University of Strathclyde Engineering

OPEN DIALOGUES FOR BUSINESS MODEL INNOVATION

Robert William Anderson

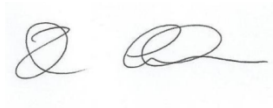
A Thesis Presented in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

2017

DECLARATION OF AUTHENTICITY AND AUTHOR'S RIGHTS

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed,



Robert William Anderson
December 2017

PREVIOUSLY PUBLISHED WORK

Sections of this thesis have been/will be published as a journal paper/conference contribution &/or paper/book chapter and/or presented at academic symposia. Therefore content from this thesis appears in the texts outlined below.

Under Review

Anderson, R W., Acur, N., Corney, J. (Under Review) Leveraging Digital and Physical Dialogues for Open Business Model Innovation. Journal of Business Research.

Forthcoming

Anderson, R. W. Acur, N., and Corney, J. (2018, Forthcoming). How do SMEs Use Open Innovation when Developing New Business Models? In: Vanhaverbeke, W., Frattini, F., Roijakkers, N., and Usman, M. (2018, forthcoming). Researching open innovation in SMEs, World Scientific Publishing: Singapore.

Refereed Conference Presentations

Anderson, R W., Acur, N., Corney, J. (2017). An SME Perspective on Innovating the Business Model through Crowdsourcing. European Academy of Management, Glasgow, UK.

Anderson, R W., Acur, N., Corney, J. (2016). Leading the Crowd in Business Model Innovation, An SME Manager's Perspective. World Open Innovation Conference, Barcelona, Spain.

Anderson, R W., Acur, N., Corney, J. (2016). Connecting with the Crowd – An SME approach to Business Model Innovation. International Product Development Management Conference, Glasgow, UK.

Anderson, R W., Acur, N., Corney, J. (2014). Connecting with the Crowd – An SME approach to Crowdsourcing and Open Innovation. European Operations Management Association, Palermo, Italy.

Anderson, R W. (2013). Open Innovation and Crowdsourcing in SMEs. Doctoral Training, International Product Development Management Conference, Paris, France.

Anderson, R W., Acur, N., Corney, J (2013). Design-Driven Open Innovation through Crowdsourcing. British Academy of Management, Liverpool, UK.

Anderson, R W., Acur, N., Corney, J (2012). Open Innovation and Crowdsourcing in SMEs. British Academy of Management, Cardiff, UK.

Anderson, R W. (2012). Open Innovation and Crowdsourcing in SMEs. Doctoral Training, British Academy of Management, Cardiff, UK.

Anderson, R W., Acur, N., Corney, J (2012). Open Innovation and Crowdsourcing in Small to Medium Sized Enterprises. International Product Development Management Conference, Manchester, UK.

Anderson, R W. (2012). Open Innovation and Crowdsourcing in Small to Medium Sized Enterprises. Doctoral Training, International Product Development Management Conference, Manchester, UK.

Anderson, R W. (2011). Open Innovation and Crowdsourcing in Small to Medium Sized Enterprises. European Doctoral Summer School on Technology Management, Istanbul, Turkey.

Anderson, R W. (2011). Open Innovation and Crowdsourcing in Small to Medium Sized Enterprises. Australasian Conference on Information Systems, Sydney, Australia.

ACKNOWLEDGEMENTS

This thesis would not have been possible without the kind, loving support and encouragement of many and so I extend my sincere appreciation and deepest gratitude to each and every person involved personally and professionally – many, many thanks.

I would like to express my special appreciation and thanks to both my academic advisors, Dr.Nuran Acur and Prof. Jonathan Corney. At times I felt as if I was part of a highly effective team, with a laser focus on the task at hand. I thank each of you for the tremendous support, encouragement, and mentorship throughout the preparation of this thesis and my scholarly training, for allowing me to grow professionally and personally – your advice and training has been invaluable.

I thank the firm directors, managers, and employees as well as the Government officials who were involved and helped me along the way. Special thanks also to Roland Harwood and his firm, 100% Open, who went above and beyond in supporting me with my Ph.D. – without each of you there would be no data and no Ph.D. Thank you to all of the participants who were enthusiastically engaged throughout the open process, in interviews, workshops, meetings and online.

My thanks also go to the funding bodies who provided scholarships to carry out my Ph.D.: the Engineering and Physical Sciences Research Council, the European Institute for Advanced Studies in Management, Research and Development Management, The British Academy of Management, The Scottish Funding Council, Scottish Enterprise, The University of Strathclyde's Impact Acceleration Account and ENCOMPASS.

I'd like to say thank you to the Professor who, as part of a workshop in Brussels, provided a version of the Stigliani and Ravasi (2012) article. I was inspired by this article during my Ph.D. it helped considerably, as an example to follow, when writing my thesis – thanks to the authors for an excellent article! Similarly, thanks to Biggam (2015) for the book which helped me with structuring small sections of the methodology chapter. Additionally, the Moultrie et al. (2007) article made conceptualising action research easier, enabling me to carry out & write up my own action research study, thanks!

Unfortunately, during my Ph.D. course, I became seriously ill, requiring three years of clinical psychiatric treatment. I'm pleased to say that through the compassion and

professionalism of the NHS team who treated me I continue to heal and improve every day. Although it was difficult I loved working with each of you. Special thanks to Dr. Frost, Mr. O'Neil and Dr. MacDonald – your service, expert treatment, and support have been second to none, all of which I could never have afforded on my own – so thank you to each of you and to our wonderful NHS. Thank you also to the other men in my hospital group, each of you inspirational, I wish you continued recovery, health, growth and every blessing now and in the future.

I have been blessed with many supportive, loving friendships, each of whom have touched my life and encouraged me through the Ph.D. Thank you, Alasdair Fyfe of Cartsbridge church, the "Alpha" & "After Alpha" group and to each and every one of my family there. Thank you to my Re: Hope family too, especially the "bible boys", Roger, John, Pascal, Onye, and Tass, who've been consistent in their prayers for me and my Ph.D., their support has been instrumental to my personal and spiritual growth. Annie and James Forbes, thanks for looking after me, for your kindness and loving, warm friendship. Also, the Glasgow City Mission Friday night team & guests, thanks for always cheering me up, always a pleasure to see & serve you all.

I thank my friends at UC Berkeley and Stanford, who helped whilst I was a visiting scholar in California, Anita Stephens, Soh Kim, and the wider open innovation community, a friendly group which continues to grow.

Good friends who've supported me during my Ph.D.; Ela Maia, Paul, Siska, Faridah, Anjar, Yiota, Peipei, Olga, Andrea, David, Ali, Romain, Lijo, Arie, Isi, David, Davide, and Marco. I take time to remember our colleague, Arthur, who tragically & unexpectedly died during the course of the Ph.D.

Thanks also to my father, Robert, mother, Jane, and sister, Ashley.

Most importantly and above all, I thank my Lord and saviour Jesus Christ, for finding me, picking me up and changing my life over the past few years. You've led me through all of my difficulties, I have experienced your guidance and love every day, Lord you are the one who has allowed me to complete my Ph.D., thank you, God, in you I trust.

ABSTRACT

A growing body of research is highlighting how open innovative business models support the growth and economic success of new ideas and technologies. In this Ph.D., building on an action research study in SMEs, I develop the Open Business Model Innovation Framework that accounts for the interactions between value creation and active participation in the development of unmet needs to new business formations. I begin to unpack the process of open business model innovation development supporting the ability of SMEs to build and re-build their businesses.

CONTENTS

DECLARATION OF AUTHENTICITY AND AUTHOR'S RIGHTS I
PREVIOUSLY PUBLISHED WORK II
ACKNOWLEDGEMENTS IV
ABSTRACT VI
LIST OF TABLES X
LIST OF FIGURES XI
1 INTRODUCTION 1
1.1 Background and Motivation for the Research 1
1.2 Contributions and Scope of the Research 3
Research Contribution 3
Research Methods and Analysis 4
2 LITERATURE REVIEW 5
2.1 Introduction 5
2.2 Innovation 5
2.3 Small and Medium Sized Enterprises (SMEs) 6
2.4 Innovation in SMEs 7
2.5 Open Innovation 9
2.6 Open Innovation in SMEs 10
2.7 The Business Model and Business Model Innovation 13
2.8 Business Model Perspectives 14
2.9 Open and Closed Business Models 16
2.10 Research Questions 19
2.11 CROWDSOURCING FOR INNOVATION 25
2.11.1 Managing Crowds 25
Crowd Behaviour 25
Rewards & Incentives 26
Employees vs. Crowd 27
2.11.2 Facilitating Crowdsourcing Projects 28
Problem / Task Design 28
Applying Crowdsourcing 29
2.11.3Crowd Knowledge Management 31
Managing Ideas 31

Integrating Ideas 31
2.12 Crowdsourcing and Business Models 32
Management Choices in Crowdsourcing 35
Open Business Model Frameworks 37
2.13 Conclusion 40
3 RESEARCH PHILOSOPHY, METHODOLOGY AND RESEARCH DESIGN 41
3.1 Introduction 41
3.2 Philosophical Assumptions 41
3.3 Ontology 42
Realism 42
Internal Realism 42
Relativism 43
Nominalism 43
3.4 Epistemology 43
Positivism and Social Constructionism 44
3.5 Connecting Ontology, Epistemology and Methodology 44
3.6 Methodology 46
3.7 Research Strategy 47
3.8 Research Approach – Action Research 47
Action Research Cycles 49
Quality and Rigor in Action Research 50
Research Design 51
3.9 Conclusion 53
4 FINDINGS 54
4.1 Introduction 54
4.2 Phase 1- Creating the Open Business Model Innovation Tool: Evidence from Exploratory Cases 54
Reflection of Learning from Exploratory Cases 58
4.3 Phase 2. Open Business Model Innovation Framework 59
Physical Healing UK Ltd. 60
Component 1 (Initiate) 63
Component 2 - Understand Needs 66
Idea Generation 68
Appraise 71

Value Development 73
Key Learning Points from the phase 2 76
4.4 The Open Business Model Framework 79
4.5 Phase 3- Applying the Open Business Model Framework 83
..... 83
Figure 4.8 Action Research Approach – Phase 3 83
Auto Ltd 83
Component 1 (Initiate): How are we currently creating value with our technologies? What's changing? 85
Needs 85
Obstacles 87
Opportunities 87
Component 2 Discover & Understand & Define- Who are we aiming to create value for? 88
Component 3 (Ideate) 91
Component 4 - Design and Form 94
Component 5 (Value Proposition) 96
Key Learning Points 99
4.6 Conclusions 100
5. DISCUSSION 102
5.1 Extending Theories of Open Business Model Innovation 103
5.2 The Opening up of a Traditionally Closed Process 105
Using Digital Tools 105
Seeking Valuable External Input 106
Creating Sharable Challenges 107
Managing and Using External Ideas 108
Using Open Practices 108
5.3 Managerial Implications 110
6. CONCLUSION 113
References 116

LIST OF TABLES

Table 2.1 Defining SMEs 6
Table 2.2 Examples of Empirical Studies on Innovation in SMEs 8
Table 2.3 Inbound and Outbound Open Innovation Activities 10
Table 2.4 Examples of Empirical Studies on Open Innovation in SMEs` 12
Table 2.5 Technology/Innovation Management View of Business Model Innovation 16
Table 2.6 Closed to Open Business Model 18
Table 2.7 Key Literature in Open Business Models 19
Table 2.8 Process Challenges 20
Table 2.9 Forms of Crowdsourcing and Use 31
Table 2.10 Value Creation and Value Capture Characteristics 34
Table 2.11 Management Considerations 36
Table 2.12 Seven factor creating crowd environment 38
Table 3.1 Ontology Overview 42
Table 3.2 Positivism and Social Constructionism 44
Table 3.3 Connecting Ontology, Epistemology and Methodology 45
Table 3.4 Four Factors of Action Research 48
Table 4.1 Overview of Project 62
Table 4.2 Tools and Techniques used at each Data Collection Point 63
Table 4.3 Project Elements 70
Table 4.4 Three Ideas to Develop Value Proposition 76
Table 4.5 Five Components of Value Proposition 77
Table 4.6 Five Questions Underlying Business Model Innovation and Crowdsourcing 79
Table 4.7 Tools and Techniques used in each Data Collection Point 87
Table 4.8 Crowdsourcing Criteria for Auto Ltd. 96
Table 4.9 Criteria Ranking 98
Table 4.10 Illustrative Case Data for Auto Ltd. 101
Table 4.11 Key Learning Points 104
Table 5.1 Underlying Questions for Managers 116

LIST OF FIGURES

Figure 3.1 Action Research Spiral 50
Figure 3.2 Action Research Approach 52
Figure 4.1 Action Research Approach 55
Figure 4.2 Action Research Approach – Phase 2 31
Figure 4.3 Initial Open Business Model Framework 63
Figure 4.4 Workshop Personas 68
Figure 4.5 Physical Healing Ltd. Online Platform 71
Figure 4.6 Service Blueprinting 74
Figure 4.7 Open Business Model Innovation Framework 86
Figure 4.8 Action Research Approach – Phase 3 87
Figure 4.9 Story Boarding and Mini Business Model 95
Figure 4.10 Auto Ltd. Online Platform 97
Figure 5.1 Open Business Model Innovation Framework 106

1 INTRODUCTION

1.1 Background and Motivation for the Research

It is generally accepted that business model innovation can transform new and existing ideas and technologies into firm growth and profitable value propositions (Zott et al., 2011). A firm's business model acts as a blueprint for how value is created and captured (Teece, 2010). The rise of digital technology and globalisation, which empowers greater connectedness and new methods of collaborating, is challenging the conventional closed business model (Chesbrough and Schwartz, 2007). These changes allow firms to access new knowledge from a wider informational landscape than has been typically possible, as opposed to searching internally for ideas to develop new business models. Consequently, the open business model concept has begun to have an effect as firm boundaries continue becoming more absorptive, where different knowledge sources flow into and out of the firm. The accelerating pace of change in the innovation process has become a priority, especially for small and medium-sized enterprise (SME) managers (Vanhaverbeke, 2017). Whilst SMEs enjoy a flexible approach to innovation, they lack the resources (skills and facilities) to cross their firm's boundaries to acquire and transact in the external knowledge landscape (Lee et al., 2010). Therefore, the aim of this Ph.D. is to investigate open business model innovation, specifically the process through which it materialises in the context of SMEs. I contribute to the emerging discussion on open business model innovation by exploring the processes through which open business model innovation happens.

The current discussion in literature leaves the process of open business model innovation in SMEs unexplored. The prevailing view is that open business model innovation is dominated by large, mature, high-tech firms (Bianchi et al., 2010). Although the discussion on 'closed' business model innovation within SMEs continues to grow, there is less understanding of the open business model process and how it works in an SME context. O'Regan and Ghobadian (2005) stress that SMEs are "not smaller versions of larger firms", supporting the idea that open business models in SMEs need to be explored from an SME perspective rather than merely altering what large firms do. Unlike large firms, SMEs have distinct ambitions and limitations in establishing and advancing open business model innovation. For instance, SME

managers have to work hard to generate and develop new business models as firm boundaries continue to become more permeable, where value creation shifts from a direct, internal process towards an open, networked, bottom-up and decentralized approach (Vanhaverbeke, 2017). As a result of resource deficiency, many technology-based SMEs do not have the resources available to develop an open business model innovation agenda (Vossen, 1998). SMEs generally assign their scarce resources to current innovation activities, leaving them with insufficient opportunities to connect with specialized workforces, customers (Ebel et al., 2016), stakeholders (Rothwell and Dodgson, 1991) or other potential new partners in efforts to develop new business models (Fredberg et al., 2008) . Additionally, SMEs tend to neglect internal technical skills necessary to interact with the external knowledge environment leading to the useful combination of internal and external knowledge necessary for business model development (Fredberg et al., 2008). Finally, SMEs lag in understanding and applying digital tools to support the process of open business model development e.g. online platforms (Rothwell and Dodgson, 1991), as digital resources and competences become key to business transformation. A recent study by Ebel et al. (2016) suggests that these challenges could be overcome by using digital tools (i.e. digital/crowdsourcing platforms) which help the firm access the external knowledge environment (i.e., crowds). It is clear therefore that a tool to help SME managers overcome the difficulties developing open innovative business models is essential. Safeguarding while capitalising on existing technology presents SMEs with challenges involving the size of the firm, decision making within closed boundaries, an obligation to differentiate internal from external ideas and limits to human and technical resources.

The objective of this research is to assist SMEs in creating value for their technologies through an open business model process which overcomes the barriers faced by SMEs. The aim of this research is, therefore, the development of a framework for managing the process of open innovation within the firms' internal and external environment. Through action research, the methodology for open business model development in the context of SMEs is developed.

1.2 Contributions and Scope of the Research

Research Contribution

This research developed and tested the Open Business Model Innovation Framework, a framework that shows how SMEs can work with their stakeholders to develop value propositions through the technology and innovation perspective of business models (Zott et al., 2011) and the definition of the open business model which uses "the division of labour to create greater value by leveraging more ideas, (external ideas) to capture greater value by using key assets, resources, or positions not only the company's own business but also in other companies' businesses" (Vanhaverbeke and Chesbrough, 2014p 5).

The key contribution of this Ph.D. is the introduction of a framework that provides a nuanced explanation of how SMEs can commercialise their technology via open business model innovation. In so doing, this research contributes to the open business model innovation literature (Chesbrough and Rosenbloom, 2002, Zott and Amit, 2010) by enhancing our understanding within the SME context in which digital tools i.e. crowdsourcing can be used to develop new value propositions (Antorini and Muniz, 2013; Magretta, 2002).

The Open Business Model Innovation Framework is different from current frameworks. It suggests that the process of business model innovation development is more complex, not sequential, rather cyclical and needs further theoretical elaboration, where an online innovation platform is a key mechanism.

External ideas from online communities help develop value creation and value propositions and enhance the SME's new value propositions and business opportunities. Following the innovation and technology management perspective on open business model innovation (Baden-Fuller and Haefliger, 2013; Chesbrough and Rosenbloom, 2002, Demil et al., 2015), the framework establishes the open business model mechanism by using a combination of digital and physical dialogues, crowd connectivity and knowledge exchange. SME managers, employees, and their stakeholders defined the needs, obstacles, and opportunities for the companies' technology and generated new ways of using technology in different market sectors. It is important to state that to date, only limited attempts to understand how digital

tools can be used in the development of open business models are available and don't include the process stages.

This research also contributes to the crowdsourcing literature by showing how crowd integration in collaborative platforms creates a context for connectivity and idea generation hubs, which facilitates the development of new collaborative knowledge creation. Thus, this Ph.D. provides new insights into the crowdsourcing for innovation research where scholars have mainly studied the fuzzy front end of innovation for product and service innovation (Antorini et al., 2012, Mount and Martinez, 2014).

Research Methods and Analysis

This Ph.D. research followed common advice for action research projects with the goal of seeking to "bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people" (Reason and Bradbury, 2001p.1). As mentioned, existing research on business models fails to explain openness in an SME context and doesn't consider open business model development and the challenges faced by SMEs. Recognising this, an action research approach was applied to allow the framework to be created, tested and improved through a collaborative series of phases with partner firms (Moultrie et al., 2007). Thus, the approach is similar to traditional action research and had two main objectives: 1) developing the research through being involved in the open business model process; and 2) assisting in enhancing and developing in the social situation of participants (Lewin, 1946).

2 LITERATURE REVIEW

2.1 Introduction

Although the adoption of open innovation methodologies is frequently motivated by the desire to disrupt 'corporate group think' the approach does not have to be limited to large companies. Indeed, the effectively 'closed innovation' approaches found in many SMEs, can create more profound challenges than those seen in larger enterprises (who can dedicate resources to open innovation projects) (van de Vrande et al., 2009b, Parida et al., 2012a).

However, smallness is both a strength and weakness of an SME. A strength because change can be rapid and ideas easily tested; but also a weakness because the close working relationships of SME staff almost inevitably lead to a shared consensus rather than a diversity of radical ideas. One area where the tension between 'speed to market' and 'radical product concept' is evident is in the creation of business models for the SME that can be employed to unlock the value embedded in new technologies.

Baden-Fuller and Haefliger (2013) support the importance of new types of collaboration models to unlock the value embedded in technologies, "For managers, the ecosystems perspective holds the promise of opening up the wider entrepreneurial and collaborative space that a new technology affords – and provides room for novel business models to succeed." (p. 424).

Scholars generally agree that firms commercialise innovative ideas through their business models, more recently business model innovation has been gaining acceptance as a new subject of innovation involving new ways of collaboration (Zott et al., 2011). However, while a number of studies point to business model innovation as a method for firm transformation (Chesbrough and Rosenbloom, 2002, Demil et al., 2015), a comprehensive and empirical account of using outsiders in open business model innovation development in technology commercialization and new market development in SMEs are still in its infancy.

2.2 Innovation

Newness and novelty are commonly understood as the basic characteristics of innovation, the term stems from the Latin word, "Novus" meaning new (Smith, 2015). Rogers (2003) defines

innovation as "…an idea, practice or object that is perceived as new by an individual or other unit of adoption." (p 12) Whilst this broad and limiting definition suggests that anything 'new' is innovation (Atkinson and Ezell, 2012), there is a difference between innovation and invention.

Scholars generally agree that only when an innovation has an associated business model, it can be bought and sold is a new idea an innovation. This is reflected in the OECD's Srategy (2009) definition; "the implementation of a new or significantly improved product (good or service), or process, or marketing method, or a new organisational method in business practices, workplace organisation or external relations." The innovation process, therefore, begins when there is a move away from the inventive, creative process towards developing the idea into a product or service which can be purchased (Smith, 2015).

2.3 Small and Medium Sized Enterprises (SMEs)

Small and Medium Sized Enterprises (SMEs) can be defined as firms employing fewer than 250 people with an annual turnover not exceeding 50 million Euros and operating with a balance sheet total not more than 43 million Euros, as outlined in table 2.1 (EuropeanCommission, 2017). SMEs perform a visible role across developed nations: UK data, for example, shows that SMEs make up 99% of business, 60% of non-governmental employment and 51% of turnover (Federation of SmallBusinesses, 2017). Typically SMEs share features differentiating them from larger firms e.g. they are usually self-governing and managed by the owner(s), have a small market share and are resource scarce (Levy and Powell, 2005).

Company category	**Staff headcount**	**Turnover**	or	**Balance sheet total**
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

Table 2.1 Defining SMEs

Source: European Commission, 2003:

http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

2.4 Innovation in SMEs

In management studies, an increasing body of research on innovation has proposed numerous models highlighting the characteristics involved in creating new products and services spanning: product and process innovation, radical and incremental innovation and technology push and market pull (Lee et al., 2010) and more recently open and business model innovation. Such models shape how individuals and firms make sense of and implement innovation.

More recent studies, however, suggest that whilst there is growth in innovation models for large firms, there are few specifically for SMEs (Lee et al., 2010). The SME literature tends to focus on entrepreneurial traits and personality (Hoffman et al., 1998, Marcati et al., 2008), for instance, increasing the SMEs innovativeness as managers adopt new practices/technologies. Strategies for increasing creativity and risk-taking behaviour (Birchall et al., 1996, Carrier, 1994) assist managers in evaluating new ideas and understandings. Finally, different forms of collaboration (Kleinknecht and Reijnen, 1992) , alliances (Forrest, 1990) or knowledge networks (LeBlanc et al., 1997, Oerlemans et al., 1998) has been shown to enhance innovation within SMEs and help compensate for the challenges related to SMEs' limited size, less resources and limited capabilities as compared to larger firms (De Toni and Nassimbeni, 2003, Pittaway et al., 2004).

Table 2.2 highlights some studies on innovation in SMEs regarding context, sample, key results and the overall focus of the study (The table headings are taken from Dahlander and Gann, 2010). Whilst not comprehensive, the table, shows a range of studies of innovation in SMEs. Table 2.2 highlights that large-scale quantitative studies are common and much of the evidence of innovation in SMEs relies on a range of industrial contexts.

Study	Context	Sample	Key Results	Focus
Marcati et al. (2008).	Food, construction, engineering, wholesale, textile, clothing & footwear.	188 respondents from 41 firms. Open & closed-ended questionnaires.	Entrepreneurs' innovativeness and personality have a key role in the adoption of innovation in SMEs.	SME entrepreneurs' innovativeness and personality.
Radas and Božić (2009).	Manufacturing and service firms in Croatia.	448 respondents from the 'Community Innovation Survey'.	The same factors that drive innovation activity in SMEs are similar in developed and developing economies.	Antecedents of SME innovativeness.
Keizer et al. (2002).	Dutch metal-electro sector.	151 SME managers.	Three factors that can support innovation in SMEs: links with knowledge centres, using innovation subsidiaries & % of turnover invested in R&D.	Understanding the importance of the factors that enhance innovation within SMEs.
Zeng et al. (2010).	Manufacturing.	137 Chinese manufacturing SMEs.	Significant positive relationships between inter-firm cooperation, intermediary cooperation, research institute cooperation.	Relationships and cooperation networks and SMEs innovative performance.

Table 2.2 Some examples of empirical studies on Innovation in SMEs

As adapted from Dahlander and Gann (2010)

Collaboration, alliances, and knowledge networks resonate with recent studies suggesting firms also use a number of 'open' practices to support the creation of new products and services as they engage in innovation. Managers, for instance, use a combination of

venturing, in and out-licensing, external networking and participation, employee involvement (van de Vrande et al., 2009) and other partnering and exchange activities as they use "…purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation…" referred to as open innovation (Chesbrough, 2006).

More generally, research in open innovation in SMEs suggests that applying open innovation provides important advantages for innovation (Chesbrough and Crowther, 2006, Gassmann, 2006a, Laursen and Salter, 2004, Lee et al., 2010). Its function helps form collaborations enabling access to diverse, dispersed knowledge sources as the complexities of technology and products increase (Bianchi et al., 2010). Therefore, in order to fully understand open innovation in SMEs, one should consider how the range of open innovation activities influences innovation within SMEs. Central to this perspective is the notion of outbound and inbound open innovation (Dahlander and Gann, 2010) such as, exploring and internalising knowledge and/or technologies or the use of internal knowledge and/or technologies in new or external business models.

2.5 Open Innovation

Open Innovation is commonly understood as the "purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough et al., 2006p.1).

Scholars generally agree that open innovation is the outcome of the rising costs of technology advancement, an era of knowledge sharing, synthesis and exchange, reduced technology life cycles and declining returns on technology and innovation investment (Chesbrough, 2004, Chesbrough and Crowther, 2006). These changes affect the way managers interact with the internal and external innovation environment. With an increasing focus on developing absorptive capacities, managers need to develop superior skills to scan, recognise and assimilate existing knowledge from the external technological landscape (Frattini et al., Forthcoming).

Open innovation is characterised by two components, inbound and outbound. Inbound involves how firms seek and obtain knowledge and resources, whilst outbound to the efforts

of selling knowledge and resources to other firms (Dahlander and Gann, 2010, Gassmann and Enkel, 2004). Examples of inbound and outbound activities are outlined in table 2.3.

Inbound Activities	Outbound Activities
• Open Innovation online intermediaries • Online platforms • Open Innovation consultants • Networks & Joint agreements with Universities, suppliers, clients, firms from other industries, start-ups • Venture capital • In-licensing	• Out-licensing • Selling Patents • Spinouts • New venture creation • Joint ventures
Sample References	
(Brunswicker and Vanhaverbeke, 2015, Parida et al., 2012b, Spithoven et al., 2010)	

Table 2.3 Inbound and Outbound Open Innovation Activities

Research on open innovation continues to gain momentum and, consistently with firms relying on openness, it suggests a need to greater understand how firms access external knowledge and how they're organised internally to support open processes. Whilst firms learn effective ways of interacting with the external knowledge environment, they need to reshape internally, e.g. structures, processes and beliefs, ensuring useful sharing, assimilation and conversion of externally generated / captured knowledge (Brunswicker and Vanhaverbeke, 2015, Spithoven et al., 2010, Frattini et al., Forthcoming).

2.6 Open Innovation in SMEs

In management research, early studies on open innovation, predominately in large, research-intensive firms, highlighted the processes and activities of openness in shaping how firms carry out innovation in the technological and knowledge landscape (Chesbrough and Crowther, 2006, West, 2003).

More recent studies, however, suggest few have researched open innovation from an SME perspective, exceptions of which are outlined in table 2.4. Funding restrictions, resource scarcity, and globalisation, for instance, encourages SMEs to investigate new ways of innovating (Dahlander and Gann, 2010, Van de Vrande et al., 2009a, Frattini et al.,

Forthcoming). Deficient R&D resources, adaptable organisational structures, and flexibility, not only distinguish SMEs from large firms (Parida et al. 2012) but prompt SME managers to search outside firm boundaries for profiting from and exchanging technology (Frattini et al., Forthcoming, Spithoven et al., 2010). Finally, a creative culture (Van de Vrande et al, 2009) and network alliances (Gassmann, 2006b) can facilitate the adoption of open innovation agendas to alleviate challenges associated with small firm size (Gassmann et al., 2010, Frattini et al., Forthcoming).

Study	Context	Sample	Key Results
Lee et al. (2010).	Korean SMEs.	STEPI survey; 2414 SME respondents.	Successful use of an innovation intermediary with the SMEs.
Van de Vrande et al. (2009).	Manufacturing & services SMEs in the Netherlands.	605 SMEs	SMEs increasingly use open innovation practices & used for mainly market-related tasks.
Parida et al. (2012).	High-tech SMEs	252 SMEs	Different open innovation practices are useful for different innovation results.
Spithoven et al. (2012).	CIS data set	967 firms (792 SMEs / 175 large firms).	Effects of open innovation practices differ between large & small firms, SMEs are more effective in using open practices when introducing new projects to the market.
Bianchi et al. (2010).	Italian SME in the packaging industry.	1 SME.	Develops a methodology for identifying out-licensing opportunities.
Bruswicker and Vanhaverbeke (2014).	SMEs in biotechnology, food / beverage, ICT / electrical / optical, knowledge intensive services, machinery / equipment, space / aeronautics / automotive, textile.	1411 SMEs.	Develop a typology of external knowledge sourcing.

Table 2.4 Some examples of empirical work in Open Innovation in SMEs

As adapted from Dahlander and Gann (2010)

Findings from the studies outlined in table 2.4 resonate with research in innovation in SMEs that shows how an SME's adaptability facilitates creativity, idea generation and R & D activity which supports an open approach to innovation (Audretsch and Vivarelli, 1996, Laursen and Salter, 2004). Research on the burdens of small firm size, however, indicates that the lack of complementary assets, such as manufacturing and marketing make it difficult for SMEs to capture value from their innovation (Freel, 2000, Frattini et al., Forthcoming).

More generally, research suggests that an SME's capability to be informed of advancements in technology and knowledge is, at best, limited. Therefore, to overcome these limitations, opening and crossing firm boundaries, assimilating and exchanging knowledge and technology is central to innovation in SMEs (Van de Vrande et al, 2009, Bianchi et al., 2010)

Taken together, these studies suggest that an open approach supports innovation in SMEs at all levels within the firm. However, while the impact of open innovation is widely recognised across large firms and published widely in management studies, the SME experience of open innovation may not only differ from large firms but is largely missing in current research (Frattini et al., Forthcoming).

2.7 The Business Model and Business Model Innovation

Essentially, a business model outlines how a firm creates and captures value (Zott et al., 2011), it serves as a framework of how the firm creates, delivers and captures this value (Teece, 2010c) and helps us see how the firm works with its surrounding environment (Zott and Amit, 2008). For Chesbrough and Rosenbloom (2002) a business model performs a number of interrelated functions, where the model summarises which markets to serve, who performs each function and describes how each function is connected.

Typically with a universal view of the business model (Teece, 2010) as "an integral part of economic behavior since pre-classical times" (Dodgson et al., 2014p 421), past research on business models has placed emphasis on e-business business models, relating to the rise of the internet (Mahadevan, 2000), value creation and competitive advantage (Zott and Amit, 2009) and innovation and technology management (Chesbrough and Rosenbloom, 2002) that supports the convergence around a shared understanding of how firms 'do business' (Zott et al., 2011).

More recent studies, however, suggest that changing at least two functions of the business model leads to business model innovation (Chesbrough and Rosenbloom, 2002). Business model innovation can be defined as a novel way of creating and capturing value, achieved through the modification or transformation of one or more components of the business model (Amit and Zott, 2001, Chesbrough, 2010, Demil and Lecocq, 2010a, Mitchell and Coles, 2003, Teece, 2010a).

Business model innovation is commonly understood as an experimental process (Hayashi, 2009, McGrath, 2010) in which managers begin to interpret the business model as a type of innovation in itself (Mitchell and Coles, 2003). The process begins when managers look for greater resilience in increasingly unstable, competitive markets. Business model innovation occurs as managers exchange knowledge and understandings in an attempt to create a new business model or change the dimensions of current business models and agree on a course of action (Teece, 2010).

In the last few years, however, a number of studies have highlighted how firms are relying on the ideas and discussions of external individuals e.g. (Antorini et al., 2012, Mount and Martinez, 2014) amongst other open innovation processes (Chesbrough, 2003a), to support the exchange and understanding of knowledge flows into and out of the firm, as they jointly engage in the less investigated forms of business model innovation, establishing co-operative innovation processes and subsequently the commercialization of ideas.

2.8 Business Model Perspectives

Initial empirical applications of the business model concept focussed on e-businesses, internet-based firms that transact commercially online with buyers and sellers of goods and services (Mahadevan, 2000). Research in this line of inquiry investigated firm and industry level responses to new ways of organising and engaging with suppliers and customers both within the firm and across the business environment. Frameworks of e-business models arising from these studies posit the idea that the business model encompasses all components (value creation and capture in addition to economic and network structures) and suggests a variation with other types of business model research in not considering business model components separately (Zott et al., 2011). These components have triggered attempts to understand business models from different perspectives and to bring order to ambiguous

relationships between the different business model components, open to multiple interpretations.

Understandings of the business model from different viewpoints of the firm vary depending on the focus of the study. On the one hand, research on business models from the strategy perspective (Shafer et al., 2005, Zott and Amit, 2008, Teece, 2007) describe the interactive nature of internal and external value creation, the relationship between the business model and firm performance and the collaboration and heightened role of the customer in creating value. In this setting, the ability to make sense of and research the business model depends on understanding that business model components and their mutually supporting relationships are independent of other types of strategy activities e.g. product market and corporate, but can, however, hold the competitive advantage for the firm (Zott et al., 2011).

Research on business models in innovation and technology management (Chesbrough and Rosenbloom, 2002, Calia et al., 2007) on the other hand emphasise how the business model is a method of connecting a "firm's innovative technology to customer needs" / firm resources (Zott et al. 2011 p 1034). Rather than being part of the business model, the technology is seen as a 'facilitator' of the business model. This perspective views business models as being able to 'unlock' potential value within the technology which is then translated into market outcomes. Therefore, business models in technology and innovation management are seen as both a driver as well as an object of innovation (Zott et al., 2011).

The perspective followed in this Ph.D. research, as previously mentioned, is the technology and innovation management perspective of business model innovation. Table 2.5 outlines select studies which follow the technology/innovation management perspective of business model innovation.

Study	Theme	Open Innovation / Crowdsourcing Perspective
Romero and Molina (2011)	Collaboration across firm networks and customer communities are increasingly used for value creation.	'Collaborative business model' using online crowdsourcing communities and distribution of knowledge, skills, and technology.
Vetter et al. (2008)	Broadband technology as a multi-service access network, where different firms jointly use the architecture whilst developing different business models.	Business models emerge through a shared technical architecture in a multi-player environment.
Kakaletris et al. (2004)	Cellular, location-based, value-added tourism services on mobile devices integrating different service providers for a combined offering.	Using shared technology to integrate multiple players in a joint service offering.
Sheets and Crawford (2012)	Using technology to unpack existing business model and improving business performance, improving learning experiences and economies of scale.	Using a combination of internal and external ideas with the emergence of business models.

Table 2.5 Studies Following the Technology / Innovation Management View of Business Model Innovation

As adapted from Weiblen (2015)

2.9 Open and Closed Business Models

In management studies, a growing body of research on business models (see Zott et al. 2011) has highlighted the underlying logic of the value creation and capture mechanisms shaping how a firm makes sense of and delivers a product or service to customers typically within firm boundaries in different sectors (Chesbrough, 2007; Teece, 2010).

More recent studies, however, suggest that firms "must develop more open business models if they are to make the most of the opportunities offered by open innovation" (Chesbrough, 2006ap 107) to support the creation and capture of value in the new innovation landscape (Chesbrough, 2007). Firms can use open models to create value by taking advantage of a

number of external ideas as they define new courses of operation. Business model variants, applying venture capital, spin-offs, joint ventures and incubators assist firms as they evaluate and improve existing and new business models and exchange understandings across the internal and external environment (Chesbrough, 2006). Finally, sharing risk with suppliers and customers and integrating their business models into planning processes, allows the firm's business model to act as a platform leading the industry whilst orchestrating the efforts of those inside and outside the firm (Chesbrough, 2006).

Table 2.6 outlines different types of business models, moving along a scale from 1 – 6, where 1 represents a 'closed' business model and 6 representing a fully 'open' approach to a firm's business model.

Business Model Type	1	2	3	4	5	6
	Closed ⟷					**Open**
Description	Indistinguishable	Differentiated	Segmented	Externally aware	Innovation Integrated with Business Model	Platform actor, shapes markets
Example	• Family Restaurant • Family farms • Barbershop	• Start-up tech firms	• Technology push firms	• Mature industrial R & D firms	• Prominent Financial Firms	• Intel, Wal Mart, Dell
Characteristics	• Competes on price and availability • Sells commodities • Copying ideas from other firms • Misses out on improvement in the wider industry • Lack of control • Little IP management	• Innovation not well planned • Budgets determined by affordability not what's needed • No formal innovation process • Reactive IP management • For tech start-ups only 1 round of funding • 'one hit wonders'	• Competes in different markets simultaneously • Planning for the future • Commercialises R & D outcomes through the business model • Looks for innovation opportunities • Planned, financially backed innovation activity • Full-time IP management	• Open to external ideas and technology • Segmentation supported by external • Risk sharing • Knows current and future needs, supported by external partnerships • Investigates adjacent markets for opportunities • Sharing with suppliers and customers • Innovation is a cross-functional activity • IP is an asset	• Connects different functions of the business • Suppliers & customers have formal access to innovation process • Good visibility into their customers and suppliers innovation roadmaps • Understanding the entire supply chain • Strong alliances and partnerships • Involves employees across the firm • IP plays a strategic role	• Ability to innovate own business model • Business model Ambidexterity • Corporate venture capital and start-ups to explore business models • Spin-offs and joint ventures to commercialise outside current business model • Establishing internal incubators • Experimenting with own and strategic partners' business models

Table 2.6 Closed to Open Business Model

As adapted from Chesbrough 2006

Table 2.7 gives an overview of key literature in open business models across the domain.

Defining Open Business Models	Function of Openness	Strategy	E-Business	Technology
Afuah and Tucci (2001); DaSilva and Trkman (2014); Johnson et al. (2008); Magretta (2002); Morris et al, (2005); Osterwalder et al. (2005); Shafer et al (2005); Teece, (2010); Zott et al (2011)	Chesbrough (2006); Mason and Spring (2011); (Sandulli and Chesbrough, 2009); Zott & Amit (2009)	Abraham (2013); Casadesus-Masanell and Ricart (2010); DaSilva & Trkman (2014); Shafer et al. (2005)	Rappa (2001); Tapscott et al. (2000); Timmers (1998); Wirtz et al. (2010)	Calia et al. (2007); Chesbrough & Rosenbloom (2002) Desyllas and Sako (2013); Gambardella and McGahan (2010)

Table 2.7 Key Literature in Open Business Models

As adapted from Weiblen (2015)

2.10 Research Questions

In management studies, an increasing body of research on business models has highlighted the company-centric nature of how firms do business, viewing 'outsiders' as targets of the business model (Osterwalder, 2004, Yip, 2004) and shaping how firms make sense of and understand the role of those in the external environment (Demil and Lecocq, 2010b).

More recent studies, however, suggest that crowdsourcing-based business models provide firms a way of innovating in a competitive environment (Hienerth et al., 2011). Consumers, for instance, can provide firms with insight into the external environment's wants and needs, resulting in an influx of valuable knowledge (Kohler, 2015). 'Generation Y's' enthusiasm for sharing, interacting, contributing and working using online platforms and social media (Bolton et al., 2013) assist firms as they assess, understand and refine new ideas. Finally, crowdsourcing's reliance on participation during the product development process has been shown to facilitate the production of market relevant products and services (Kohler, 2015, Prahalad and Ramaswamy, 2002).

Findings from these studies resonate with research in open business models that show how firms use different ways to benefit from external participation and collaboration to support value creation and capture and argues that 'openness' facilitates the transformation of industries and business models (Chesbrough, 2006b). Research on customer participation similarly points to the role of diminishing firm boundaries and the part customers play in

bringing about changes in business models and the logic of value creation (Vargo and Lusch, 2004, Vargo and Lusch, 2008).

In crowdsourcing studies, a limited body of research on business models has highlighted a number of challenges associated with implementing business models based on crowds and the new mindset needed to shape how firms incorporate crowds into business models (Kohler, 2015, Djelassi and Decoopman, 2013, Davis et al., 2015). The studies suggest two primary challenges when using crowds in business models, 1 Process challenges (see table 2.8) and 2 People challenges.

Business Model Feature	From	To	Firm Response
Consumers	Passive Customers	Active Co-creators	Develop suitable crowd platform and incentives for motivation.
Firm Role	Selling Products & Services	Facilitating Crowd / Firm Engagement	Enabling engagement whilst managing firm/crowd activities
Value Creation	Continuous	Many-to-many interactions	Non-traditional business model strategies apply
Value Capture	Central	Dispersed	New models of value capture apply which consider value creating crowd

Table 2.8 Process challenges

As adapted from Kohler, 2015, Djelassi and Decoopman, 2013, and Davis et al, 2015

Process challenges refer to difficulties firms face when attempting to construct crowd-driven businesses, which have been highlighted by recent failures e.g. (Chanal and Caron-Fasan, 2008). The changes reflect a different way of approaching the business model. Crowdsourcing, by its nature, synchronises a vast range of human interactions which calls for a different skill set from those required in traditional business modelling (Kohler, 2015).

Studies have also explored crowd and management reactions as they engage in integrating crowds into the current business model. Cultural change, for instance, represents an important shift from the previous way of ‘doing business’ (Davis et al., 2015). Structured work

processes, project management, being rewarded on project outcomes and publications create opposition to the changes required of employees' perception of the updated role of being predominantly 'problem solvers' in addition to being 'solution seekers' (Lifshitz-Assaf, 2016). Finally, balancing rewards with crowd effort, transparency, thorough rules and selection processes could mitigate against feelings of being cheated and used, whilst facilitating the emergence of a co-operative crowd and protecting the brand (Djelassi and Decoopman, 2013).

Research along this line is gaining momentum and with a consistent view that firms should look beyond their boundaries for innovation, it suggests how understanding external inputs in exclusively adopting new open business models, for example, sharing or licensing (Chesbrough, 2007, 2010) will only provide a partial account of the process. Past studies have focused on specific areas within crowdsourcing e.g. crowd behaviour, motivation or managing projects, but an integrated framework detailing the interplay between the firm and the crowd and the process of developing open business model innovation is still missing.

Advancing our understanding of open business model development in SMEs requires studies from an SME perspective. It is generally agreed that inadequate financial, knowledge, human and technological resources hinder innovation efforts in SMEs. "Small firms, therefore, must rely on innovation partners to realize major business model changes. Open innovation is a direct consequence of a small firm's ambition to change its business model." (Vanhaverbeke, 2017p 106). Vanhaverbeke (2017) Points to a number of findings suggesting small firms can overcome obstacles and create value through open business model development:

- SMEs can penetrate new markets using new technology, which are often not big enough to appeal to large firms. This is also true when offering customers new, enhanced / unique experiences. SMEs are more agile and flexible than large firms which affords more time for development and exploration.
- New innovation partners of an SME are mainly established based on the new business model the SME wants to apply.
- SMEs developing new business models draw on diverse knowledge from different domains, unrelated to the SMEs current operation.

Therefore, this research investigates the following research question.

RQ1: How does open business model innovation create value for SMEs' technology through turning outsiders (i.e. the crowd) into collaborators?

The use of crowdsourcing, enabling firms to connect and collaborate with customers and the wider population, has continued to increase in recent years. According to eYeka, a global leader in creative crowdsourcing, the world's biggest brands use crowdsourcing for product innovation with continued growth in usage of up to 325% (AdoboMagazine, 2014). Developments in technology and associated collaboration mechanisms have been essential in facilitating interactions between firms and crowds at lower costs than standard mechanisms used to involve people in the innovation process (Stieger et al., 2012, Howe, 2006). In particular, crowdsourcing platforms provided by firms such as BrightIdea and Crowdicity are increasingly used as tools to involve crowds in innovation. The involvement of crowds in the innovation process generates multiple, diverse interactions, providing a valuable knowledge source.

To date, research has focussed on the application of crowdsourcing at the front end of the innovation process e.g. (Bayus, 2013, Huang et al., 2014, Lauto et al., 2013). So far and in spite of the influential effects of crowdsourcing on the innovation process, research is limited in investigating its use in different phases in the innovation process (Mount and Martinez, 2014), specifically concerning how crowds can be used as a means of facilitating the development of open business model innovation.

Organisations using crowdsourcing for business model innovation leverage their 'way of business' or its 'business concepts' (Magretta, 2002) from crowds of individuals' ideas by using online platforms, as means of strengthening its business concept. Results arising from implementing crowdsourcing for innovation posit that crowdsourcing has a largely beneficial effect on innovation, where firms can gain access to helpful, often specialised knowledge and expertise, complementary and new skills and expertise adding to the overall brain power of

the firm, whilst gaining exposure to wide-ranging external interests e.g. Antorini and Muniz (2013).

These results have triggered researchers to consider more areas of crowdsourcing for innovation including e.g. the design of crowdsourcing projects for innovation, effects on internal employees and how firms can manage crowd knowledge. Crowds help firms to look beyond their current boundaries and obtain insights from an extensive and diverse knowledge base that can be used in firm innovation (Di Gangi et al., 2010, Fueller, 2010). The involvement of crowds in the innovation process generates multiple, diverse interactions, providing a valuable knowledge source (Mount and Martinez, 2014). Crowds encourage creativity, supporting the creation of valuable ideas and solutions, because participants with different capabilities, experiences and skills can cooperate with each other online (Malhotra and Majchrzak, 2014). Dell, for instance, engages crowds in ideation and co-creation via their crowdsourcing platform ideastorm.com. Interacting with crowds enables knowledge transfer that not only gives ideas and solutions but more general knowledge relating to consumer and market preferences, enabling the development of enhanced value propositions (Antorini et al., 2012, Malhotra and Majchrzak, 2014, Poetz and Schreier, 2009).

In summary, a survey of past literature shows that understanding crowdsourcing for innovation in primarily large firms may lead us to miss the important ways in which crowdsourcing plays a role as a driver of the innovation process within small and medium-sized firms. As SMEs are not the same as large firms, we can also expect that their business model experience, motivations, uses and outputs also differ. There are also differences in open and closed business model innovation, in that, open business models "refers to situations where the innovating company relies on partners' competencies to jointly create value for customers and share that value according to agreements they have negotiated prior to collaboration." (Vanhaverbeke and Chesbrough, 2014p 55) . This then allows SMEs to create value with a diverse range of new innovation partners, which enhances the SME's knowledge through assimilating cross-boundary ideas with its own technology and know-how.

Literature offering guidance and understanding of the open business model innovation process is limited. Hence, this research explores the following research question:

RQ2: What are the components of the crowd-based open business model innovation process in SMEs?

Despite the fact that crowdsourcing is a mechanism that supports openness it's connection to and the process of business model innovation is under-researched. Available open business model frameworks provide an insightful, but a partial explanation of the process, yet we don't fully understand how this connects and works in an SME setting. The following literature review on crowdsourcing aims to connect innovation and crowdsourcing, whilst providing a foundation for using crowdsourcing in open business model innovation in this study.

2.11 CROWDSOURCING FOR INNOVATION

The current literature is lacking complete linkages between innovation management and the crowdsourcing concept. Such missing connections often result in divergent thinking among definitions, scope, the processes used by firms and the outcomes when using crowdsourcing for innovation purposes. In order to develop an understanding of how firms use crowdsourcing for innovation, this section of the literature review focusses on crowdsourcing for innovation.

2.11.1 Managing Crowds

Crowd Behaviour

In conventional crowdsourcing innovation challenges, studies have highlighted how managers interact with the crowd by encouraging participants to vote and comment whilst focussing on increasing crowd numbers, participation levels and community diversity (Malhotra and Majchrzak, 2014).

Recent studies, however, suggest that managers should be aware of various types of crowd behaviour, which if nurtured, can support the crowd in delivering superior results as they engage with the firm and each other. Participants' personalities, for instance, affect their motivations which determine their online expectations (Fueller, 2010). Developing relationships, experiencing enjoyment and working in teams encourage crowds as they post and refine new ideas (Boudreau and Lakhani, 2013, Porter et al., 2011, Vuculescu and Bergenholtz, 2014) and exchange understandings across the community (Huang et al., 2014, Malhotra and Majchrzak, 2014).

Crowds can also display negative behaviours, criticising and 'flaming' (Di Gangi et al., 2010), applying pressure on firms through alliances (Di Gangi and Wasko, 2009), experience negative emotions influencing participation (Bagozzi and Dholakia, 2006), opportunistic conduct (Avenali et al., 2013) and using defensive strategies to protect collaborative work using legal e.g. licencing systems and normative mechanisms and punitive behaviour towards those who don't act according to group norms and values (Dahlander and Magnusson, 2008), which have been shown to influence crowd behaviour that can develop the emergence of updated, harmful assumptions and beliefs about the firm.

Findings from these studies resonate with research in the theory of social exchange which helps explain social human behaviour, and shows how crowds anticipate a satisfying experience when taking part in online co-creation activities (Fueller, 2010), participants find both tangible (e.g. prizes and money) and intangibles (e.g. friendship and socialising) rewarding (Lambe et al., 2001) which helps facilitate the submission and discussion of ideas. Research on the cognitive and behavioural perspectives of human engagement also points to participation being motivated by underlying emotional and subjective dynamics (Porter et al., 2011), affecting the willingness of individuals to engage and collaborate with other crowd participants and the firm in creating individual and collective value.

More generally, research on the behavioural perspective of crowds suggests that participation does not only rely on individuals' cognitive interpretation but rather in the online competition/collaboration environment (Lakhani and von Hippel, 2003) (Archak, 2010). Therefore, for a comprehensive understanding of crowd behaviour, one should consider the interface between participants, firm, and crowd platform and associated processes they interact with. Key to this viewpoint is the notion of consumer needs fulfilment and motivation (Porter et al., 2011) – understanding crowd needs and motivations, promoting participation, encouraging the submission of high-quality content and promoting connections between the crowd, creating enjoyable experiences & a state of 'flow' (Mathwick and Rigdon, 2004) and motivating co-operation – which facilitates several crowd processes by extending and sustaining online engagement with the firm.

Rewards & Incentives

In crowdsourcing studies, a growing body of research has drawn attention to the crowd's extrinsic motivations (Zheng et al., 2011) to explain participation in crowdsourcing projects (e.g. Brabham, 2010, Fueller, 2010). Key extrinsic motivators include monetary rewards and gaining status and recognition within the community.

Recent findings, however, suggest that individuals are driven greatly by intrinsic incentives which encourage the broadcasting of ideas and discussions as individuals engage in crowdsourcing. Feelings of trust and having open communication channels, for example, play a major role in crowdsourcing success (Ebner et al., 2009). Relationships and encouragement between participants, designing and building products (Antorini et al., 2012), beliefs of

embeddedness and empowerment to take part in research (Porter et al., 2011), teamwork, universal enjoyment and fun (Frey et al., 2011) have been found to be highly effective intrinsic motivators as the crowd connect across the community. Finally, intrinsically motivated crowds are particularly valued as they display higher levels of activity, knowledge diversity and effort resulting in more quality ideas and discussions (Antorini et al., 2012, Frey et al., 2011).

Findings from these studies echo research in the theory of extrinsic and intrinsic motivation that shows how both have a substantial impact on people's behaviour and argues that a combination of both types of incentive drives participation in online communities (Hars and Ou, 2002, Ke and Zhang, 2009). Research on consumer needs fulfilment and motivation also point to satisfying participants' needs through creating an environment where people feel a sense of belonging, being valued and like-mindedness amongst participants (Porter et al., 2011).

Employees vs. Crowd

In New Product Development studies, a classic line of reasoning is that firms should ask their employees to take on creative tasks (Amabile et al., 2005, Leonard and Rayport, 1997a, Schulze and Hoegl, 2008), based on market research and the belief that professionals (e.g. marketers, engineers or designers) are well placed to create solutions to consumer problems, and consumers' ideas are bound by the current market environments (Poetz and Schreier, 2009).

In contrast, however, an alternative line of inquiry suggests that individuals are also capable of creating novel product or service ideas (Jeppesen and Frederiksen, 2006). This thinking is supported by studies showing that consumers often innovate autonomously and their innovations are often considered as having high commercial appeal (von Hippel, 2005). Open source software development (e.g. Linux) is an example of crowd innovation, with advancement almost exclusively performed by crowds (Lakhani and von Hippel, 2003). The success of open source software (e.g. Apache) has led other firms to go beyond their boundaries and experiment with the creative talents and knowledge of those outside the firm (e.g. consumers, supply chain, academia, and Government) (Poetz and Schreier, 2009).

Similarly, with open source software development, the basic notion to outsource idea generation to an undefined population (Chesbrough, 2003, Howe, 2008) has resulted in an interest in the appeal of ideas generated by users vs. a firm's professionals. Crowds, for instance, score more highly in the innovativeness of their ideas, whilst professionals submit ideas that are more market ready, however, the highest rated ideas were dominant amongst the crowd (Poetz and Schreier, 2009). These findings indicate that crowds can work alongside professionals, broadening idea novelty whilst increasing the number of ideas.

Findings from these studies resonate with marketing research that shows how crowd created products outperform their corresponding designer-created products on the market through a combination of factors including highly motivated participants with high degrees of problem-solving and technical expertise (Nishikawa et al., 2013). Research on idea diversity similarly points to the role of crowdsourcing increasing the likelihood of unique ideas (Surowiecki, 2004, Terwiesch and Ulrich, 2009) which can then be adopted into the firms' NPD product or service pipelines.

2.11.2 Facilitating Crowdsourcing Projects

Problem / Task Design

Whilst an increasing number of firms are adopting crowdsourcing initiatives in an effort to involve external individuals in product/service development and value creation (Chesbrough, 2003, Chesbrough, 2006, Howe, 2008), a number of firms resist crowd involvement largely due to a lack of understanding of what problems crowds can handle (Boudreau and Lakhani, 2013).

Recent studies suggest that managers utilise characteristics of job design to support the creation of easily understandable tasks as they engage in problem design (Zheng et al., 2011). Independence, for example, gives participants freedom and choices in when and how they tackle the problem (Hackman and Oldham, 1980) and leads to feelings of increased responsibility (Hackman and Oldham, 1976), which acts as an intrinsic motivator (Deci, 1975) and gives a clear indication of the expected outcomes (Hackman and Oldham, 1980). Diversity in activities and skills required to complete the task, assist crowds as they create and critique ideas, using a range of skills to complete different task actions can stimulate and create interest and feelings of pleasure among individuals (Morgeson and Humphrey, 2006a,

Sims et al., 1976b). In addition, contest tacitness can result in ill-defined problem design and as such crowds submit unclear ideas which in turn can affect the transmission of knowledge from the crowd to the firm (Zheng et al., 2011). Finally, increasing task complexity can lead to the application of advanced skills when engaging with the problem (Zheng et al., 2011).

Findings from these studies resonate with research in crowdsourcing that shows how problem design should be clearly described, easily understandable and with enough details to be cognitively challenging (Afuah and Tucci 2012 and Sieg, et al., 2010) and argues that this approach to problem design facilitates the collective production of high-quality ideas and knowledge. Research on the task type similarly points to the role of these design elements in the type of problems crowds can handle routine, non-routine and complex tasks (Erickson et al., 2012).

Related research on crowdsourcing suggests that crowdsourcing is well-matched to needs-based problems, expertise-based problems, and innovation based projects, but not technological-based problems or trial and error projects (Poetz and Schreier, 2009, Terwiesch and Xu, 2008).

Applying Crowdsourcing

Having decided that a problem cannot or shouldn't be solved internally, managers have to work out how to apply crowdsourcing (Boudreau and Lakhani, 2013). Scholars generally agree on six forms that crowdsourcing can take: contests, collaborative communities, complementors, online workforces, internal crowdsourcing and crowdsourcing through a broker (Boudreau and Lakhani, 2013, Simula and Ahola, 2014, Terwiesch and Xu, 2008). The six forms of crowdsourcing represent different purposes, challenges, and best uses and are closely linked to the problem/task type and design, highlighted in table 2.4.

Crowd contests, for instance, use specific problems and are powerful when it's difficult to envisage what a valuable solution will look like (Boudreau and Lakhani, 2013, Terwiesch and Xu, 2008). High numbers of ideas, diversity, extensive modularization and little organisation assist firms in creating a knowledgeable crowd around a number of problems that can be combined into a 'value-creating whole' (Boudreau and Lakhani, 2013) through collaborative communities (Simula and Ahola, 2014). Crowd complementors work when the firm requires novelty around its main products or services and multiple solutions to multiple

problems (Boudreau and Lakhani, 2013, Simula and Ahola, 2014, Terwiesch and Xu, 2008). Online workforces connect firms with flexible labour for various tasks, online 'employees' work when you know what a solver and solution look like (Boudreau and Lakhani, 2013, Terwiesch and Xu, 2008). Finally, crowdsourcing via a broker connects problem solvers with firms' problems (Marjanovic et al., 2012), meaning firms can tap into the global specialised knowledge, increasing the overall raw brainpower of the firm (Tapscott and Williams, 2010).

	Function	**Challenges**	**Best Use**
Contests	Creation of valuable solutions to multifaceted problems, through far-reaching, varied experimentation.	Problems/tasks need to be universally understood and have no particular firm details.	Problems with high technical uncertainty, low market uncertainty, scientific, design, creative problems.
Collaborative Communities	Combining high numbers of ideas to create value.	Difficult to control due to the absence of shared culture and unity of a workforce, protecting intellectual property is complicated.	Wikis, consumer groups, open partnership projects, FAQ's sections.
Complementors	Encouraging ideas/solutions around the firm's main product.	Providing access to information around the main product whilst protecting assets can be off-putting.	Apps, marking, operational or product data.
Online Workforce	Flexibility and efficiency of matching tasks to corresponding talent.	Classifying the tasks to go outside the company and managing the pool.	Work that can be clearly defined e.g. repeated tasks, transcription and human computation.
Via a broker	When lacking the expertise to run crowdsourcing initiatives, connecting potential solvers and ideators to firms' problems.	Potential risks for sensitive information, future plans which can create problems for crowdsourcing initiatives.	Anonymous posting of problems/tasks, tapping into a global network of specialised knowledge, increase brainpower without vast increases in fixed costs.

Table 2.9 Forms of Crowdsourcing and Uses

Adapted from (Boudreau and Lakhani, 2013, Simula and Ahola, 2014, Terwiesch and Xu, 2008, Vuculescu and Bergenholtz, 2014, Tapscott and Williams, 2010)

2.11.3 Crowd Knowledge Management

In crowdsourcing studies, a growing body of research on managing knowledge from crowd participants has highlighted two key aspects (managing ideas and integrating ideas), which shapes how the firm makes sense of, organises and takes advantage of crowd knowledge.

Managing Ideas

Recent studies suggest that managers use various methods to support an inward flow of diverse knowledge as they engage the crowd in ideation activities. Creating an open and inclusive online atmosphere (Mount and Martinez, 2014), for example, helps the crowd to interact with each other through commenting and taking part in natural discussions (Bayus, 2013) which "creates a collage of diverse perspectives on the problem" (Malhotra and Majchrzak, 2014). Encouraging the crowd to learn about their idea potential (high or low) and the firm's cost structure through peer voting and firm feedback helps refine and filter ideas and increases the overall potential of ideas received, signifying that a reduction in ideas over time is related to market efficacy and self-selection rather than a break-down in the crowdsourcing process (Huang et al., 2014). Finally, participants with past success (idea implementation) have been shown to have a negative impact on their ability to submit further unique ideas valued by the firm due to the effects of cognitive fixation (Smith et al., 1993). However, such effects can be lessened by issuing instructions to the crowd (Bayus, 2013, Malhotra and Majchrzak, 2014) encouraging different types of knowledge to be shared which can facilitate the emergence of valuable ideas (Bayus, 2013).

Findings from these studies resonate with research in the behavioural biases in the self-perception of individual characteristics that shows how people have a propensity to overvalue their capabilities in different areas of everyday life, including innovative performance (Dunning et al., 1995). Such an idealistic view results in participants submitting high numbers of low-potential ideas (Huang et al., 2014). Research on cognitive fixation similarly points to the role of an individual's established knowledge base counteracting the creative thinking needed to submit further original ideas (Birch and Rabinowitz, 1951).

Integrating Ideas

The notion that hosting a crowdsourcing platform, inviting participants to submit ideas and offering rewards will result in 'ready to go' ideas, complete with a business model is far from

reality (Jouret, 2009). Managers need to be closely involved with the process, limiting criticality too soon to preserve the latent value of ideas that could be used in different settings, markets etc. in addition to being aware of their potential biases (Jouret, 2009).

Recent studies, supporting this view, suggest that firms use different approaches to support the absorption of crowd knowledge as managers examine ideas. Using external partners, for example, can assist in handling the large volumes of information associated with crowdsourcing which can often impede the internalisation of knowledge (Mount and Martinez, 2014). Opinion polls, discussion threads, visuals and other original user content (Malhotra and Majchrzak, 2014, Mount and Martinez, 2014) assist managers as they appraise and refine crowd ideas and exchange insights across professional groups (Mortara et al., 2013). Finally, instructing the crowd to do more than simply sharing their ideas by forming solutions through combining the knowledge in multiple idea discussions, allowing personal experiences, information on similar challenges and substitutions to be shared (Malhotra and Majchrzak, 2014) not only increases the quality of ideas overall but helps managers understand ideas and assists in the transfer of knowledge (Di Gangi et al., 2010).

Findings from these studies connect with research in the knowledge integration literature which shows how knowledge sharing, knowledge highlighting and knowledge combination support the process of knowledge transfer and integration (Grant, 1996, Tiwana, 2002) which managers need to learn to receive higher quality knowledge from the crowd. This builds on research in organisational ambidexterity (Tushman and O'reilly, 1996) that whilst managers need to keep track of past processes, products, and services, learning new skills in managing crowdsourcing and looking forward to innovations yet to come is key to successful crowdsourcing initiatives.

2.12 Crowdsourcing and Business Models

As outlined previously, crowdsourcing is an effective way of getting others involved in the organisation and can be used as an effective tool to facilitate firm openness. I define crowdsourcing as “innovation in a crowdsourcing context as the public generation of innovative solutions to a complex problem posed by the company sponsoring the challenge call” (Majchrzak and Malhotra, 2013). While the notion of crowdsourcing and business

model innovation is acknowledged by scholars, we still know little about how the crowd can help firms 'do' business model innovation.

Empirical applications of crowdsourcing for innovation have focussed on crowd participation in value creation e.g. (Afuah and Tucci, 2012, Di Gangi et al., 2010, Antorini et al., 2012). Research in this line of inquiry explores crowd and firm-level responses to using crowdsourcing as an approach to problem-solving, integrating crowds for co-ideation and how best to collaborate with online communities. Findings from these studies suggest that crowds can be used throughout the innovation process and suggest a gap between crowd value creation and value capture (Kohler, 2015).

Another relevant line of inquiry has begun investigating crowd based businesses, the associated business models and how crowds can affect existing business models e.g. (Kohler, 2015, Djelassi and Decoopman, 2013, Davis et al., 2015). Research in this area has applied concepts such as customer participation, service-dominant logic (Vargo and Lusch, 2004, Vargo and Lusch, 2008), open business models (Chesbrough, 2006b), the type of platform business model (Boudreau and Lakhani, 2009) and business model frameworks (Osterwalder and Pigneur, 2010) to investigate the development of new businesses centred on crowds. Compared to research on using crowds in ideation, these studies offer guidelines on managing a crowd-based business model and how technology can help shape new business models. Table 2.10 Outlines value creation and value capture characteristics across studies showing crowd-centered business models.

	Integrator	Product	Multi-Sided
Value Creation	• Creative process more efficient • Convert crowd solutions into products • Low technical / skill based • Partial replacement of marketing functions • Award-winning Products	• Solving Business Problems • Encourage crowd development • High Use of crowd input (creativity, tacit knowledge and experience and skills) • Management Adaptions • High Involvement	• Personal Focus • Connecting 'creators' with customers
Common Characteristics	• Understanding Key Actors (firm, crowd, and consumers) • Attract and Engage the Crowd • Multiple Communication Channels • Encourage Partnerships • Reinforcing 'warm' and 'open' relationships		
Value Capture Common Characteristics	• Decrease costs (firm and crowd) • Develop new methods of generating revenue • Understanding and recompensing crowd motives		

Table 2.10 Value creation and value capture characteristics across studies

As adapted from Boudreau and Lakhani (2009)

Scholars suggest that crowdsourcing business models can be categorised depending on the buyer and seller relationship. Boudreau and Lakhani (2009) propose three platform business models: integrator, product and multi-sided to support new understandings as more firms integrate crowds in value creation and capture activities. The integrator platform takes crowd inputs and sells them to customers. Through governing customer relationships the platform management retains control of developments. In the product platform, the crowd develops and improves existing technology, products or services, selling the resulting creations to customers. In this model, the crowd is able to interact directly with customers, where the platform management retains control of the underlying technology, product or service. In multi-sided platforms, crowds and customers interact directly, crowds can be customers and vice versa.

Management Choices in Crowdsourcing

Although current research emphasises the importance of problem/task design e.g. Zheng et al. (2011) Afuah and Tucci (2012) and Wallin and von Krogh (2010), there is a gap in our knowledge of how we understand what firm managers want from crowdsourcing in order to *create* the crowd project. Boudreau and Lakhani's (2013) work involves identifying the kinds of problems crowds can manage effectively, whilst guiding managers on using the different approaches available. Some studies look at task design for motivating people to take part in crowd challenges (Zheng et al., 2011). Others, such as Garcia Martinez and Walton (2014) for example, suggest that problems which require experimentation and a diverse solution set are best when using crowdsourcing for innovation. Few researchers address the nature of the business problems which lead to the creation of a crowdsourcing challenge. We, therefore, have little understanding of how managers can build crowd challenges through the associated choices and translate them into crowd projects which enable open business model development.

With little consideration in the literature of the choices, managers can make for crowd projects (table 2.11) research is limited in providing managers with a 'toolkit' supporting the decision making before focussing on the business problem and subsequent challenge statement. Despite the growing influence of crowdsourcing on firms and organisational processes, research is not clear about managers' involvement in creating crowd projects e.g. the degree of openness, the degree of instruction, ownership, crowd makeup, what goods are being developed and why crowds are involved. Whilst we have research advising managers on problem types (Boudreau and Lakhani, 2013), local or distant search (Afuah and Tucci, 2012), challenges and rewards of using crowds (Antorini and Muniz, 2013) research on guiding managers through a whole crowdsourcing for an open business model development project are lacking.

For this reason, although crowdsourcing for innovation is assumed to be desirable for firms, focus on managerial decision making does not appear to be raised in the literature. This suggests the need for research to explore the involvement of and choices that managers need to make associated with the creation of a crowd project when developing business models with external participants.

Problem Complexity	Direction of Search	Ownership	**How**	Channels	Crowd Incentive	Who
Simple	Directional	Mixed	**Tournament**	Lateral, IT backed, widely advertised	Predominantly Extrinsic	Broad coverage of those holding relevant knowledge
Complex	Theory-Based	Firm	**User Communities**	Lateral, Publicly available	Predominantly Intrinsic	Product / Service users e.g. Dell Idea Storm
Simple	Directional	Firm	**Collaboration**	Lateral, IT backed, widely advertised	Predominantly Intrinsic	Broad coverage of those holding relevant knowledge e.g. Facebook language translation
Simple	Directional	Firm	**Crowd Labour**	Lateral, IT backed, widely advertised	Predominantly Extrinsic	Broad Coverage e.g. transcribing

Table 2.11 Management Considerations

As adapted from Felin and Zenger (2014) and Boudreau and Lakhani (2013)

Despite the fact that crowdsourcing processes can underpin and provide valuable inputs for innovation, like those mentioned above, the crowdsourcing for open business model development process is under-researched. Available models give us an insightful, but incomplete view of the process, as we still know little about how crowdsourcing can lead to other innovation outputs rather than incremental or radical, which are highly reported in current literature.

Crowds help firms to look beyond their current boundaries and obtain insights from an extensive and diverse knowledge base that can be used in firm innovation (Di Gangi et al., 2010, Fueller et al., 2007). Crowds encourage creativity, supporting the creation of valuable ideas and solutions, because participants with different capabilities, experiences and skills can cooperate with each other online.

To date, research has focussed on the application of crowdsourcing at the front end of the innovation process e.g. (Bayus, 2013, Huang et al., 2014, Lauto et al., 2013). So far and in spite of the influential effects of crowdsourcing on the innovation process, research is limited in investigating its use at different phases in the innovation process (Mount and Martinez, 2014), specifically concerning how crowds can be used as a means of facilitating open business model development.

Open Business Model Frameworks

Scholars generally associate business model innovation with a stage-gate process (Mitchell and Bruckner Coles, 2004, Osterwalder and Pigneur, 2010, Teece, 2010b) Franke et al. 2006). Such systematic approaches are considered to be of central importance which drives competitiveness and business model success (Teece, 2010). That said, a lack of feedback and documentation is thought to be a key difficulty in creating value. Currently and in spite of a growing interest in business model innovation, no studies, to my knowledge, have attempted to define the entire business model innovation process from an SME perspective. Current business model frameworks focus on the closed innovation perspective, from a strategy viewpoint in the wider management literature.

Compared to open business model innovation, SMEs depend on their own resources for idea development, application, and marketing. Existing literature suggests that SMEs apply

'openness' in two ways, 1. Developing strategic alliance agreements and partnerships with large firms (Rothwell and Dodgson, 1991) and 2. Accessing marketing and sales channels at the point of commercialisation (Vanhaverbeke and Cloodt, 2006). In comparison, the open business model concept suggests using a combination of internal and external knowledge and resources to capture value at all stages of the innovation process. This implies that open business model innovation development is fundamental for SMEs in generating value and nurturing their businesses.

Finally, business model innovation processes have not been studied from an SME viewpoint. Literature offering guidance and understanding of the business model innovation process is limited with exceptions outlined in table 2.12

Table 2.12 summarizes the open business model components from relevant literature.

Source	Model	Description	Components
Rohrbeck et al. (2013)	Collaborative business model innovation in multi-actor settings.	Uses business model canvas as a template to develop new business ideas, embedded in a systematic group work process, consists of ideation, prioritisation, and validation.	Customer segment, value propositions, the channel of distribution, customer relationships, revenue streams, key resources, key activities, partnerships, cost structure.
Breuer et al. (2017)	Value-based network business model innovation.	Use business model canvas and business innovation kit which includes several creativity and planning techniques (Breuer, 2013) as a template to explore a range of ideas and viable business models for new and existing business in a workshop format .	Value proposition, revenue generation mechanism, cost structure, partners, capabilities, touchpoints, and stakeholders.
Loïc et al. (2010)	Customer-integrated business model	Uses customer participation literature and secondary sources to understand consumer socialisation process and their inputs in the development of business model innovation .	Resources and competencies, value proposition, organization, internal and external organization.
Ebel et al. (2016)	Virtual business model innovation	Use Action design research project to build	Mobilization, environmental analysis,

		IT-tool for the development of new business models in a systematic group work process, interviews and expert focus groups.	business model design, implementation, management.
Wirtz et al. (2010)	Web 2.0 4 factors model	Draws on the '4C' internet business model typology to show the changes in value creation and capture mechanisms of web-based business models & disruption due to the continued growth of web 2.0.	Social networking (social trust, social identity, virtual word of mouth, customer power), Interaction orientation (customer centricity, interaction configuration, customer response, cooperative value generation), Customisation / Personalisation (personal customisation, group customisation, social customisation), User-Added Value (user-generated content, user-generated creativity, user-generated innovation, under-generated revenue / contracts).
Agafonovas and Alonderiene (2013)	Crowdsourcing-driven business model innovation.	Draws on the business model canvas as a template and 'critical factors for crowdsourcing success' (Sharma, 2010) to develop a model for crowdsourcing based businesses showing value and knowledge flows.	Crowds, core team, customer, crowd intermediary.

Table 2.12

The frameworks outlined in table 2.12 highlights key contributions in developing open business model innovation.

2.13 Conclusion

In summary, the literature review shows that crowdsourcing and business model innovation is usually described based mainly at the front end of the innovation process, as a static procedure, a crowd-based firm or from a "closed" process, especially in SMEs. It is also usually studied in large firm settings. Current research, nonetheless, suggests that continuing to understand business model innovation and crowdsourcing mainly in large firms and not applying "open innovation lenses" to the wider business model conversation, or indeed making explicit connections may lead us to neglect the ways that open practices affect the innovation process in SMEs.

3 RESEARCH PHILOSOPHY, METHODOLOGY, AND RESEARCH DESIGN

3.1 Introduction

This research considers crowdsourcing for innovation in small firms within a field that, while stimulating dialogue in research and practice, and continued appeals for further research and adoption, is still in its infancy (van de Vrande et al., 2009b). Calls for further research in the field have been made by various scholars (Lee et al., 2010, Vanhaverbeke, 2017). Studying the development of new business models through crowdsourcing in small firms, therefore, should make a considerable contribution, to both the study of crowdsourcing and business model innovation in general, whist enhancing what we already know of the issues facing small firm managers when engaging in innovation activities, and, more importantly when implementing a crowdsourcing project.

Central to this research is the collection and analysis of empirical data on the process of how small firms can use crowdsourcing for innovation. The empirical nature of the research allows for a 'real world' look at the practices involved, giving rich insights to the process of implementing a crowdsourcing for innovation project, resulting in a helpful framework for small firms.

This chapter outlines the research philosophy and strategy followed to answer the research questions. It includes the research design of the study and details the research sites, data collection, and analysis.

3.2 Philosophical Assumptions

Easterby-Smith et al. (2012) summarise the advantages of having an appreciation of philosophical issues and states that it can be helpful in clarifying research designs, the type of data to be collected and how such data is collected and interpreted. This knowledge can assist researchers in deciphering the types of research designs available and which of those designs will likely work best in answering the research questions. Based on this knowledge researchers can identify designs within or outside past experience or make adjustments for restrictions in different subjects or fields.

Easterby-Smith et al (2012) suggests that having an understanding of philosophical issues and applying it to research studies, based on the research questions and objectives assists researchers in navigating the ontological, epistemological and methodological choices available. Ontology considers the nature of reality and existence. Epistemology takes into account the most appropriate ways of investigating into the nature of the world, whilst methodology represents groupings of techniques used to investigate a certain situation.

3.3 Ontology

Ontology is concerned with the "philosophical assumptions about the nature of reality" (Easterby-Smith et al, 2012 p 18) it includes four ontologies which can be mapped onto a 'scale'. Table 3.1 gives an overview of the ontologies and outlines what each position 'holds' as 'truth' and 'fact'.

Ontology	Realism	Internal Realism	Relativism	Nominalism
Truth	Single Truth	Truth exists but is obscure	There are many 'truths'	There is no truth
Facts	Facts exist and can be revealed	Facts are concrete, but cannot be accessed directly	Facts depend on the viewpoint of the observer	Facts are all human creation

Table 3.1 Ontology Overview Source: Easterby-Smith et al. (2012) p 19

Realism

Easterby-Smith et al (2012) outlines the realist position which asserts that the world is external, holding an objective view of the world as being independent of the researcher. Conducting research from this starting point assumes that scholarship can only develop "through observations that have a direct correspondence to the phenomena being investigated" (Easterby-Smith et al. 2012 p 19). In this position the researcher cannot affect "truth" and as such researcher observations are separate from theories used to describe the phenomena under investigation. Phenomena studied from a realist position and observations made can be influenced by the requirements and desires of the researcher (Meredith et al., 1989).

Internal Realism

Easterby-Smith et al (2012) explains the internal realist position postulates that scientific truth exists and is absolute. Further, although operating from a belief that there is a single

reality, the assertion in internal realism is that it's beyond the bounds of possibility to access the truth of reality directly. Therefore, any data collected is done so indirectly to the phenomena under study. Internal realism assumes that scientific laws can develop autonomously without researcher involvement.

Relativism

The relativist position, as outlined by Easterby-Smith et al (2012), posits that scientific laws aren't "out there" to be found but rather such laws are developed in the minds of others. The "truth" is brought about through a number of discussions, considerations and viewpoints between people about the best way of justifying the results of the phenomena under study. This process places an emphasis on power dynamics, as the people involved hold different views, meaning that the accepted "truth" may depend on people's status and reputation within a group. This line of thinking also suggests then that the resulting "truth" can be influenced by current world issues, the political and business environment and resources available.

Nominalism

Nominalism, as summarised by Easterby-Smith et al. (2012), holds that a single "truth" does not exist and in fact "truth" is constructed through human thought and interaction. Nominalism is largely used within the social sciences in studying behaviours and human interactions in the social world. This, therefore, suggests that popular thinking, societal norms, and values form the "truth" of the world. Consequently, using a nominalist approach within social science studies is suitable, unlike observing phenomena in the natural sciences which do not consider human behaviours.

3.4 Epistemology

As previously mentioned epistemology takes into account a researcher's assumptions about interacting with the world and is associated with the different ways in which to investigate our world (Easterby-Smith et al. 2012). A debate exits around two extremes, positivism, and social constructionism. While additional epistemologies have developed namely, critical realism, critical theory, feminism, hermeneutics, postmodernism, pragmatism, and saturation theory, which while independent, are classified through the two extremes, positivism and social constructionism (Easterby-Smith et al. 2012), the following section outlines positivism and social constructionism.

Positivism and Social Constructionism

Easterby-Smith et al. (2012) outlines the positivist stance suggesting that the world is external from the researcher and therefore any phenomena studied should be done so objectively and not through subjective emotions, thoughts, feelings or intuition. Measuring phenomena objectively involves a researcher being independent of the study using, mostly, quantitative methods. Researching objectively fits with positivist thinking of reducing problems into their smallest components, ensuring explicitly clear-cut knowledge and answers to the research problems (Crotty, 1998).

Alternatively, social constructionism, as outlined by Easterby-Smith et al. (2012) is derived from the notion that reality is not autonomous, but is created socially by people. Researching phenomena from a social constructionist perspective does not focus on external facts; instead the focus is on the process of how people make sense of phenomena through communication and interaction. Table 3.2 gives an overview of the differences in researching from positivist and social constructionist points of view.

	Positivism	**Social Constructionism**
The Observer	Independent	Part of what is being observed
Human Interests	Irrelevant	Main drivers of science
Explanations	Demonstrates Causality	Aims to increase general understanding of the situation
Research Progresses Through	Hypotheses and Deduction	Gathering rich data from where the ideas are induced
Concepts	Need to be defined to be measured	Incorporate stakeholder perspectives
Units of Analysis	Reduced to simplest terms	Can include the complexity of 'whole' situations
Generalisation Through	Statistical Probability	Theoretical Abstraction
Samples	Large, randomly selected	Small, chosen for specific reasons

Table 3.2 Positivism and Social Constructionism

(Source: Easterby-Smith et al. 2012 p 24)

3.5 Connecting Ontology, Epistemology and Methodology

Understanding the ontology and epistemology concepts reveals a link between both, the realist ontology corresponds closely to positivist epistemologies whilst the nominalist

ontology corresponds closely with social constructionist epistemologies (Easterby-Smith et al, 2012). Again, the linkages between ontologies and epistemologies can be set out along a 'scale' with stronger thinking at both ends and more 'normal' thinking towards the centre (see table 3.3) e.g. 'normal' thinking in social constructionism is characterised by the acceptance of independent objective information in the world, whilst forming socially constructed information. This is in contrast with strong social constructionist thinking which adopts a position where there is no variation amid individual and social knowledge (Ernst, 1996, Easterby-Smith, 2012)

Ontologies	**Realism**	**Internal Realism**	**Relativism**	**Nominalism**
Epistemology / Methodology	Strong Positivism	Positivism	Social Constructionism	Strong Social Constructionism
Aims	Discovery	Exposure	Convergence	Invention
Staring Points	Hypotheses	Propositions	Questions	Critique
Designs	Experiment	Large Surveys; Multiple cases	Cases and Surveys	Engagement and Reflexivity
Data Types	Numbers and Facts	Numbers and Words	Words and Numbers	Discourse and Experiences
Analysis / Interpretation	Verification / Falsification	Correlation and Regression	Triangulation and Comparison	Sense-Making; Understanding
Outcomes	Confirmation of Theories	Theory Testing and Generation	Theory Generation	New Insights and Actions

Table 3.3 Connecting Ontology, Epistemology and Methodology

(Source: Easterby-Smith et al. 2012 p 25)

Easterby-Smith et al (2012) continues that research within a strong positivist position adopts the view that 'truth' is external of the researcher, therefore the work of the researcher is to uncover such 'truths' (laws and theories) which exposes and justifies reality. Research within strong positivism is conducted through experiments and measurements by setting up and testing hypotheses. Positivism in the weaker form starts from the assumption that reality cannot be approached directly. Research beginning with this assumption will proceed by collecting large samples of data through questionnaires and deduce the nature of reality.

In contrast, Easterby-Smith et al (2012) explains that the constructionist view is that 'truth' may hold various realities, leading the researcher to collect several viewpoints often using a

combination of qualitative and quantitative methods to draw on the perspectives of diverse people. The stronger social constructionist perspective adopts the view that there is no previously extant reality. Therefore the researcher's objective is to investigate the frameworks people use to make and give sense to the reality of the world. Accordingly, great care is given to language, dialogue, interaction and exchanges between people.

3.6 Methodology

A number of methodologies are available to researchers. Methodology can be defined as "a combination of techniques about the best ways of inquiring into the nature of the world" (Easterby-Smith et al, 2012 p xv). It refers to the approach taken by the researcher, linked to ontology and epistemology, methodology, guides the research design, the methods used to collect data, data type and analysis (Collis and Hussey, 2003, Silverman, 2005).

Methods, as outlined by Easterby-Smith et al (2012), are the various means that researchers can use to collect and analyse data. There is a general difference between methods of positivist and interpretivist epistemologies. The positivist approach, as previously mentioned, adopts the position that there is an objective truth where the data collection and analysis is phased. Generally, a positivist study avoids contact with research participants to avoid researcher bias. The next phase of this type of study is an analysis done separately from data collection processes and most usually involving statistical analysis techniques.

A constructionist approach, outlined by Bryman (2012) and Silverman (2005) however, differs, both in terms of the philosophical approach and the ability of the researcher. The differences lie in the research process where there is no division of the data collection and analysis, it is also common to continually update the research question as new information from research participants and analysis is gained. The process is iterative and data analysis often continues simultaneously with data collection activities (Bryman, 2012, Silverman, 2005).

It is important to note that particular methods are not completely synonymous with either a positivist or constructionist paradigm (Easterby-Smith et al. 2012). This research follows a relativist, social constructionist, qualitative approach to data collection and analysis. The remainder of the chapter will concentrate on those methods and techniques for data collection.

3.7 Research Strategy

The empirical component of this Ph.D. is exploratory and in-depth, investigating the development of innovative open business models, within a real business environment, focussing on physical and digital dialogues to solve business problems. With a managerial perspective, the study explores the process the development of open business model innovation. The focus of the research is on the projects and the involvement of the firms and the internal and external participants involved. To fully address the research questions data was collected from the projects (workshops, interviews, video recordings, meetings, online content generation and statistics) as such, the study required a research strategy suited to facilitating an in-depth study, gaining different perspectives to develop our understanding of the new business models can be formed in a live business setting. Researchers can choose from a number of research strategies to carry out the objectives of the study.

Applying an archival / historical approach for instance, is unsuitable for research exploring and recording data in a live setting, as it investigate past events, not real-time experiences (Biggam, 2015). With a focus on casual relationships, and isolating research elements from the world, experimental research designs are also unsuitable (Biggam, 2015). In the same way, survey research strategies would fail to take into account the objective of this research with a high involvement with research participants (Biggam, 2015).

Fundamentally, this research is a qualitative research study aiming to follow live projects in firms "in their natural setting, attempting to make sense of, or interpret, phenomena in terms of the meaning people bring to them." (Denzin and Lincoln, 1994 p 2). Quantitative studies, on the other hand, popular within the natural sciences, use experiments and mathematical modelling (Biggam, 2015) don't support the objective of this research. That said, mixed method studies are also common which use both qualitative and quantitative methods (Myers, 1997).

3.8 Research Approach – Action Research

Action Research, developed in the management field, has the twofold aim of supporting the practical concerns of people and social research (Gill and Johnson, 2010, Rapoport, 1970) and "seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of pressing concern to people" (Reason and Bradbury, 2001p 1). Whilst this definition indicates the comprehensive scope of action research, Shani and Pasmore

(1982p 1) offer a more precise definition, "Action research may be defined as an emergent inquiry process in which applied behavioural science knowledge is integrated with existing organizational knowledge and applied to solve real organizational problems. It is simultaneously concerned with bringing about change in an organisation, in developing self-help competencies in organizational members and adding to scientific knowledge. Finally, it is an evolving process that is undertaken in a spirit of collaboration and co-inquiry." Their theory is explained in four factors outlined in table 3.4

Context	Relationship Quality	Action Research Process Quality	Research Outcomes
Characteristics			
• Shared goals (researcher & manager). • Firm history & degree of formality. • Local, national & international economic environment.	• Trust. • Concern for others. • Fairness of influence. • Shared language.	• Investigation process. • Research application process.	• New knowledge creation. • Tenable outcomes (human, social, economic, ecological). • Development of new knowledge.

Table 3.4 Four factors of Action Research by Shani & Pasmore (1982), as adapted from Coughlan & Brannick (2014).

As noted in Coghlan and Brannick (2014) the four factors of action research in Table 3.4 outlines how 'context', 'relationship quality', 'action research process quality' and 'research outcomes' influences an action research project. Context, for instance, influences collaboration and the readiness of managers to participate. Managing relationships assist both researchers and managers to communicate effectively and exchange understandings. Quality in the research process allows for a twofold focus on research activities and practical application. Finally, the outcomes of the research, on the one hand, deal with the business problem and, on the other hand, developing new knowledge.

Action research is based on three distinct features; 1, “Research in action, rather than research about action” (Coghlan and Brannick, 2014p 6), 2, an equal, cooperative relationship and 3, a series of events and a method for finding solutions to real problems, each outlined below (Coughlan & Brannick, 2014):

1. The main principle of action research is its objective approach to studying real problems faced by businesses together with the managers involved. On the one hand, this develops existing research, whilst on the other hand, improves the problem faced by the managers. Action research involves a four-step cyclical process: 1. Planning, 2. Action, 3. Evaluating and 4. Additional planning.
2. Action research is based on a collaborative working relationship. Both researchers and managers participate in the action research cycles. This distinguishes action research from other forms of research as those involved are not only objects of study.
3. The series of events in action research consists of iterative cycles of data collection meaning joint analysis, planning, and action and reviewing throughout the action research project.

Action Research Cycles

The action research process is iterative in that whilst a project may begin with a particular research question and setting, are subject to change as the research progresses through the phases of action research (Saunders et al., 2012). Following Saunders et al. (2012) and Saunders et al. (2007), we see that each phase of the research consists of problem identification (diagnosing), action planning (planning), implementing (taking action) and reviewing the action (evaluating), see fig. 3.1 Identifying problems in the initial stages allows for action planning and decision making. Actions from the planning stage are carried out and subsequently evaluated, representing one cycle of action research. The first cycle informs successive cycles.

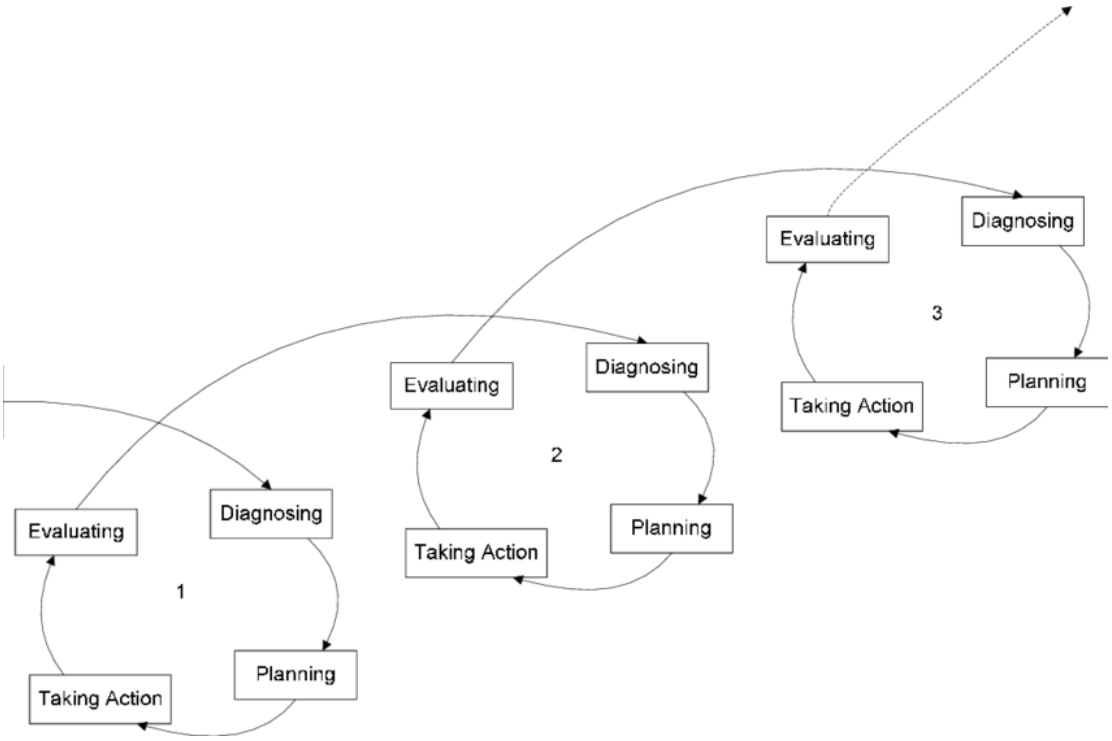


Fig 3.1 Action Research Spiral (Saunders et al., 2007p 141)

Source: https://www.researchgate.net/figure/307553170_fig1_FIGURE-2-Action-Research-spiral-from-Saunders-et-al-2007-p141

Quality and Rigor in Action Research

Instead of compromising on thoroughness, the approach requires rigor (Lüscher and Lewis, 2008). Since the action researcher is part of what is being studied, the researchers', along with participants' account for their viewpoints (Susman and Evered, 1978). Encouraging rigor involves an iterative process of data collection, analysis, and triangulation of different perspectives (Lüscher and Lewis, 2008), described as a repeated cycle of developing and extending theory from practice (Eden and Huxham, 1996). Whilst triangulation in traditional research approaches aids pattern recognition, action research draws on a number of perspectives as a stimulus for challenging fixed routines (Eden and Huxham, 1996). Generally, by way of iterative cycles and triangulation, findings are the outcome of joint action through various viewpoints validated by the participants involved in the project (Lüscher and Lewis, 2008).

Research Design

The research approach followed common advice for action research projects with the goal of seeking to "bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people" (Reason and Bradbury, 2001p 1). Current research on business models doesn't account for openness in an SME context and fails to explain open business model development in light of the challenges faced by SMEs.

Acknowledging these limitations and following Moultrie et al. (2007) as an example of applied action research, I applied an approach allowing the model to be designed, developed, trialled and modified through a collaborative series of phases with partner firms (Platts, 1993, Sein et al., 2011). Thus, the approach, akin to traditional action research had two main goals: 1) developing theory through involvement in the process; and 2) facilitating improvement in the social situation of participants (Lewin, 1946). Meeting these goals required three key phases as outlined in Figure 3.2 and in the descriptions below.

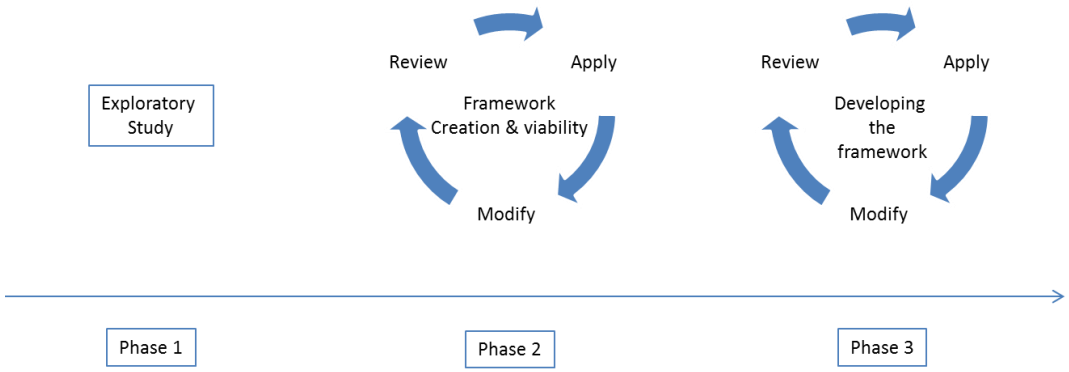


Figure 3.2

The research was conducted accross three phases as follows:

Phase 1 — Exploratory study, this phase involved three firms. The firms were looking externally for new ideas, knowledge, and technology for value creation. This exploratory phase gave insights into the open business model process. Data was collected through a combination of meetings with the firms, observations, document collection, and semi-structured interviews. Through involvement in the case firms, I was able to articulate,

appraise and adjust my understanding of the open business model process components and processes in the literature.

Phase 2 — Framework creation & viability, an initial tool using the literature and exploratory cases was created. Experts reviewed the tool based on its usefulness, content, and form. The tool was applied in one SME, Physical Healing UK Ltd. (also outlined in a forthcoming book chapter, as mentioned in the "previously published research" section of this thesis). During this phase I took part in and conducted meetings (on and offline), two workshops, interviews and an online crowdsourcing platform, data sources included interviews, participant observation and documentation (online and firm literature) as well as interactions from the crowd and firm on the crowdsourcing platform.

Initial meetings included all stakeholders and centered on discovering and understanding the SME's business challenges, workshop activities and the function of the online platform. Debriefing meetings took previous actions into account, looked at developing ideas and what their associated business models would look like.

Workshops included people from a wide range of professional and personal backgrounds, who assisted in creating innovation challenge statements to be published on the online platform. The workshop participants then helped the firm in creating new business models based on a number of ideas chosen from the crowd. Each workshop produced a number of physical outputs including: completed worksheets e.g. dot voting, storyboards, and investable proposition templates for new business models. The online (i.e., Crowdsourcing) phase involved SME employees and the external crowd who created and developed ideas through conversation and voting through internet-enabled devices. Subsequent post-workshop meetings with SME managers and their new potential partners were held to review ideas, business models, expectations and next steps.

Phase 3 — Developing the framework, the tool was then adapted from the initial and creation phases and applied to another SME, Auto Ltd. The process followed that of phase 2 with a number of initial and follow-up meetings, workshops and use of the online platform.

3.9 Conclusion

The study aims to develop a framework of open business model innovation, through a series of activities and on and offline dialogue, at the same time as advancing our understanding of open business model innovation in SMEs. Appreciating the complexities of open business model innovation involving a number of actors, the framework was developed following a three-phase action research design. Data was collected through a variety of methods (Observations, semi-structured interviews, video, audio recording, notes, drawings and online content) applicable to each phase of the research. Relevant philosophical and methodological considerations for management research were examined, as outlined in this chapter.

4. FINDINGS

4.1 Introduction

This chapter presents the research findings. The findings are reported following the sequence of phases 1 to 3 as outlined in fig 4.1. Phase one involved three pilot exploratory cases and together with the literature review led to the initial development of the Open Business Model Framework. In phase two the tool was applied in the first SME, Physical Healing UK. Ltd The study combined participant observation, interviewing, workshop recording (audio and visual), completed activity forms and online data from the crowdsourcing platform to investigate the development of open business models. The data and learning from phase 2 led to an updated version of the tool which was then applied in phase 3 under the same conditions as phase 2, similar data was collected in this phase as in phase 2.

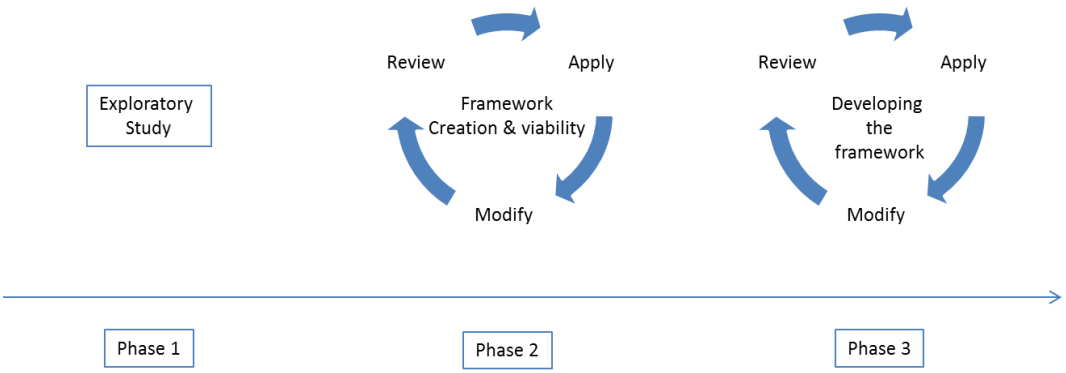


Figure 4.1 Action Research Approach

4.2 Phase 1- Creating the Open Business Model Innovation Tool: Evidence from Exploratory Cases

Initially, three pilot cases were conducted which helped substantiate the open business model innovation framework. The pilots involved two small firms in Scotland and one in London. Data from the pilots included interviews, observations, pictures and being involved in a number of crowdsourcing and innovation workshops. These pilot studies demonstrated the usefulness of the framework.

The pilot cases were conducted in an exploratory nature. First of all, I asked firms to what extent they collaborate with outsiders including the use of crowd platforms and why they needed the ideas from outsiders. One of the interviewees stated that "*We're stuck in group-think, our people talk to our people*", whilst another firm manager explained that "*I think understanding that sharing is the way forward…it's easy to share ideas and then have people to improve on them"* another manager mentioned, *"the customer is coming to us with a problem that they can't solve themselves, and then we have access to all these people, who potentially can solve it.*"

I then asked firms what kinds of opportunities they have that crowds and external participants can work on and what they would like to obtain from the online crowds and external participants, one of the interviewees suggested that external participants help them to find solutions to pressing problems, "*this is a well-known problem in fabric care, and literally thousands of scientists have spent millions of R&D hours trying to solve this problem, and those scientists tend to be chemists, who are used to developing a chemical, sticking it on a stain, seeing if it works, if it does, then it eventually makes it into the product, but how can we use our technology / patents / other people's to solve this?"* another response was that "*they helped to tap into innovation networks across the UK, reach out to 500 start-ups and SME's working in the service innovations to find the next big innovation."*

Whilst all of the firms involved in the pilot cases had opportunities and problems to present to the crowd I asked the firms about the process before entering the crowd platform stage. One manager talked about the importance of holding workshops to help define the challenge, "*a starting point for us is we've got a community that we thought we could do more in this community, help us figure out what some of the problems are that we could solve, and so we will run what we call a problem pow wow, which is face to face workshops, sometimes we do it online as well, if it's a geographically dispersed community, to help figure out what the problems are to be solved, and then prioritise them and then craft them into an interesting challenge statement that can then be pushed out to you know, small businesses or whoever, that the target audience might be"* it was further mentioned that, *"there's an innovation need, but it's undefined, or you know there's not much clarity, and that's where we would get involved in kind of the strategic aspects of working with them, through a series of workshops and interviews to help them short-list their top innovation challenges or unmet needs. There*

could be a technology problem, or there could be a business problem." Additionally, "*with that sort of community, a lot of that stuff is done online, but actually, it really helps to get people in a room together and get some face to face stuff. So, and that is a bit more organic."*

Following the firm's problem definition and opportunities phase, I was interested to find out how the firms used the crowd platform, in interacting with the crowd one director mentioned, "*So ideas were pretty much a way of capturing unprotected, non-confidential thoughts into the company. So this could be done through open platforms, through outsourcing, or through speaking with customers, suppliers, innovators, you know in an open forum"* another manager said, "*So we do crowd-sourcing for employees, or with employees, that's one way of enabling the open innovation culture to happen, or open innovation happens inside organisations. And then they work together to help both parties come closer towards a picture or proposition that meets the company's needs, but also exploits intellectual property in the other company."* On bringing people to the platform, "*I mean typically, we typically rely on social media, to help recruit our assistants, and in some cases we have bespoke communities that are built around customer panels, so then we work with clients, and they would either give us a database that we would use for the initial feed, we will then generate a lot of noise by collecting the crowd-sourcing platform or community, through social media, and then reach out and recruit other participants."* And on rewarding the crowd one commented, "*for example on this platform there was no extrinsic reward, because it was a very charitable objectives and the crowd were just happy to invest their time and commitment and their interest in [firm A], [firm A] set up this platform because it was going to benefit charity, as well as the company."* On managing a problem-solving crowd platform, "*And, yes, just trying to create as much help and value as well as paying people for their time. Generally we wouldn't suggest paying for ideas, because ideas are cheap or worthless, but if people are spending significant time doing work for you, you need to recognise that and reward that, either with money or with other value, and it depends on who it is, if it's customers, then it might be handing out some iPads, if it's small businesses, it might be, okay, you've got a one in 10 chance of pitching to the chief executive which, so, the incentives are very different in different crowdsourcing projects."* After the initial workshops when the firm turns the platform 'on', it was explained that, "*And then usually just having a bit of adrenaline and momentum, trying to build up ahead of stream, a short time-scale, get*

everyone excited about it, get everyone sort of competing and collaborating at the same time, and yes, so it's a number of different ways, but so combining all of that together generally drives participation, and it's not for everybody, you know you can drop out at every stage, but in a way that's a good thing, so people are self-selecting, participating in the process and coming along for the ride sort of thing."

Following the online crowd process, I asked the managers of the firms what they do with and how they use the information from the crowd platform. One manager said when the crowd process starts the firm begins to, "*understand their customers' unmet need. They understand the requirement but don't understand how to implement it"*, what follows is an iterative process where, "*And you know, find new business models and revenue streams. That's, with that sort of community"* through a number of meetings and workshops, new relationships are also important where firms can exchange technology and knowledge and use it in another firm with a different business model instead of developing it themselves, "*So it kind of fitted quite nicely, and anyway, so through the crowdsourcing platform, [Firm B] found this company and they bought the technology, they bought the intellectual property, and the most valuable thing they acquired was the relationship this company [Firm C] had with all the comedy and music venues around the UK*."

Finally, I wanted to learn about how the ideas generate new value propositions for the firms involved in running crowdsourcing projects. On smaller firms connecting with a larger firms, "*we ran a project, where this was one of the problems that we were trying to solve, and it was a product design company whose biggest claim to fame, up until that point, was designing Remote Controls, and so nothing to do with cleaning fabrics. Their proposed solution which really blew [Firm D] away, if you put a little vacuum pump on the stain, and then you put the detergent in a ring around the stain, and you suck, then you use a little suction thing, and you suck the detergent into the stain, and then the stain and the detergent and in the product, it contains the stain in that area, and it cleans it, in that smaller area, and the comment, I remember from [Firm D], which really stuck with me, 'no one has ever thought not to put the detergent on the stain', so in this case, it took a product design company to say why don't you put the detergent next to the stain and suck it into the stain with a little vacuum pump. So it's sometimes those little lateral insights, you know it would seem obvious, within the industry, and that came from a product design company, with no real expertise in fabric care, they*

came with a very fresh pair of eyes to the problem, and they actually came up with something that was really interesting". This is one example where a smaller firm was able to use their technology and know-how in new ways. It was a way of commercialising into a new market, with a new partner.

Reflection of Learning from Exploratory Cases

The exploratory phase highlighted both the SMEs' business problems and business model components as identified in the literature. Also evident was how the SMEs accessed external ideas and transferred the knowledge to create new value propositions. The cases in this phase had impromptu processes for business model development and faced difficulties in being 'open' and forming new relationships for joint value creation.

It became clear that adopting online crowd platforms to access external knowledge was important for the SMEs involved, although assimilating such knowledge differed across the firms. It turned out that each of the firms had difficulties in implementing open innovation. The managers were encouraged by open innovation and what it could bring to their firm. However, there was a general unwillingness to take steps to use 'openness' in any of their processes. Managers reported that they worried their unique abilities, know-how and knowledge would be available publicly and open to imitation and leakage (Laursen and Salter, 2006). To mitigate the perceived risks SME managers agreed to 'openness' by employing stringent guidelines, for example, participants involved in innovation activities needed to be screened to ensure there was no direct or indirect connection to competitors.

Observing a number of procedures allowed for identifying practices to be included in the open business model innovation framework. The firms in this phase revealed the value placed on openness in bringing about creativity for identifying new knowledge, markets, partners as well as advancing technology and its use. The firms' access to external technology and knowledge enabled new partnerships which could be integrated into their own technologies.

4.3 Phase 2. Open Business Model Innovation Framework

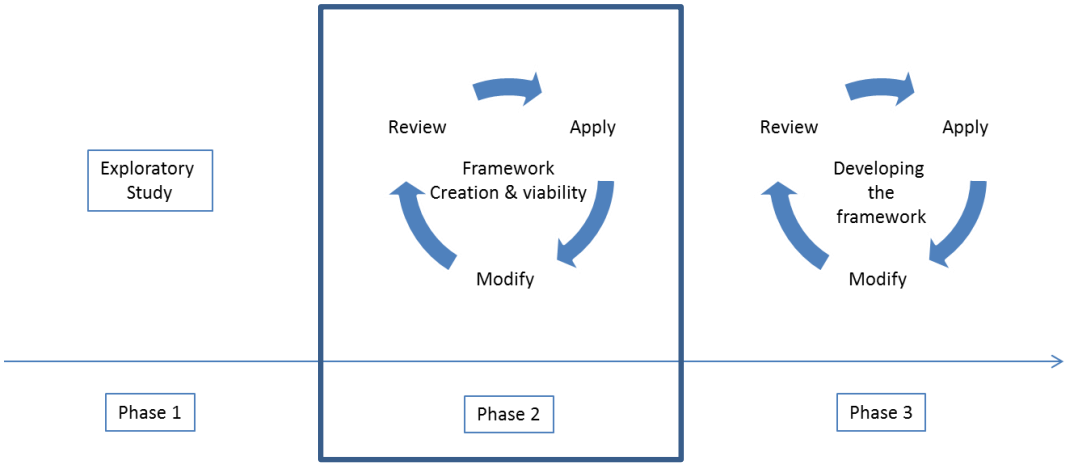


Figure 4.2 Action Research Approach – Phase 2

A combination of the exploratory cases and literature helped develop the initial Open Business Model Innovation Framework (see fig. 4.3). This version of the tool was applied and modified through the pilot case in phase 2, Physical Healing UK Ltd. Physical Healing UK Ltd, the name of which is a pseudonym to comply with confidentiality agreements, is a rehabilitation firm which uses engineering, technology, and physical/neurological therapy to care for people experiencing the results of life-threatening injuries or illnesses. The pilot case allowed for a number of modifications in the framework by understanding the innovation activities through observing and capturing fundamental business model management components. The framework began to form a structure around different innovation activities applied in the pilot case e.g. stakeholder personas, storyboarding and online platforms and includes a combination of open business model development methods. The pilot phase, informed by the exploratory phase and literature, identified five complementary components essential in developing open business models from an SME perspective. The components, as outlined in fig. 4.3 include 1. “Initiate”, enabling the SMEs to generate challenges, 2,

"Understand Needs", discerning the needs of the SMEs stakeholders, 3, "Idea Generation", an online phase of ideation for accessing external knowledge, 4. "Appraise", taking the ideas, knowledge and discussions and understanding their business models and 5, "Value Development", understanding the value of and how the new ideas and knowledge can create new value propositions.

Figure 4.3 Initial Open Business Model Framework

Physical Healing UK Ltd.

Physical Healing UK Ltd. is a rehabilitation firm using a combination of engineering and therapy to treat people suffering from catastrophic injuries or illnesses. At the time of the study, Physical Healing UK Ltd. was headquartered in Glasgow, UK, employing four directors, one company secretary and a number of mobile field service technicians. The directors were responsible for the overall strategy and organisation of the firm, with the aim of providing rehabilitation engineering technology and related services within the United Kingdom. This involved working with a number of partners throughout the UK and abroad, including the National Health Service and local Governmental organisations. In order to capitalise on the firm's expert knowledge and know-how, the directors decided that including services associated with the products they provide should play a central role in the business. Providing services would give the firm new growth opportunities and an opportunity to have profit growth independent of their larger partners. Table 4.1 outlines the characteristics of Physical Healing's open business model innovation project. Table 4.2 gives more details of the data points within the project, detailing the purposes, processes and the 'toolkit' used at each point of the process.

Project Characteristics	Physical Healing UK Ltd.
Industry Type	Healthcare / Biotechnology
Business Problem for Crowd	Moving from a product based business to a service based business
Idea Ownership	Firm
How to Interact with the Crowd	Combination of workshops and online Community
Communication Channels	IT-enabled, wide-reaching & connected across multiple platforms
Crowd Incentives	Predominantly Intrinsic
Who	Product / service users, employees, subject specialists & value chain partners

Table 4.1 Overview of the Open Business Model Innovation Project

Event	Purpose	Process	Toolkit
Meetings	Generating a shareable business problem with the crowd. Defining the crowd process.	Uncovering business problems, identifying challenges from the business problems, defining challenges, workshops and online process.	• Top level decision makers. • Deep understanding of the firm internal/external environment. • Multi-team approach (university team and firm team). • Access to strategic / supply chain / diverse knowledge. • Business Diversity Challenge • Business Model Challenge • Service Innovation Challenge • New markets/conditions challenge
Workshop 1	Starting a dialogue with the crowd to understand the business problem widely and from different perspectives. Encouraging idea and knowledge exchange.	• Sharing the business problem, introducing the crowd to the firm, its internal and external market environment. • Firm presentations, questions, and answers with directors. • Introductions to the firm's products and services.	• I = P x S x E (Innovation = Problem x well understood Solution x plan of execution) • Service Innovation Challenge • Persona's challenge (healthcare professionals, patients, patient's families, stakeholders) • Unmet needs of personas • Solving unmet needs • Service Blueprinting
Online Platform	Creating a diverse online dialogue between the firm and crowd. Generating valuable solutions to the complex business problem.	• Online crowd guidance • Populate platform with workshop ideas from the originators • Facilitating a discussion between the crowd members and firm • Invite additional crowd participants	• Multi-function online platform • Voting functionality • Popularity functionality • Idea posting functionality • Discussion Functionality • Document / Picture / Video / Visual functionality • Management communication functionality • Statistical analysis functionality • Social media functionality • Multi-device functionality • Notification functionality
Workshop 2	Analysing the results from the online platform. Agreeing on next steps for the firm.	Facilitating a discussion around the crowd ideas. Modelling and building the ideas into realistic propositions.	• Online Ideas • Top level decision makers • Service Blueprinting • Idea owners • Crowd members • Reviewers

Table 4.2 Tools and techniques used in each data collection point

As adapted from (Miles et al., 1994)

Following is an explanation of the business model development phases for each component;

Component 1 (Initiate)

In the initiate phase, directors collaborated with the 'university team' to build a common understanding of the objectives of the project and, in particular, on how to make sense of the business problem to take to the crowd. Two meetings with firm managers were conducted and secondary data and company reports analysed. In this phase, the needs, obstacles, and opportunities of Physical Healing were uncovered and defined.

Needs- Physical Healing wanted to find a business model to allow expansion into new markets with their current new technology range. The directors were responsible for the overall strategy and organisation of the firm, with the aim of providing rehabilitation engineering technology and related services within the United Kingdom. This involved working with a number of partners throughout the UK and abroad. In order to capitalise on the firm's expert knowledge and know-how, the directors decided that including services associated with the technology they provide should play a central role in the business. Providing services would give the firm new growth opportunities and an opportunity to have profit growth independent of their larger partners. The firm traditionally had a diversity of ways of delivering services and products. For example, some products were sold directly to the NHS, whilst others directly to businesses who re-sell products (expert customers). The problem Physical Healing Ltd. faced was in taking the diversity of ways of delivering services and experiences and turning it into a scalable business with different experiences and market offerings. Traditionally, Physical Healing's main market for its product was comprised of 100% orthotics in the NHS. The firm saw this vulnerability. Hence, they added more specialist rehabilitation technology, delivered to the private healthcare market in addition to the NHS. One of the challenges for Physical Healing was that their specialist products required expert knowledge wrapped around them to be effective, in what they do, and for that reason, they had difficulties in scaling the business. The difficulty faced by Physical Healing was in providing high-value products with service across the UK, whilst providing the same service level to their customers. So, scaling their business had been a problem.

As such, the market split gradually changed over six years to 70% / 30%, with 70% of the new technology going to orthotics and NHS whilst the remaining 30% reached people using at home. In the previous six years, Physical Healing managed to enter a new market by

aiming to reach the end-users of their product. The following needs were identified in the first two meetings with the management team;

1) *Scaling the business;* how can Physical Healing scale their niche products to more mainstream markets that could be offered through different ways of partnering using existing suppliers or possibly joining with new partners or starting to sell direct to the NHS or others and so looking at the current business model and thinking about new ways of operating.

2) *Developing a new service experience for new technology*; although Physical Healing has helpful, popular products, how could Physical Healing develop services that complement those products or make those products more complete or more attractive by adding services on top of the products offered.

3) *Establishing new markets or conditions;* to comply with British Government policy and new health conditions, Physical Healing needed to develop a new market for the business in new ways.

Obstacles – Physical Healing works daily with patients who experience chronic and debilitating illnesses and injuries. To ease their daily living they apply specialist knowledge with an extensive product line. The business challenge had been to connect externally and develop their limited working partnerships with healthcare professionals and carers, families and end users of theirs and similar products to gain insight, knowledge and new ideas of how to develop new services to enhance their existing products. Whilst it was envisaged that the relationship with the NHS would be enhanced, the company would also be able to understand their market threats and weaknesses. Physical Healing required tested and validated technology to sell the NHS as a total entity. One director said, "*There's a lot of repeat business its unfortunately quite concentrated in relatively few businesses*."

Additionally, six years ago, Physical Healing began investigating niche technologies in the rehabilitation sector to offer to the UK market. They managed to help develop and obtain new

value-adding niche technologies. This resulted in two new high value technologies with long sale cycles able to serve the business to business market as well as business to consumer market and as such the technologies required different ways of trading than what was done in the past. For these newly introduced technologies, managers mentioned their challenge by saying *"I'm nervous about increasing the volume of prospects that potential clients we have to deal with unless we can handle what happens at the ground you know the interface with the client and one of the limits to that is how to deliver that personal service effectively at scale at a distance."*

The managers could also see the other challenges relating to growth and managing such growth with their new high value adding technologies. This is highlighted by one director mentioning "*It's very easy to say well, you just hire more people, but it's very difficult to borrow money at reasonable rates, for growth, and we've always, through the whole time of business, we've grown steadily, without external finance, it's just like literally nothing there but the bootstraps, so probably we could have grown faster with external finance, but we also would have been in a greater risk inherent with that."* So the main threat for the future for Physical Healing is not just managing growth and but also managing to scale the business despite competition and changes in the marketplace.

Opportunities - Due to new UK government policy, where healthcare is delivered predominantly in the community, Physical Healing had an opportunity to reach end users. End users would be patients, NHS / healthcare managers, or third party suppliers. This new policy enabled the SME to offer a new service experience for patients treated at home with their new technology, highlighted by one director, "*if you look at it 5 years ago the coin was flipped because there were people starting to go out into the community people are now in the community you're hardly in hospital before you're out of hospital so what keeps you at home is the right equipment and I don't mean that in a clichéd way the right equipment in the right place it is if you've got it it's there if its fitted properly and you get benefit from it so, for example, a standing frame could be in your house but if you're not standing in it properly supported then it's no use to you know so its factors like that that we need to look at the product actually meets the environment."* He also added, *"To explain people usually*

associate treatment with a hospital bed you know it's a perception of where healthcare is delivered, although it's now is in the community."

Physical Healing also had an opportunity to meet patients' unmet needs that the NHS is unable to, reflected in a manager's thought *"the reality is at the moment there's a gap between the expectations that people have when they are rehabilitated, a gap in expectation. People have always, like my age are led to believe that the NHS will do everything for you and you've had a stroke and you'll be treated but unfortunately the NHS doesn't have the resource perhaps to allow people to achieve the potential for recovery so there's a gap between people's expectation and the reality of what the NHS can deliver."*

Component 2 - Understand Needs

In this phase, the aim was to discover, understand & define Physical Healing's problems and how they could create value for their customers. An initial workshop was held, where the managers engaged in a learning activity with people from different backgrounds, around the available choices, to inform how the firm would work with the crowd (workshop activities, online platform, crowd motivation, crowd activities and employee/crowd interactions). We engaged in sourcing new ideas for Physical Healing's new high value adding technologies. Participants in the first workshop helped to begin internalising the ideas through an open dialogue in understanding new directions in value creation.

The workshop aimed to understand the nature of the customers and their problems and tried to develop solutions to their problem. 22 participants with diverse backgrounds attended the workshop, including healthcare professionals, biotechnology experts, designers, inventors, mechanical engineers, academics, marketing professional and so on. The workshop opened a dialogue with the participants to define key stakeholders and understand the stakeholder's unmet needs. Participants were divided into different groups and completed three different activities. In the first activity, each group defined stakeholders using the persona empathy tool to understand how stakeholders are thinking and feeling about the health problem they face. We asked workshop participants to temporarily place themselves into a similar position and imagine how somebody (i.e., patient, doctors, NHS employee, patient carer and so on) else might think and feel in a particular context. We asked workshop participants to discuss

and complete a worksheet that reflected on what patients might feel, think, and do whilst living with their conditions. The Personas helped identify the key stakeholder's problems, expectations, and frustrations, and helped bring the stakeholders 'alive' by giving them names, personalities and accompanied with a drawing.

Figure 4.4 Workshop Personas

Participants considered the stakeholders' motivations and challenges; what problems do our stakeholders face? Can you find new ways of cooperation and collaboration with your technology? Why are our stakeholder problems important? Why have their problems not been solved yet? How can you connect your technology to stakeholder problems?

The participants defined four key stakeholders and their unmet needs as follows;

- **Service Users** - This category consisted of the actual end users. The participants defined the following unmet needs for this category;
    - Understanding recovery progress through measurement to motivate service users and family.
    - Understanding the trend of user's performance to reduce anxiety whilst increasing motivation.
    - Involving family in the recovery process.
    - NHS treatment is often not measured, making it difficult to see progress.

- **Carer -** This category consisted of the friends and family providing care to end users. Their unmet needs were;
    - Availability of appropriate rehabilitation technology within the home.
    - Training on the rehabilitation technology.
    - Cost of rehabilitation technology.
- **Healthcare professionals -** This category consisted of doctors, nurses and others who administer professional healthcare.
    - Limited business knowledge of the wider NHS operation.
    - Difficulties in managing stakeholder expectations.
    - Wider communication and connection.
- **Healthcare managers from medical supply & private companies**: Their unmet needs were:
    - Lack of training, education, and experience.
    - Access to the right people and equipment at the right time.
    - Up-to-date information.
    - Managing cases efficiently and effectively
    - Appropriate management systems.
    - Personal skills update.
    - Increased awareness of new ideas.

Idea Generation

At this stage, an online platform was used, to obtain suggestions from the crowd. The platform provide was provided by a UK-based SME providing online crowdsourcing tools for facilitating innovation and co-creation among internal and external crowds of various sizes.

The platform ran for six weeks in total, with one challenge displayed on the platform, the 'Service Innovation Challenge'. The platform was organised in three phases. First, the crowd defined unsolved problem areas, similar to that described in the second component. Three problem definitions from the workshop were used to start conversations between the participants. In the following weeks, users were asked to define solutions to those problems, involving brainstorming and building on each other's ideas, in the final week, the online participants started thinking about implementing the ideas.

Physical Healing defined the governance of platform based on seven criteria, see Table 4.3. The managers decided that their problem was complex, requiring a theory-based search, with Physical Healing holding the ownership of ideas and information on the online platform. Online participants were motivated with small gift incentives but mainly intrinsic incentives. Physical Healing decided to have broad coverage, however only inviting trusted participants onto the platform including trustworthy customers, healthcare professionals, suppliers, university students, and academics from different fields, government partners, and external industry experts.

Problem Complexity	***Direction of Search***	***Ownership***	***How***	***Channels***	***Crowd Incentive***	***Who***
Complex	Theory-Based - University team facilitated the conversation	Firm-Crowd sign a contract when you enter the platform	Collaboration-crowd could build on each other's idea	Lateral, IT backed, widely advertised	Predominantly Intrinsic	Broad coverage of those holding relevant knowledge

Table 4.3 Online Platform Management Decisions

The platform's architecture features provided participants with two complementary options. 1) Users were able to submit entirely new problems/solutions and ideas and/or 2) build on existing problems statements/solutions and ideas. Figure 2 shows the front page of the online platform, including the leaderboards. Leaderboards were the primary basis for value proposition development and used to document ideas, an individual's ranking in terms of quality and quantity of contributions respectively. All participants could comment on existing ideas, which drove cooperation and co-creation.

Figure 4.5 Physical Healing Ltd. Online Platform

When the platform closed, there was 25 ideas, with 112 votes, the four top voted ideas were:

Rehashare*: "No one uses a rehabilitation machine all the time, so it would make sense to share the cost of it with others. But, of course, the problem is finding people with the same therapeutic need in the same region. So perhaps the company website could help facilitate the organization of some form of "group purchase" of machines or therapy. Patients (or perhaps therapists) could register an interest in being part of a group purchase in the same way sites such as http://www.buyinggroups.co.uk/ do for various consumer items. In the USA (amazingly) there appears to be a site attempting to facilitate the group purchase of "drug rehabilitation" services http://www.rehabs.com/deals/ and others orientated more towards healthcare professionals rather than patients http://www.healthcarebuyinggroup.com/"*

Second life of used equipment – remanufacturing: *"The high-value products can be remanufactured. Remanufacturing is one of the product recovery option in which a used product can be brought back to a condition at least equal to that of a new product in terms of*

quality, performance, and warranty. The used product can be disassembled, into components, which then will be cleaned, inspected, and tested to verify that they meet the required quality standards to be reused without further work. Those that do not meet the requirements can be reprocessed via remanufacturing. If this is not possible due to technological issues or economic reasons will be replaced with new parts. The remanufactured parts will then be reassembled together with new parts into the product."

Ananet and Ana-phone: *"In order to "delight our clients with service and support at distance" and to scale up, the business needs to create Ana-net - a space where product information, therapist training and support materials, carer information and related can be held and disseminated. Creating a portal with a mix of documentation, video content accessible to "business customers", "therapists", "end users' carers", and "end users" would create a space for both business to business and user community interaction, company mediation and more. Under this platform, there will be many services could be offered. Ana-phone is a service that would allow those whose issues were more urgent or less well met by community support could access a specialist or peer by telephone -this could be managed by the company, a contractor or via a network of distributed therapists on a paid for, call back basis."*

PhysicalHealing @ hospital: *"Could Physical Healing have bases in the hospitals that deal with, for example, spinal cord injury to be closer to the patients and medical staff? A more joined up and fluid service could be formed around the patient who will be able to access the expertise and knowledge within the care facility before going back to the community."*

Appraise

In this phase, a workshop was organised to review and assess the value of the crowd ideas for the new service experience for Physical Healing's new high-value technologies. The SME's managers, three Governmental department employees (Innovation Division managers), academics as well as some top idea related sector specialists were involved in this workshop. There were 15 participants were divided into the three groups.

Each group mapped out the service touch points in order to understand the end user's journey as well as his / her needs at a certain time and his / her interaction with technology-driven service. According to Risdon (2013) as cited by (Lähteenlahti, 2015) touchpoints are "all of the contact points between the customer and the service provider, which involve an interaction with a human need in specific time and place." So touch points are things that people interact with all the time. Web, print, phone, people, anything they can touch, see, hear, taste can be described as a touch point. By following the Bitner et al. (2008) framework, a service blueprinting approach was used to understand where value could be created through the different touch points by defining five key stages; 1) aware, 2) join, 3) use, 4) continue and 5) leave. Participants needed to define each key stage. For example, on Amazon.com, the touch points include the web platform, how a person signs up, how a person engages with the platform and the delivery partners that they use, which are all integral to making the service work effectively. So there are five generic stages to service life.

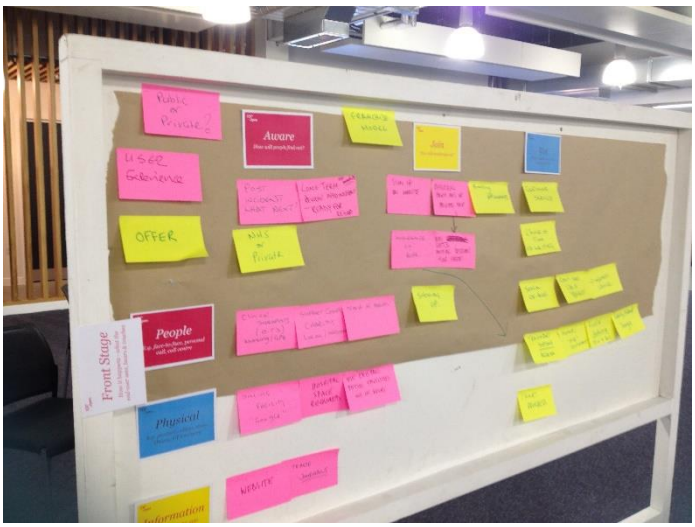


Figure 4.6 Service Blueprinting

Ananet: ***"****The intention was to provide an online facility that would deal with many of the pre-issues of service delivery and support people who would seek to interact with Physical Healing's technologies. This service could offer different experiences to the end-users; such as ananetwork, anaphone etc. The portal would allow a range of media, text media, images, audio-visual, podcasts, that would support the communities of practice, ananetwork, in effect, okay, and provide a cluster point where that information could be gathered, shared,*

disseminated, in an overlapping set to different communities of interest and practice, and could have supporting infrastructure that would allow discussion, conversation, question and answer. Anaphone is a proximal guide, so it could be anaSkype or anaVisualCommunityHangout, or so that people can have a conversation. So the idea is very much about creating infrastructure around which the thing can be disseminated, and that portal could support communities, it could support the network, it could support product sale, it could support re-manufacture It's just a cluster point for that information, but with support of real people doing real stuff with the product and on a 25% billing budget."

Ananet was very much about creating communities of practice, communities of purpose, and discourse within the user base. It was suggested that Ananet could be facilitated by communities of users, carers, therapists, and clinicians, who either support the users of the equipment or who would influence the purchase of equipment, but in effect, communities of interest, who have an involvement and engagement. One participant said, "*I noticed somebody had communities and community use, which is a kind of enactment of that in the real world, this was more a virtual community of online computer-aided supported at a distance, but it ties in, I think there is also an idea coming in at therapists."* The director of Physical Healing was conscious about "*how to make it vibrant, and with all our communities it's a challenge to get that momentum to see them grow."*

Value Development

Considering what, who and how questions for the three ideas (Rehashare, remanufacturing and Ananet) a value proposition for the SME can be developed.

Who should we serve?	*What should we offer?*
• Current Users, who no longer need the equipment or would like to upgrade or have been advised to start work on another part of their body. • New users who have been advised to use rehabilitation equipment but are price sensitive. • Healthcare specialists (doctor, nurse, organizations who provide services, career etc.) • Online information platform for equipment users, offering community support, access to healthcare professionals, informational videos and	• Providing, dynamic fluid service. • Easy access to expensive rehabilitation equipment via providing product access at the right time and place. • Competitive pricing. • Convenient locations. • Professional support. • Risk reduction • Opportunity to sell back used equipment. • Accessible to a wider range of people.

documents.	• Convenient and usable service. • Easily accessible specialised information via Ananet • Ease of access to expensive rehabilitation equipment. • Range of payment options. • No health board waiting list – flexible booking system.
How should we offer it? • Define different customer touchpoints and develop services for each touch point • Collaboration with stakeholders, for example, partnering with healthcare specialists, pharmacy chains, current hospital partnerships, support groups for space and access to customers, local authorities for space and so on. • Using key resources (e.g., Physical space and human resources) and developing key competitiveness around each touchpoint service • Defining different places to use services • New marketing strategy for the 'old' and 'new' products. • Develop human resources competencies to monitor, update and communicate across the firm, customers, and partners, linking to social media.	

Table 4.4 Three ideas to develop a value proposition

In explaining how Physical Healing developed value propositions for the top agreed-on ideas in I found:

- *New offerings*- Physical Healing combined three ideas (re-share, ananet, remanufacture) to offer new services for its technology. The idea behind ananet could be linked to the re-manufacture idea via the production idea or sharing idea, where their technology could be returned and re-used. As such, offering a community of practice web portal would allow the SME to apply the reuse of its equipment based on the 'sharing economy' principle. The sharing economy principle is about building socio-economic ecosystems in order to share ideas, experiences, physical resources (i.e. non-use equipment) as well as intellectual resources (i.e. knowledge about the health conditions and available technologies and their usage). The equipment may no longer have utility to its owner due to the changing user conditions (i.e. sadly people die or their condition worsens or people

recover). As such, Physical Healing could offer a web portal to develop economies of scale / more leverage to negotiate/preserve price.

- *New customers and segments* - For the first time, Physical Healing applied a diversification strategy to start offering new services for end users using their technologies.

- *New channels*- Physical Healing was also able to find new channels to sell its technology via offering new experiences through the community of practice as well as the sharing technology concept. To enable the Anatrade community of practice to happen, Physical Healing thought about including different partners, with the ability to act as channels to system designers, producers, integrators and potential end users (patients, careers, health specialists). These channel partners would be highly involved in the test phase of the project, also acting as the primary stage-gate managers in order to ensure that the evolving outputs are relevant to the wider healthcare sector.

Table 4.5 outlines each component in the process, with representative quotes from those involved.

Component	Representative Quotes
1 Initiate	having such a dependence on a small number of clients the business had developed we saw a vulnerability and for that reason about 6 years ago we started to look for other if you like niche products in the rehab sector that we could uh offer into the UK So the main threat for the future is one of just managing growth and managing to scale the business despite competition and kind of changes in the marketplace
Component 2- Understand Needs	we really want to understand the problems faced by people in this world that we'll come to understand figure out what these problems are and the opposite problems we really are looking at giving equipment to people where there's an identified clinical need there's something whether it's an injury it's been an illness that been a chronic or acute scenario where we are looking we are working with healthcare professionals in that but very importantly applying this to yourselves to come to terms with a condition that they would not otherwise want but they have and that would very much be from spinal cord injury to a person that's got an aggressive degenerative condition

	Another unmet need is how to manage the personal skill updates
Component 3 – Idea Generation	To increase awareness of new ideas, just awareness, not just in her own field. Why is it important? Well, without this awareness she'll miss opportunities for getting the best results. Why isn't it addressed? Well, probably again, time. Maybe there isn't resource, an easy way of doing it. Maybe she doesn't know how.
Component 4- Appraise	In context, some of these service specialist products are quite valued, and they use probably people who need them at home. One of the questions that surface frequently from those that provide finance is, "can you show the value when you show the evidence" that this is working well for this person. The ability to remotely measure performance and progress is very useful ammunition for us, and the thought was using, am, sensors with the person's permission. Mobile phone technology perhaps, "is the means of transmitting information." My ideas actually blend with other ideas, and the first Anna-Trade was, actually, it wasn't the first, but Anna-Trade was all about the notion, for some of us it's been this equipment is fairly expensive okay. Now cost is a relative thing and two things that come to me relating to cost. This one relates to the re-use of equipment because sadly people die or their condition worsens or fortunately people recover, and hopefully, more people recover. There is a point in time in which equipment, when people have procured, doesn't benefit their need. Okay, so the idea behind Anna-Trade probably limits to the manufacturing idea, and the cost reduction idea or sharing idea is that very useful equipment may no longer have utility to get to
Component 5. Value Development	product range we work with healthcare professionals within professional groups which are also associated and members of different professional bodies so from our professional development So the kind of unmet bit was probably to have rehab at home would provide the opportunity, the optimum level of therapy and would maximise the quality of life for both the patient and carer Well, just awareness of new technologies, new approaches, new advances in medical sciences it was about by using a community of people also similar to even share in communities that need the product to travel to these places, and be accessible to them, and having the expertise, and at that same time to be able to help other people.

Table 4.5 Five components in Open Business Model Development

Key Learning Points from the phase 2

During and after phase two it became apparent that there was a number of questions underlying the entire open business model development process. Building on the findings

from the previous two phases and on the relevant literature, fundamental questions for developing business models from each phase were developed and outlined in table 4.6.

Five Questions Underlying Open Business Model Innovation Through Online Platforms

Component 1 (Initiate):

How are we currently creating value with our technologies? What's changing?

- Needs: What products and/or services are you trying to offer and/or combine? Who are your customers? How do your (business) customers compare (size, products/services offered, who are their customers)? What is your product and/or service portfolio? What niche / new products have you launched recently? What is your market reach? How has the business been growing? What did your firm look like 6-8 years ago? What's changed?

- Obstacles: Do you anticipate growth with your current technology? What will your firm look like 3 years from now? Does your current knowledge, skills, human & technological resources, networks and funding meet your growth requirements? What problems do you face connecting your technologies to current and adjacent markets?

- Opportunities: What problem themes can we solve? How is our market changing? What do our adjacent markets look like? How are they developing? How could market changes be applied in our company with our technologies?

Component 2 (Understand Needs)

Who are we aiming to create value for?

- Who are we innovating for? Understanding stakeholders – their motivations and challenges, what problems do our stakeholders face? Who are we innovating for? Can you find new ways of cooperation and collaboration with your technology?

- Problem definition- unmet needs- what problems could be solved for an end user? What's the problem you're solving, and for whom, who is the most important? Why does it matter? What difference does it make, and why has it not been properly addressed yet? How can you connect your technology to stakeholder problems?

- The solution for problems - What's the best alternative to your solution, if nothing? What value will your solution deliver for the customer or the user, and how will you know that your solution actually works?

- Mini business plan- What's the idea in a nutshell? Why is it different? What are the benefits of this to the user? To your firm? What's the business model? Give us a sense of how the benefit and the value will flow, and what's the plan? What do you do next? What do you propose will happen next?

Component 3 (Idea Generation)

How do you organise a collaborative, online community?

- Problem complexity: Is the type of problem we've uncovered simple or complex?
- Direction of Search: Theory-based or directional search?
- Ownership: Who owns the ideas and content posted online? Mixed or firm models?
- How: Crowd platform approach: tournament, user community, collaboration or crowd labour?
- Channels: How do we reach people?
- Incentives: What incentives do you we give the crowd?
- Who? Who is in our crowd?

Component 4 (Appraise)

How do the ideas unlock the value embedded in the technology and translate into market outcomes?

- Business Model Success Factors: Pioneering, Practicality, and Profitability,
- Business Model Success Factors: Who? How? What? Value?

Component 5 (Value Development)

How do we commercialise our technology in new ways?

- Value Proposition: What are our new offerings? Who are our new customers and what markets are they in? What are our new channels for reaching the customers?

Table 4.6 Emerging Questions for Each Phase

In addition to understanding that the SME managers, employees, university team, external participants, and crowd were providing answers to the questions in table 4.6 I found that the process was not linear but cyclical. It was common for the SMEs to look back to previous phases, whilst simultaneously looking forward and starting to develop business model blueprints in their minds with the help of external knowledge. Iterating between the phases also developed the value proposition, at each stage the value proposition was being built and changed as the managers cycled between the phases.

The underlying questions and data from the project enabled the development of the updated open business model development tool, presented in the next section.

4.4 The Open Business Model Framework

This five-phase process builds on and connects the crowdsourcing and business model innovation literature, whereby triggers perceived in the external or internal environment lead to the launch of an open business model innovation project including an online platform. Understanding the business challenge (initiate) is then subject to a dialogue between internal and external actors (understand, discover and define), a creative online process (ideate) followed by business model prototyping (review and form). It's anticipated that the process will be shaped in large part by the conscious and thoughtful actions of participants, also worth being aware of is the unintended actions and consequences by participants which could affect the process. My framework (see Figure 4.7) suggests that business model development efforts are highly iterative. I observe that knowledge flow during business model development in a technology context is very much cyclical with cycles showing progression and in some cases a convergence, of assimilation, and exploitation. A key feature of the framework is that it does not assume a static sequence of activities. The process of innovation is complex and cyclical. This is addressed in the model by focussing attention on how participants progress through the process and iterate among the five key activities. For example, the activity 'value proposition' involves the firm and participants iterating between initiate, discover, understand and define, ideas and review and form.

Initiate

Needs and Obstacles - Current literature implies that managers are motivated to apply open methodologies for business model innovation by understanding that firm needs and associated obstacles cannot be solved internally. This is usually characterised by managers identifying gaps in the firm's current and potential performance. Gaps are typically the needs and obstacles which sabotage current firm performance, in addition to new options available to the firm or environmental changes. Managers may assign such gaps as shortcomings in applying innovation practices or after receiving inadequate results from a local, problem-driven search and so a broad, external search is launched.

Opportunities - Recognising opportunities is the outcome of uncovering and understanding firm needs and associated obstacles which need consideration by management. Opportunities are a response to recognised needs and obstacles that can be shared externally. Generally described as "challenge statements", opportunities described in this way assists in opening a dialogue between the firm and the external environment. I propose that external knowledge integrated with firm knowledge results in business model innovation. Shareable opportunity "statements" enable firms to identify and receive a range of knowledge, with ideas at the abstract end and new practices and methods at the applied end.

Discover, Understand and Define

The Discover, understand and define component refers to the activities involved in supporting project participants exploring new ways in which firm technology can be applied. Here, participants focus on two aspects of a new business model: 1. "Who are we innovating for?" And 2. "What are their unmet needs?" It is at this point where the project participants link the firm's needs and obstacles with the lives of their stakeholders.

Collecting knowledge from the external environment in this component is a vital phase in open business model innovation. This mitigates against path dependency together with unspoken firm traits and their industrial context, which has the potential to restrict an all-encompassing informational process needed for developing new business models. That said, there is still merit in having knowledge inflows similar to the firm's current business model as it may be more easily integrated.

Ideate

The ideate phase consists of all the activities involved in setting up the online phase of the open business model innovation project. In this phase, participants discuss, vote and develop ideas online. Whilst the online discussion is active the SME managers review and develop, along with the voting statistics from the online participants, ideas to take forward into the "design and form" component of the framework. Table 2.11 recommends seven elements for managers to take into consideration when working with online participants to generate new ideas for business models: *problem complexity, the direction of search, ownership, how, channels, crowd incentive and who?* Although every element holds distinct advantages for

operating crowd platforms, business model innovation is more likely to be achievable in their joint application.

Design and Form

The design and from component comprises of the activities concerned with "working up" the business model. This includes the full evaluation of ideas and new knowledge to the firm. The evaluation analyses the online ideas, discussions, quality, and voting. At this point, the SME managers also seek to develop and make sense of the emergent value propositions and use of their technology in other markets and how that can be realised.

The framework outlines the key activity in this component as "unlocking ideas". Using pre-defined appraisal criteria the SME alongside participants involved in the project score the applicability of the online ideas. Subsequently, participants then consider their scoring results as "one team" taking into account all the expertise in the room. Consistent with other researchers in the field e.g. (Franke et al., 2006, Moreau and Dahl, 2005, Poetz and Schreier, 2012) the value of the ideas are scored using three criteria: (1) Pioneering - evaluating the ideas with current solutions across the knowledge and technological landscape, (2) The profitability of the idea and the ability to solve problems whilst generating new streams of income and (3) The Practicality of an idea, the conversion of the idea into a commercial merchandise, taking into account the technical and economic factors (Poetz and Schreier, 2012).

Value Proposition

Central to business model innovation, the value proposition in my framework is developed and advanced as the SME and participants pass through each component. Developing the value proposition encompasses stating and clarifying the new value proposed through the ideas. The new relationships the firms will have with new customers, their associated markets, the new channels are outlined throughout progressing through the framework.

New offerings – describes how the firm can connect their products and services in resolving the unmet needs of customers.

New customers and markets – describes the new customers/markets the SME will serve with their new business model.

New channels – describes the delivery of value to customers.

New customer relationships – describes the ability of the SME to develop new customer relationships.

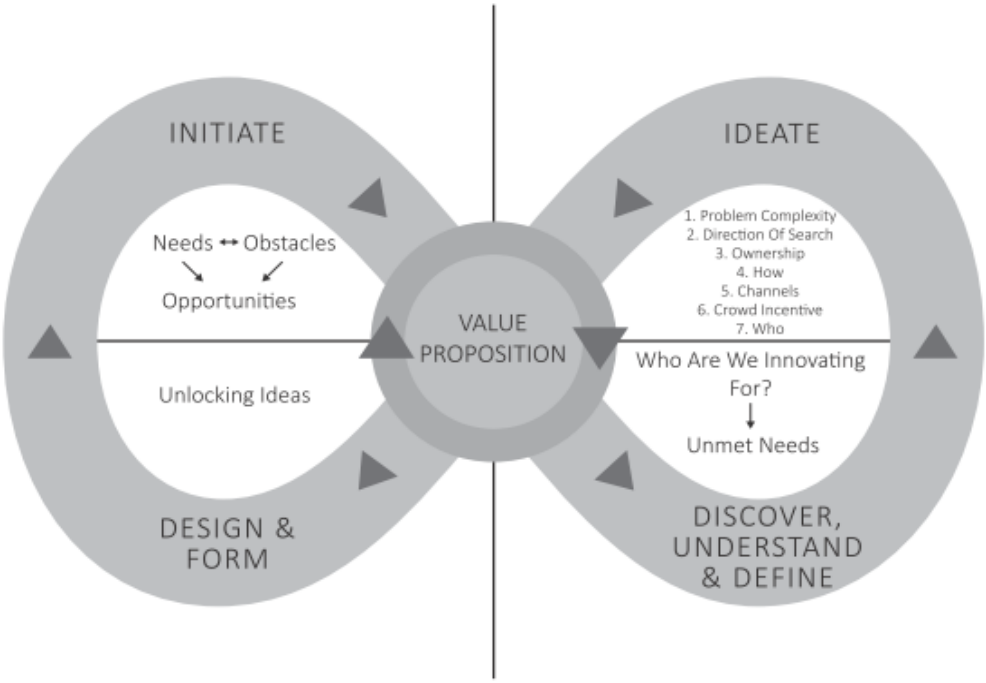


Figure 4.7 Open Business Model Innovation Framework

4.5 Phase 3- Applying the Open Business Model Framework

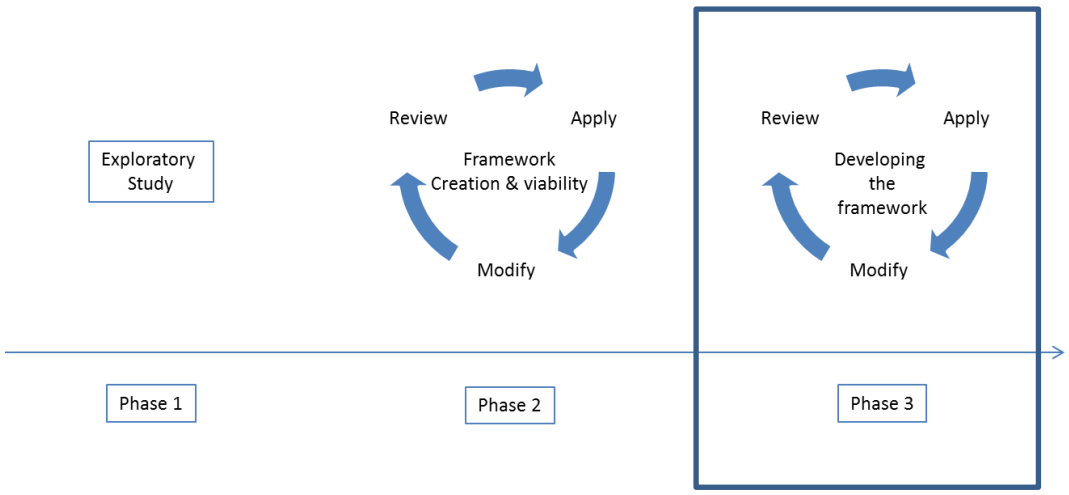


Figure 4.8 Action Research Approach – Phase 3

Auto Ltd

At the time of the study the Glasgow site employed 104 employees, among who included: directors and management team, engineers, technicians and design artists. These groups were responsible for creating strategies for product design and development based on expert knowledge and analysis of the global market, customers, and competitors. Following a turbulent period, affecting the firms and its employees, Auto's directors decided that innovation should play a central role in business strategy. To reduce possible biases associated with Auto's innovation strategy, my study focuses on the Open Business Model innovation project, as outlined in table 4.7.

Event		Purpose	Process	Toolkit
	Meetings	Generating a shareable business problem with the crowd. Defining the crowd process.	Uncovering business problems, identifying challenges from the business problems, defining challenges, workshops and online process.	Top level decision makers. Deep understanding of the firm internal/external environment. Multi-team approach (university team and firm team). Access to strategic / supply chain / diverse knowledge. Active Surfaces Challenge
	Workshop 1	Starting a dialogue with the crowd to understand the business problem widely and from different perspectives. Encouraging idea and knowledge exchange.	Sharing the business problem, introducing the crowd to the firm, its internal and external market environment. Firm presentations, questions, and answers with directors. Introductions to the firm's new technology.	I = P x S x E (Innovation = Problem x well understood Solution x plan of execution) Active Services Challenge Three-minute joint venture Factory/facility tour Technology demonstration Problem Pow Wow Dot Voting Investible propositions and storyboarding Pitching ideas to Auto Ltd.
	Online Platform	Creating a diverse online dialogue between the firm and crowd. Generating valuable solutions to the complex Active Surface Challenge.	Online crowd guidance Populate platform with workshop ideas from the originators Facilitating a discussion between the crowd members and firm Invite additional crowd participants. Involving employees from all sites.	Multi-function online platform Voting functionality Popularity functionality Idea posting functionality Discussion Functionality Document / Picture / Video / Visual functionality Management communication functionality Statistical analysis functionality Social media functionality Multi-device functionality Notification functionality Motivational Prizes

	Online Platform	Creating a diverse online dialogue between the firm and crowd. Generating valuable solutions to the complex business problem.	Online crowd guidance Populate platform with workshop ideas from the originators Facilitating a discussion between the crowd members and firm Invite additional crowd participants	Multi-function online platform Voting functionality Popularity functionality Idea posting functionality Discussion Functionality Document / Picture / Video / Visual functionality Management communication functionality Statistical analysis functionality Social media functionality Multi-device functionality Notification functionality
	Workshop 2	Analysing the results from the online platform. Agreeing on next steps for the firm.	Facilitating a discussion around the crowd ideas. Modelling and building the ideas into realistic propositions.	Online Ideas Top level decision makers Service Blueprinting Idea owners Crowd members Reviewers

Table 4.7 Tools and techniques used in each data collection point

As adapted from (Miles et al., 1994)

Component 1 (Initiate): How are we currently creating value with our technologies? What's changing?

In the initiate phase, directors collaborated with the 'university team' to build a common understanding of the objectives of the project and, in particular, on how to make sense of the business problem to take to the crowd. Two meetings with Auto's managers were held with secondary data and company reports being analysed. In this phase, the needs, obstacles, and opportunities of Auto were defined.

Needs – [redacted]

[redacted] (This text has been removed in respect of copyright law).

Auto specialises in supporting worldwide Automotive Industry suppliers. The business challenge has been to connect externally and develop their limited working partnerships with other sectors to gain insight, knowledge and new ideas of how to advance their newly developed touch activated surface as one of the directors mentioned *"I think one of the biggest barriers that we've got is that we are thinking too much about the technology and less about to develop the product to fit a market or markets*."

Auto was seeking to find new markets for their capacitive touchscreen technology embedded within decorative plastic mouldings. This view is reflected in the thinking of the Managing Director: '*We tend to be very focused at what we do, but as a consequence, we probably don't think objectively in many cases, what we're looking for, is, I think from this process, is independent, articulate and objective analysis and evaluation of what we had today, and to critique that, and then actually help us with the thought processes, how do we actually develop and take this to a market.'*

The company are currently a tier 2 supplier to the automotive industry and are ambitious to develop into a tier 1 supplier. They believe that through connecting with external actors from different sectors outwith the automotive sector e.g. consumer, medical, renewables, retail, and the Government the company will gain original and fresh ideas to not only improve but break into new market sectors with a new product – the result of a 7-year research and development project.

One manager of Auto stressed,*"we are very good at what we do, we've got a good reputation and we're very happy with doing that, but it's, it feels like we are underperforming, in terms*

of what we can do. And I don't necessarily limit it to the technology that we just talked about, I think there are other areas that we can probably leverage and explore."

Obstacles – [redacted] (This text has been removed in respect of copyright law). One Director mentioned, "*The majority of what we do goes into the car industry and I have to say, that's one of our constraints. It is very very conservative in its thinking and as a consequence, we tend to follow the same trac*k."

[redacted]

(This text has been removed in respect of copyright law).

[redacted] (This text has been removed in respect of copyright law). One director stated that "*what we're not very good at is breaking out of that comfort zone with the industry sectors we're involved in*."

Opportunities – [redacted]

[redacted] (This text has been removed in respect of copyright law).

Auto is an established SME that wants to apply open innovation methodologies into its product development process. This study enabled the company to trial the open method facilitated by university expertise. This is highlighted by a director who indicated that "*creative evaluation of the cost abilities that this technology offers, to me there are a few no-brainers, but they may not be lucrative sectors, or they may not fit in a business model sense, within the infrastructure that's there, but I think there's a bit that's about unpacking, in front of people who would get excited about this technology, to capture and cluster areas of opportunity*."

Component 2 Discover & Understand & Define- Who are we aiming to create value for?

A discover, understand & define phase followed, where the managers engaged in a learning activity with people from different backgrounds, around the available choices, to inform how the firm would work with the crowd (workshop activities, crowdsourcing platform, crowd motivation, crowd activities and employee/crowd interactions). Participants were engaged in sourcing new ideas for Auto's technology in the first workshop in order to begin internalising the ideas through an open conversation in understanding new directions in value creation. The workshop aimed to understand the nature of the problem, and the possible solutions to the problems. 21 people from diverse backgrounds attended the workshop. The workshop started a dialogue with participants to understand the business problem, using the active surface technology which Auto developed. Participants were divided into six different groups and engaged in three different activities. In the first activity, each group needed to brainstorm problems that could be solved. The famous quote from Einstein was used '"*If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions*." to ask participants first to focus on best possible three problems they could

solve. Participants were asked to stay solution and sector neutral for as long as possible as they discussed the problem. There were 18 different problem ideas developed by the workshop participants.

In the second activity, participants were asked to vote for the best problems. Then the workshop focussed on the top three problems and asked the participants to define the solutions to those problems. The following are examples of problems defined by the participants;

1) Use the technology for outdoor activities – *"So if you are doing a sport, especially in Scotland, its wet and its cold, or could we use kind of platform (Auto technology) to activate? This idea is for people, sports people, people working in the outdoors, the energy sector, forestry, agriculture, etc., using Auto's technology to navigate, communicate, monitor heart rates, and listen to their iPads whatever. Generally, the solution at the moment is either to build the product so concave, waterproof that it's difficult to operate, where your fingers typically in very cold and wet weather, or it's encased in some sort of plastic sheath, which again makes it more difficult to operate. So that's the problem if it's anywhere in the outdoors'*

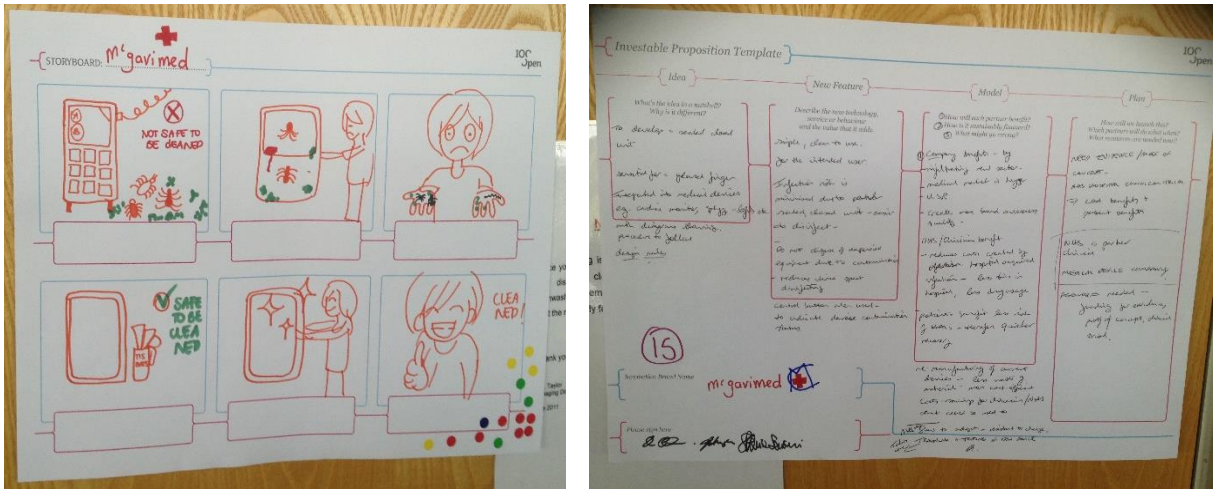
2) Hygienic water-tight surfaces - Offer a new hygienic surface interface which could be used in different sectors such as healthcare. The discussion is reflected in the following quotes; "*We've got some things down here we were talking about, they were just generic problems, but we talked about a surface that's intrinsic, it could be cleaned, doesn't allow ingress in, and that's just generic across industries and different applications, so I guess, we weren't really thinking about a specific, well, we actually did, because we were talking very much about the medical environment, but then we tried to back off a little bit and see what was actually, oil rigs, it could be petrol pumps, it could be anything, so just not allowing materials to get into the electronic unit. Also, the surface would, could be cleaned, so it's a dual benefit."*

Then, participants voted for each problem before working up some of the solutions, to the selected problems. Participants needed to create a visual story of how a user interfaces with their solution. The story needed to have a beginning, middle and an end. The participants

needed to revisit the problems, articulate them further, and then describe what the solution would look like. The first task at this stage was about figuring out what the solution might be, and to represent it on a storyboard. The participants were then asked to develop a mini business plan outlining how their ideas could be implemented by using a business planning sheet.

Using the highest voted problem idea within the workshop, Hygienic water-tight surfaces, I illustrate how participants develop solutions and the business model. The participants called this problem/solution 'Automed'. They considered using the idea to integrate Auto's technology into existing medical devices to reduce hospital-acquired infection, a big problem for the NHS. The participants postulated that Auto's technology could be integrated into *"cardiac monitors, defibrillators, any gadget and gizmo that are currently used in the medical market"*, making it "*simple to disinfect, quicker to disinfect, so you're reducing your, you know your staff time, staff cost, and obviously you don't have to dispose of any contaminated equipment, because you are able to disinfect it basically, when it is contaminated. There's a big drive to reduce hospital-acquired infections. Although similar control panels exist today, they've all got nooks and crannies where the bacteria can gather, so they're not that easily decontaminated. This would benefit the company by infiltrating a new sector, the medical market is huge. This solution would be the anti-bacterial side of it because this is a sealed closed unit."* The participants explained that it would also be an informational unit, helpful for the end user. Auto's technology also allows for a multi-functional instructional panel in it, where the participants would like to also incorporate the use of a button. They stated that a button "*flags up to say this has been used, so it needs to be decontaminated, a red button or something, so it tells you that it's been used, so you don't use it again until it's been disinfected basically. Since you need evidence to prove a concept, if everything in the NHS needs to be evidence-based basically, so you won't get into the NHS, unless you have the evidence behind it to back it up, so you wouldn't see the NHS as a partner, clinicians as a partner, as well as probably you'd see a medical device company or some or people in the industry as a partner."*

Figure 4.9 Storyboarding and mini business model



Component 3 (Ideate)

How do you organise a collaborative, online community?

In this phase, the online platform was used to obtain suggestions from the crowd. The same provider, as in the previous stage provided the online platform.

The platform ran for six weeks in total. There was one challenge displayed on the platform, the "active surfaces challenge". Three phases were included in this stage, first involving defining problems, similar to the workshop activities in the Discover, Understand & Define phase. The problems defined in the workshop were used to start a dialogue between the users, managers, and employees. In the following weeks, users were asked to define some solutions to those problems and build on each other's ideas. In the final week, users started thinking about how we can get our ideas to work.

Auto Ltd. defined the governance of the platform based on seven criteria, see Table 4.8. They decided to have theory based search and keeping all ownership of the ideas. The crowd was motivated by extrinsic gift incentives as well as intrinsic motivations. Auto decided to

only invite into the platform those that the management team could trust including trustworthy customers, suppliers, university students, academics from different fields, Scottish Enterprise partners and potential industry experts.

Problem Complexity	***Direction of Search***	***Ownership***	***How***	***Channels***	***Crowd Incentive***	***Who***
Complex	Theory-based - University team facilitated the conversation	The firm-Crowd sign a contract when you enter the platform	Collaboration-crowd could build each other's idea	Lateral, IT backed, widely advertised	Predominantly Intrinsic	Broad coverage of those holding relevant knowledge e.g. Facebook language translation

Table 4.8 Online Platform Decisions for Auto Ltd.

The platform's architecture design features provided participants with two complementary options. 1) Users are able to submit entirely new problems/solutions and ideas and or 2) build on existing problems statements/solutions and ideas. As before, Figure 2 shows the leaderboards which are the primary basis for value proposition development for Auto Ltd. These are used to document ideas; an individual's ranking in terms of quality and quantity of contributions respectively. All participants could comment on the existing ideas, which helped drive cooperation and co-creation.

Figure 4.10 Auto Ltd. Online Platform

At the end of the platform, there were 83 ideas generated, 432 votes for ideas and the three top voted ideas were;

1) *easySet: The Invisible Burglar Alarm Controller* – "There is an opportunity to create an active surface interface for a domestic burglar alarm that blends invisibly into a surrounding surface whilst providing a more intuitive interface. The easySet controller would incorporate a proximity sensor so it could activate if the homeowner passes his, or her, hand over its secret location. In activation, the 'Hidden-til-lit' display could reveal a traditional keypad or possibly a touch-sensitive dot pattern (analogous to the 'pixel-pin' grid used to unlock mobile phones with a swipe pattern) or even a number of pictures (i.e. icons). The interface could also support 'hidden' or 'invisible' buttons whose location is known only to the homeowner. E-set would be a stylish unit that allows alarms to be set and disarmed in a manner familiar to users of tablet computers and mobile phones."

2) Automed - This idea was first developed at the initial workshop and rated second best idea in the platform

3) iBar - An active surface bar/countertop that allows thirsty or hungry customers to indicate to the staff they want to be served, or review hidden-till-list lists of drink is or even to specify their order (i.e. two pints of lager and a packet of crisps) while waiting.

Component 4 - Design and Form

How do the ideas unlock the value embedded in the technology and translate into market outcomes?

In this phase, another workshop was held to review the crowd ideas to assess the ideas' value for the firm's technology. SME's managers and R&D employees were invited (6 people from Auto), Government agency employees (Scottish Enterprise Innovation Division managers), academics as well as some top idea related sector representatives. Employees were invited from Auto based on their technical and marketing knowledge. There were 12 participants. We divided participants into groups. In each group, there were two people from the firm and at least one academic to facilitate the discussion and report findings to the participants. Before the participants reviewed the value of ideas, the assessment criteria were introduced and how the ideas could be applied to Auto's technology, current market, and possible new markets. I asked each team to evaluate the top voted ideas from the platform with all the other ideas in terms of three assessment criteria. All three criteria were measured on a ten-point scale ranging from low to high value (low value= 0-9, medium value= 10-19, high value= 20-30).

Top Ideas	Idea Ranked in the platform	Pioneering	Practicality	Profitability	Total Value
White goods interfaces	7	22	18	20	62
Automed	2	25	15	14	54
Interactive Menu	35	18	15	15	48
EasySet	1	10	7	7	24

Table 4.9 Criteria ranking

Two examples from the workshop and assessment criteria are illustrated below.

Profitability was considered the most important criteria to assess the value of the product by the Auto employees and managing directors. After the first team discussion, two teams concluded the *white good interfaces idea* was the most profitable mostly due to the manufacturing cost. After discussions with sector experts and academics, they realised that large white goods manufacturers are involved in direct long-term relationships with their current suppliers, mostly located in low-cost countries. These big players have the competencies to develop their own interfaces with some already applying the 'Internet of Things' concept in their products. Profitability and practicality became questions as to whether to enter the white goods sector as Auto needed to create a focused customer engagement strategy via offering new digital features and experiences. This is where some of the big players in the sector already implement such features. After the discussion, Auto decided not to pursue this idea further.

The second highest scoring idea was Automed. The idea was considered "*highly profitable"* as the new surface could "*replace control front ends that exist which could create a massive reduction cost if the regulation is not that high on the control surface*." The idea was seen as practical since it is not actually altering the medical device, but rather altering the control front end of the device. The idea was also seen as pioneering as reflected in one of the director's thoughts, *"there are many ways of alternative applications for the dust free easy to*

clean keypad, if you will, not that particular application, but something using that technology……a medical device application, you tend to be looking at European directives, and then mapping the various directives against the product which is why my preference is towards the technical solution, rather than market, because if you identify where the most attractive opportunities sit, then adjacent to those it's very close to solving the technical problems."

Component 5 (Value Proposition)

How do we commercialise our technology in new ways?

This phase focused on the most profitable, pioneering and practical ideas and develops a value proposition for each of the ideas. Two years after Auto's involvement in the crowd-based business model project Auto states that they are "[redacted]*"*(This text has been removed in respect of Copyright Law). They successfully implemented ideas in the firm, collaborated with Government organisations as well as other companies to offer new products to new sectors. The following explanation outlines how Auto developed value propositions for the medical sector after the completion of the crowd-based business model project in the different dimensions of the value propositions.

- *New offerings*- By considering bacteria and infection problems in healthcare settings, Auto's technology offers a sealed, flat surface for medical devices which can be easily cleaned and moved onto the next person quickly and easily. Auto's technology is resistant to fluid and so human/medical liquids won't affect the operation of the machine, since 'all the 'nooks & crannies' in some devices which include dials and buttons, can gather bacteria and infections and be passed from person to person as the device is used and transported through the hospital. "*To be cleaned there is often a wait, if the device can't be decontaminated then they could be thrown out and it costs money to replace them*." An added level of assurance was incorporated into the new offering; "*As there is no point*

relying on a wipe-clean surface if it hasn't been wiped lately" therefore Auto could program the surface to be sensitive to a standardised wiping pattern.

- *New customers and segments*- This is the first time, Auto applied a diversification strategy to enter into the healthcare industry which Auto was not currently a part of, whilst also developing a new surface technology for the healthcare industry.
- *New channels*- Auto is able to grow into partnerships with the medical sectors. They are able to offer specialised technical expertise, whilst the NHS, for example, offers healthcare services.
- *New customer Relationships* - Auto considered a licensing business around its technology involving other device manufacturers. With an opportunity again to "*create a module that a number of potential partners could create their own boards and systems for*."

Table 4.10 Empirical themes and illustrative Auto case data for business model innovation.

Component 1 (Initiate):	What we are is we're all about trying to grow and invest in a business that's got a robust business plan, robust market to go after. It is very very conservative in its thinking and as a consequence, we tend to follow the same track, the majority of what we do goes into the car industry and I have to say, that's one of our constraints
Component 2- Discover & Understand & Define	Could actually be advantageous for us to develop, or should we be going to a very different area in the markets, in the broader context. I want to try and take it beyond a nice market plan, it's more about how we develop a strategic roadmap that gets us from being, I think a very competent technical plastics manufacturer, into a business that has the ability to lock in greater value into its products I would also put the caveat there, we have, an embryonic technology for us, there may be competitive technologies out there which could also move into this evolving space, where HMI technology is growing.
Component 3 (Ideate)-	widen the conversation, and to bring some new voices to the table, who could inform the breadth and scope, of the possibilities Bring in additional voices, you know design, manufacture, maybe biotechnology, maybe medical devices kind of folk, you know. Then I would imagine, some of them could get quite excited about this An online platform – there will be a demonstration of the Auto platform (at the end of the workshop). The community will be live for four weeks and will consist of phases around problem definitions and solutions. Prizes awarded for the best ideas and best behaviors. Workshop delegates will have access and encouraged to invite other

	contacts who are able to contribute. Being a small Scottish company, what is required now is a "crowdsourcing" effort to introduce new ideas from vast, international and specialist online communities, leveraging the minds and talents of many in the advancement of innovative product ideas. Such collective intelligence will give Auto global reach to gain valuable knowledge that has the potential to allow Auto to enter and compete in new markets through new and enhanced innovative products. I would find it challenging to access academics, perhaps some design students, engineering, manufacturing, aesthetic. Perhaps some bio-scientists
Component 4- Design and Form	What we want to try and do is see whether this technology can actually be taken realistically, rather than idealistically
Component 5. Value creation	as part of this process we may conclude that we need to lock into a partnership or an amalgamation with a group or a group of companies, who have got an equal vested interest in the success of it, but have also in a combined form, have got the mechanics and the wherewithal to be able to get it to market. Who they might partner with, so finding large and small partners that might be relevant to partner with I feel there's application in the kind of bio-medical devices area for this kind of technology, possible people from things like sensors or control systems, who might again be able to utilise the technology what we believe to be a potentially very interesting and value-adding technology, up through the food chain, to a level where we can industrialise and develop the product

Key Learning Points

Applying the Open Business Model Innovation Framework during phase three brought about a number of expected and unexpected results. The activities carried out in the workshops, online platform, interviews, and observations enabled Auto to identify new knowledge for creating new value propositions for the firm. Auto was also able to identify new partners based on joint interests for value creation at the same time as launching knowledge sharing networks. Unexpected results included IP risks and subsequent protection, discouraged employees and deficient leadership from the management team resulting in an open business model project that is unlikely to be supported going forward.

As an established SME, Auto is trialling a number of innovation initiatives and keen to embrace openness throughout its processes. Applying the Open Business Model Innovation Framework allowed Auto to trail the open methodology, one director said, "*evaluating the technology, within the infrastructure that's there, but I think there's a bit that's about unpacking, in front of people who would get excited about this technology, to capture and cluster areas of opportunity*."

The framework suggests that the process of developing open business models is repetitious. Throughout observing the business model development process it is clear that the knowledge flowed through cycles oftentimes merging through the process of defining problems, solutions, opportunities, and value creation. Managers and employees from Auto could see, after defining their business challenges, that opportunities were surfacing that were not identified in previous phases, one manager said, "*We have a desire to take the work that we've done over the last 18 months to 2 years on developing this technology, into something that's commercially valuable, and therefore generate value for the business. We've got to hone that down into probably one or two opportunities that we can actually have confidence that we can turn into a monetary gain."*

The results indicate that understanding the needs of the firm e.g. scalability, developing new products, new business models, in turn, uncovers the obstacles which firms face e.g. limited knowledge, skills, human & technological resources, networks and funding which prevent the

firm meeting their needs. In line with past research such needs and obstacles are examples of vague, complex problems representing opportunities which can be shared with the SMEs stakeholder and or crowd through challenges (see Table 4.11).

Key learning points	Illustrated quotes from interviews
Facilitated identification of opportunities and value creation and development (anticipated)	*We tend to be very focused at what we do, but as a consequence, we probably don't think objectively in many cases, what we're looking for, is, I think from this process, is independent, articulate and objective analysis and evaluation of what we had today, and to critique that, and then actually help us with the thought processes, how do we actually develop and take this to a market with different partners.*
The open BMI tool was appreciated for implying a vision development that would reduce constraints of being an SME with few resources (anticipated)	*I think the whole range of things, is precisely what we need, we just don't have that spark of inspiration. We are tunnel visioned, and these are constraints.*
Facilitated leaders' interest and involvement during value creation from external ideas in the online platform (unanticipated)	*The process works because there is someone, like managing director, is that involved, I'm sure at the start of it he didn't actually expect to be spending you know, every evening reading and commenting on things, but because he does, it does mean that everything gets some feedback and reaction and there are some ideas that have captured his imagination.*
Find the best way of protecting IP during the joint value creation process (unanticipated)	*Protected IP, I think it's more about, the IP really is going to be associated with the process, of how you actually enable it, rather than the idea.*
Helped to define new possible partners for a joint value creation	*what we're not very good at is breaking out of that comfort zone with the industry sectors we're involved in.*

Table 4.11

4.6 Conclusions

In this chapter, the findings of the development of the Open Business Model Innovation Framework were described. The overall aim was in explaining how, through starting with the business challenges and unmet needs of the firm and their stakeholders, firms can generate new value propositions through turning 'outsiders' into collaborators in their business model innovation process. The resulting tool and the process outlined in this chapter shows how each phase strengthens the ideas and knowledge from each person involved. It shows how the cycles of initiation, understanding, ideation, and reviewing and value proposition facilitate a

physical and digital dialogue, each time transforming explicit and latent knowledge into new combinations of technology and service enhancement. The tool, therefore, provides a more complete view and understanding that brings together the entire firm and its stakeholders in new business model generation.

5. DISCUSSION

My study of open business model innovation in SMEs helped me establish an account of the value creation process as well as the components involved in the development of new business models in SMEs. By unpacking the collective sequences that make up the foundations of the process, my study advances our understanding of "openness" that supports business model innovation (Rohrbeck et al, 2013) and online activities (Ebel et al, 2016) accessible to all firms as they take part in innovation activities with external participants.

For clarity, figure 5.1 represents the open business model development process I observed as a cyclical sequence of four macro-stages (initiate, discover, understand & define, ideate and design & form) developing through a series of activities within each stage. Still, as outlined in previous sections, the process tends to progress through multiple iterations at all stages to build the value proposition (represented by each macro-stage passing through the value proposition stage) as the firms progress through open business model development (represented by the arrows and infinity loop).

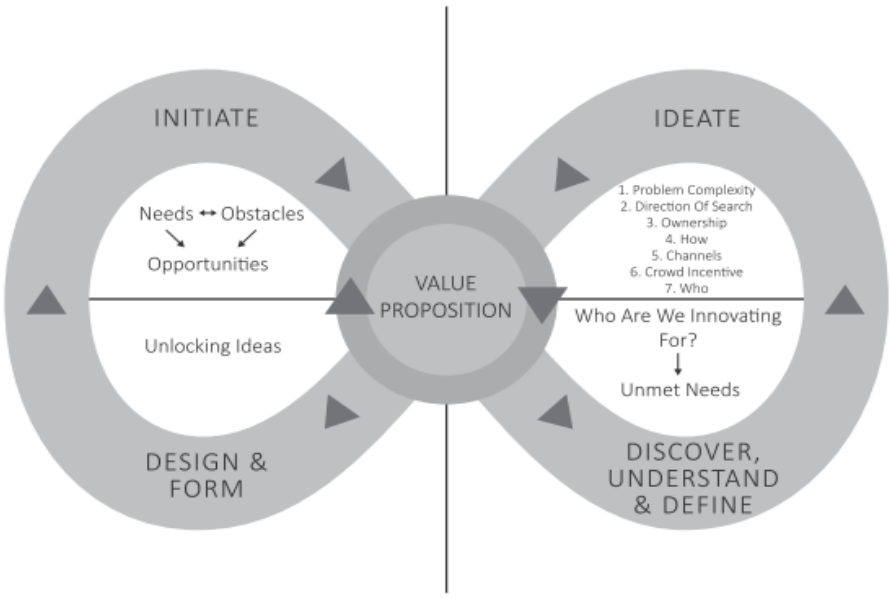


Figure 5.1 Open Business Model Innovation Framework

In the remainder of this chapter, I discuss the implications of my findings for the theory and practice of open business model innovation in SMEs.

5.1 Extending Theories of Open Business Model Innovation

My study suggests how existing frameworks offer an incomplete account of open business model innovation as they typically overlook the entire process, especially in SMEs. By doing so, my study responds to an appeal to apply "open innovation lenses" to extend our understandings of the strategic value of openness as a tenable approach in a number of business circumstances (Breuer and Lüdeke-Freund, 2017). Current accounts of business model innovation broadly reflect an increasing body of knowledge on "closed" business model innovation within SMEs (Bianchi et al, 2010). The ambiguity of business model innovation frameworks for SMEs would indicate that existing knowledge is not suitable to explain the new open condition: new frameworks need to be developed and detachments between advice for large vs small and medium firms. My open business model innovation framework begins to unpack this important shift in open business model innovation, by focussing attention on the SME and the inclusion of an online phase, versus classifying open business model frameworks based on current business model components, usually in the context of large firms.

Theories of open business model innovation have a tendency to miss the explicit activities involved in the open processes of ideation, knowledge creation and exchange. Frameworks lacking the articulation of activities may hinder the formulation of new business models. Addressing the activities involved in open business model innovation assists managers in designing new businesses, in addition to being a common way of working (Zott & Amit, 2010). Having a focus on activities, alternatively, offers the prospect of the continual coupling of knowledge in and between the stages of developing new business models. Past research, however, whilst providing an incomplete explanation in the context of large firms, is completely missing for SMEs. Mahadevan (2000) focusses on e-business business models proposing a framework assisting managers in discerning the business model from an internet perspective. Chesbrough and Rosenbloom (2002), instead, highlight the function of the business model in capturing value from technologies in spin-off firms but neglect the open process of the inward flow of external knowledge creation. The tool I'm proposing fills this gap by outlining the entire open business model innovation process in SMEs that underpins

the transition from “closed” innovating to inter-connected cycles of “openness” and business model generation, contributing a more comprehensive understanding of open business model innovation in SMEs.

The absence of fully-fledged explanations of open business model innovation in SMEs may be ascribed to a number of commonly referred to conditions affecting SMEs. Building on (Vanhaverbeke, 2017) who argues that SMEs face increasing pressures as firm boundaries continue to disappear and value creation is no longer centralised, but decentralised, SMEs face an increasing pressure to innovate differently. Accordingly, open innovation efforts happen as managers give resources to creating cross-boundary initiatives engaging in and outbound innovation (Chesbrough, 2003b), that is, they embark on “major organizational and technological changes associated with open innovation” (Dodgson et al., 2006p 333). Accounts of innovation in SMEs, however, continually document the scarcity of resources leaving little to contribute to developing new business models (Vossen, 1998). Focussing on new value propositions appears less desirable when allocating most of the firms’ resources on current innovation projects and therefore restricting opportunities for engaging customers, external workers (Ebel et al., 2016) or stakeholders (Rothwell, 1991) in ambiguous innovation development efforts. I believe that my open business model innovation tool resolves the tension of initiating “openness” with scant resources, by describing open business model development as based on four complementary cycles of open business model development activities.

As shown in fig 5.1, the first stage of creating unambiguous, shareable, cross-boundary challenges occurs as SME directors and managers intentionally engage in understanding the firm’s needs and obstacles, revealing opportunities (Initiate). New understandings result as the SME and external participants iterate through activities understanding the firm’s stakeholders and their unmet needs (Discover, Understand & Define). A third stage is linked to the launch of an online platform to host the exchange of crowdsourced knowledge (Ideate). A number of diverse, fragmented ideas are posted and considered by the SME at the same time, continually seeking knowledge for new business models. The requirement to make sense of emergent ideas for new business models sees the SME directors and managers consider each idea from the online platform to establish the possibility of creating new business models from the new knowledge. It is in this stage that the different possibilities

expressed in the knowledge and ideas from previous stages are brought to closure and linked to form new business models (Design & Form). Finally, new explanations and meanings of a range of benefits to current and potential customers are revealed as participants iterate and progress through each stage (Value Proposition).

5.2 The Opening up of a Traditionally Closed Process

Current conceptualisations of business model research highlight the activities involved in developing static blueprints of value creation and capture mechanisms within the firm. According to Teece (2010) and Osterwalder & Pigneur (2010), a business model is a framework of how a firm generates, distributes and captures value. My study enhances the dominant depiction of business model innovation as a principally "closed" activity, by presenting how external participants can be involved in business model innovation.

My observations resonate with work in "openness" advocating that, firms "must develop open business models if they are to make the most of the opportunities offered by open innovation" (Chesbrough, 2006ap 107). In line with this concept, my study implies that the inclusion of external participants advances the scope of the firm to create, collect and combine knowledge and technology. This allows a flow of ideas, discussions and partnerships and assists firms in engaging externally to build new business models that would usually be initiated and implemented exclusively inside the firm.

SME managers and participants frequently mentioned the advantages of "being connected to others" as ideas developed through "having access to other brains that we wouldn't normally have access to" and discussions throughout the process which "were wacky but broke down the barriers to our tunnel vision" that indicated how the open process enabled SMEs to engage in a wider discussion across the knowledge landscape.

Using Digital Tools

Current conceptualisations of crowdsourcing for innovation emphasise the use of crowds in business settings and the role they play e.g. Kohler (2015), Boudreau & Lakhani (2013). According to open business model scholars, capturing and exchanging ideas, knowledge, and technologies across firm boundaries create more value (Chesbrough & Schwartz, 2007; Chesbrough & Rosenbloom, 2002). My study develops and enhances the general depiction of crowdsourcing in open business model innovation as principally an "idea", by demonstrating

its use whilst in the process whilst underlining how crowdsourcing practices influence SMEs in open business model innovation.

My study resonates with current work in the value creation process using crowdsourcing, upholding that the participation of external individuals in the business model innovation process allows for superior results (Ebel et al, 2016). In agreement with these results, insights from my study propose that the use of digital tools in business model innovation extends not only the reach but assists the SME in overcoming a number of obstacles which hinder the general innovation process.

Seeking Valuable External Input

A common impediment to managers, of large and small firms alike, not intentionally involving others in innovative efforts is partly explained by the mindset that a firms' own employees carry out all creative tasks (Amabile et al., 2005, Leonard and Rayport, 1997b).

The benefits, however, of engaging with external participants in innovation is made clear by studies showing that non-creative experts often generate original ideas supporting new products/service e.g. Jeppesen and Frederiksen (2006), von Hippel (2005) normally resulting in business model innovation. Participation in the online platform, for instance, served as a digital conference space allowing continuous discussion as a basis for developing new ideas and their associated business models. Applying openness in this way created a number of ideas and experimental business models available for the firms' involvement in classifying new value (value proposition) and in linking between emerging (discover, understand and define) and more complete business models (design & form). By doing so, external participants helped the firms develop novel ideas (Poetz and Schreier, 2009) subsequently building unique business models. Recurrent comments such as, "We've been exposed to a new way of doing things" and "a valuable overall process" suggest, the series of meetings, workshops, activities and online participation revealed to the managers the significance of external involvement. The unambiguous, documented process meant that managers could easily bring back ideas and merge knowledge whilst iterating through the cycles, integrating updated assumptions into new business models.

Creating Sharable Challenges

An established and constant "challenge statement" also supported the development of new business models. By guiding diverse participants in the types of information to share, such as the features of job design and having diversity between activities (Morgeson and Humphrey, 2006b, Zheng et al., 2011) facilitated the sharing of relevant information. Experiences, ideas, and discussions were made explicit by the participants (drawings, completing forms, posting pictures, voting, expressing through writing, video and sound) enabled the codification of meeting, workshop and online activities into emergent categories and structures around a value proposition representing new business models. This allowed the SMEs to construct new business models by rearranging and grouping salient ideas and categories. Just as current business model frameworks e.g. Osterwalder and Pingeur (2010) support the creation of new business models, the connection between needs, obstacles and opportunities facilitated insights and linkages relating to the experiences and ideas of external participants represented in the SMEs' challenge statement. As summarised in fig 5.1, the formation of new business models through value building activities and the integration of ideas supported the continuing formulation and development of nascent understandings. This is exhibited in the modification and recombination of new business model concepts through the activities in the four phases.

These observations are in line with research in crowdsourcing, job characteristics and intrinsic and extrinsic motivational theories. Sims et al. (1976a), for instance, observe that diverse activities which use a range of skills result in work enjoyment. Similarly, research on crowdsourcing indicates a relationship between task complexity and the use of advanced skills (Zheng et al. 2011) resulting in progressive solutions to complex problems (Poetz & Schreier, 2009).

This advice points to a relationship with the "question" asked to external participants and performance, usually in terms of an online crowd. Existing open innovation, business model and crowdsourcing theories posit broadly that "new" business models can result as abstract knowledge is linked to ill-defined problems. As mentioned beforehand, however, this notion hardly explains the formation of open business model innovation. In the cases I investigated, it was the complete understanding of the firms' needs and obstacles and resulting opportunities that supported the entire process of open business model innovation. The combination of understanding new knowledge, by enabling the transitions from hypothetical

ideas to tangible new business models worked only through a succession of specific activities building the value proposition.

Managing and Using External Ideas

Current understandings of capturing external ideas emphasise the methods that support open processes (e.g. Mount & Martinez, 2014), and the broad practices associated with them (e.g. Bayus, 2013; Malhotra & Majchrzak, 2014). The application of new ideas is usually explained by the ability of participants to propose unique ideas in addition to learning about the firm (Huang et al, 2014; Smith et al. 1993). Consistent with this notion, issuing instructions to participants (Malhotra & Majchrzak, 2014) and encouraging "natural" discussions (Bayus, 2013) is thought to influence the number of relevant ideas received by the firm. My observations develop this notion by demonstrating how involving participants in guided activities (on and offline) support the generation of relevant knowledge for firms, rather than, simply inviting the open submission of ideas haphazardly.

Similarly, a common notion that an influx of ideas into the firm results in market-ready products/service is a long way from practice (Jouret, 2009). The difficulties involved in integrating new ideas into the firm are generally explained in terms of large volumes of incoming data (Mount & Martinez, 2014). Current advice usually relates to online solutions (e.g. opinion polls) reducing the volume data in a bid to assist managers to evaluate incoming data (Mortara et al, 2013). My study extends this notion by assisting the managers through a series of business model building activities, as mentioned earlier, iterating between on and offline phases which is unique amongst current advice for SMEs. Consequently, the processes of combining internal, external, new and old knowledge, support managers as they understand, communicate and transmit knowledge into their firms (Grant, 1996; Tiwana, 2002) at the same time as extending theories of ambidexterity in firms (Tushman & O'reilly, 1996).

Using Open Practices

While a few of the open practices I have described (e.g. digital tools, encouraging external engagement, workshops) are commonplace in innovation management processes, I believe my observations into "openness" and the business model innovation process in SMEs can be applied in other settings, especially since more firms attempt to implement open practices. Essentially, open business models involve the search and inclusion of external ideas,

technologies, and knowledge (Chesbrough, 2007). At the heart of open business models then, are numerous methods (e.g. licensing & spin-offs) to facilitate the exchange of ideas and co-development partnerships (Chesbrough & Schwartz, 2007). In line with this view, the outcome of the process I observed was not articulated as a single technique resulting in an unstructured flow of external ideas, but as a series of interconnected activities intended to bring about new business models. The fundamental insights from this study, consequently, are not dissimilar to other forms of "openness" reported in SMEs, such as, the use of intermediaries (Lee et al, 2010) or the importance of open innovation practices (Spithoven et al, 2013), where firms take part in a number of practices in an attempt to develop new products and services.

In this regard, my observations seem to be substantiated by research on the increasing adoption of open processes in SMEs (e.g. Van de Vrande 2009) describing related practices needed to achieve new / enhanced products and/or services. Adding a range of services, for instance, is thought to help SMEs reduce the risks associated with product commoditisation (Vanhaverbeke, 2017). Parida et al's (2012) study of four inbound practices shows how inflows of knowledge and technology positively influence innovation outcomes. Similarly, in research on how SMEs engage in "openness" suggest that having a choice of ways to cross over into the knowledge landscape help integrate knowledge and what other organisations they open up and interact with (Cosh and Zhang, 2011).

In another context, Lifshitz-Asaf (2016), observed not only how rapid scientific advancement happened at NASA through an open program including online platforms, but called into question the R&D professionals' work identity. Similarly, Classen et al. (2012)'s research on SME directors suggests how their personalities can influence the levels of firm openness resulting in different outcomes for different SMEs.

Together, these studies indicate that my insights may be applicable in other settings where managers are oriented towards openness, have a need for open business model innovation but are unsure how to proceed and engage. My emergent "tool" brings together isolated observations by providing a consolidated account of how open activities and digital online tools support openness and facilitating the transition from closed to open, the business problem to new business model development.

I anticipate relative re-application of my observations and analysis in conventional and idiosyncratic settings to develop our understanding of how open business models are developed with participants beyond firm boundaries. Perhaps at Physical Healing Ltd. And Auto Ltd. a lack of conflicting motivations and using the tool in the commercialisation phase of innovation resulted in the comparative eminence of the stages of the resulting tool. Both SMEs had common concerns in dealing with their business problems and finding a valid and persuasive business model. As external participants became an extension to the firms' employees, I could see their ideas and knowledge, at the outset thought of as untrustworthy, being used as assets to support the development of new value propositions. Future research may, by design, choose SME business problems at the front end of the innovation process to consider the interplay between open business model and the fuzzy front end of innovation, since we know that most SMEs apply openness generally at the commercialisation stage.

Future research may develop my insights and consider to a greater extent how SMEs engaging in crowdsourcing and/or other online digital tools manage and develop the influx of ideas. Researchers interested in intellectual property in SMEs may explore the role of intellectual property, comparing the differences involved in in and outbound open practices. Additionally, researchers keen on understanding innovation networks may consider how SMEs can be a focal point and coordinate efforts for innovation (Brunswicker and Van de Vrande, 2014).

Irrespective of what researchers focus on, the core of openness in SMEs involves advancing internal competencies (Brunswicker and van de Vrande, 2014) which call for researchers to examine adjustments in the firms' strategy and business model. Observations from my study suggest that future research could focus on either of two perspectives 1 the SME / managers or 2 the external participants/crowd. In the first situation, researchers may take human & technological resource into account, what processes are needed to understand when a business problem becomes a shareable challenge? In the second situation, researchers may focus on how to make their external challenges attractive since brand recognition is lacking.

5.3 Managerial Implications

The open business model innovation tool presented in this Ph.D. supports SMEs in actively shaping and changing their current business in response to internal, external, technological

and digital catalysts. This enables the firms to respond to market changes whilst creating new business relationships and ultimately designing new business models. The tool empowered firms to use digital online tools as an external ideation source in the quest for new business models. The study demonstrates that open business model innovation has the capability to impact SMEs' business model innovation efforts. Through understanding the general and specific barriers to creating new business models, SMEs can progress through a series of activities alongside digital tools to choose and connect with the external environment whilst solving their most important challenges. Fundamentally, the tool provides a comprehensive method to integrate a number of external partners (online crowds, Government agents, individual developers and end-users) in open business model innovation. My observations show how the tools assist managers in developing new value propositions through the input and support of external participants.

Based on the stages in the tool, table 5.1 summarises a number of underlying questions that SME managers can use to support and reflect on their business challenges to create new value propositions. By understanding the firm's unmet needs and obstacles, the firm can use the tool to design and develop an open business model development project using online digital tools to access the external environment.

Phases	Underlying Question	Toolkit	Activities
Initiate	How are we currently creating value with our technologies? What's changing?	Top level decision makers, multi-team approach, access to strategic information, drawing on this information to create a shareable challenge statement.	Meetings, Interviews, archival data.
Discover, Understand & Define	Who are we aiming to create value for?	I = P x S x E (Innovation = problem x well-understood solution x plan of execution), joint venture activity, facility tour and technology demonstrations, problem pow wows, dot voting, investible propositions, storyboarding, pitching, understanding stakeholder personas, understanding unmet needs, solve unmet needs, service blueprinting	Workshops, firm directors & employees, academic staff & students, governmental agencies, stakeholders, customers & their families & friends
Ideate	How do you organise a collaborative, online community?	Multi-function online platform, Voting functionality, Popularity functionality, Idea posting functionality, Discussion Functionality, Document / Picture / Video / Visual functionality, Management communication functionality, Statistical analysis functionality, Social media functionality, Multi-device functionality, Notification functionality	Creating an online crowd, through social media, email invitations, firm advertising, online mediator, engagement from firm directors and employees
Design & Form	How do the ideas unlock the value embedded in the technology and translate into market outcomes?	Online ideas, developed ideas, top-level decision makers, service blueprinting, idea owners, crowd members, reviewers	Workshops, firm directors & employees, academic staff & students, governmental agencies, stakeholders, customers & their families & friends
Value Proposition	How do we jointly commercialise our technology in new ways with our partners?	Value and supply chain information (buyers and partners) 3.	Meetings, interviews, project data & results.

Table 5.1

6. CONCLUSION

I hope that the open business model innovation framework offers an exemplar for the study and development of the open business model innovation processes. The framework, from an SME manager's perspective involving stakeholders, provides opportunities and challenges for researchers studying new open systems and SMEs. On the one hand, the research method, applying a number of activities allowed for significant access to the open business model innovation process in the SMEs involved. What we know from the previous studies and my observations, is that the open business model innovation process involves a diversity of actors usually emanating from the relationships the SME has with its stakeholders and potential partners. The framework extends our understanding of knowledge exchange among SMEs, online crowds, partners, workshop participants, and researchers. The activities involved in all stages of the framework allowed the SMEs to uncover business challenges whilst questioning the current business model and unfolding opportunities to generate shared value with new partners. Review meetings accompanied and supplemented the ongoing conversation within the SMEs. Such sessions broadened the dialogue by involving the SMEs in thinking about new business model configurations and likely new partner agreements in shared value development for new products/services.

My observations demonstrate an open, co-operative process resulting in new business model development. In a joint effort with the SME directors, advisors, on and offline participants, I worked through the grey areas of organising open value creation in SMEs. My findings are substantiated by Ebel et al.'s (2016) suggestion that the use of digital tools enables the capture of external knowledge for entering new markets and new business creation. Applying open innovation

By applying open innovation and disrupting long-standing perceptions about innovation and business models, the SMEs involved were able to link their technologies to beneficial outcomes through a series of activities to develop new value and competitive advantage. Researchers actively encourage the application of open innovation in diverse business settings to develop our understanding of the strategic and sustainable of the approach (Rohrbeck et al. 2013; Ebel et al, 2016; Breuer et al. 2017). My observations addressed this need by applying open innovation to show how SMEs develop new value propositions

through on and offline activities with a range of external participants. I demonstrate how the experiences of SMEs and others' knowledge flow through the systems as they build new value together. The positive experience I observed in applying open innovation to the development of new business models through the SMEs' challenges, disputed established thinking whilst supporting new processes.

My study highlights the openness involved in developing new business models, triggered by the SMEs' and stakeholders' unmet needs through the inclusion and development of external value. Notably, I do not observe the value development process in isolation, however, illustrate the sequence of actions resulting in new business models through communication, knowledge sharing and idea generation. In this way, I demonstrate that the cycles of the extraneous ideas and knowledge creation jointly augment each other. The cycles help develop dialogue, converting external knowledge into useful value propositions for the SME. Observing and analysing the sequences involved in value generation and their linkages I have developed a comprehensive view of open business model innovation. By bringing together diverse participants and open practices I demonstrate the course of joint value development.

My resulting framework suggests connecting open thinking to business model innovation, through the inclusion of on and offline external participants. Incorporating a number of tools and activities for evaluating current business model configurations, emergent models and auditing changes to subsequent business models facilitates the creation of an innovation hub for the SME to track and visualise new business model configurations.

In conclusion, my study answers the call for using open innovation the business model innovation process. Implementing business model development through open innovation has developed our understanding of how SMEs can use open business model innovation and provided a process for doing so. My observations help overcome the concerns of many SME managers relating to a lack of marketing channels, capabilities, and international relationships to launch open business model programs. The absence of extensive resources didn't disappear, but through gaining confidence in the framework, the experience of openness and joint cooperation brought about a renewed understanding of managing the intricacies of managing open business model development in SMEs. In essence, my framework offers a start to resolving the theoretical puzzle of translating external knowledge in technology-

driven SMEs and building sustainable value propositions to unmet needs. I suggest that the solution is demonstrated in the ability of SMEs to successfully apply open business model innovation. Fundamentally, I have developed a methodology encompassing a range of activities and associated tools which facilitate a process allowing SMEs to commercialise new ideas and technologies through new business models and collaborative industrial relationships that anticipate market and business needs through on and offline collaboration using open innovation practices.

References

ABRAHAM, S. 2013. Will business model innovation replace strategic analysis? *Strategy & Leadership,* 41**,** 31-38.

AFUAH, A. & TUCCI, C. L. 2001. *Internet business models and strategies*, McGraw-Hill New York.

AFUAH, A. & TUCCI, C. L. 2012. CROWDSOURCING AS A SOLUTION TO DISTANT SEARCH. *Academy of Management Review,* 37**,** 355-375.

AGAFONOVAS, A. & ALONDERIENE, R. 2013. Value creation in innovations crowdsourcing: example of creative agencies.

AMABILE, T. M., BARSADE, S. G., MUELLER, J. S. & STAW, B. M. 2005. Affect and creativity at work. *Administrative science quarterly,* 50**,** 367-403.

AMIT, R. & ZOTT, C. 2001. Value creation in e-business. *Strategic Management Journal,* 22**,** 493-520.

ANTORINI, Y. M. & MUNIZ, A. M., JR. 2013. The Benefits and Challenges of Collaborating with User Communities. *Research-Technology Management,* 56**,** 21-28.

ANTORINI, Y. M., MUNIZ, A. M., JR. & ASKILDSEN, T. 2012. Collaborating With Customer Communities: Lessons From the Lego Group. *Mit Sloan Management Review,* 53**,** 73-+.

ARCHAK, N. 2010. Money, glory and cheap talk: analyzing strategic behavior of contestants in simultaneous crowdsourcing contests on TopCoder.com. *Proceedings of the 19th international conference on World wide web.* Raleigh, North Carolina, USA: ACM.

ATKINSON, R. D. & EZELL, S. J. 2012. *Innovation economics: the race for global advantage*, Yale University Press.

AUDRETSCH, D. B. & VIVARELLI, M. 1996. Firms size and R&D spillovers: Evidence from Italy. *Small Business Economics,* 8**,** 249-258.

AVENALI, A., BATTISTELLA, C., MATTEUCCI, G. & NONINO, F. 2013. A mechanism for supporting collective innovation: the open contract-based challenge. *Information Systems and E-Business Management,* 11**,** 541-568.

BADEN-FULLER, C. & HAEFLIGER, S. 2013. Business Models and Technological Innovation. *Long Range Planning,* 46**,** 419-426.

BAGOZZI, R. P. & DHOLAKIA, U. M. 2006. Antecedents and purchase consequences of customer participation in small group brand communities. *International Journal of Research in Marketing,* 23**,** 45-61.

BAYUS, B. L. 2013. Crowdsourcing New Product Ideas over Time: An Analysis of the Dell IdeaStorm Community. *Management Science,* 59**,** 226-244.

BIANCHI, M., CAMPODALL'ORTO, S., FRATTINI, F. & VERCESI, P. 2010. Enabling open innovation in small- and medium-sized enterprises: how to find alternative applications for your technologies. *R & D Management,* 40**,** 414-431.

BIGGAM, J. 2015. *Succeeding with your master's dissertation: a step-by-step handbook*, McGraw-Hill Education (UK).

BIRCH, H. G. & RABINOWITZ, H. S. 1951. THE NEGATIVE EFFECT OF PREVIOUS EXPERIENCE ON PRODUCTIVE THINKING. *Journal of Experimental Psychology,* 41**,** 121-125.

BIRCHALL, D., CHANARON, J. & SODERQUIST, K. 1996. Managing innovation in SMEs: a comparison of companies in the UK, France and Portugal. *International Journal of Technology Management,* 12**,** 291-305.

BITNER, M. J., OSTROM, A. L. & MORGAN, F. N. 2008. Service blueprinting: a practical technique for service innovation. *California management review,* 50**,** 66-94.

BOLTON, R. N., PARASURAMAN, A., HOEFNAGELS, A., MIGCHELS, N., KABADAYI, S., GRUBER, T., LOUREIRO, Y. K. & SOLNET, D. 2013. Understanding Generation Y and their use of social media: a review and research agenda. *Journal of Service Management,* 24**,** 245-267.

BOUDREAU, K. J. & LAKHANI, K. R. 2009. How to Manage Outside Innovation. *Mit Sloan Management Review,* 50**,** 69-76.

BOUDREAU, K. J. & LAKHANI, K. R. 2013. Using the Crowd as an Innovation Partner. *Harvard Business Review,* 91**,** 60-+.

BRABHAM, D. C. 2010. MOVING THE CROWD AT THREADLESS. *Information, Communication & Society,* 13**,** 1122-1145.

BREUER, H. 2013. Lean venturing: Learning to create new business through exploration, elaboration, evaluation, experimentation, and evolution. *International Journal of Innovation Management,* 17**,** 1340013.

BREUER, H. & LÜDEKE-FREUND, F. 2017. Values-based network and business model innovation. *International Journal of Innovation Management,* 21**,** 1750028.

BRUNSWICKER, S. & VAN DE VRANDE, V. 2014. Exploring open innovation in small and medium-sized enterprises. *New frontiers in open innovation***,** 135-156.

BRUNSWICKER, S. & VANHAVERBEKE, W. 2015. Open innovation in small and medium-sized enterprises (SMEs): External knowledge sourcing strategies and internal organizational facilitators. *Journal of Small Business Management,* 53**,** 1241-1263.

BRYMAN, A. 2012. *Social Research Methods*, OUP Oxford.

BUSINESSES, F. O. S. 2017. *UK Small Business Statistics, Business Population Estimates for the UK and Regions in 2017* [Online]. Available: http://www.fsb.org.uk/media-centre/small-business-statistics [Accessed December 2017].

CALIA, R. C., GUERRINI, F. M. & MOURAC, G. L. 2007. Innovation networks: From technological development to business model reconfiguration. *Technovation,* 27**,** 426-432.

CARRIER, C. 1994. Intrapreneurship in large firms and SMEs: a comparative study. *International Small Business Journal,* 12**,** 54-61.

CASADESUS-MASANELL, R. & RICART, J. E. 2010. From Strategy to Business Models and onto Tactics. *Long Range Planning,* 43**,** 195-215.

CHANAL, V. & CARON-FASAN, M. How to invent a new business model based on crowdsourcing: the Crowdspirit. EURAM, 2008 Lubjana, Slovenia.

CHESBROUGH, H. 2003a. The Era of Open Innovation. *MIT Sloan Management Review*.

CHESBROUGH, H. 2003b. *Open Innovation: The New Imperative for Creating and Profiting from Technology,* Boston, Harvard Business School Press.

CHESBROUGH, H. 2004. Managing open innovation. *Research-Technology Management,* 47**,** 23-26.

CHESBROUGH, H. 2006a. *Open business models: How to thrive in the new innovation landscape*, Harvard Business Press.

CHESBROUGH, H. 2007. Business model innovation: it's not just about technology anymore. *Strategy & leadership,* 35**,** 12-17.

CHESBROUGH, H. 2010. Business Model Innovation: Opportunities and Barriers. *Long Range Planning,* 43**,** 354-363.

CHESBROUGH, H. & CROWTHER, A. K. 2006. Beyond high tech: early adopters of open innovation in other industries. *R & D Management,* 36**,** 229-236.

CHESBROUGH, H. & ROSENBLOOM, R. S. 2002. The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change,* 11**,** 529-555.

CHESBROUGH, H. & SCHWARTZ, K. 2007. Innovating business models with co-development partnerships. *Research-Technology Management,* 50**,** 55-59.

CHESBROUGH, H., VANHAVERBEKE, W. & WEST, J. 2006. *Open innovation: Researching a new paradigm*, Oxford University Press on Demand.

CHESBROUGH, H. W. 2006b. *Open innovation: The new imperative for creating and profiting from technology*, Harvard Business Press.

CLASSEN, N., VAN GILS, A., BAMMENS, Y. & CARREE, M. 2012. Accessing resources from innovation partners: The search breadth of family SMEs. *Journal of Small Business Management,* 50**,** 191-215.

COGHLAN, D. & BRANNICK, T. 2014. *Doing action research in your own organization*, Sage.

COLLIS, J. & HUSSEY, R. 2003. *Business Research*, Palgrave Macmillan.

COMMISSION, E. 2017. *What is an SME?* [Online]. Available: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en [Accessed December 2017].

COSH, A. & ZHANG, J. J. 2011. Open innovation choices–What is British Enterprise doing? UK: UK Innovation Research Centre.

CROTTY, M. 1998. *The Foundations of Social Research: Meaning and Perspective in the Research Process*, SAGE Publications.

DAHLANDER, L. & GANN, D. M. 2010. How open is innovation? *Research Policy,* 39**,** 699-709.

DAHLANDER, L. & MAGNUSSON, M. 2008. How do Firms Make Use of Open Source Communities? *Long Range Planning,* 41**,** 629-649.

DASILVA, C. M. & TRKMAN, P. 2014. Business Model: What It Is and What It Is Not. *Long Range Planning,* 47**,** 379-389.

DAVIS, J. R., RICHARD, E. E. & KEETON, K. E. 2015. Open Innovation at NASA: A New Business Model for Advancing Human Health and Performance Innovations. *Research Technology Management,* 58**,** 52-58.

DE TONI, A. & NASSIMBENI, G. 2003. Small and medium district enterprises and the new product development challenge: evidence from Italian eyewear district. *International Journal of Operations & Production Management,* 23**,** 678-697.

DECI, E. L. 1975. HEALING SPLIT BETWEEN MIND AND BODY. *Psychology Today,* 8**,** 104-104.

DEMIL, B. & LECOCQ, X. 2010a. Business Model Evolution: In Search of Dynamic Consistency. *Long Range Planning,* 43**,** 227-246.

DEMIL, B. & LECOCQ, X. 2010b. Business Model Evolution: In Search of Dynamic Consistency. *Long Range Planning,* 43**,** 227-246.

DEMIL, B., LECOCQ, X., RICART, J. E. & ZOTT, C. 2015. INTRODUCTION TO THE SEJ SPECIAL ISSUE ON BUSINESS MODELS: BUSINESS MODELS WITHIN THE DOMAIN OF STRATEGIC ENTREPRENEURSHIP. *Strategic Entrepreneurship Journal,* 9**,** 1-11.

DENZIN, N. K. & LINCOLN, Y. S. 1994. *Handbook of qualitative research*, Sage Publications.

DESYLLAS, P. & SAKO, M. 2013. Profiting from business model innovation: Evidence from Pay-As-You-Drive auto insurance. *Research Policy,* 42**,** 101-116.

DI GANGI, P. M. & WASKO, M. 2009. Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell IdeaStorm. *Decision Support Systems,* 48**,** 303-312.

DI GANGI, P. M., WASKO, M. M. & HOOKER, R. E. 2010. GETTING CUSTOMERS' IDEAS TO WORK FOR YOU: LEARNING FROM DELL HOW TO SUCCEED WITH ONLINE USER INNOVATION COMMUNITIES. *Mis Quarterly Executive,* 9**,** 213-228.

DJELASSI, S. & DECOOPMAN, I. 2013. Customers' participation in product development through crowdsourcing: Issues and implications. *Industrial Marketing Management,* 42**,** 683-692.

DODGSON, M., GANN, D. & SALTER, A. 2006. The role of technology in the shift towards open innovation: the case of Procter & Gamble. *R&D Management,* 36**,** 333-346.

DODGSON, M., GANN, D. M. & PHILLIPS, N. 2014. *The Oxford Handbook of Innovation Management*.
DUNNING, D., LEUENBERGER, A. & SHERMAN, D. A. 1995. A NEW LOOK AT MOTIVATED INFERENCE - ARE SELF-SERVING THEORIES OF SUCCESS A PRODUCT OF MOTIVATIONAL FORCES. *Journal of Personality and Social Psychology,* 69**,** 58-68.
EASTERBY-SMITH, M., THORPE, R. & JACKSON, P. 2012. *Management Research,* London, Sage.
EBEL, P. A., BRETSCHNEIDER, U. & LEIMEISTER, J. M. 2016. Can the crowd do the job? Exploring the effects of integrating customers into a company's business model innovation. *International Journal of Innovation Management,* 20**,** 1650071.
EBNER, W., LEIMEISTER, J. M. & KRCMAR, H. 2009. Community engineering for innovations: the ideas competition as a method to nurture a virtual community for innovations. *R & D Management,* 39**,** 342-356.
EDEN, C. & HUXHAM, C. 1996. Action research for management research. *British Journal of Management,* 7**,** 75-86.
ERICKSON, L. B., PETRICK, I. & TRAUTH, E. M. Hanging with the right crowd: Matching crowdsourcing need to crowd characteristics. the Eighteenth American Conference on Information Systems, 2012 Seattle, Washington.
FELIN, T. & ZENGER, T. R. 2014. Closed or open innovation? Problem solving and the governance choice. *Research Policy,* 43**,** 914-925.
FORREST, J. E. 1990. Strategic alliances and the small technology-based firm. *Journal of Small Business Management,* 28**,** 37.
FRANKE, N., VON HIPPEL, E. & SCHREIER, M. 2006. Finding commercially attractive user innovations: A test of lead-user theory. *Journal of product innovation management,* 23**,** 301-315.
FRATTINI, F., USMAN, M., ROIJAKKERS, N. & VANHAVERBEKE, W. Forthcoming. Introduction. *In:* WIM VANHAVERBEKE, F. F., NADINE ROIJAKKERS, MUHAMMAD USMAN (ed.) *Researching Open Innovation in SMEs.* Singapore: World Scientific Publishing.
FREDBERG, T., ELMQUIST, M. & OLLILA, S. 2008. Managing Open InnovationPresent Findings and Future Directions.
FREEL, M. S. 2000. Strategy and structure in innovative manufacturing SMEs: the case of an English region. *Small Business Economics,* 15**,** 27-45.
FREY, K., LÜTHJE, C. & HAAG, S. 2011. Whom Should Firms Attract to Open Innovation Platforms? The Role of Knowledge Diversity and Motivation. *Long Range Planning,* 44**,** 397-420.
FUELLER, J. 2010. Refining Virtual Co-Creation from a Consumer Perspective. *California Management Review,* 52**,** 98-122.
FUELLER, J., JAWECKI, G. & MUEHLBACHER, H. 2007. Innovation creation by online basketball communities. *Journal of Business Research,* 60**,** 60-71.
GAMBARDELLA, A. & MCGAHAN, A. M. 2010. Business-model innovation: General purpose technologies and their implications for industry structure. *Long range planning,* 43**,** 262-271.
GARCIA MARTINEZ, M. & WALTON, B. 2014. The wisdom of crowds: The potential of online communities as a tool for data analysis. *Technovation,* 34**,** 203-214.
GASSMANN, O. 2006a. Opening up the innovation process: towards an agenda. *R & D Management,* 36**,** 223-228.
GASSMANN, O. 2006b. Opening up the innovation process: towards an agenda. *R&d Management,* 36**,** 223-228.
GASSMANN, O. & ENKEL, E. 2004. Towards a theory of open innovation: three core process archetypes.
GASSMANN, O., ENKEL, E. & CHESBROUGH, H. 2010. The future of open innovation. *R & D Management,* 40**,** 213-221.
GILL, J. & JOHNSON, P. 2010. *Research methods for managers*, Sage.

GRANT, R. M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal,* 17**,** 109-122.
HACKMAN, J. R. & OLDHAM, G. 1980. *Work redesign,* Reading, MA: Addison-Wesley.
HACKMAN, J. R. & OLDHAM, G. R. 1976. MOTIVATION THROUGH DESIGN OF WORK - TEST OF A THEORY. *Organizational Behavior and Human Performance,* 16**,** 250-279.
HARS, A. & OU, S. S. 2002. Working for free? Motivations for participating in open-source projects. *International Journal of Electronic Commerce,* 6**,** 25-39.
HAYASHI, A. M. 2009. Do You Have a "Plan B"? *Mit Sloan Management Review,* 51**,** 10-11.
HIENERTH, C., KEINZ, P. & LETTL, C. 2011. Exploring the Nature and Implementation Process of User-Centric Business Models. *Long Range Planning,* 44**,** 344-374.
HOFFMAN, K., PAREJO, M., BESSANT, J. & PERREN, L. 1998. Small firms, R&D, technology and innovation in the UK: a literature review. *Technovation,* 18**,** 39-55.
HOWE, J. 2006. The rise of crowdsourcing. *Wired magazine,* 14**,** 1-4.
HUANG, Y., SINGH, P. V. & SRINIVASAN, K. 2014. Crowdsourcing New Product Ideas Under Consumer Learning. *Management Science,* 60**,** 2138-2159.
JEPPESEN, L. B. & FREDERIKSEN, L. 2006. Why do users contribute to firm-hosted user communities? The case of computer-controlled music instruments. *Organization Science,* 17**,** 45-63.
JOHNSON, G., SCHOLES, K. & WHITTINGTON, R. 2008. *Exploring corporate strategy,* Essex, England, Prantice Hall.
JOURET, G. 2009. Inside Cisco's Search for the Next Big Idea. *Harvard Business Review,* 87**,** 43-+.
KAKALETRIS, G., VAROUTAS, D., KATSIANIS, D., SPHICOPOULOS, T. & KOUVAS, G. 2004. Designing and Implementing an Open Infrastructure for Location-Based, Tourism-Related Content Delivery. *Wireless Personal Communications,* 30**,** 153-165.
KE, W. L. & ZHANG, P. 2009. Motivations in Open Source Software Communities: The Mediating Role of Effort Intensity and Goal Commitment. *International Journal of Electronic Commerce,* 13**,** 39-66.
KEIZER, J. A., DIJKSTRA, L. & HALMAN, J. I. 2002. Explaining innovative efforts of SMEs.: An exploratory survey among SMEs in the mechanical and electrical engineering sector in The Netherlands. *Technovation,* 22**,** 1-13.
KLEINKNECHT, A. & REIJNEN, J. O. 1992. Why do firms cooperate on R&D? An empirical study. *Research policy,* 21**,** 347-360.
KOHLER, T. 2015. Crowdsourcing-Based Business Models. *California Management Review,* 57**,** 63-84.
LÄHTEENLAHTI, P. 2015. *Defining Touchpoints in Service Design* [Online]. Available: https://medium.com/perfektio/defining-touchpoints-in-service-design-1682d0f5db55 [Accessed December 2017].
LAKHANI, K. R. & VON HIPPEL, E. 2003. How open source software works: "free" user-to-user assistance. *Research Policy,* 32**,** 923-943.
LAMBE, C. J., WITTMANN, C. M. & SPEKMAN, R. E. 2001. Social Exchange Theory and Research on Business-to-Business Relational Exchange. *Journal of Business-to-Business Marketing,* 8**,** 1-36.
LAURSEN, K. & SALTER, A. 2004. Searching high and low: what types of firms use universities as a source of innovation? *Research policy,* 33**,** 1201-1215.
LAURSEN, K. & SALTER, A. 2006. Open for innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal,* 27**,** 131-150.
LAUTO, G., VALENTIN, F., HATZACK, F. & CARLSEN, M. 2013. Managing Front-End Innovation through Idea Markets at Novozymes. *Research-Technology Management,* 56**,** 17-26.

LEBLANC, L. J., NASH, R., GALLAGHER, D., GONDA, K. & KAKIZAKI, F. 1997. A comparison of US and Japanese technology management and innovation. *International Journal of Technology Management,* 13**,** 601-614.
LEE, S., PARK, G., YOON, B. & PARK, J. 2010. Open innovation in SMEs-An intermediated network model. *Research Policy,* 39**,** 290-300.
LEONARD, D. & RAYPORT, J. F. 1997a. Spark innovation through empathic design. *Harvard Business Review,* 75**,** 102-+.
LEONARD, D. & RAYPORT, J. F. 1997b. Spark innovation through empathic design. *Harvard business review,* 75**,** 102-115.
LEVY, M. & POWELL, P. 2005. *Strategies for growth in SMEs: the role of information and information systems,* Oxford, UK, Elsevier Butterworth-Heinenmann.
LEWIN, K. 1946. Action research and minority problems. *Journal of social issues,* 2**,** 34-46.
LIFSHITZ-ASSAF, H. 2016. Dismantling knowledge boundaries at NASA: From problem solvers to solution seekers.
LOÏC, P., LECOCQ, X. & ANGOT, J. 2010. Customer-integrated business models: a theoretical framework. *M@ n@ gement,* 13**,** 226-265.
LÜSCHER, L. S. & LEWIS, M. W. 2008. Organizational change and managerial sensemaking: Working through paradox. *Academy of Management Journal,* 51**,** 221-240.
MAGAZINE, A. 2014. *Global brands up use of crowdsourcing: eYeka* [Online]. Available: http://adobomagazine.com/global-news/global-brands-use-crowdsourcing-eyeka [Accessed December 2016].
MAGRETTA, J. 2002. Why business models matter. *Harvard Business Review,* 80**,** 86-+.
MAHADEVAN, B. 2000. Business models for Internet-based E-commerce: An anatomy. *California Management Review,* 42**,** 55-+.
MAJCHRZAK, A. & MALHOTRA, A. 2013. Towards an information systems perspective and research agenda on crowdsourcing for innovation. *Journal of Strategic Information Systems,* 22**,** 257-268.
MALHOTRA, A. & MAJCHRZAK, A. 2014. Managing Crowds in Innovation Challenges. *California Management Review,* 56**,** 103-123.
MARCATI, A., GUIDO, G. & PELUSO, A. M. 2008. The role of SME entrepreneurs' innovativeness and personality in the adoption of innovations. *Research Policy,* 37**,** 1579-1590.
MARJANOVIC, S., FRY, C. & CHATAWAY, J. 2012. Crowdsourcing based business models: In search of evidence for innovation 2.0. *Science and Public Policy,* 39**,** 318-332.
MASON, K. & SPRING, M. 2011. The sites and practices of business models. *Industrial Marketing Management,* 40**,** 1032-1041.
MATHWICK, C. & RIGDON, E. 2004. Play, Flow, and the Online Search Experience. *Journal of Consumer Research,* 31**,** 324-332.
MCGRATH, R. G. 2010. Business Models: A Discovery Driven Approach. *Long Range Planning,* 43**,** 247-261.
MEREDITH, J. K., RATURI, A., AMOAKO-GYAMPAH, K. & KAPLAN, B. 1989. Alternative research paradigm in operations. *Journal of Operations Management,* 8**,** 297-326.
MILES, M. B., HUBERMAN, A. M., HUBERMAN, M. A. & HUBERMAN, M. 1994. *Qualitative data analysis: An expanded sourcebook*, sage.
MITCHELL, D. & COLES, C. 2003. *The Ultimate Competitive Advantage: Secrets of Continually Developing a More Profitable Business Model*, Berrett-Koehler.
MITCHELL, D. W. & BRUCKNER COLES, C. 2004. Business model innovation breakthrough moves. *Journal of business strategy,* 25**,** 16-26.

MOREAU, C. P. & DAHL, D. W. 2005. Designing the solution: The impact of constraints on consumers' creativity. *Journal of Consumer Research,* 32**,** 13-22.

MORGESON, F. P. & HUMPHREY, S. E. 2006a. The Work Design Questionnaire (WDQ): Developing and validating a comprehensive measure for assessing job design and the nature of work. *Journal of Applied Psychology,* 91**,** 1321-1339.

MORGESON, F. P. & HUMPHREY, S. E. 2006b. The Work Design Questionnaire (WDQ): developing and validating a comprehensive measure for assessing job design and the nature of work. *Journal of applied psychology,* 91**,** 1321.

MORTARA, L., FORD, S. J. & JAEGER, M. 2013. Idea Competitions under scrutiny: Acquisition, intelligence or public relations mechanism? *Technological Forecasting and Social Change,* 80**,** 1563-1578.

MOULTRIE, J., CLARKSON, P. J. & PROBERT, D. 2007. Development of a design audit tool for SMEs. *Journal of Product Innovation Management,* 24**,** 335-368.

MOUNT, M. & MARTINEZ, M. G. 2014. Social Media: A TOOL FOR OPEN INNOVATION. *California Management Review,* 56**,** 124-143.

MYERS, M. D. 1997. Qualitative research in information systems. *Mis Quarterly,* 21**,** 241-242.

NISHIKAWA, H., SCHREIER, M. & OGAWA, S. 2013. User-generated versus designer-generated products: A performance assessment at Muji. *International Journal of Research in Marketing,* 30**,** 160-167.

O'REGAN, N. & GHOBADIAN, A. 2005. Innovation in SMEs: the impact of strategic orientation and environmental perceptions. *International Journal of Productivity and Performance Management,* 54**,** 81-97.

OERLEMANS, L. A., MEEUS, M. T. & BOEKEMA, F. W. 1998. Do networks matter for innovation? The usefulness of the economic network approach in analysing innovation. *Tijdschrift voor economische en sociale geografie,* 89**,** 298-309.

OSTERWALDER, A. 2004. *The business model ontology a proposition in a design science approach.* Université de Lausanne.

OSTERWALDER, A. & PIGNEUR, Y. 2010. *Business model generation: a handbook for visionaries, game changers, and challengers*, John Wiley & Sons.

OSTERWALDER, A., PIGNEUR, Y. & TUCCI, C. L. 2005. Clarifying business models: Origins, present, and future of the concept. *Communications of the association for Information Systems,* 16**,** 1.

PARIDA, V., WESTERBERG, M. & FRISHAMMAR, J. 2012a. Inbound Open Innovation Activities in High-Tech SMEs: The Impact on Innovation Performance. *Journal of Small Business Management,* 50**,** 283-309.

PARIDA, V., WESTERBERG, M. & FRISHAMMAR, J. 2012b. Inbound open innovation activities in high-tech SMEs: the impact on innovation performance. *Journal of small business management,* 50**,** 283-309.

PITTAWAY, L., ROBERTSON, M., MUNIR, K., DENYER, D. & NEELY, A. 2004. Networking and innovation: a systematic review of the evidence. *International Journal of Management Reviews,* 5-6**,** 137-168.

PLATTS, K. W. 1993. A process approach to researching manufacturing strategy. *International Journal of Operations & Production Management,* 13**,** 4-17.

POETZ, M., K & SCHREIER, M. 2009. The Value of Crowdsourcing: Can users really compete with professionals in generating new product ideas? . *SSRN*

POETZ, M. K. & SCHREIER, M. 2012. The Value of Crowdsourcing: Can Users Really Compete with Professionals in Generating New Product Ideas? *Journal of Product Innovation Management,* 29**,** 245-256.

PORTER, C. E., DONTHU, N., MACELROY, W. H. & WYDRA, D. 2011. How to Foster and Sustain Engagement in Virtual Communities. *California Management Review,* 53**,** 80-+.
PRAHALAD, C. K. & RAMASWAMY, V. 2002. The co-creation connection.
RADAS, S. & BOŽIĆ, L. 2009. The antecedents of SME innovativeness in an emerging transition economy. *Technovation,* 29**,** 438-450.
RAPOPORT, R. N. 1970. Three dilemmas in action research: with special reference to the Tavistock experience. *Human relations,* 23**,** 499-513.
RAPPA, M. 2001. *Managing the digital enterprise: Business models on the web* [Online]. North Carolina State University. Available: http://digitalenterprise.org/models/models.html [Accessed December 2017].
REASON, P. & BRADBURY, H. 2001. *Handbook of action research: Participative inquiry and practice*, Sage.
ROGERS, E. M. 2003. The diffusion of innovation 5th edition. New York: Free Press.
ROHRBECK, R., KONNERTZ, L. & KNAB, S. 2013. Collaborative business modelling for systemic and sustainability innovations. *International Journal of Technology Management 22,* 63**,** 4-23.
ROMERO, D. & MOLINA, A. 2011. Collaborative networked organisations and customer communities: value co-creation and co-innovation in the networking era. *Production Planning & Control,* 22**,** 447-472.
ROTHWELL, R. 1991. External networking and innovation in small and medium-sized manufacturing firms in Europe. *Technovation,* 11**,** 93-112.
ROTHWELL, R. & DODGSON, M. 1991. External linkages and innovation in small and medium-sized enterprises. *R&d Management,* 21**,** 125-138.
SANDULLI, F. D. & CHESBROUGH, H. 2009. The two sides of open business models.
SAUNDERS, M., LEWIS, P. & THORNHILL, A. 2007. *Research Methods for Business Students*, Financial Times/Prentice Hall.
SAUNDERS, M., LEWIS, P. & THORNHILL, A. 2012. *Research Methods for Business Students*, Pearson.
SCHULZE, A. & HOEGL, M. 2008. Organizational knowledge creation and the generation of new product ideas: A behavioral approach. *Research Policy,* 37**,** 1742-1750.
SEIN, M. K., HENFRIDSSON, O., PURAO, S., ROSSI, M. & LINDGREN, R. 2011. Action design research. *MIS quarterly***,** 37-56.
SHAFER, S. M., SMITH, H. J. & LINDER, J. C. 2005. The power of business models. *Business Horizons,* 48**,** 199-207.
SHANI, A. B. & PASMORE, W. A. Towards a New Model of the Action Research Process. 1982/08// 1982. Academy of Management, 208-212.
SHEETS, R. G. & CRAWFORD, S. 2012. Harnessing the Power of Information Technology: Open Business Models in Higher Education. *Educause Review,* 47**,** n2.
SIEG, J. H., WALLIN, M. W. & VON KROGH, G. 2010. Managerial challenges in open innovation: a study of innovation intermediation in the chemical industry. *R&D Management,* 40**,** 281-291.
SILVERMAN, D. 2005. *Doing Qualitative Research: A Practical Handbook*, SAGE Publications.
SIMS, H. P., SZILAGYI, A. D. & KELLER, R. T. 1976a. The measurement of job characteristics. *Academy of Management journal,* 19**,** 195-212.
SIMS, H. P. J., SZILAGYI, A. D. & KELLER, R. T. 1976b. The measurement of job characteristics. *Academy of Management Journal,* 19**,** 195-212.
SIMULA, H. & AHOLA, T. 2014. A network perspective on idea and innovation crowdsourcing in industrial firms. *Industrial Marketing Management,* 43**,** 400-408.
SMITH, D. 2015. *Exploring Innovation*, McGraw-Hill Education.

SMITH, S. M., WARD, T. B. & SCHUMACHER, J. S. 1993. Constraining effects of examples in a creative generation task. *Memory & cognition,* 21**,** 837-845.

SPITHOVEN, A., CLARYSSE, B. & KNOCKAERT, M. 2010. Building absorptive capacity to organise inbound open innovation in traditional industries. *Technovation,* 30**,** 130-141.

SRATEGY, O. I. 2009. Innovation in Firms. A microeconomic Perspective. OECD publishing.

STIEGER, D., MATZLER, K., CHATTERJEE, S. & LADSTAETTER-FUSSENEGGER, F. 2012. Democratizing Strategy: HOW CROWDSOURCING CAN BE USED FOR STRATEGY DIALOGUES. *California Management Review,* 54**,** 44-68.

STIGLIANI, I. & RAVASI, D. 2012. Organizing thoughts and connecting brains: Material practices and the transition from individual to group-level prospective sensemaking. *Academy of Management Journal,* 55**,** 1232-1259.

SUROWIECKI, J. 2004. Mass intelligence. *Forbes,* 173**,** 48-48.

SUSMAN, G. I. & EVERED, R. D. 1978. An assessment of the scientific merits of action research. *Administrative science quarterly***,** 582-603.

TAPSCOTT, D. & WILLIAMS, A. D. 2010. Innovation the 21st century university: It's time. *January/February.* Educause Review.

TEECE, D. J. 2007. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal,* 28**,** 1319-1350.

TEECE, D. J. 2010a. Business Models, Business Strategy and Innovation. *Long Range Planning,* 43**,** 172-194.

TEECE, D. J. 2010b. Business models, business strategy and innovation. *Long range planning,* 43**,** 172-194.

TEECE, D. J. 2010c. Business Models, Business Strategy and Innovation. *Long Range Planning,* 43**,** 172-194.

TERWIESCH, C. & ULRICH, K. 2009. *Innovation tournaments: Creating and selecting exceptional opportunities,* Boston, Harvard Business School Publishing.

TERWIESCH, C. & XU, Y. 2008. Innovation contests, open innovation, and multiagent problem solving. *Management Science,* 54**,** 1529-1543.

TIMMERS, P. 1998. Business models for electronic markets. *Electronic markets,* 8**,** 3-8.

TIWANA, A. 2002. *The knowledge management toolkit: Orchestrating IT, strategy, and knowledge platforms*, Prentice Hall.

TUSHMAN, M. & O'REILLY, C. 1996. Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review,* 38**,** 8-30.

VAN DE VRANDE, V., DE JONG, J. P., VANHAVERBEKE, W. & DE ROCHEMONT, M. 2009a. Open innovation in SMEs: Trends, motives and management challenges. *Technovation,* 29**,** 423-437.

VAN DE VRANDE, V., DE JONG, J. P. J., VANHAVERBEKE, W. & DE ROCHEMONT, M. 2009b. Open innovation in SMEs: Trends, motives and management challenges. *Technovation,* 29**,** 423-437.

VANHAVERBEKE, W. 2017. *Managing Open Innovation in SMEs*, Cambridge University Press.

VANHAVERBEKE, W. & CHESBROUGH, H. 2014. A classification of open innovation and open business models. *New Frontiers in Open Innovation***,** 50-68.

VANHAVERBEKE, W. & CLOODT, M. 2006. Open Innovation in Value Networks. *In:* CHESBROUGH, H. V., W.; WEST, J. (ed.) *Open Innovation: Researching a New Paradigm.* Oxford: Oxford University Press.

VARGO, S. L. & LUSCH, R. F. 2004. Evolving to a new dominant logic for marketing. *Journal of Marketing,* 68**,** 1-17.

VARGO, S. L. & LUSCH, R. F. 2008. Service-dominant logic: continuing the evolution. *Journal of the Academy of Marketing Science,* 36**,** 1-10.

VETTER, P., FREDRICX, F., RAJAN, G. & OBERLE, K. 2008. Recommendations for a multi-service access architecture from the European MUSE project. *Bell Labs Technical Journal,* 13**,** 11-28.

VON HIPPEL, E. 2005. *Democratizing Innovation*, MIT Press.

VOSSEN, R. W. 1998. Relative strengths and weaknesses of small firms in innovation. *International small business journal,* 16**,** 88-94.

VUCULESCU, O. & BERGENHOLTZ, C. 2014. How to Solve Problems with Crowds: A Computer-Based Simulation Model. *Creativity and Innovation Management,* 23**,** 121-136.

WALLIN, M. W. & VON KROGH, G. 2010. Organizing for Open Innovation: Focus on the Integration of Knowledge. *Organizational Dynamics,* 39**,** 145-154.

WEIBLEN, T. 2015. *Opening up the business model: Business model innovation through collaboration.* Ph. D. Thesis. University of St. Gallen, Bamberg.

WEST, J. 2003. How open is open enough? Melding proprietary and open source platform strategies. *Research Policy,* 32**,** 1259-1285.

WIRTZ, B. W., SCHILKE, O. & ULLRICH, S. 2010. Strategic development of business models: implications of the Web 2.0 for creating value on the internet. *Long range planning,* 43**,** 272-290.

YIP, G. S. 2004. Using Strategy to Change Your Business Model. *Business Strategy Review,* 15**,** 17-24.

ZENG, S. X., XIE, X. M. & TAM, C. M. 2010. Relationship between cooperation networks and innovation performance of SMEs. *Technovation,* 30**,** 181-194.

ZHENG, H., LI, D. & HOU, W. 2011. Task design, motivation, and participation in crowdsourcing contests. *International Journal of Electronic Commerce,* 15**,** 57-88.

ZOTT, C. & AMIT, R. 2008. The fit between product market strategy and business model: Implications for firm performance. *Strategic Management Journal,* 29**,** 1-26.

ZOTT, C. & AMIT, R. 2009. Business Model Innovation: Creating Value In Times Of Change. *Universia Business Review***,** 108-121.

ZOTT, C. & AMIT, R. 2010. Business model design: an activity system perspective. *Long range planning,* 43**,** 216-226.

ZOTT, C., AMIT, R. & MASSA, L. 2011. The Business Model: Recent Developments and Future Research. *Journal of Management,* 37**,** 1019-1042.