & Tagg, 2011; Mason, 2010). Moreover, existing findings within the literature suggest that most small businesses are reluctant to engage in collaborative activities (Casals, 2011). This study is concerned with collaborative propensity among home-based businesses, and will adopt a quantitative, data driven approach to providing evidence which is able to

support or deny this claim, providing evidence showing the extent of collaboration among HBBs.

1.2 Aims of the Research

The aims of this study are as follows:

- A1: To determine the extent of collaboration among HBBs.
- A2: To determine the differences in collaborative behaviours across industry sectors.
- A3: To explore patterns of common associations between collaborative behaviours exhibited by HBBs.

Collectively the insight provided via the above aims will provide an overview of the current collaborative environment in which HBBs inhabit, in addition to illustrating the areas in which collaboration is most required, thus providing direction for future work.

2.0 Methodology

2.1 Research Structure

The study utilized a number of methods to assess the collaborative behaviours of HBBs, presented as follows in the sequence which they were performed. Firstly, summary statistics by frequency were used to develop an understanding of the degree of collaboration exhibited by HBBs. Next, individual analysis was performed by industry sector, using descriptive statistics to outline collaborative trends across a range of industries. Lastly, association analysis was performed to detect trends and frequent associations between the collaborative behaviours.

2.2 Data Overview

The data used for this research was provided by the Global Entrepreneurship Monitor (Global Entrepreneurship Monitor, 2016), henceforth referred to as GEM. The 2012 release of the data was used due to the presence of year-specific questions concerning the collaborative activities of the surveyed businesses, not found in prior or subsequent releases of the dataset. The rationale behind the choice of using the GEM dataset was twofold: firstly, the unique composition (among publically available

repositories) of the dataset which allows for the concurrent study of individual, organizational and environmental variables, and secondly, as it provides access to standard, consistent data relating to businesses from almost all OECD countries, thus increasing the applicability of the findings produced.

2.3 Data Preparation

To identify usable cases for the study the original dataset was condensed on the basis of three main conditions: firstly, the presence of values indicating that the business was home-based. Secondly, the presence of data indicating the collaborative activities of the business, and thirdly, the location of the business indicated as being within OECD country, so that relative parity in terms of national economic conditions could be assured. The total number of cases post data reduction was 3891, from a total of 20 countries (further detail can be found in Appendix A).

Variable Name	Represented behaviour(s)	Possible value
CollabProduce	Production of goods or services with other businesses or organizations	1 = Yes, 0 = No
CollabProcure	Procurement of goods or materials with other businesses or organizations	1 = Yes, 0 = No
CollabSellMarket	Selling and/or marketing of goods or services with other businesses or organizations	1 = Yes, 0 = No
CollabCreate	Creating new goods or services with other businesses or organizations	1 = Yes, 0 = No
CollabEffective	Working with other businesses or organizations to make the business more effective	1 = Yes, 0 = No

Table 1. Variables present in the GEM 2012 dataset representing collaborative behaviour.

The dataset includes data on five different forms of collaborative activity, indicated through the values contained in five variables, as shown in Table 1. The data in each is represented by a Boolean value denoting a business's participation in an activity. While the behaviours identified within the data are not exhaustive, the scope of this study is defined by the boundaries of the dataset, and is deemed satisfactory for the

purpose of identifying the general disposition towards collaboration demonstrated by HBBs.

In the original dataset collaborative activities were split over ten variables, with each behaviour represented by two variables – one for start-up businesses and another for established businesses. As each pair of variables includes only one value, each pair were consolidated into a single variable for analysis. An example of the data structure and the associated interpretation of the variables can be seen in Table 2.

CollabProduce	CollabProcure	CollabSellMarket	CollabCreate	CollabEffective	Interpretation
0	0	0	0	0	No collaborative activity indicated
1	0	0	1	0	Some collaborative activity indicated
1	1	1	1	1	All collaborative activities indicated

Table 2. Example of variables within the GEM 2012 dataset.

Post data reduction there still remained a small quantity of missing values in the collaboration variables (<5% for each). Imputation was therefore required to best preserve the size of the dataset, with the use of the expectation-maximization (EM) algorithm being chosen as the method best suited to the task, due to the ability of algorithm to preserve the relationships between variables (Schaffer, 1997).

3.0 Findings and Discussion

3.1 Extent of Collaboration Among HBBs

To assess the extent of collaborative behaviours among HBBs, basic summary statistics were produced, as seen in Table 3. The most prominent finding from the summary statistics is the overall engagement in any collaborative behaviour by HBBs, with over 75% of businesses (75.6%, shown in Table 3) collaborating in some way. This is in contrast to the previous studies which indicated that the majority of HBBs

are indisposed to collaboration, due to the barriers impeding successful inter-firm cooperation such as a lack of suitable partners, a lack of the required investment or the fear of knowledge over-sharing (Casals, 2011),

Collaborative activity	Percentage of HBBs engaged in activity (%)
Any collaborative activity	75.6
Production	49.8
Procurement	42.1
Selling/Marketing	43.6
Creation	26.7
Making business more effective	38.0

Table 3. Summary statistics of collaborative behaviours among HBBs.

Regarding the forms of collaboration engaged in, it can be seen that the most common is working with others to produce goods or services, and the least common is working with others to create new goods or services (as given in Table 3). This indicates that collaboration among HBBs is primarily of a practical nature – utilizing it as a tool to access resources not held internally or to derive transaction cost benefits via resource pooling – as opposed to joint initiatives and ground-up collaborative product development.

3.2 Analysis of Collaborative Propensity by Industry

An industry based analysis was performed in order to explore the nature of collaborative activities among HBBs operating within various sectors. A double digit International Standard Industrial Classification (ISIC) code (United Nations, 2014) recorded within the GEM data was used as the industry identifier, with a range of twelve industries being identified within the data, as seen in Table 4. Across each industry two tests were performed: a breakdown of collaborative propensity by percentage of industry total, and a collaborative activity breakdown illustrating the ratios of industry members exhibiting or not-exhibiting each behaviour. A summary of the results can be seen in Table 4.

Industry	% of businesses showing no collaborative behaviours	% of businesses showing one or more collaborative behaviours	% Deviation from aggregated industry mean*	Most common collaborative behaviour (% engaged)	Least common collaborative behaviour (% engaged)
Agriculture, Forestry, Fishing	22.8	77.2	1.6	Procurement (49.9)	Creation (20.9)
Mining, Construction	18.0	82	6.4	Procurement (56.8)	Creation (26.0)
Manufacturing	19.0	81	5.4	Procurement (53.8)	Creation (27.8)
Utilization, Transport	30.2	69.8	-5.8	Production (51.2)	Creation (21.8)
Wholesale trade	20.1	79.9	4.3	Procurement (54.3)	Creation (26.7)
Retail trade, Hotels, Restaurants	24.6	75.4	-0.2	Procurement (51.4)	Creation (24.1)
Information, Communication	22.8	77.2	1.6	Production (55.4)	Procurement (35.3)
Financial intermediation, Real Estate	25.7	74.3	-1.3	Selling/Marketing (55.8)	Procurement (25.7)
Professional services	25.7	74.3	-1.3	Production (56.3)	Procurement (31.8)
Administrative services	34.9	65.1	-10.5	Production (42.1)	Creation (27.2)
Government, Health, Education, Social services	24.7	75.3	-0.3	Production (47.1)	Creation (27.8)
Personal/ Consumer service	24.4	75.6	0	Production (57.3)	Creation (31.7)

Table 4. Summary of collaborative behaviours across industries. (*Non-weighted mean of the percentage of collaborative businesses across industries)

Across all industries, at least 65% of HBBs engaged in at least some form of collaboration (65.1% being the lowest value, shown in Table 4) with the mean across industries being 75.6%, calculated from the data shown in Table 4. The most common form of collaboration (by frequency) across all industries is working with other businesses to produce goods or services. The least common form of collaboration (by frequency) is working with other businesses to create new goods or services. While the majority of industries achieve similar collaborative propensities relative to the mean, those outside of the standard deviation from the mean (which is calculated to be 4.5) include "*Mining, Construction*" and "*Manufacturing*" – both of which show a higher than average inclination toward collaborative activity, in addition to "*Utilization, Transport"* and "*Administrative Services*", both of which demonstrate a lower than average inclination toward collaborative activity.

Of note is the lack of focus on collaborative creation of new goods or services, which runs as a counterpoint to the theory that working together to achieve innovation and generate new products is the primary purpose of collaborative activity among SMEs. (Casals, 2011; Narula, 2004).

3.3 Association Pattern Analysis

To explore the relationships which exist between the multiple forms of collaboration, two key areas were investigated; the associations between the varying activities and the likelihood of their common occurrences. To achieve an understanding of the regularity of certain combinations of collaborative behaviours, a frequency pattern (FP) tree was compiled, a method commonly used for the identification of frequently occurring itemsets within a dataset (Han & Kamber, 2006). illustrating the number of incidences of behaviours one to five (as shown in Table 1) occurring together, up to a total of three concurrent behaviours. The minimum support cost was set at one fifth of the number of cases, 778. Table 5 details the frequently grouped item sets which achieved that threshold.

The measures of support and confidence were utilized as a method of identifying the most prominent relationships within a dataset. Support can be seen as measure of frequency, indicating the proportion of cases exhibiting a particular combination of behaviours. Confidence designates the amount of times a statement of association can

be seen to be correct. From the data it can therefore be seen that the activities of "*Production*" and "*Selling/Marketing*" jointly occur in 35% of all cases, yet based on the presence of one of these activities it can be predicted with a 61.2% confidence that the other will also be present in a given case.

Combination	Support	Confidence
Production, Selling/Marketing	0.35	61.2%
Production, Procurement	0.28	55.8%
Production, Making business more effective	0.26	52.8%
Selling/Marketing, Making business more effective	0.26	58.7%
Procurement, Selling/Marketing	0.24	57.6%
Selling/Marketing, Creation	0.22	50.9%
Procurement, Making business more effective	0.22	52.0%
Production, Creation	0.22	43.8%

Table 5. The most numerous collaborative combinations ranked by support.

The association analysis identified that in addition to "*Production*" being the most prevalent form of collaboration among HBBs when taken in isolation, it is additionally the behaviour most likely to occur in combination with others. The overall spread of behaviours however is diverse, with only four behavioural combinations occurring in over 25% of cases. The following phase involved determining the probabilities of a behaviour occurring based on the presence of one or more other behaviours. Table 6 displays the behaviours most likely to occur in conjunction with others.

Behaviours (Dependent | Independent(s)	Conditional Probability
Making business more effective | (Selling/Marketing & Creation)	0.74
Making business more effective | (Production & Creation)	0.73
Making business more effective | Creation	0.69
Selling / Marketing | (Production & Procurement)	0.67
Making business more effective | (Procurement & Selling/Marketing)	0.66
Making business more effective | (Production & Selling/Marketing)	0.64
Selling/Marketing | Production	0.61
Creation | (Production & Selling/Marketing)	0.61

Table 6. Most probable incidences of behaviours occurring in combination.

The figures shown in Table 6 help to illustrate a number of trends shown in the data. One combination of behaviours which is of interest is "*Making business more effective*" and "*Creation*", which in isolation are the two behaviours least likely to occur (see Table 3) but possess a high probability (0.69) of occurring in tandem. Another key trend revealed via the probability analysis is the prominence of "*Making business more effective*", with 5 of the 8 most probable behavioural combinations including this behaviour, which when compared with the base rate of occurrence 38% (shown in Table 3) indicates the increased likelihood of this behaviour to occur in conjunction with other behaviours as opposed to in isolation. One explanatory hypothesis for this phenomenon is that HBBs with existing willingness to collaborate in areas such as joint purchasing and outsourced production of goods are more also more open to receiving outside assistance in improving their internal business processes.

4.0 Conclusions

The study has shown that collaboration among HBBs is widespread, with over 75% exhibiting one or more collaborative behaviours, with collaborative production, procurement and selling/marketing being the most frequent forms of collaboration among HBBs. Equally, this study has shown that the collaborative behaviours of HBBs vary considerably, with even the least frequently occurring behaviour – collaborative creation – being exhibited by over 26% of HBBs.

Furthermore, collaboration is a practice not limited to a small selection of industries and is instead commonplace across all industry sectors, with all industry's possessing at least a 65% rate of collaboration. The most collaboratively inclined industries were shown to be the mining/construction and manufacturing industries, both of which possessed collaboration rate in excess of 80%. Additionally, this study has provided insights into the nature of collaboration in HBBs, illustrating which behaviours are likely to occur in combination with others. This analysis has highlighted a number of trends within the data, including the increased likelihood of collaboration to make a business more effective occurring in conjunction with other behaviours, and the close relationship displayed between the behaviours of collaborative production and collaborative selling/marketing.

Of particular note is that a number of the findings generated by this study - concerning both the extent of and the nature of HBB collaboration - are far enough removed from those existing in the current literature on SME collaboration to reinforce the theory that HBBs operate in a different manner to SMEs and must therefore be considered as a separate entity (Clark & Douglas, 2014). By addressing the subject of HBB collaboration from a data analytics perspective, the findings illustrate the reliance shown by HBBs on collaborative activities, and are able to clearly demonstrate that HBBs located within OECD countries are actors heavily engaged in joint enterprise and inter-organizational cooperation.

5.0 Further research

The future research will comprise a more involved analysis of the areas covered in this study, including studying HBB collaboration on the basis of intensity and business maturity. Following this, classification of businesses into like groups on the basis of their collaborative activity will be performed by means of cluster analysis, with the aim of using the identified clusters to develop an understanding of common factors which exist between collaboratively inclined HBBs.

Appendix A

Table 7 displays a breakdown of the composition of businesses utilized in the study by country of origin. Businesses from a total of 20 OECD countries were used in the study, a number limited by valid cases in dataset post data reduction, as detailed in section 2.3.

Country	Number of valid cases	Percentage of total cases (%)
Spain	997	25.6
Netherlands	383	9.8
Poland	211	5.4
Estonia	209	5.4
Austria	202	5.2
Latvia	197	5.1
Hungary	175	4.5
Sweden	174	4.5
United Kingdom	171	4.4
Germany	171	4.4
Finland	171	4.4
Ireland	169	4.3
Slovakia	137	3.5
Slovenia	118	3
Denmark	98	2.5
Belgium	94	2.4
Israel	74	1.9
Italy	68	1.7
Greece	46	1.2
Portugal	26	0.7

Table 7. Breakdown of valid cases by country

References

Camarinha-Matos, L.M., Abreu, A. (2007) Performance indicators for collaborative networks based on collaboration benefits. Production planning and control, 18(7), 592-609.

Casals, F. E. (2011) The SME Co-operation Framework: a Multi-Method Secondary Research Approach to SME Collaboration, 2010 International Conference on E-Business, Management and Economics, IPEDR vol. 3, IACSIT Press, Hong Kong.

Clark, D. N., Douglas, H. (2014) Micro-enterprise growth: Lessons from home-based business in New Zealand. Small Enterprise Research, 21(1), 82-98.

Enteprise Nation Home Business Report (2014) https://en-production-assets.s3.amazonaws.com/2014/10/22/08/47/31/599/Home_Business_Survey.pdf, last accessed 2016/12/05.

Global Entrepreneurship Monitor (2016) http:/www.gemconsortium.org, last accessed 2017/06/20

Han, J, Kamber, M. (2006) Data Mining: Concepts and Techniques (2nd Ed.), Morgan Kaufmann.

Johannisson, B. (1987) Beyond process and structure: social exchange networks. International Studies of Management & Organization, *17*(1), 3-23.

Mason, C. (2010) Home based business: Challenging their Cinderella Status, Small Enterprise Research, 17(2), 104-111.

Mason, C.M., Carter, S., Tagg, S. (2011) Invisible businesses: The characteristics of home-based businesses in the United Kingdom. Regional Studies, *45*(5), 625-639.

Narula, R. (2004) R&D collaboration by SMEs: new opportunities and limitations in the face of globalisation. Technovation, 24(2), 153-161.

Schafer, J. L. (1997) Analysis of incomplete multivariate data. CRC press.

United Nations Statistics Division (2014) https://unstats.un.org/unsd/cr/registry/isic-4.asp, last accessed 2017/09/07.