

Designing a Behavioural Additionality Evaluation
Methodology for the Knowledge Transfer
Partnerships Scheme Employing Case-Based
Methods and Theory-Based Evaluation Approaches

A thesis submitted to The University of Manchester for
the Degree of Doctor of Philosophy (PhD) in the Faculty
of Humanities

2016

Carlos Ramos Pérez

Alliance Manchester Business School

Contents

List of Tables.....	7
List of Figures	8
List of Boxes	9
List of Abbreviations.....	9
Abstract	10
Declaration	11
Copyright Statement.....	11
Dedication	12
Acknowledgements	13
The Author	14
Chapter 1. Introduction	15
1.1 Research background	16
1.2 Challenges in the evaluation of the <i>behavioural additionality</i> concept	18
1.3 Research questions, objective and premises of the research	21
1.4 Structure of the thesis	25
1.5 Expected contribution to knowledge and research limitations.....	28
Chapter 2. <i>Behavioural Additionality</i> , Definitions, Dimensions and Theories Associated with the Concept.....	29
2.1 Introduction	30
2.2 Evolution of <i>behavioural additionality</i> as a concept of innovation policy evaluation.....	31
2.3 Dimensions of the <i>behavioural additionality</i> concept	34
2.4 Theories associated with the <i>behavioural additionality concept</i>	36
2.4.1 Explaining changes in organisational behaviour and governmental intervention as a remedy for market failures	37
2.4.2 Organisational behaviour as competitive advantages and strategic capabilities: the resource-based view	38
2.4.3 Evolutionary economics and organisational routines.....	40
2.5 Chapter conclusions	44
Chapter 3. Current Methodological Practices of <i>Behavioural Additionality</i> Evaluation	45
3.1 Introduction	46
3.2 Systematic review of <i>behavioural additionality</i> practices	46
3.3 <i>Behavioural additionality</i> methodological practice tree	50
3.4 Appraisal of methods for measuring and assessing <i>behavioural additionality</i> : What works, for whom, and under which circumstances?	53
3.4.1 The experimental perspective.....	53

3.4.2 <i>Behavioural additionality</i> and quasi-experimental designs	54
3.4.3 The non-experimental view.....	60
3.5 Variables representing <i>behavioural additionality</i>	69
3.6 Chapter conclusions	78
Chapter 4. Challenges in the <i>Behavioural Additionality</i> Evaluation Practice.....	79
4.1 Introduction.....	80
4.2 The congruence problem.....	80
4.3 The project fallacy.....	82
4.4 The input-output dichotomy.....	84
4.5. The catalogue of behaviours trap	86
4.6 Chapter conclusions	93
Chapter 5. Research Design	95
5.1 Introduction.....	96
5.2 Research orientation and scope	97
5.2.1 Philosophical position of the thesis: an epistemological middle ground	97
5.2.2 Relationship between the research question and the proposed research design: orientation and scope.....	98
5.3 Main components of the research design: The CBM, TBE and evidence-based approaches	103
5.3.1 Main components of the Case-Based Method (CBM)	103
5.3.2 Main components of the Theory-Based Evaluation (TBE) approach	110
5.3.3 Main components of the evidence-based approach, as used in the thesis	114
5.4 Procedure for constructing the methodology and main assumptions.....	116
5.5 Designing a case study to test the methodology.....	121
5.5.1 Selecting a policy intervention.....	122
5.5.2 Selecting the individual cases for analysis	125
5.5.3 Validating the methodology	133
Chapter 6. Proposing a Methodology for Evaluating the <i>Behavioural Additionality</i> Effect of Innovation Policies.....	136
6.1 Introduction.....	137
6.2 Proposed evaluation methodology for the <i>behavioural additionality</i> effect.....	138
6.3 First step of the methodology: Planning.....	140
6.4 Second step of the methodology: Contribution assessment	141
6.4.1 General components of the contribution analysis framework.....	141
6.4.2 Adapting contribution analysis to the assessment of <i>behavioural additionality</i> effects	143
6.5 Third step of the methodology: Decision-making.....	153

6.6 Addressing the challenges in assessing the <i>behavioural additionality</i> effect through the methodology.....	154
6.7 Chapter conclusions	155
Chapter 7. A Case Study on the Experiences of Six Company Based Partners with the Knowledge Transfer Partnerships Scheme.....	156
7.1 Introduction	157
7.2 Case study setting: the KTP scheme	158
7.2.1 Components of the KTP scheme	158
7.2.2 Programme rationale	160
7.2.3 Articulating the KTP theory of change: logic framework and propositions	162
7.3 Six case studies from the KTP scheme	165
7.3.1 Case A: Middle-sized manufacturing firm.....	166
7.3.2 Case B: Small-sized BID.....	171
7.3.3 Case C: Small-sized charity	176
7.3.4 Case D: Small-sized design start-up.....	181
7.3.5 Case E: Small-sized IT consultancy.....	185
7.3.6 Case F: Middle-sized coffee and tea producer	191
7.4 Chapter conclusions	197
Chapter 8. The methodology as an Instrument for Detecting and Assessing <i>Behavioural Additionality</i>	198
8.1 Introduction	199
8.2 The methodology as a tool for describing organisational change	199
8.2.1 Moving from outputs and outcomes of the KTP projects to organisational change	199
8.2.2 Detecting the process of organisational change from the cases	201
8.3 The methodology as an instrument for <i>behavioural additionality</i> contribution assessment	206
8.3.1 Configuring organisational routines.....	206
8.3.2 Characterising behaviours for each case	207
8.3.3 Contribution assessment.....	208
8.4 The methodology as an instrument to learn about the <i>behavioural additionality</i> effect from the cases.....	212
8.4.1 Learning about the <i>behavioural additionality</i> effect from the cases	212
8.4.2 Learning from the KTP theory of change from the cases	214
8.5 Chapter conclusions	215
Chapter 9. Methodological Discussion: Approaching <i>Behavioural Additionality</i> through the Use of the Case-Based Method and Theory-Based Evaluation.....	217
9.1 Introduction	218

9.2 Findings from the case study: methodological implications of the use of CBM and theories of change	218
9.3 Methodological discussions: incorporating the CBM and TBE approaches in evaluations of <i>behavioural additionality</i>	222
9.4 Solving the methodological challenges identified in <i>behavioural additionality</i>	230
9.5 Assessment of the quality of the research design for <i>behavioural additionality</i>	232
9.6 Strengths and weaknesses of the CBM/TBE approach for <i>behavioural additionality</i>	234
9.7 Chapter conclusions	235
Chapter 10. Conclusions	237
10.1 Introduction	238
10.2 Uses of the CBM/TBE approaches for evaluating the <i>behavioural additionality</i> effect of innovation and collaboration policies	239
10.3 Considerations on the CBM/TBE methodology for addressing three methodological challenges when evaluating the <i>behavioural additionality</i> dimension of innovation and collaboration policies	243
10.3.1 Effect of the conceptual vagueness and its treatment.....	243
10.3.2 The project fallacy and the black-box evaluation problems.....	246
10.3.3 Predetermined notions regarding changes in behaviour.....	251
10.4 Contributions to the existing knowledge.....	253
10.5 Recommendations for future practice and policy implications	255
10.6 Limitations of the current study and further research opportunities	257
10.6.1 Limitations	257
10.6.2 Further research.....	260
References	263
Annex A. KTP <i>Behavioural Additionality</i> Case Study Protocol.....	286
A.1 Introduction	287
A.2 Overview of the case study	287
A.3 Data collection instrument.....	289
A.4 Glossary of terms used in the research.....	293
Annex B. Portfolio of evidences for the Case Study.....	294
B.1 Introduction	295
B.2 Sources of information and analytical process for conducting the pilot case study	295
B.3 Sources of information and evidence used for the case study	300
B.3.1 Case A	302
B.3.2 Case B.....	303
B.3.3 Case C.....	305
B.3.4 Case D	307

B.3.5 Case E.....	308
B.3.6 Case F.....	310
B.4 Three examples of interviews.....	312
Annex C. Tools and methods included for the analysis.....	321
C.1 Introduction.....	322
C.2 Selecting the programme and case studies for analysis.....	322
C.3 Analytical procedures.....	329
C.4 Summary of evidence obtained from the cases.....	334

Final word count, including footnotes and endnotes: 72,379 excluding references and annexes.

List of Tables

<i>Table 3.1 Search, classification and appraisal procedures.....</i>	49
<i>Table 3.2 Two procedures for constructing behavioural additionality models.....</i>	56
<i>Table 3.3 Quasi-experimental, mixed method approach in behavioural additionality.....</i>	57
<i>Table 3.4 Umbrella questions on behavioural additionality surveys (selected reports)...</i>	61
<i>Table 3.5 Non-experimental, mixed method approach in behavioural additionality.....</i>	66
<i>Table 4.1 Summary of possible sources of common method bias in social research.....</i>	87
<i>Table 4.2 Comparing behavioural questions.....</i>	90
<i>Table 5.1 Typologies of case studies.....</i>	106
<i>Table 5.2 Sources of information employed in the pilot case.....</i>	129
<i>Table 5.3 Sources of information used to develop the KTP theory of change.....</i>	130
<i>Table 5.4 Sources of information included in the cases.....</i>	132
<i>Table 6.1 Behavioural additionality theory of change: Changes-Capabilities-Routines Framework.....</i>	146
<i>Table 6.2 Suggested tools and methods for investigating organisational routines with the CCR framework.....</i>	150
<i>Table 6.3 Criteria for judging the additionality dimension of observed changes.....</i>	152
<i>Table 8.1 Partnership outcomes.....</i>	200
<i>Table 8.2 Patterns of organisational change for companies engaging in a KTP project....</i>	203
<i>Table 8.3 Dimensions of change (sequence).....</i>	205
<i>Table 8.4 Organisational routines and aspect impacted.....</i>	206
<i>Table 8.5 Characterising behavioural dimensions per case.....</i>	207
<i>Table 8.6 Behavioural additionality assessment.....</i>	208
<i>Table 9.1 Strategies to select an adequate number of behavioural additionality cases.....</i>	225
<i>Table 9.2 Indicators for behavioural additionality.....</i>	228
<i>Table 9.3 Criteria for increasing the quality of the approach.....</i>	233

List of Figures

<i>Figure 1.1 Thesis Plan</i>	27
<i>Figure 2.1 Different definitions for behavioural additionality in academic and evaluation practice</i>	32
<i>Figure 2.2 Levels of aggregation and adoption mechanisms in behavioural additionality.</i>	42
<i>Figure 3.1 Behavioural additionality methodological Tree</i>	52
<i>Figure 3.2 Behavioural effects (of an innovation network)</i>	59
<i>Figure 4.1 Behavioural additionality construct in survey exercises</i>	89
<i>Figure 5.1 Embedded research design employed in the thesis</i>	103
<i>Figure 5.2 Procedure for developing the evaluation methodology</i>	117
<i>Figure 5.3 Data collection procedure for the cases</i>	131
<i>Figure 6.1 Proposed behavioural additionality evaluation methodology</i>	138
<i>Figure 6.2 Steps of contribution analysis for behavioural additionality</i>	143
<i>Figure 6.3 Addressing challenges in behavioural additionality</i>	154
<i>Figure 7.1 Proposed logic matrix for the KTP scheme</i>	163
<i>Figure 8.1 Changes in organisational routines resulting from KTP projects</i>	214
<i>Figure 9.1 Modified logic matrix: behavioural additionality in the KTP scheme</i>	221
<i>Figure 10.1 Thesis plan with conclusions</i>	242

List of Boxes

<i>Box 5.1 Optimal situations/suitability criteria for selecting a programme.....</i>	123
<i>Box 5.2 Assessment of policy instruments.....</i>	124
<i>Box 5.3 Selecting cases for analysis.....</i>	127
<i>Box 6.1 Codifying and preparing information for the contribution assessment.....</i>	151
<i>Box 6.2 Documenting the contribution.....</i>	153
<i>Box 7.1 Main components of the KTP scheme.....</i>	159
<i>Box 7.2 'The KTP+ model'.....</i>	161

List of Abbreviations

BID	Business Improvement District
CBM	Case-Based Method
CBP	Company Based Partner
CCR	Changes-Capabilities-Routines
CEO	Chief Executive Officer
CAD/CAM	Computer Assisted Design and Manufacturing
DAC	Design Against Crime
FP	Framework Programme
KBP	Knowledge Based Partner
KTP	Knowledge Transfer Partnerships
OECD	Organisation for Economic Cooperation and Development
RBV	Resource-Based View
R&D	Research and Development
SFLG	Small Firms Loan Guarantee
SMEs	Small and Medium-sized Enterprise(s)
SNA	Social Network Analysis
SOP	Standard Operating Procedure
STI	Science, Technology and Innovation
TBE	Theory-Based Evaluation
TCS	Teaching Company Scheme
VSR	Variation Selection Retention

Abstract

The University of Manchester

Carlos Ramos Pérez

Thesis submitted to The University of Manchester for the Degree of Doctor of Philosophy (PhD) in the Faculty of Humanities

Designing a *Behavioural Additionality* evaluation methodology for the Knowledge Transfer Partnerships scheme employing Case-Based Methods and Theory-Based Evaluation approaches

2016

After 20 years of development, the concept of *behavioural additionality* (Buisseret, Cameron and Georghiou, 1995) has achieved important conceptual progress. However, when facing the task of identifying and evaluating the *behavioural additionality* effect produced by innovation and collaboration policies, three important issues remain: conceptual disagreement, the ‘black-box’ and project fallacy problems, and the need to select a unit of analysis compatible with a holistic perspective on innovation and which does not constrain the type of effects to pre-conditioned behaviours.

Motivated by these challenges, this thesis proposes an alternative methodology for evaluating the *behavioural additionality* dimension of a government-supported policy instrument designed to stimulate and promote collaboration between firms and universities. Thus, in an attempt to close the gap, the thesis explores and merges two complementary frameworks or perspectives: the Case-Based Method (CBM) and the Theory-Based Evaluation (TBE) approach in addition to prior evidence within the evaluation practice of the *behavioural additionality* effect.

The combination of these frameworks results in the proposed methodology, an iterative, three-step evaluation model, where CBM finds its utility as the tool to scope and select the programme focus of analysis, providing an in-depth exploration of the behavioural characteristics of the policy beneficiaries, and TBE helps to develop a programme theory which helps to map the logic of the intervention. In addition to the use of these approaches, another novelty of the approach lies in its incorporation of organisational routines as the unit of analysis (Gök, 2010) and contribution analysis (Mayne, 2012) to attribute policy effects.

The methodology is then tested and validated by applying it to six companies (cases) who participated in the Knowledge Transfer Partnerships (KTP) Scheme, a government-supported policy instrument designed to stimulate and promote collaboration by pairing companies with Higher Education Institutions, which has an extensive track record in the UK. The programme was selected due to its potential for stimulating changes in behaviour. The findings of the case studies provide evidence of modifications in behaviours, either by changing the decision-making process that governs the innovation strategy, or by managing to develop new technological components.

This research demonstrates the way in which the CBM and the TBE approaches can each be used as a potential research design for evaluating the *behavioural additionality* effect. Merging these perspectives produces a systematic approach for understanding organisational behavioural change, leading to an improved decision-making process in designing innovation and collaboration instruments that enact the desired influence upon organisational behaviours.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree of qualification of this or any other university or other institute of learning.

Copyright Statement

- i. The author of this thesis (including any appendices and/or schedules to this thesis) owns certain copyright or related rights in it (the “Copyright”) and s/he has given The University of Manchester certain rights to use such Copyright, including for administrative purposes.
- ii. Copies of this thesis, either in full or in extracts and whether in hard or electronic copy, may be made only in accordance with the Copyright, Designs and Patents Act 1988 (as amended) and regulations issued under it or, where appropriate, in accordance with licensing agreements which the University has from time to time. This page must form part of any such copies made.
- iii. The ownership of certain Copyright, patents, designs, trade marks and other intellectual property (the “Intellectual Property”) and any reproductions of copyright works in the thesis, for example graphs and tables (“Reproductions”), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property and/or Reproductions.
- iv. Further information on the conditions under which disclosure, publication and commercialisation of this thesis, the Copyright and any Intellectual Property and/or Reproductions described in it may take place is available in the University IP Policy (see <http://documents.manchester.ac.uk/DocuInfo.aspx?DocID=487>), in any relevant Thesis restriction declarations deposited in the University Library, The University Library’s regulations (see <http://www.manchester.ac.uk/library/aboutus/regulations>) and in The University’s policy on Presentation of Theses.

Dedication

To my parents, Carlos and Yolanda.

To my wife, Inés and my son Gabriel.

Acknowledgements

This Thesis is about additionality, and through my doctoral studies I learnt that a successful PhD involves not only the work of the researcher but also, the network of people that surrounds him. To all these individuals, I am forever grateful. I will only name a few here, for space is limited. However, my gratitude extends to all of those that I have met during my time at The University of Manchester.

First, I would like to express my gratitude to my supervisor Dr Paul Cunningham and my co-supervisor Dr Abdullah Gök for their expert advice, guidance and patience.

I would also like to thank several of the Directors and Academic Staff of the Manchester Institute of Innovation Research. Professors Jakob Edler, Silvia Massini, and Philippe Laredo; Ms. Kate Barker and Dr John Rigby. To Professor Naomi Chambers, Dr Reza Salehnejad and Mr Hugh Cameron (double thanks!), for the opportunity to help you in your projects. Thanks to the friends that I was fortunate to meet during my time here. Dr Zsófia Tóth, Jaime Sierra, Vajk Lukacs, Tarig Ali, Mahgoub Abdelgadir, Rumana Bukht and Yanchao Li., Sofía González, Clara Weisshaar, Katia Pina, Huong, Lilian, and Zeynep; Mr Julián Salazar, Amir Khorasani and Colm Lundrigan.

The research benefited from the support of the following people: All the participants of the in-depth interviews; associates, academic advisers and company partners from the cases and the proofreaders that assisted me. Special acknowledgment goes to Dr Arantxa Echarte. To Miss Joanne Goede, TAFTIE Assistant Secretariat, for granting access to TAFTIE (2003) data. I have to express my gratitude to the University of Manchester and the MBS team: Anusarin, Daniel, Madonna, Helen Dean and Lynne Barlow-Cheetham, especially, to the generous MBS Doctoral Studentship. The contribution of the award was fundamental, and without it this project would not have been possible. Similarly, I thank CONACYT, the National Council of Science and Technology from my home country Mexico. Their additional support, through the programme ‘Becarios CONACYT’, is greatly appreciated.

Last but not least, I give thanks to my family. My parents, Yolanda and Carlos, without your love and support none of this would have happened. My brother, Jorge, who has always been there, to Inés, who gives me her advice, unconditional support and more importantly, has helped me to build a home with Gabriel.

The Author

Carlos Ramos received his BSc in Business and Management from Universidad del Pedregal in Mexico City, Mexico. Later, he pursued his master studies from Universidad Autónoma Metropolitana (UAM)- Xochimilco, Mexico City. Graduating as a Msc. in Economics and Innovation Management with the thesis: “Evaluation and Performance of Science and Technology Policy in Mexico: A Discussion to the Special Programme for Science and Technology (PECyT) 2001-2006”.

During his time at Manchester, Carlos served as a Researcher Teaching Assistant for the following courses, all at an undergraduate level: Investment Economics and Innovation (BMAN31212), Innovation in Product Markets (BMAN20481) and Managerial Economics (BMAN20320 & BMAN20701).

Similarly, the author engaged in different projects as a research assistant. Along with Professor Naomi Chambers and other colleagues from Manchester Business School, he analysed data for a study of High Performing NHS Organisations (2012), resulting in a publication (non-related to this thesis). He also assisted Dr Paul Cunningham, Professor Jakob Edler and Dr Abdullah Gök (Manchester Institute of Innovation Research, MIOIR), in different projects, including the Compendium of Evidence in Innovation Policy (NESTA, 2012).

Carlos participated in the 2014 EU-SPRI Conference on Science and Innovation Policy: Dynamics, Challenges, Responsibility and Practice held on 18th – 20th June in Manchester, UK. His presentation title was “Development of an evaluation framework to investigate the behavioural additionality of the Knowledge Transfer Partnerships programme”. The presentation included a preliminary version of the contents that developed, later, as Chapter 3 in this thesis.

The author also participated in the short course, Evaluation of Science and Innovation Policies offered by the MIOIR in 2012.

Carlos Ramos is a grant recipient of the MBS Doctoral Studentship Award given by the Manchester Business School. He also had the support of the National Council of Science and Technology (CONACYT) in Mexico, in the form of the International Scholarship Programme (‘Becas al Extranjero’).

Chapter 1. Introduction

1.1 Research background

The Promise of A Great Future: The Role of Innovation Policy in Society

Currently, entrepreneurs, innovative companies and various organisations in the UK have access to a broad array of policies, programmes and initiatives that allow them to generate and disseminate new products, processes or services in the market. These instruments may include access to know-how located at universities and research centres (both public and private), obtaining technical assistance and infrastructure support, and creating support networks with other entrepreneurs and potential partners.

It is assumed that, by providing these innovation instruments, governments generate significant economic gains for the beneficiary companies. In addition, recent studies (Edler et al., 2013, p. 40) have acknowledged that there is an "axis of well-established policy rationales" that justifies governments' involvement in the provision of innovation policies that extend beyond the traditional aim of correcting 'market failures', such as correcting 'systemic failures', promoting conditions of 'fair competition', and allowing the development of certain technologies that are of interest to society.

Moreover, current research in the evaluation practice argues that the main objective of innovation policy is to modify the behaviour of those agents who benefit from it (Gök and Edler, 2012; Edler et al., 2013).

The elements identified above justify governmental intervention, and at the same time determine the important role that understanding the effect of past interventions has for society. In this sense, evaluation becomes one of the mechanisms that governments have to generate learning.

Thus, governments may employ evaluation as a systematic exercise to generate a better understanding of the behaviour of the beneficiaries of the policy. Therefore, it can be argued that, through evaluation, better public policies that benefit the entire society are generated (Chelimsky, 2013; Shaw, Greene and Mark, 2013).

General problems in the evaluation of innovation policy

Although governments are interested in evaluating the performance and impact of their policies, assessing innovation policy is a complex process, given some of the characteristics inherent in innovation listed below.

Innovation can be characterised as a complex process, since it is organised as a system in which different or heterogeneous actors co-exist and adapt to each other to survive by competing or, in other instances, by collaborating. Within this system, components such as 'context' and the actor's history generate an important influence on the adaptation processes mentioned before (Nelson and Winter, 1982; Larosse, 2004; Fagerberg and Verspagen, 2009; Dodgson and Gann, 2010). Similarly, the variety of actors in the system present a challenge in itself, as it generates multiple policy goals that need to be addressed (Molas-Gallart and Davies, 2006).

The second element that increases the difficulty of assessing innovation policy corresponds to problems that are particular to the evaluation activity, including conceptual limitations and challenges related to causality, and those of a methodological nature.

Causal problems relate primarily to the 'attribution problem', which states that it is difficult to isolate the effects generated by the intervention accurately. Therefore, establishing linear and direct causal links between an innovation policy and the effects it achieves in a company is difficult and inappropriate.

According to Edler et al. (2013), there are at least two conditions that increase the presence of causal problems in evaluation exercises of innovation policy: 1) a partial understanding of the current complexity of the innovation system, and 2) an incorrect specification of the 'context' in which the policy instrument operates. These problems appear frequently in those instruments that support the collaboration between universities and companies (Cunningham and Gök, 2012).

In terms of the 'methodological challenges', the same authors noted that some tools commonly used in other areas of evaluation have a more limited scope in the study of innovation policy. For example, the use of 'controlled studies', which are preferred in certain contexts (such as clinical trials) as "the most valid way to establish the effects of an intervention" (Rossi et al., 2004, p. 237), are problematic for the evaluation of innovation policy, since there is a reduced ability to reproduce the phenomena under observation versus the control capacity offered by the laboratory experimentation.

Secondly, various schools of thought in evaluation have argued that the use of controlled studies and other purely experimental methods are able to generate information concerning the operation of the programme ('which' components work), but are limited in their ability to explain how these changes are achieved, and the degree to which context matters for these differences (Pawson and Tilley, 2004; Patton, 2011; Pawson, 2013; Alkin, 2013).

Given their persistence in innovation policy, it is relevant to understand the influence of conceptual limitations and the causal and methodological problems when the policy objective is to modify the beneficiaries' behaviour (*behavioural additionality* effect).

1.2 Challenges in the evaluation of the *behavioural additionality* concept

Behavioural additionality (Buisseret, Cameron and Georghiou, 1995) has emerged as a phenomenon that evaluators have attempted to measure, since it has been identified as a product of innovation policy.

Several investigations have determined that the issues and problems identified during the previous section are also present in the practice of evaluating the *behavioural additionality* concept (Cunningham and Gök, 2012; Edler et al., 2013; Amanatidou et al., 2014). However, there are certain particularities that need to be considered.

Firstly, the 'conceptual limitation' problems are common to evaluations conducted under different innovation programmes, even when these evaluations claim to address the *behavioural additionality* effect.

These problems could be attributed to the fact that the assessments focus exclusively on measuring the effects of the intervention in terms of their 'inputs' or the innovation 'outputs', and forget to measure the impact in terms of behaviour. The *behavioural additionality* concept was introduced as a complement to the 'additionality framework' to assist in visualising the effects that the input and output additionality measurements are not able to capture, such as the effects generated when companies collaborate, or those related to Research and Development (R&D).

Overall, the result of limiting the analysis to measurements that rely exclusively on input and output indicators generates an effect known as the 'input-output paradigm' (Gök, 2010; Gök and Edler, 2012; Amanatidou et al., 2014), which tends to 'neglect' (Gök and Edler, 2012, p. 4) the process in which inputs result in outputs. The presence of the 'input-output paradigm' produces what has been called the 'black-box type evaluations'.

Suchman (Suchman, 1967; in Astbury and Leeuw, 2010) was the first to recognise the existence of the ‘black-box’ problem in evaluation practice. According to his observations, these type of assessments refer to the practice of “seeing social programs primarily in terms of effects, with little or limited attention to how these [effects] occurred” (Astbury and Leeuw, 2010 p. 369).

An additional problem with the *behavioural additionality* concept is the presence of “conflicting perspectives of the concept, which result in further difficulties in its evaluation”; since the concept is “wrongly applied, under-evaluated or misused” its explanatory power is reduced (Gök and Edler, 2012, p. 307).

Furthermore, the use of instruments based on an ‘input-output paradigm’ is linked to some of the ‘methodological’ problems present in the *behavioural additionality* concept, mainly the incompatibility of these instruments in conceptualising innovation as a holistic process and then measuring its effects as a strictly linear process (Molas-Gallart and Davies, 2006). In this sense, a linear deterministic perspective of innovation undermines the cumulative effects of (organisational) learning, and the organisation’s capabilities in the long-term.

In addition, when innovation is conceptualised as a holistic process, certain government objectives become 'incommensurable' (Buisseret, Cameron and Georghiou, 1995); that is, the effects are so substantial and diverse among the agents of the system that they cannot be measured. Under this scenario, attributing effects to a single policy is complicated.

Moreover, an additional methodological challenge present with the assessment of the *behavioural additionality* effect is the project fallacy or “the failure to distinguish between a single sponsored project and the longer-term business innovation effort of which it is part” (Georghiou and Clarysse, 2006, p. 10).

Finally, current research on the use of the *behavioural additionality* concept for policy making and evaluation indicates that two problems remain: 1) a lack of a consistent unit of analysis, and 2) a lack of an appropriate analytical framework, as current research still depends on comparative statistics based on experimental or quasi-experimental research designs (Gök and Edler, 2012; Amanatidou et al., 2014).

The deficiencies above have several consequences; for example; when the results of various evaluations inclusive of the *behavioural additionality* effect are compared, and the conceptual disagreement problem is present, comparison of results becomes increasingly difficult.

Other (major) consequences attributed to the lack of consistency include the generation of ‘conceptual vagueness’ and unclear operative components that produce a *behavioural additionality* concept that can be “manipulated to justify [almost any] political outcome” (Amanatidou et al., 2014, p. 437) with a potential that is rarely exploited in current evaluations of European innovation policy (see Amanatidou et al., 2014).

In summary, although important conceptual progress has been achieved in the 20 years since the *behavioural additionality* concept was introduced, in practice, three fundamental issues remain when evaluating innovation and collaboration policies assessing the *behavioural additionality* effect:

1. Conceptual disagreement,
2. Methodological challenges, including the ‘black-box’ problem and the project fallacy, and
3. Challenges in producing a unit of analysis compatible with a holistic perspective of innovation, less biased towards experimental methods.

Given the presence of the challenges above, an important gap in the evaluation process for assessing the *behavioural additionality* effect can be observed. This gap potentially limits the type of knowledge produced by the evaluation practices in this area of research, and hampers the capacity of governments to produce better policies, which ultimately leads to increasing difficulties in reaching societies’ goals. Therefore, this thesis attempts to address these methodological gaps.

1.3 Research questions, objective and premises of the research

In order to reduce the gap presented above, the proposed research question asks: How can *behavioural additionality* be evaluated? However, certain limitations to the scope of the thesis need to be established; therefore, this thesis attempts to:

1. Address the ‘conceptual disagreement’ problem

The problem can be solved by relying on an evidence-based approach, since this perspective would understand the evolution of the concept and its implications for the methodology selection. Therefore, the literature review generated in the thesis should maintain this perspective.

2. Address the ‘black-box’ evaluation problem and the project fallacy

The assessment of the *behavioural additionality* effect has relied on different approaches, ranging from the use of quantitative methods, such as econometric studies, to more qualitatively oriented methods, such as interviews, ad-hoc questionnaires and surveys (see OECD, 2006 and Gök and Edler, 2012).

Notwithstanding the use of econometric studies for assessing the effects of R&D support, there are a number of challenges present in this method (see Boekholt et al., 2001), such as producing biased estimations of the relationship between government support and the independent variable due to the omission of relevant variables from the analysis. Additionally, there is an “inability to capture qualitative, or ‘soft’, effects that are included in the objectives of the programme such as networking, improving the absorptive capacity and competences of firms” (Boekholt et al., 2001, p. 73).

Moreover, Georghiou and Clarysse (2006) identified two important limitations with such an approach when adapted for the assessment of *behavioural additionality*. First, because econometric studies “tend to focus on input additionality or output additionality by estimating additional R&D expenditure and comparing the performance of firms that received and did not receive public support” (Georghiou and Clarysse, 2006, pp.12- 13), they are limited as “in neither case is causality examined, nor is there an explicit or implicit model of how the firm uses public support” (Idem.). Second, “as long as the impact of government R&D support is formulated in terms of input or output measures, evaluation treats the firm as a black box, the internal workings of which have no relevance for evaluation” (Georghiou and Clarysse, 2006, p. 13).

Based on the limitations presented above, alternative methods for an impact assessment need to be proposed. In this sense, it is currently acknowledged that evaluation practitioners use a wide variety of methods to address the questions of programme performance and impact assessment (Boekholt et al., 2001; Ruegg and Feller, 2003; Datta, 2013; Mark and Henry, 2013), mainly because “one size never really fits all circumstances in evaluation” (Datta, 2013, p. 423). Accordingly, different methods are available: analytical/ conceptual modelling of underlying theory, bibliometrics, case study, content analysis, historical tracing, patent analysis, peer review, survey, sociometric and Social Network Analysis.

Each of the methods above confer the analysis with different advantages and disadvantages. For example two methods useful for understanding the underlying mechanisms, and thus, providing detailed descriptions of how and why things occur are analytical/conceptual modelling of underlying theories and case studies. On the other hand, methods useful for addressing macro-level patterns are patent analysis and bibliometrics. However, these approaches have the disadvantage of not being capable of focusing on indicators other than patents and citation counts, respectively.

Other methods, such as survey designs, permit asking multiple stakeholders diverse questions, which can be statistically analysed. However, surveys are subject to a number of biases, such as respondent and interpretative bias (Boekholt et al., 2001; Ruegg and Feller, 2003).

Moreover, the selection of methods to use for the assessment of *behavioural additionality* needs to account for the problematics highlighted above, namely the ‘black-box’ problem. In this sense, a method used to solve the ‘black-box’ problem is the Case-Based Method (CBM). CBM develops cases to study a particular phenomenon in-depth. One of the strengths of conducting a detailed study of the phenomena is the ability of the method (Yin, 2014, p. 14) to:

- Address research questions that are of an exploratory or explanatory type (‘how’ and ‘why’),
- Study a contemporary phenomenon when the researcher has the ability to obtain information from living subjects (the opposite would be a historical study),
- Address situations in which the researcher has little or no control over the phenomenon under study, and,

- Be used when the entities under analysis (the cases) are intangible.

According to Astbury and Leeuw (2010, p. 364), another methodology explicitly designed to “unpack programmatic black boxes” is the Theory-Based Evaluation (TBE) approach; this capacity is justified because “theory-based explanations serve to describe how and why programmes work (or fail to work) in different contexts and for different programme stakeholders” (Idem.). In this sense, Mark and Henry (2013, pp. 327 - 328) argued that, as a response to the critiques made by different scholars and evaluators alike to “early evaluations [...] in terms of their failure to penetrate the ‘black-box’ [...] and their exclusive focus on estimating the statistical significance of net effects”, numerous methodological innovations have been introduced, “many of which have become standard practice in high-quality evaluations that are aimed at estimating programme effects” (Idem.). These include an “increasing prevalence of programme theory and the associated desire to know more about the underlying mechanisms that produce effects” (Idem.).

TBE has the added benefit of being a powerful tool for solving the problems of attribution and causality (Woolcock, 2009; 2013), given the explicit inclusion of the 'context' in the approach. Similarly, the main product of the TBE, a *programme theory*, is “amenable to testing by systematic research” (Donaldson and Lipsey, 2013, p. 71), which means that the assumptions made about causality may be subject to verification.

Finally, an additional advantage with CBM and TBE is that both approaches are compatible with different data collection and analysis techniques, whether these are quantitative or qualitative in nature (Yin, 2014; Weiss, 1997; 1998).

For this research, the strengths presented in the list above are observed as desirable features to introduce into the study of the *behavioural additionality* effect, especially when considering the limited control over the behavioural consequences that innovation policies might have.

3. Address the challenges with the unit of analysis: innovation observed holistically

The unit of analysis selected to represent the changes in the behaviour of the policy beneficiaries should offer a potential solution to the input-output paradigm. Therefore, behaviour is observed as a process. In addition, a unit of analysis that considers the latest developments of the framework was selected based on the evidence provided by the literature review.

Taking into account the previous discussions, this thesis asks: How can the *Case-based Method* and *Theory-Based Evaluation* approaches as research design be used for evaluating *behavioural additionality*?

Based on this question, the main purpose of the research can be defined as: To contribute to the knowledge through the generation of a deeper methodological understanding of the advantages and disadvantages of including CBM/TBE approaches for evaluating *behavioural additionality*, one of the effects of innovation policy. Consequently, the objectives of this research are:

1. To reduce the potential ‘conceptual disagreement’ problem.
 - 1.1 To select an operational definition for the concept of *behavioural additionality* that is congruent with current research.
 - 1.2 To map the various methodologies used to evaluate the concept and describe their advantages and disadvantages.
 - 1.3 To detect, through a revision of the methodological practice of the evaluation of the *behavioural additionality* effect, the presence of the challenges as described in this introduction.
2. To integrate and propose an evaluation methodology supported by an evidence-based approach that employs the CBM/TBE approaches.
 - 2.1 To investigate the characteristics of the CBM and TBE approaches.
 - 2.2 To design the methodology.
 - 2.3 To design an appropriate case study to apply the methodology.
3. To test the methodology in an applied setting; that is, to use the methodology to investigate a government-supported policy instrument designed to stimulate and promote collaboration.
 - 3.1 To determine under what conditions the methodology is capable of identifying *behavioural additionality*.
 - 3.2 To determine the strengths and weaknesses of the proposed approach.
 - 3.3 To determine the usefulness of the methodology to solve the challenges in *behavioural additionality* evaluation.

Finally, to assist the investigation and to meet the research objectives, some premises were developed:

- It is recognised that a variety of elements influence the effectiveness of innovation policy instruments, such as its design, the implementation and several contextual factors (Edler et al., 2013). Therefore, these elements are important parameters to be considered within the methodology.
- A relevant feature of social systems is the complexity that permeates government interventions.
- The use of those frameworks that observe causality under the assumption ‘*Ceteris paribus*’ (all other things being equal) are intentionally avoided. This premise follows Patton (2011, p. 197) who argued that “things are not equal, never have been and never will be”, thus implying that social entities are in a perpetual state of change.
- Linked to the above, the attribution process of the innovation policy effects is performed through a triangulation technique, combining different approaches: TBE, Contribution Analysis (Mayne, 2008; 2012) and logic models. Here, a logic model is understood as a consistent description of the design of a programme that describes the steps that connect a series of anticipated effects with the mechanisms, impacts and results expected from the intervention (IKED/VINNOVA, 2004; in Miles and Cunningham, 2006). Although logic models are usually applied to a more generalised level, logic models were useful for mapping the elements that generate the process of change for this thesis.

1.4 Structure of the thesis

This thesis is composed of ten chapters (see Figure 1.1, below). Chapters 2, 3 and 4 incorporate the literature review. Chapter 2 explores the evolution of the *behavioural additionality* concept; in addition, the chapter describes the dimensions (or areas of impact) in which the theory assumes a behavioural change would occur. Chapter 3 provides a qualitative, systematic review of methodological practices for the evaluation of the *behavioural additionality* concept in academic practice and evaluation reports (145 reports were considered in total). Finally, Chapter 4 identifies and discusses four challenges identified in the review of the previous chapter.

Chapter 5 contains the research design of the thesis. This chapter follows a theory-testing research approach. Accordingly, the chapter includes the main components of the two approaches explored to propose the methodology (CBM/TBE), and the elements to select the case study.

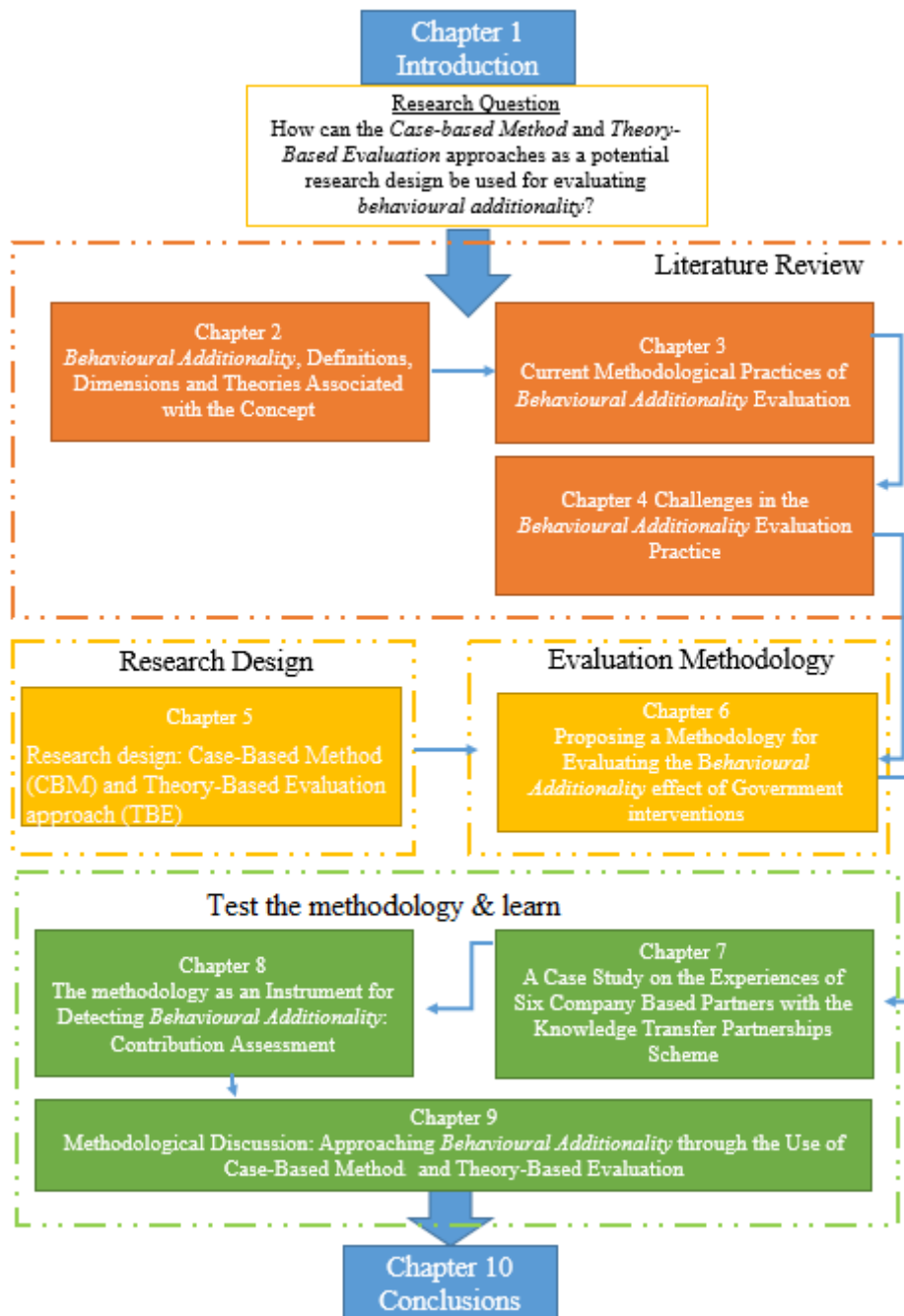
Chapter 6 presents the proposed methodology to assess the *behavioural additionality* effect produced by a governmental innovation policy in its beneficiaries. The methodology is a direct product of the literature review, and thus follows a theory-driven approach.

Once the methodology has been presented, it is applied in Chapter 7 and discussed in Chapter 8. Chapter 7 contains the case study developed for the thesis, an analysis of the Knowledge Transfer Partnerships (KTP) Scheme, an innovation policy intended to foster collaboration between universities and businesses. After presenting the case study, Chapter 8 discusses the methodology as an instrument for detecting and assessing *behavioural additionality*.

Using the lessons learned in Chapters 7 and 8, Chapter 9 reviews the methodology and discusses the way to address *behavioural additionality* through the CBM and the TBE approach. Accordingly, this chapter follows a theory-refinement process, which is a central component of the TBE approach.

Finally, Chapter 10 presents the conclusion. The chapter also offers a set of policy guidelines for future evaluations aiming to assess the *behavioural additionality* effect of innovation policies. These guidelines are presented as a set of evaluation principles.

Figure 1.1 Thesis Plan



1.5 Expected contribution to knowledge and research limitations

The main contribution of this thesis is of a methodological nature, offering a new approach to use CBM/TBE methods for assessing *behavioural additionality*. In this regard, the exploration of the *behavioural additionality* effect starts with an exploration of the concept, followed by an investigation of the different ways for its assessment (following Gök and Edler, 2012). This specific order in investigating *behavioural additionality* is observed as a logical way to proceed since, first, this enables to understand what the ‘object’ of assessment is, and second, where the difficulties in assessing originate from.

Moreover, it is important to mention that there are various methodologies that already assess the concept of *behavioural additionality* through case studies or by following a theory-driven approach (there is a limited number of evaluation practices that combine both methods). However, so far (as far as the researcher is aware), no previous work combines both methods with a purely methodological approach with the set of tools suggested for this project, such as the use of contribution analysis.

Therefore, this thesis does not claim to offer a unique or the best approach for behavioural analysis. Rather, and paraphrasing the words of Breiger (2013), its purpose is to ask different questions that lead to some new but highly complementary and useful insights.

It is also important to highlight that, although this thesis deals extensively with the topic of evaluation, it is not an assessment exercise in itself. That is, its purpose was not to conduct a full evaluation of the KTP scheme. Instead, it was to observe the applicability of the proposed methodology to the detection of *behavioural additionality*. Additionally, the objective of the current research is not conceptual (provide definitions; this task was performed by Gök, 2010 and Gök and Edler, 2012), but rather methodological, that is to explore how the *behavioural additionality* effect has been evaluated.

Finally, it is pertinent to discuss the generalisation capacity of the methodology. Since the types of generalisations that the CBM approach tries to achieve are not statistical but analytical, this thesis, and therefore the methodological suggestions it proposes, follows the same approach. The implication is that the findings produced by the research consist of examples and guiding principles, and not of statistical regularities.

Chapter 2. *Behavioural Additionality*, Definitions,
Dimensions and Theories Associated with the
Concept

2.1 Introduction

In the context of innovation policy, the concept of *behavioural additionality* is important for policy-making and policy evaluation. This importance is because of the interrelationship between the two dimensions that comprise the concept: the ‘additionality’ aspect and the ‘behavioural’ side, which help to determine the difference caused by the intervention (additionality) and the rationale that justifies the intervention (influencing behaviour).

The first dimension is helpful for evaluation practice, as additionality asks questions intended to identify the effects that government interventions have on the efforts of a firm in terms of an additional unit (input additionality) or according to the outputs or outcomes (output additionality) obtained from them. However, when the aim of the governmental intervention is to influence innovation processes and capacities in enterprises, an entirely new set of questions needs to be addressed and analytical frameworks need to be incorporated, as the input and output concepts cannot capture the effects of innovation and capability development adequately.

The concept of *behavioural additionality* (Buisseret, Cameron and Georghiou, 1995) was introduced to complement the additionality framework and address those questions related to the effects of supporting innovation. However, as indicated in the introduction to this thesis, important conceptual challenges remain, as there are important conceptual disagreements regarding the use of the *behavioural additionality* concept.

Thus, this chapter begins by addressing the challenges presented in the introduction by exploring the theoretical components of the *behavioural additionality* concept. This objective is achieved by including four sections.

Section 2.2 explores the definitions associated with the *behavioural additionality* concept. The discussion starts with tracing its evolution, uses and potential problems.

Section 2.3 describes the areas of impact that the literature assumes would be modified and which would thus generate the *behavioural additionality* effects. Section 2.4 describes the theories that serve to examine behaviour associated with the concept. Accordingly, three different theories were analysed: neo-classical economics, the resource-based view and evolutionary economics. Finally, section 2.5 provides the conclusion.

2.2 Evolution of *behavioural additionality* as a concept of innovation policy evaluation

Behavioural additionality has emerged as a concept in the science, technology and innovation policy evaluation literature as part of the broader additionality framework. According to recent research, the concept of *behavioural additionality* has had three phases of development (Gök, 2010), as follows:

- 1) The origins of the concept (Buisseret, Cameron and Georghiou, 1995),
- 2) The OECD report (OECD, 2006), and
- 3) 'Recent' attempts (works dating from 2007 onwards).

The evolution of the concept is marked by the inclusion of a broader range of effects that are assumed to be affected by government intervention. Therefore, during the first phase, the proposed definition stressed *behavioural additionality* as “the change in a company’s way of undertaking R&D that can be attributed to policy actions” (Buisseret, Cameron and Georghiou, 1995, p. 587). The OECD report increased the scope to include “the difference in firm behaviour resulting from government intervention” (Georghiou et al., 2004, p. 7; later reproduced in OECD, 2006).

Finally, during the third phase, several definitions co-existed, but current research defines that *behavioural additionality* is the persistent change of behaviour through the evolutionary change of organisational routines (Gök, 2010) or, in more general terms, the persistent change in what the target group are doing and how they are doing it and this change is attributable to the policy action (Gök and Edler, 2012). As can be observed in both definitions, the stress is placed on the persistence of the behavioural changes.

In addition to the elements described above, and as described in the introduction to this thesis, a problem of conceptual disagreement is present in the different domains in which the *behavioural additionality* effect is discussed. These domains include the use of the concept in the literature on evaluation, as part of the evaluation practice, and as a concept used for policy making (Gök, 2010). The following characteristics were identified in each domain (Gök, 2010, pp. 63-64, 82 and 97):

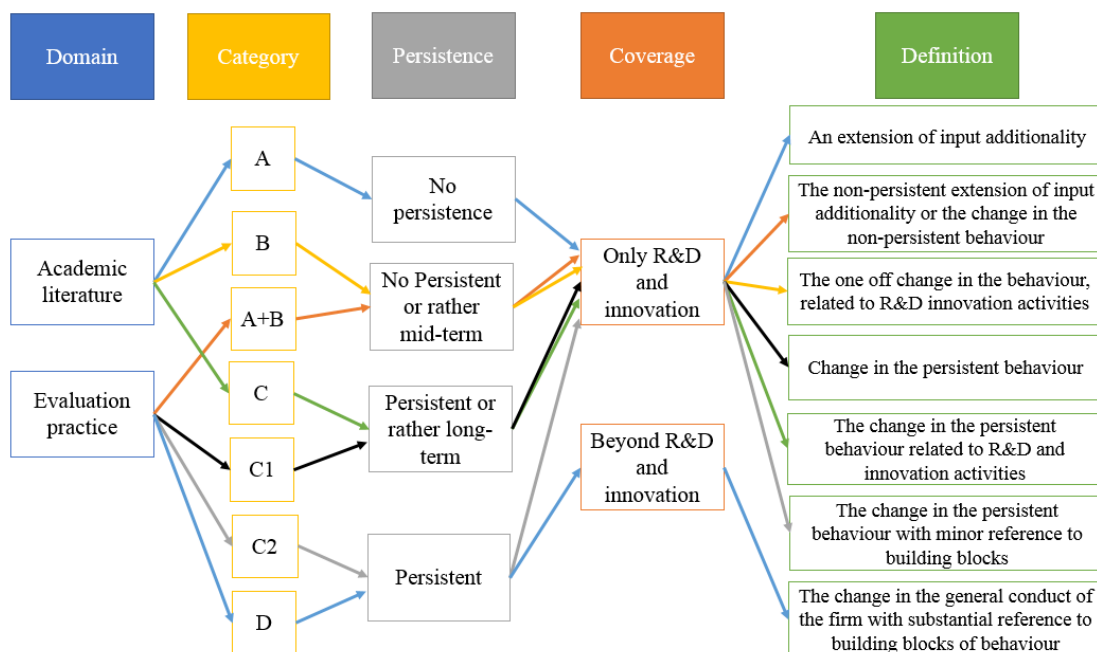
- 1) As a concept in the evaluation literature, the *behavioural additionality* effect is defined in four conflicting ways that measured changes in behaviour as programmatic black-boxes (see Figure 2.1, below).

- 2) The *behavioural additionality* concept as a part of the evaluation practice replicates the same problems as its counterpart from the evaluation literature.
- 3) As a concept used for policy making, *behavioural additionality* is discussed under an ‘economic evolutionary and structuralist approach’.

Figure 2.1 presents a typology (Gök, 2010; Gök and Edler, 2012) for the concept of *behavioural additionality* from two of the domains presented above (evaluation literature and practice). In the typology, the consideration of the persistence of the effects and the elements that the definition covers were essential to integrate the different categories existing in the field.

The figure includes five different elements. The first element is the ‘domain’, which covers the two fields, academic literature and evaluation practice, where Gök (2010) and Gök and Edler (2012) performed their analysis of the literature covering the *behavioural additionality* concept. The second element, ‘category’ corresponds to the different definitions as identified and labelled by the authors. The third element is the consideration and degree of ‘persistence’ from each definition. The fourth element includes the ‘coverage’, referring to the inclusion of only R&D and innovation, or going beyond. Finally, the fifth element is the actual definition.

Figure 2.1 Different definitions for *behavioural additionality* in academic and evaluation practice



Source: Adapted from Gök (2010) and Gök and Edler (2012)

As can be observed from Figure 2.1, there are multiple definitions in both domains. In academic practice, the definitions A and B do not consider persistence, whereas type C does. Moreover, all three types focus only on R&D and innovation. In terms of the evaluation practice, more variability is present and some of the definitions include the topic of persistence, covering elements that go beyond R&D and innovation, and which make substantial reference to the building blocks of organisational behaviour.

Finally, when researching the concept of *behavioural additionality*, several scholars have determined that the following conditions are present (Gök, 2010; Gök and Edler, 2012, Amanatidou et al., 2014):

- The concept is not yet mature and its definition and theorisation still requires further work.
- The literature presents conflicting and ‘diffuse’ perspectives about the concept. Thus, the concept is wrongly applied, with a tendency to miss or underestimate the effects of public support (Georghiou, 2007), and misused.
- In the academic literature, the concept lacks a comprehensive theoretical basis and operationalisation.

Addressing the conditions listed above is important, as a brief review of current evaluation practices trying to assess the behavioural additionality effect, done for this thesis¹ (2014, early 2015), agrees with the observation that the literature presents conflicting and diverse perspectives with a high degree of variation in the operationalisation of behaviour.

For example, while the majority of the current evaluation practices included in the brief review adopt the OECD (2006) definition of the *behavioural additionality* concept, it is operationalised either as an input (Afcha and García-Quevedo, 2014; Neicu, Teirlinck and Kelchtermans, 2014), and output (Roper and Xia, 2014), or a process (Simachev et al., 2015).

¹ The web-based reports or scientific publications included in the brief review, dated from 2014 to 2015, were located through the Google Scholar search engine by explicitly including the key term: ‘*behavioural additionality*’. A more systematic analysis of the literature is offered in Chapter 3.

Additional examples include other perspectives that understand *behavioural additionality* as a ‘personality trait’ (Bloch et al., 2014; Okamuro and Nishimura, 2014). For example, Okamuro and Nishimura’s (2014, p. 7) study is unique in its conceptualisation of *behavioural additionality*, as it is defined as the “firm’s perceptions about the university partner’s benevolence and integrity”. Although this perspective is highly innovative, behavioural changes are finally measured as specific outcomes achieved by the partnerships in terms of new products and new manufacturing processes.

A second aspect of interest derived from the exploration of the *behavioural additionality* concept is the idea that *dimensions* (or layers) of *behavioural additionality* exist. As these dimensions describe the location at which behavioural changes are expected to occur, it is important to understand their evolution. The various perspectives will next be presented in some detail.

2.3 Dimensions of the *behavioural additionality* concept

Following the phases of evolution of the *behavioural additionality* concept, five distinct perspectives or dimensions of impact can be observed:

1. *Impacts as scale, scope and speed additionality*

The first discussions of the *behavioural additionality* effect (Buisseret, Cameron and Georghiou, 1995; Davenport et al., 1998) assess behavioural changes as impacts at the level of R&D projects, including differences in the scale (size), objectives (quantity) and duration (length) of such projects. The terminology used to refer to these effects included the concepts of *scale*, *scope* and *speed* additionality (Buisseret, Cameron and Georghiou, 1995; Davenport et al., 1998). Later, these dimensions were extended to incorporate the *absorptive capacity* of firms, and their business strategy and related knowledge (Georghiou et al., 2004).

2. *Impacts on organisational strategies and capabilities*

A second perspective considers that *behavioural additionality* occurs as a long-term effect, evidenced as *acquired competencies* manifested through the firm’s strategy with three potential dimensions of impact (Georghiou et al., 2004; OECD, 2006):

- The *strategy*, or the modification to the general direction the firm faces.

- *Prioritisation*, referring to the organisational preference for, and the actual selection of, a particular set of technologies or a precise body of projects to achieve an objective (technological choice).
- *Operationalisation*, or the process of modifying *managerial capabilities*².

The dimensions above permeate *behavioural additionality* (Georghiou and Clarysse, 2006) and integrate the *dynamic capabilities* (Teece et al., 1990; Amit and Schoemaker, 1993) that firms have to possess specific resources (either physical or cognitive), and thus to generate *competitive advantages* (Barney, 1991). Further details of the dynamic capability framework are provided in Section 2.4.2 (below).

3. Dimensions of behavioural additionality as a process-based concept

Another recognised categorisation considers *behavioural additionality* as ‘concepts’ following a particular order in time (Falk, 2007): Resource-based concepts (input additionality), process-based concepts (*behavioural additionality*), and result-based concepts (output additionality).

Some authors (Clarysse et al., 2009; Wanzenböck, Scherngell and Fischer, 2013) have embraced the categorisation above. However, current research in the use of the *behavioural additionality* concept considers this categorisation as “marginal as the rest of the literature agrees on a different taxonomy” (Gök, 2010, p. 58). Moreover, this categorisation falls under the input-output paradigm, as it considers that “behaviour is inherently intangible and it only becomes manifest in terms of results” (Idem.).

4. Behavioural changes as impacts on knowledge and learning

Another perspective (Clarysse et al., 2009) links *behavioural additionality* with organisational learning theory³, combining Falk’s (2007) perspective (above) with the idea of *cognitive capacity additionality* (Bach and Matt, 2005), thus representing *behavioural additionality* as three complementary learning aspects: *experiential* (Cyert and March, 1963), *congenital* (Cohen and Levinthal, 1990) and *inter-organisational learning* (Levitt and March, 1988; Autio et al., 2008).

² Georghiou (2004) included six dimensions for operationalisation: corporate responsibility and sustainability, capital investment, human resources, knowledge acquisition, market position and manufacturing or service provision.

³ A similar categorisation insofar that it considers a learning component, is the one offered by Madsen et al. (2008), who observed behavioural changes as a manifestation of different search behaviours. Therefore, behavioural additionality includes knowledge, technology, and market search behaviour.

5. Behavioural additionality as impacts on routines

Finally, recent research on *behavioural additionality* (see Gök, 2010) perceives differences in behaviour as an impact on the organisation's way of doing things (routines) as manifested in the technologies that firms use, the rules that constitute actions and the way the members of the organisation act and respond. According to this perspective, organisational routines are argued as being useful for understanding behavioural transformations, as they are indicators of "stability and change in organisations" (Gök, 2010, p. 111).

The idea of dimensions of impact (as presented thus far) is important, as it provides a clear idea of the type of effect that is being assessed. Similarly, these dimensions are often associated with one of the theoretical perspectives present in the assessment of *behavioural additionality*, and are explored next.

2.4 Theories associated with the *behavioural additionality* concept

Amanatidou et al. (2014, p. 420) suggested that "innovation policies of the past mainly followed a rationale based on the 'neo-classical' economics approach. Lately, another rationale has been increasingly adopted characterised by the 'evolutionary structuralist' approach".

In line with the observation above, a historical survey of the *behavioural additionality* concept conducted for this chapter led to the identification of three phases of major theoretical development. These phases match the evolution of the concept as described in Section 2.2 (above). Therefore, the following links were established:

1. Origins of the concept working within a market failure rationale and (neo-classical) economic approaches.
2. The OECD (2006) report, linking the concept with the resource-based view and the capabilities framework addressing system failures.
3. 'Recent' attempts linking the *behavioural additionality* concept with the economic evolutionary and structuralist framework.

In the following subsections, the main components of each phase are explained.

2.4.1 Explaining changes in organisational behaviour and governmental intervention as a remedy for market failures

In the introduction to this thesis (Chapter 1), the idea that governments intervene to solve market failures in economic systems was presented. The market failure approach includes a series of assumptions based on neo-classical economic theory determining what behaviour is and what modifies it.

Economic agents have certain traits: they are *rational* beings who seek to *maximise* their *utility* by *optimising scarce resources*. (O'Brien and Parthiban, 2014). The rationality postulation observes that agents can calculate the full set of (potential) choices they have for achieving maximisation. At the same time, rationality relies on the existence of perfect information (O'Brien and Parthiban, 2014). Therefore, the decision-making process represented as go or no-go choices (for example, concerning which resources to maximise) provides the possible sets of behaviours these agents have.

This framework considers that when firms (an economic agent) are capable of deciding which products or services to exchange in their corresponding markets, they are behaving rationally. It is the appropriate combination of factors of production (land, capital, labour and/or technology) that determines these decisions. Therefore, strategic investments in specific resources (such as R&D investments) are guided by rationality and the calculation of financial returns (O'Brien and Parthiban, 2014).

The dependency on rationality causes the economic system to have an increased sensitivity to the presence of any distorted information (Arrow, 1962). Some types of distortion include distrust between agents or cognitive discrepancies⁴ (Sapsford et al., 2009). When these signals appear, a market failure is likely to originate.

In the scenario presented above, governments have the policy option to address these market failures. Some instruments at the government's disposal to achieve this include making information (for example about prices) more available to the actors in the system and, to a lesser extent, improving the capacity of the economic agents to choose between different sets of information. The main duty of the system is therefore to reduce information asymmetry and thus increase (social) effectiveness (Salmenkaita and Salo, 2002).

⁴ Some recognised cognitive discrepancies include agents disliking losing more than liking winning (for example in auctions), also, feelings such as fairness, reciprocal altruism (mutual benefit) and even revenge might lead to conditions of mutuality as opposed to pure self-interest (Sapsford et al., 2009).

Thus, following a market failure rationale, evaluation is depicted as a mechanism for *control* (Salmenkaita and Salo, 2002). This perception is possible because evaluation has the objective of offering prescriptions that help to predict and trace the outcomes and effects of the interventions governments provide.

Numerous science and technology programmes have followed the market-failure perspective (Arrow, 1962), causing market failure to permeate the evaluation tradition, eventually reaching the practice of additionality. For example, Buisseret, Cameron and Georghiou (1995) described the net present value of the R&D project under a comparative analysis (before and after receiving the subsidy) as a relevant tool to calculate *behavioural additionality*, assuming that the criteria for investing in riskier projects would be driven by profit maximisation. However, Buisseret, Cameron and Georghiou (1995) advised caution when following a market failure approach for behavioural analysis.

Further details of the rationale underlying the market failure approach for the empirical evaluation of *behavioural additionality* are provided in Chapter 3.

2.4.2 Organisational behaviour as competitive advantages and strategic capabilities: the resource-based view

When the OECD report (2006) was completed, the knowledge available from the effects of the innovation policy recognised the existence of other failures that were not related exclusively to the market failure rationale. Thus, the second phase of development of the *behavioural additionality* concept incorporated concepts belonging to the resource-based view (RBV) of the firm and the systemic failure argument into the discussion (Georghiou et al., 2004; OECD, 2006).

The RBV proposes that *bundles of strategic resources* integrate firms (Mowery, et al., 1996). The main characteristic of these resources is that they are problematic to obtain and difficult to imitate, as they involve long-term commitments (Winter, 2003). According to this perspective, the firm's *dynamic capabilities* control these strategic resources (Teece and Pisano, 1994; in Mowery, et al., 1996). In this sense, these types of dynamic capabilities are “higher-level competencies that determine the firm's ability to integrate, build, and reconfigure internal and external resources or competencies to address, and possibly shape, rapidly changing business environments” (Teece et al., 1997, p. 1395).

The RBV is interrelated with the *knowledge-based theory*, as both consider knowledge as a key competitive asset. These perspectives are also related to the *absorptive capacity* literature (Cohen and Levinthal, 1990). *Absorptive capacity* refers to the different abilities organisations have to assimilate and replicate the (new) knowledge gained from external sources and to apply it for commercial ends (Zahra and George, 2002; Lane and Koka, 2006).

According to the absorptive capacity perspective, the learning capacity that any unit has depends on "its endowment of relevant technology-based capabilities" (Mowery, et al., 1996; in Tsai, 2001, p. 998). Similarly, the ability to use external knowledge is often indicated as being positively related to R&D investments (Tsai, 2001).

From this perspective, collaboration plays a central role, since it enables firms to access other companies' capabilities. Collaboration also provides various advantages (Mowery, et al., 1996), as it spreads the costs and risks of innovation. Furthermore, it allows for the acquisition of new technical or technological skills and capabilities, and is a means of coordinating and formulating technical standards or dominant designs.

Finally, a firm's prior expertise in a particular area of knowledge is an important determinant of its absorptive capacity, as it is critical for creating *know-how* (Mowery, et al., 1996; Simonin, 1997).

It is important to note that absorptive capacity is not restricted specifically to R&D processes, as it also relates to innovation (in its general terms). Similarly, not only do external cues generate the process to develop innovation, but internal processes also help organisations to generate it (Lane and Koka, 2006).

The connection between the dynamic capabilities framework and the *behavioural additionality* concept arose because it was observed that the concepts of absorptive capability and competitive advantage provided a robust foundation "for understanding business innovation processes" (Georghiou and Clarysse, 2006, p. 13). Similarly, it was assumed that the *behavioural additionality* effect could modify the capacity of firms to generate strategic resources, providing them with competitive advantages, and thus impacting on their innovation strategies (OECD, 2006).

These concepts serve to explain behavioural differences as the firm's capacity to manage its resources via its strategic position. Here, prior organisational knowledge and the company's expertise will determine the potential firms have for taking advantage of government support, given that the knowledge transfer process is completed when the organisation learns.

Despite the exploration of the potential that RBV offers for *behavioural additionality*, its contributions were only discussed conceptually. Thus, the potential for this area of research remains largely unexplored.

2.4.3 Evolutionary economics and organisational routines

Section 2.4.1 explained how cognitive discrepancies (or dissonance) pose a threat to the maximisation rationale argument leading to a potential problem with employing neo-classical economics' explanations to explore rationality and behaviour. In line with this, Sapsford et al. (2009) reasoned that, whenever the perfect rationality argument is invalidated, other explanatory frameworks need to be identified. This situation has led different authors (Nelson and Winter, 1982; Rogers and Jordan, 2011) to incorporate a *behavioural approach* in their explanations, relying on the research done by Herbert Simon and his *bounded rationality* concept (Simon, 1947).

Bounded rationality, as the name implies, means that economic agents (whether these represent individuals or groups), have certain (cognitive) limitations and capabilities. Therefore, these actors cannot make perfectly rational choices, as they do not have all the available information. Actors with bounded rationality are also inclined to make deliberate preliminary assumptions and have the potential to err.

The bounded rationality assumption questions whether the fundamental role of the agents in an economic system is optimisation. Accordingly, other perspectives have observed that the economic agents' objective is to survive (Nelson and Winter, 1982). Moreover, firms do not appear to make choices based on planned rationalism (Nelson and Winter, 1982); thus, the behavioural trait implying *choice* maximisation is ill-conceived.

Based on the factors described above, a different economic approach (Nelson and Winter, 1982) was proposed with several objectives: to broaden the discussion on ‘long-run economic development’, to incorporate an evolutionary argument, to revisit the conceptualisation of the firm’s *behavioural traits* and *capabilities* and to shift its attention from optimisation procedures resulting in *output maximisation* to describing the *processes* that enabled firms to reach their objectives. Accordingly, this new perspective required a new unit of analysis to describe ‘behaviour’, since ‘prices’ (an information signal to make rational choices) was no longer appropriate.

In this case, *organisational routines* were considered as appropriate, as these are the *structures* that contain the information, rules, process and procedures that help the firm to achieve a particular position or objective. Therefore, routines could serve to explain behaviours in the organisation (Nelson and Winter, 1982).

Current research (Gök, 2010; Gök and Edler, 2012) into the use of the concept of *behavioural additionality* has determined that several solutions to the conceptual problems (indicated above in Section 2.2) are offered when the concept extends its rationale beyond the market failure approach and embraces the economic evolutionary-structuralist perspective (as described above).

According to this point of view, innovation policy would only be successful if it were to trigger the generation of the cognitive capabilities of the agents in the system in a persistent way. Similarly, the government’s role would be to “overcome a broad range of failures, such as system and knowledge processing failures” (Gök and Edler, 2012, p. 2).

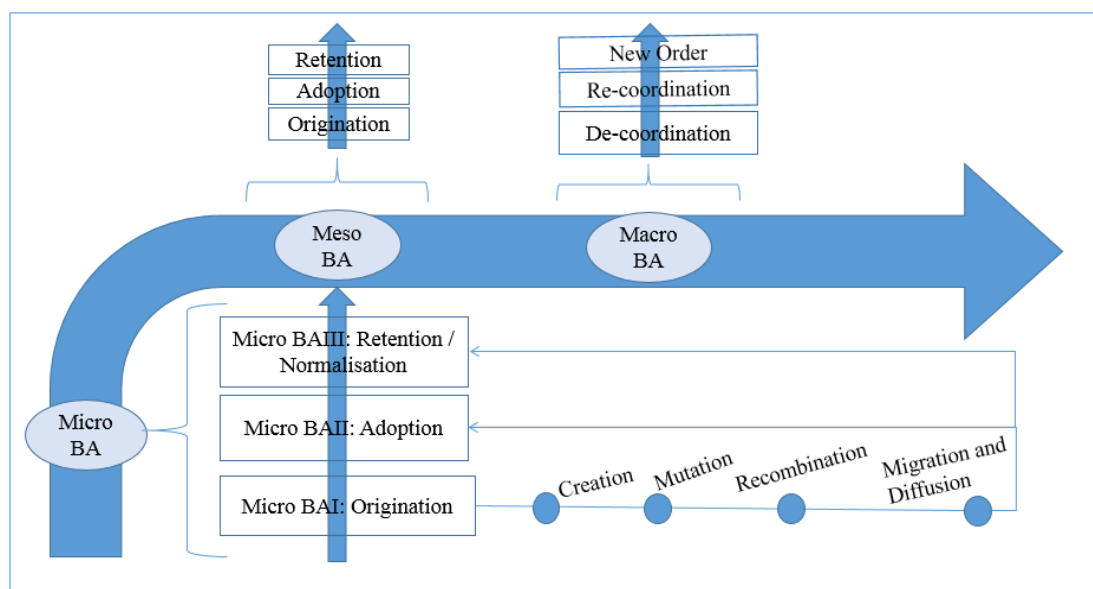
Some of the desirable features that make the evolutionary-structuralist perspective a compelling theory for *behavioural additionality* include (Gök, 2010):

1. Its focus lies in knowledge production and dissemination.
2. It considers agents as heterogeneous with different cognitive capabilities to use knowledge.
3. Its fundamental feature is to discuss dynamics first. This focus helps the framework to establish clear, firm boundaries and contributes to explaining context and system dynamics.
4. It provides a full explanation of the micro-foundations (why things happen) in organisations.

- The role of the Government is to modify the behaviour of economic agents and thus, facilitate the market process, boost variety in the economic system, or minimise adverse selection (Gök, 2010, pp. 175-176).

Therefore, when based on the evolutionary structuralist approach, *behavioural additionality* is represented as an incremental adaptive process (Gök, 2010) that observes the influence of governmental support on the evolution of a firm's routines. In this framework, changes in behaviour move through three levels of aggregation: micro, meso and macro (see Figure 2.2, below).

Figure 2.2 Levels of aggregation and adoption mechanisms in *behavioural additionality*



Source: Adapted from Gök (2010, note: BA stands for *behavioural additionality*).

The levels of aggregation, as presented in Figure 2.2, can be understood as follows (Gök, 2010): the first level (Micro BA) refers to a single organisation receiving a subsidy. The potential (initial) effect is to *originate* (MicroBAI) a routine. If the entity is completely new, then the process is called *creation*. Similarly, if it represents a variation of a previous one, it is called *mutation* and/or *recombination*.

As the routine becomes successful, it migrates and diffuses through the organisation. An *adoption* process (MicroBAII) begins when the routine is widespread throughout the organisation, and it is then said to have been normalised (MicroBAIII).

The transition between normalisation (MicroBAIII) at the micro level and origination (Meso BAI) at the meso level corresponds to a process of imitation and exploration performed by firms. This process occurs as firms perceive the success of others in becoming better (adapted) at doing something and thus desiring to imitate them.

Gök (2010) provided an illustrative example to understand the processes depicted in the figure: Ford's car manufacturing process (represented as a routine). As soon as the model for car manufacture first pioneered by Ford proved successful for the company, other companies tried to replicate the model and adopt it. Naturally, this process implied that each manufacturer modified Ford's original model and were thus able to retain the newly developed routines.

Finally, the last dimension (Macro BA), continuing with the Ford example, represents the process whereby Ford's manufacturing process became a production paradigm at the level of social systems.

The macro level also follows three phases: de-coordination, re-coordination and new order. De-coordination occurs when the new routines at the level of populations disrupt the current system and force the organisations to forget what they previously knew in order to adapt the new routine to their systems. Re-coordination happens when conflicting routines compete to become the *new norm*. Finally, a new order is achieved when all units in the system adopt the new routines (normalised).

An additional component in the model (Gök, 2010) refers to the process of change, which could be one of three types: *problemistic* (sic), *slack* or *institutional*. The first refers to the influence (real or perceived) on the sort of problems the organisation faces, which leads to a change in the perceived performance gap. 'Slack search' refers to a process whereby resources are employed to increase the firm's performance. Finally, institutional search refers to the decisions made by the firm as a whole to increase its performance.

The three theoretical frameworks presented in this section have been employed, to varying extents, in the empirical practice of evaluating *behavioural additionality*. As these theories are based on various philosophical and methodological foundations, the evidence of behavioural change is varied. However, some methodological practices remain common. These methodological practices will be analysed in Chapter 3.

2.5 Chapter conclusions

This chapter explored the evolution of the *behavioural additionality* concept from its development in 1995 to the most recent approaches. The exploration led to the conclusion that the literature and evaluation practices using the *behavioural additionality* concept present conflicting perspectives of the concept. However, important theoretical advances have occurred, as the definition has recently become wider in its scope and includes innovation as a holistic phenomenon, as well as the notion of the persistence of the effects.

A second topic of discussion corresponded to the dimensions of *behavioural additionality*, an indicator of the location (or type) of effects assumed to be caused by the intervention. Again, several non-unified typologies were observed. This multiplicity generates conflicting understandings, which result in the problem of attribution described in the introduction of the thesis.

Finally, three theories linked to the *behavioural additionality* concept were explored, namely the market-failure approach, the capabilities framework and the evolutionary economics perspective. Of these perspectives, the third approach provides important analytical advantages over the rest, as it incorporates the notions of innovation as a holistic process, system dynamics and the micro-foundations of behaviour (organisational routines) to analyse the effects of governmental interventions.

To conclude, this chapter has explored the different definitions developed of *behavioural additionality*. Based on this exploration, one definition will be selected and used as part of the conceptual framework of the methodology developed for this research. In the next chapter, an in-depth review of methodological practices for the evaluation of *behavioural additionality* will be conducted.

Chapter 3. Current Methodological Practices of
Behavioural Additionality Evaluation

3.1 Introduction

The preceding chapter focused on describing the theoretical components of *behavioural additionality*, its definition and dimensions of impact. Following the theoretical discussion, this chapter explores a set of current methodological practices on *behavioural additionality*. Thus, the aim of the chapter is to generate, via a systematic review, evidence on the assessment and measurement⁵ of behavioural change and the type of data collection tools and analysis methods employed to detect it.

The review resembles a *realist synthesis* (Pawson et al., 2004), because it serves to review the research evidence on complex social interventions, and offer an explanatory analysis of how and why interventions (or a particular aspect of them) work. In the context of this thesis, the particular aspect under review corresponds to the state of the art of current methodological practices.

The review involved four systematic, ordered, and iterative steps. First, a set of guiding questions were developed. Second the search and appraisal procedures were described, then the analysis of the relevant knowledge was performed (by answering the guiding questions) and finally, some conclusions were reached.

The remainder of the chapter resembles the structure described above, thus, it includes five sections. Section 3.2 describes the procedure followed to conduct the review. Section 3.3 classifies the reports into a methodological ‘practice-tree’. Section 3.4 answers the questions: what works, for whom and under which circumstances? Section 3.5 describes the variables used to represent behaviour and section 3.6 concludes.

3.2 Systematic review of *behavioural additionality* practices

The review of methodological practices for the *behavioural additionality* concept was framed by the following set of questions:

1. How is *behavioural additionality* operationalised and assessed or measured in current evaluation practice?

⁵ The term ‘assessment’ implies a qualitative judgement, whereas ‘measurement’ indicates a quantitative one. This chapter employs the term ‘assessment’ for those evaluations using a qualitative dimension and ‘measurement’ when the evaluation or academic report under discussion uses quantitative-oriented tools and methods to evaluate the *behavioural additionality* effect or when the reports make explicit use of the term ‘measurement’.

2. What works, for whom and under which circumstances, for the set of practices under analysis?

The first question has the objective to provide a description of the state of the art in terms of methodology. Recent research on the topic (Cunningham and Gök, 2012; Gök and Edler, 2012; Edler et al., 2013; Amanatidou et al., 2014) suggests that evaluations that examine *behavioural additionality* focus mainly on determining the effect of public subsidies on direct financial support measures, networking and, to a lesser extent, technology transfer policies. Moreover, the unit of analysis employed with greater frequency is the ‘firm’ or ‘project’, and the calculations of changes in behaviour often follow an input/output paradigm. Similarly, whether behavioural effects persist beyond support is often not investigated.

In terms of the effects produced because of governmental intervention, three different *behavioural additionality* effects are reported in the literature:

1. Subsidies impact on the characteristics of supported projects by modifying their scale, scope or speed. That is, interventions generate *project additionality* (see, for example, the evidence provided by Roessner, 2000; Rugg and Feller, 2003; Shipp et al., 2005; OECD, 2006 and Roessner et al., 2010).
2. Public funding increases the cooperation levels of subsidised firms (Arvanitis et al., 2002; Hyvärinen, 2006; OECD, 2006; Hyvärinen and Rautiainen, 2007; Roessner et al., 2010).
3. Impacts on the risks associated with conducting R&D (OECD, 2006).

Despite the cumulative findings on the *behavioural additionality* effect as reported above, there appears to be a tendency in the current attempts that empirical evidence for the concept is ‘relatively scarce’ (Afcha and García-Quevedo, 2014; Okamuro and Nishimura, 2014). Moreover, *behavioural additionality* is observed as a phenomenon of ‘recent interest’ (Knockaert et al., 2014) or ‘rare in science and technology policy studies and typically not addressed’ (Antonioli, Marzucchi and Montresor, 2014; Aragón et al., 2014; Simachev et al., 2015).

The second question (above) tries to contextualise the capacity of the explored methodologies to solve the problems of evaluating behavioural change produced by government interventions in firms.

A total of 145 reports, including academic works and evaluations, were analysed. The following databases were explored:

- 14 reports from the INNO-Appraisal repository (EVAL-INNO, 2012).
- 64 reports from the NESTA Compendium of Evidence on Innovation Policy (NESTA, 2012).
- 12 reports from the OECD (2006) report⁶.
- 55 additional web-based reports, located through different Internet search engines, Google Scholar, Scopus and Web of Science/Knowledge.

Table 3.1 (below) presents the search and appraisal procedures and knowledge extraction processes undertaken for the review.

⁶ The OECD (2006) report included the following methods:

- Interviews: R&D Start programme – Australia, IWT Support – Belgium, Public R&D project funding – Germany, R&D projects of NEDO – Japan (combined with a questionnaire), Innovation Norway (Loans and grants) – Norway, SMART and LINK initiatives – UK (in ten in-depth case studies).
- Surveys - Federal R&D Support Scheme (FFF) and Kplus Funding Initiative – Austria (including a counter-factual scenario), Advanced Technology Programme – USA (including also online-based interviews), and FP5 – EU (questionnaire-based survey).
- Econometric analysis - General R&D funding – Korea.

Table 3.1 Search, classification and appraisal procedures

Stage	Procedure
Search	<ol style="list-style-type: none"> 1. Select a database 2. Adopt a search strategy <ol style="list-style-type: none"> a. Dynamic. Search for key terms: ‘<i>behavioural additionality</i>’¹; ‘Buisseret’²; ‘OECD (2006)’. The search is restricted to date, from 1995 to early 2014. b. Snowball. Review the references cited from each report. Any report related to <i>behavioural additionality</i> is retrieved. 3. Cross-validate between databases. 4. Repeat the procedure until no new reports are located.
Classification	<ol style="list-style-type: none"> 1. If the report contains one or more keywords, it was selected. 2. Include a report in the selected <i>corpus</i> if: <ol style="list-style-type: none"> a. It explicitly acknowledged assessing <i>behavioural additionality</i>. b. It assessed a behavioural dimension but did not name it as such (implicit <i>behavioural additionality</i>). c. It cited one (or both) of the key references (signalled in the dynamic search). 3. A report was classified according to: <ol style="list-style-type: none"> a. Its research design: Experimental, quasi-experimental or non-Experimental. b. The variable used for representing behaviour. <p>Reports could be of academic nature or evaluations.</p>
Appraisal	<ol style="list-style-type: none"> 1. Determine the type of research design followed by the report. 2. Describe the theoretical- conceptual approach towards <i>behavioural additionality</i> adopted by the report. 3. Understand the report’s methodological position³. 4. Report the findings from the search and elaborate the conclusions.
<p>Notes: ¹ American spelling was accepted.</p> <p>² Similarly, the key terms Georghiou or Cameron were employed in the search.</p> <p>³ Specific reports required to be translated (i.e. Mateus et al., 2003 and Bronzini and Blasio, 2006).</p>	

3.3 Behavioural additionality methodological practice tree

Following the procedures explained in Table 3.1 (above), a methodological ‘practice tree’⁷ was constructed. The methodological practice tree offers a graphical illustration of *behavioural additionality*.

In the figure, the reviewed reports were classified according to the research design they followed. For the thesis, and for the purposes of the review, a research design is understood as the logical structure followed by the research that ensures that the evidence obtained through it answers the research questions as unambiguously as possible (De Vaus, 2013).

Three types of research designs are most frequently recognised (Patton, 2011): Experimental, Quasi-experimental and Non-experimental (or rapid assessment)⁸. The differences between each design correspond to the way each particular method addresses the problems of *attribution* (or causality).

Experimental designs employ *random assignment* as the main attribution mechanism to explain the differences caused by government interventions (Shadish et al., 2002; Picciotto, 2012). The method follows a procedure that is similar to that followed for calculating additionality⁹. Additionality is calculated as the difference between the (observed) impacts of the supported group (referred as the *intervention* option) minus the effects of the *reference* case (also referred as deadweight case). The resulting measurement distinguishes between the *gross direct effects* of the intervention (which are inclusive of *immediate* and *agglomeration* effects), *leakage* (those outside the intervention’s target area or group who have also benefitted), and the *substitution* effect (also referred to as *crowding in* or *out*¹⁰) (English Partnerships, 2008).

⁷ The tree is inspired by Alkin’s (2013) classification of evaluation traditions.

⁸ The term ‘rapid assessment’ is used by Patton (2011). However more classifications exist. For example, Stake (1978), Patton (2004, 2011), De Vaus (2013) or Yin (2014) include the ‘naturalistic approach’ and case studies as differentiated designs.

⁹ The Additionality Guide (English Partnerships, 2008) offers two differentiated approaches for assessing impacts through the additionality framework: *top-down* and/or *bottom-up* perspectives. The former, also referred as the outcome indicator approach, consists of “assessing expected changes in overall indicators” (English Partnerships, 2008, p. 3). The latter consists of “appraising the expected impact on individual actions or projects, through consideration of their likely outputs or outcomes” (Idem.).

¹⁰ According to the Additionality Guide (English Partnerships, 2008, p.49) crowding out effects are a specific case of an impact. These are defined as “the tendency for outputs (other than those that increase the rate of capacity growth through a supply side improvement) to be entirely offset because of macro-economic adjustments”. The guide also suggests that “crowding out is of most relevance in relation to impacts at the national level. It is also possible that an intervention might result in crowding in effects, whereby variables in the economy adjust and result in an increase in private expenditure” (Idem.).

In the absence of randomisation¹¹, evaluation practitioners rely on different statistical controls to ‘artificially’ construct an experimental group, thus producing a quasi-experiment. Finally, non-experiments, do not use randomisation, but rather rely in-depth information of the human and social endeavour based on more qualitative-oriented techniques to establish causation.

The *behavioural additionality* methodological practice tree is presented in Figure 3.1 (below). The roots of the tree include the input and output additionality frameworks (English Partnerships, 2008), the trunk contains those works, considered as ‘core’, that discuss the topic from a theoretical and conceptual perspective. Finally, the branches correspond to a particular research design with the sub-branches representing specific tools and methods considered under each research design.

Experimental Designs

This branch contains only one report: Bakhshi et al., (2013). The report evaluates the effectiveness of the UK Creative Credits initiative in 150 SMEs from Manchester (North-West England).

Quasi-Experimental Designs

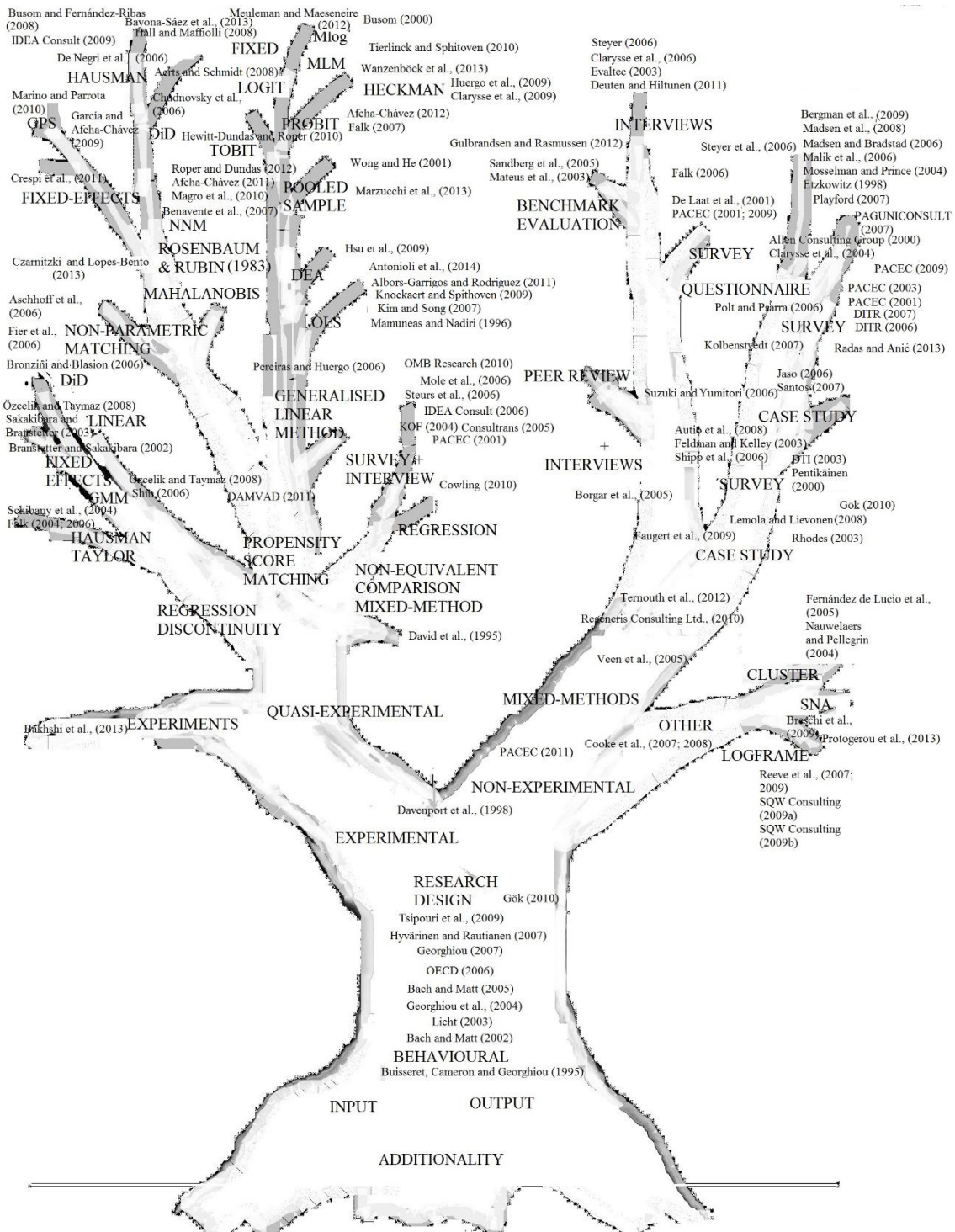
Nearly half of the reports under analysis followed a quasi-experimental research design to test *behavioural additionality*, these reports shared a similar conceptual backbone, adopting as a working definition the concept developed by Buisseret, Cameron and Georghiou (1995). In the same way, the reports assume that innovation policies are inherently biased because policy agencies (pre)select their beneficiaries based on a set of desirable characteristics, that is Governments follow a ‘*picking-the-winner*’ approach (see for example Chudnovsky et al., 2006; Busom and Fernández-Ribas, 2008; Czarnitzki and Lopes-Bento, 2013 and Antonioli et al., 2014).

Non-experimental designs

The majority of works in this branch are qualitative-oriented and most are evaluation reports. The sub-branches contain surveys, interviews, case studies, mixed methods and other methods (such as social network and cluster analysis).

¹¹ An important assumption behind experimental designs is that of equivalence: the only perceived difference between the experimental and the control groups is the intervention, while the following characteristics remain identical: 1) composition, 2) predispositions (achieve an outcome, regardless of the intervention) and 3) experiences (same time related-process) (Rossi et al., 2004).

Figure 3.1 Behavioural additionality methodological Tree¹²



¹² Only selected reports appear on the tree. Some reports appear more than once and in different sub-branches as they use more than one method.

3.4 Appraisal of methods for measuring and assessing *behavioural additionality*: What works, for whom, and under which circumstances?

3.4.1 The experimental perspective

The report by Bakhshi et al., (2013) provides several lessons for the measurement of *behavioural additionality*.

1. The report tries to go beyond the quantitative dimension by employing future innovation intentions, a behavioural variable composed of both quantitative and qualitative elements.
2. The employment of a longitudinal data collection strategy that, according to the authors, maximised the internal validity of the exercise. This data collection approach helped to generate an accurate description of the firm's reality.
3. The use of a programme theory. Bakhshi et al., (2013, p.25) argue that the programme theory helped them to emphasise the “contingent nature of evaluation outcomes”, thus, enabling the authors to understand the process of change.

Regarding the last point above, in the context of the experiment, it was assumed that the Creative Credit initiative, by enabling collaboration, provided strategic opportunities for SME managers to collaborate with a creative partner. Specific managerial attitudes condition these collaboration opportunities, including (excessive) risk aversion, selection myopia and cognitive bias. The role of an innovation voucher, then, is to mitigate the possible (information and cognitive) failures that managers may experience.

The programme theory developed for this report depicts *behavioural additionality* as organisational learning, operationalising changes in behaviour as *future innovation intentions* (Bakhshi et al., 2013) in different periods (six, 12 and 24 months after the intervention). For the report, organisations learn when the SME managers learn to use the vouchers and, thus, place a higher value on creativity (observed as an input for achieving innovation).

The work by Bakhshi et al., (2013) reaches two major conclusions. First, they detected no significant differences between the innovation intentions of the treatment and the control groups. Therefore, they conclude that the credit vouchers caused little or no *behavioural additionality* effect. Second, and despite the previous observation, the authors endorse experimental designs as “promising” for impact (i.e. behavioural) assessment of innovation policies.

Despite the advantages presented above, there are essential questions that remain unresolved. First, the authors do not offer any explanation that justifies the assumption that both the control and experimental groups had identical ‘predispositions’ or behavioural experiences before receiving the creative voucher. As discussed earlier (Section 3.3), if the principle of perfect equivalence is not maintained, then the use of experiments is invalid.

Second, the behavioural variable has a high degree of subjectivity. Furthermore, and of greater consequence for the analysis, no description of the managers’ previous innovation intentions before the subsidy is offered. This absence of description is problematic as it increases the difficulty of observing how or why the vouchers generated additionality.

Finally, a practical issue with the experiment is its total cost of implementation since it exceeded £750,000 (each participating firm received, through a lottery raffle, a ‘creative credit voucher’ with a face value of £4,000), therefore, becoming impractical and costly to replicate in other settings.

3.4.2 *Behavioural additionality* and quasi-experimental designs

As mentioned before, the core concern of the reports that follow a quasi-experimental design to analyse *behavioural additionality* is to solve the innovation policies’ inherent *selection bias*. Accordingly, to solve the ‘picking-the-winner’ problem, three different statistical controls were identified: regression discontinuity designs¹³, matching procedure techniques¹⁴ and reflexive controls. Each technique offered certain advantages and helped the various reports to ‘construct’ an equivalent control group.

¹³ This method consists of selecting an adequate control group because of the presence of a particular variable (cutting point), based on an accurate pre-determined score. The methodology then requires the selection of a regression variable, which represents the fundamental difference of equivalence (between the intervention groups). The regression discontinuity design is interested in the causal effect of a binary intervention or treatment on a particular unit (e.g. individual, firms or countries) which can either receive or not receive a subsidy (Imbens and Lemieux, 2007).

¹⁴ According to Rossi et al., (2004) a Matching Technique would typically require specifying the intervention group first. Then, based on some ad-hoc characteristics previously specified by the evaluator, the appropriate (or equivalent) control group is constructed.

For example, a regression discontinuity design enabled Meuleman and De Maeseneire (2012) to model the effects of the intervention on a non-observable (or latent) variable, such as behaviour¹⁵. Second, several authors (Falk, 2004; 2006; Schibany et al., 2004 and Hsu et al., 2009) managed to include the effect of *time* on the expected behavioural changes by using regression discontinuity models.

On the other hand, the group of reports employing a matching technique *predict* that public R&D support provides incentives to positively impact the behaviour (or the variable selected to represent it) of the beneficiary firms. These works reach similar conclusions, with one group of reports finding evidence of behavioural change expressed as higher degrees of cooperation (García and Afcha-Chavez, 2009; Antonioli et al., 2014), and another group expressing behavioural change as higher degrees of R&D efficiency (Chudnovsky et al., 2006; De Negri et al., 2006).

Also, the matching procedure technique was employed explicitly for its perceived capacity to increase the internal and external validity of the measurements (Aschhoff et al., 2006; Busom and Fernández-Ribas, 2008; Magro et al., 2010). In addition, the matching procedure provided different solutions for the problem of *endogeneity*¹⁶, such as: considering the mediating influence that innovation's internal climate has when developing the model to measure behavioural change (Wong and He, 2001; Branstetter and Sakakibara, 2002), or by estimating the potential levels of R&D investments that the policy is expected to generate (Shin, 2006; Özçelik and Taymaz 2008; Neicu, Teirlinck and Kelchtermans, 2014).

Table 3.2 summarises the generic procedure followed to construct a *behavioural additionality* model employing Regression Discontinuity Designs and the Matching Procedure.

¹⁵ On their study on Technology Development Funds in Chile and Panama, Hall and Maffioli (2008) also claim to have solved the problem of the limited degree of *observation* behaviours have. They arrive at this conclusion from measuring the firm's innovation strategy operationalised as the changes in *external sources allocated to knowledge and the level of internal finance*.

¹⁶ See also: Busom (2000); Aschhoff et al., (2006); Busom and Fernández-Ribas (2008); Magro et al., (2010); Teirlinck and Spithoven, (2010); Afcha-Chavez, (2011b); Bayona-Sáez et al., (2013).

Table 3.2 Two procedures for constructing *behavioural additionality* models

Design	Regression Discontinuity	Propensity Score Matching
Methodology		
	<i>Generalised Linear Model (GLM)</i>	<i>Matching Procedure Technique</i>
Generic Procedure	<ol style="list-style-type: none"> 1. Determine and select the <i>behavioural additionality</i> dimensions (theoretical considerations). 2. Design the variable representing behaviour. 3. Decide the unit of analysis. 4. Decide the benchmark or comparison technic (e.g. longitudinal approach). 5. Construct and run the regression. 6. Regress with the selected benchmark. 	<ol style="list-style-type: none"> 1. Specify and estimate the model by obtaining a propensity score. 2. Create a matching group based on the propensity scores. 3. Select an appropriate Matching technique. 4. Select an observation from the experimental and control groups, calculate the distances of these observations with those from their respective groups. 5. Repeat step 3 for all observations. 6. Using the matched comparison group, calculate the <i>Average Treatment of the Treated</i>¹⁷ as the average difference of the matched samples.

Source: IDEA Consult (2009) and Czarnitzki and Lopes-Bento (2013)

Finally, the reports employing reflexive controls, have the objective of identifying any potential *crowding-out effects* (e.g. IDEA Consult, 2009). The reports under this branch shared some commonalities:

- All the reports constructed their respective control groups with ad-hoc surveys.
- Attribution was tested with the use of the counterfactual question applied¹⁸, through interviews with the firm managers.
- The reports make a distinction between two definitions of *behavioural additionality*, one normative in nature, and often referred to as broader or pure social-economic additionality, the other defines a narrower concept, or financial, and input additionality.
- All the reports were performed for Northern European Countries, including three different Framework Programmes.

¹⁷ The Average Treatment on the Treated refers to a counterfactual scenario, where the effect on the treated population is calculated (Rossi et al., 2004).

¹⁸ What would have happened in the absence of the intervention (English Partnerships, 2008).

The group of reports using reflective controls coincides with the practice of a mixed method approach. Table 3.3 (see below) summarises these methods.

Table 3.3 Quasi-experimental, mixed method approach in *behavioural additionality*

Method (Attribution)	Control group	Programme, report and other methodological particularities
Interviews + Econometric models (regression design)	Surveys (data)	FP2 (EU), FP3 (EU) in David et al., (1995). None observed.
		Austrian FFF & Austrian Science Fund (FWF) in KOF (2004). Use of document review and prior evaluations.
		Business Links UK Programme in Mole et al., (2006). Theory approach and Hackman approach (2 stage).
		Austrian FFF in Falk (2007). None observed.
Interviews (via counterfactual)		FP6 (EU) in IDEA Consult (2009). Survey applied on-line.
		Small Firms Loan Guarantee (SFLG) Scheme (UK) in Cowling (2010). None observed.
		SMART UK in PACEC (2001). None observed.
		Spanish PROFIT programme (R&D support) in Consultrans (2005). Use of telephone or face to face interviews.
	R&D Grants from IWT-Belgium, in IDEA Consult (2006) and Steurs et al., (2006). Using telephone or face to face interviews with tailored questionnaires. Use of two control groups: (1) firms supported and not supported by R&D grant, and (2) firms who never had received a grant.	
	SFLG UK in OMB Research (2010). Use of comparison survey.	

As can be observed in Table 3.3 two methods were used to attribute effects: isolating the impact of the policy with the aid of econometric models (and interviews), or through the counterfactual question which relied exclusively on interviews exploring hypothetical scenarios.

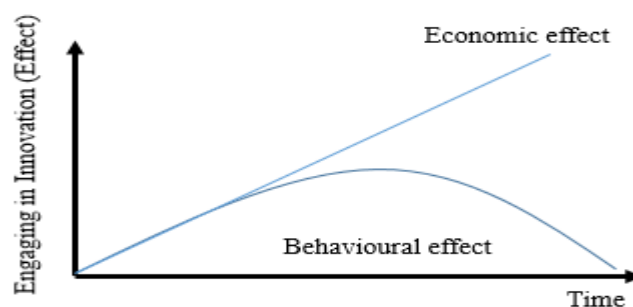
There are two cases (KOF, 2004 and Mole et al., 2006) which include additional methods for further increasing the robustness of their approaches. The first case (KOF, 2004; see also Schibany et al., 2004), consisted of a triangulation technique combining evidence obtained from interviews and an analysis of prior evidence of different evaluations, with a survey assessing four dimensions of *behavioural additionality* (project, acceleration, scale and scope). It also included an econometric analysis using a fixed effects model (using, as *behavioural additionality* variable, the ratio between the R&D subsidy and the growth in R&D personnel). The quasi-experimental nature of the approach is observed in the survey, which compared the answers given by two groups, one integrated by firms who had received support by the FFF, and the control group, composed of 203 firms who had been rejected from receiving similar support.

The second case, Mole et al., (2006), combined a survey, a two-step econometric model and a programme theory analysing *behavioural additionality* (“changing the way in which the firm does business”, Mole et al., 2006, p.70). The survey investigated the differences (impact assessment) that receiving support by ‘Business Links’ made to a group of 3,500 companies, employing as a comparison, a control group of non-supported firms with a sample of similar size. The econometric model tried to establish the causal effect of receiving assistance on business performance, when a subsidy was received and when it was not.

A characteristic shared by all the sub-branches of the quasi-experimental branch (regardless of the technique employed to construct the control group) is their conceptualisation of behavioural effects as a linear process. A useful example is provided in DAMVAD (2011).

DAMVAD’s model (2011), presented in Figure 3.2, assumes that *behavioural additionality* is the (increased) probability of being innovative.

Figure 3.2 Behavioural effects (of an innovation network)



Source: Adapted from DAMVAD (2011, p.19)

The model in Figure 3.2 presents the effects of engaging in innovation as two effects: one economic and another behavioural. Both effects appearing at the same time and following the same trajectory, until a moment when behavioural effects reach a peak and eventually, start to decrease. Considering the way the behavioural effect was characterised (as the probability of being innovative) the model suggests that over time this probability decreases, leading to questions regarding the persistency of effects.

The characteristics signalled above are important because they provide a representation of the manner in which quasi-experiments understand and then measure *behavioural additionality* by implying that behavioural changes follow a predetermined order. Another assumption is that those behavioural changes constitute a different and separate entity from firm-specific economic effects.

The conceptualisation of the effects as linear and non-persistent correspond to two of the most significant disadvantages present in the use of quasi-experimental research designs. Similarly, these approaches have other fundamental limitations, such as the tendency to describe that behavioural changes occur on a longer-term, yet, measuring behaviour as a short-term or middle-term impact. In addition, there is no unified consensus on the persistence of the effects, with most arguing that *behavioural additionality* shows decreasing returns over time (as seen in Figure 3.2, above).

3.4.3 The non-experimental view

Surveys and behavioural additionality

Hakim (2000) discussed that the greatest advantage of incorporating *surveys* in social research corresponds to the level of detail achieved by the phenomenon under investigation for large samples. According to the author, this characteristic is also its greatest disadvantage, as the cost of developing large-scale instruments increases with the sample size.

Surveys have been employed consistently as means for the assessment of *behavioural additionality* since the early attempts to assess and measure behavioural changes (see for example Georghiou, 2004; Clarysse et al., 2004; OECD, 2006 and Georghiou, 2007). Accordingly, fifteen reports included in the systematic review were observed to use surveys as a method of choice¹⁹.

The majority of reports using survey design agree with Hakim (2000), while also identifying other strengths of the method, including the greater degree of freedom offered for designing the instruments (DITR 2006, 2007), which result in the inclusion of broader categories of behavioural change.

Two examples of the above tendency include, Allen Consulting Group (2000), which included dimensions such as sales, employment and R&D (related) activities, while Clarysse et al., (2004), discussed elements such as quality, competitiveness and formalised innovation processes.

In terms of the umbrella questions incorporated in surveys, these are varied and include the counterfactual scenario or directly inquiring about the impact of the intervention (see Table 3.4).

¹⁹ Allen Consulting Group (2000); De Laat et al., (2001); PACEC (2001, 2003; 2009); Clarysse et al., (2004); DITR (2006, 2007); Falk (2006); Hyvärinen (2006); Kolbenstvedt (2007); Playford (2007); Polt and Psarra (2006); Shipp et al., (2006) and PAGUNICONSULT (2007).

Table 3.4 Umbrella questions on *behavioural additionality* surveys (selected reports)

Questions	Reports
What <i>effects</i> and <i>benefits</i> society, companies and university research has been generated by the contributions made by the programme?	(Kolbenstvedt, 2007)
What are the <i>motivations</i> for forming joint ventures?	(Shipp et al., 2006)
Would the project <i>continue</i> without funding?	(PACEC, 2003; DITR 2006, 2007; and Polt and Psarra, 2006)
Has the programme incentivised actors <i>to get more involved</i> in R&D activities?	(Falk, 2006)
What was the <i>impact</i> of the innovations developed with the help of the grant?	(Clarysse et al., 2004)

An important characteristic of surveys is that they have the capacity to include *atypical* behavioural responses without necessarily altering the overall structure of the instrument (see Clarysse et al., 2004; Shipp et al., 2006 and Playford, 2007). For example, Playford (2007) included the researcher's experience as an assessment of behaviour.

Similarly, survey designs offer the possibility to include multiple time frames (DITR, 2006, 2007; Shipp et al., 2006 and Playford, 2007) evidenced as an exploration of long-term (*enduring*) behavioural effects. This 'endurance' is often assumed to produce both structural and institutional impacts perceived at the level of the innovation system or the firm's skills base (PACEC, 2001, 2003, 2009; Clarysse et al., 2004 and PAGUNICONSULT, 2007).

DITR (2007) offers another example of the importance of persistence of behavioural effects in surveys. The report distinguishes between *short-term* (impacts) and *long-term effects*, the former includes the perceived differences in the R&D activities, while the latter includes the differences in the projects conducted by the firm and encompass new attitudes, skills and capabilities evidenced as the acquisition of new competencies²⁰.

The reports using the survey approach face significant challenges related to the design of their instrument. Some of these challenges include issues with the selection of the number and size of the sample, appropriate distribution channels and survey structure.

²⁰ These competencies ranged from project management skills, through to various technological and market routines and capabilities.

One report (Clarysse et al., 2004) is illustrative of the issues signalled above. In terms of the overall design, the authors argue that a ‘one-size-fits-all’ instrument is suitable to address all types of firms, regardless of their size or industry and that for this particular method relying on small sample is problematic²¹. A more important limitation (as observed by the authors), is the difficulty of attributing policy effects, due to an omission of the counterfactual case.

Finally, Clarysse et al., (2004) argued that *behavioural additionality* data collection methods require the careful guidance of the interviewees. Therefore, the authors strongly advise against the use of postal surveys as data collection techniques²².

Besides the difficulties signalled above, two additional aspects are little explored, the predisposition of surveys to constrain the analysis to pre-defined categories of behavioural change, and the topic of population diversity, which surveys are particularly prone to suffer, according to Woolcock (2009).

Interviews and behavioural additionality

The use of interviews as an instrument to understand the effect that public support has in influencing managerial attitudes is not novel and can be traced back to Rubenstein et al., (1977).

In *behavioural additionality*, the use of interviews has found an increasing level of acceptance amongst evaluators and scholars alike (Clarysse et al., 2006; Malik et al., 2006), mostly because interviews adapt to different levels of aggregation. Examples of this adaptability include evaluations at the following levels: individuals (Bergman et al., 2009), programmes (Deuten and Hiltunen, 2011), agencies (Madsen and Brastad, 2006) or countries (Evaltec, 2003).

²¹ Clarysse et al., (2004) hand-picked 22 cases from different manufacturing industries, and divided the population into four subsets based on their R&D intensity (permanent or no R&D department) and size.

²² De Laat et al., (2001) reached the opposite conclusion, claiming that using postal surveys facilitated the correspondence between interviewer-interviewee.

There are two distinctive interviewing practices identified in the field, one performing *deadweight* calculations under an input-output framework (Evaltec, 2003; Deuten and Hiltunen, 2011), the other broadening the type of behavioural effects under analysis by incorporating categories such as persistence and organisational capabilities (Malik et al., 2006). Furthermore, the reports using interviews tend to target senior (R&D) managers as questionnaires respondents (Malik et al., 2006; Bergman et al., 2009).

An advantage of using interviews to analyse behavioural change is observed by the reports done by Madsen and Brastad (2006) and Malik et al., (2006), who argue that the method provided in-depth information about specific changes in behaviour. For example, the work of Malik et al., (2006) adds several novel elements (often not observed in other reports), including, technological ‘lock-in’ failures, development of new cooperative networks or coordinating innovation systems as a result of the intervention, and the process described to acquire certain (innovative) competences. Another major contribution of this report is its inclusion and identification of unanticipated effects, mainly observed as a sense of ‘*legitimacy*’ regarding the firm’s attitudes towards collaboration, as described by the interviewees.

Case study approach to behavioural additionality

Case studies are claimed to offer rich and detailed descriptions of the phenomenon under investigation (Hakim, 2000). Thus, scholars in *behavioural additionality* observing this potential, strongly endorse their incorporation in the field (Georghiou et al., 2004; OECD, 2006). However, a very limited number of the reports from the synthesis employ case studies as a principal data collection method (Rhodes, 2003; Lemola and Lievonon, 2008 and Gök, 2010).

Although the work of Lemola and Lievonon (2008) addresses the topic of behavioural change, it addresses it as a side issue only. The work discusses the potential effect of public interventions supporting firms to generate *open innovation* (Chesbrough, 2003). Thus, the works of Rhodes (2003) and Gök (2010) are the only examples available in this chapter to observe the use of case studies in the field²³.

²³ Rhodes (2003) analysed the Engineering Technicians Programme (UK), while Gök (2010) tested his *behavioural additionality* theory with fourteen probing cases from two programmes, the TUBITAK–TIDEB technology and innovation programme (Turkey) and the UK’s Collaborative R&D programme.

The works by Rhodes (2003) and Gök (2010) follow a similar methodological approach including two analytical phases. The first stage involves scoping the programme while the second consists of conducting the fieldwork (engaging with stakeholders).

For Rhodes (2003) the (behavioural) changes that the programme can incorporate were perceived as modifications to the skills of its beneficiaries, divided into *generic* and *technical*. The former includes productivity or customer oriented knowledge, teamwork, leadership and business development while the latter refers to process improvements, and incorporation of novel (manufacturing) techniques. Rhodes discusses the generation of these skills with the aid of *descriptive narratives*.

On the other hand, Gök (2010) observes that firms change their behaviour when they integrate organisational routines (following Pentland and Feldman, 2005). His research design included the use of the umbrella question (through interviews), “what kind of *task* do you *do* to accomplish the firm’s activities?” Moreover, Gök (2010) uses a framework termed ‘Variation, Selection and Retention (VSR)’.

The inclusion of the VSR framework enabled Gök to understand the impact of public support at different levels of aggregation and incorporate the idea of *sources* (origins) and *consequences* of routines, with his methodology, Gök (2010) identified changes at the level of activities. In his cases, the firms under analysis reached different outcomes as they developed different routines²⁴.

The reports that employ case studies to analyse behavioural changes offer several advantages. Gök (2010, p. 226) argued that case studies are particularly advantageous over surveys in *behavioural additionality* because the latter only focuses on partial and tangible aspects of the organisational behaviour (e.g. technologies). Thus, concluding that surveys do not escape the ‘black-box type’ evaluations.

Gök (2010) also reaches the following conclusions:

- *Behavioural additionality* should result in a change of people’s cognitive capabilities because behavioural changes assist in “freeing up cognitive resources that are necessary for learning” (Gök, 2010, p. 223).

²⁴ Gök (2010) studied firms exclusively belonging to the manufacturing sector, to demonstrate that behavioural additionality is not only a ‘soft’ concept.

- The physical manifestation of a routine is an important but insufficient condition to provide evidence that behavioural change has occurred. Thus, people actions and the rules they follow are essential in understanding changes.
- Context and behaviour cannot be isolated. Thus, any analysis must include contextual considerations and *behavioural additionality* should be “evaluated along the entire funding cycle and beyond” (Gök, 2010, p.184).

Another advantage includes the type of evidence case studies produces. In this sense, the evidence is context-specific and involves the influence of time. For example, Rhodes (2003) concludes that public support helps policy beneficiaries to increase and modify their skill base (both on generic and technical expertise). These skills vary in magnitude and type, according to the recipients’ past experiences and an initial set of competences.

A final advantage of case studies is their capacity to identify unanticipated (or *perverse*) behavioural effects. For example, one of the cases in Gök’s study (2010) includes the description of a firm that, because of the impact of the subsidy, engaged consistently in research activities that were more challenging and beyond the firm’s actual capabilities.

The non-experimental, mixed methods approach for behavioural additionality

Several reports combined different methods to detect behavioural changes, ranging from the use of desk research and prior evaluations to diverse combinations of case studies, interviews, questionnaires and surveys (see Table 3.5, below).

The majority of authors working on the mixed methods approach highlight the presence of the respondent’s bias. Accordingly the reports perceived that the policy beneficiaries had incentives to provide strategic answers (see for example Ship et al., 2006), and thus, try to account for this effect with the inclusion of different controls.

Table 3.5 Non-experimental, mixed method approach in *behavioural additionality*

Methods		Programme	Country	Report
<i>Desk research review</i> + (prior) <i>evaluations</i> or reinforcing <i>interviews</i>		FORNY programme	Norway	Gulbrandsen and Rasmussen (2012)
		Leading Technological Institutes		Veen (2005)
		VINNVAXT	Sweden	Cooke (2007, 2008)
<i>Questionnaires</i>	<i>Surveys</i>	Vehicle Research Programme (FFP)		Faugert et al., (2009)
		Advanced Technology Programme		USA
		KENNO, PIGMENTTI and PROMOVI	Finland	Autio et al., (2008)
	<i>(Explorative) Case Studies</i>	Collaboration programmes	Mexico	Jaso (2006)
		R&D tax credits		Santos (2007)
	<i>Interviews and statistical analysis</i>	NEDO (agency)	Japan	Suzuki and Yumitori (2006)
<i>Economic analysis, market value analysis and benchmarking</i>		Neck Injuries Research	Sweden	Sandberg et al., (2005)
		OEP (Economy)	Brazil	Mateus et al., (2003)
<i>Impact analysis + Case Studies</i>		VINNOVA	Finland	Kolbenstvedt (2007)
<i>Peer assessment + interviews</i>		DEMO 2000	Norway	Borgar et al., (2005)
<i>Programme theory, interviews and modelling</i>		KTP Scheme	UK	Ternouth et al., (2012)

Table 3.5 (continued)

Methods		Programme	Country	Report
Survey +	Interviews	R&D Collaboration programme	New Zealand	Davenport et al., (1998)
		SMART and CR&D programme (collaboration)	UK	PACEC (2009, 2011)
		KTP Scheme		Regeneris Consulting Ltd (2010)
	BUSSINESS LINK scheme	PACEC (2003)		
	Case studies	R&D programmes (generic)	Finland	Pentikäinen (2000)
		RAZUM initiative	Croatia	Radas and Anić (2013)

Some of the advantages of the mixed methods approach to *behavioural additionality* (besides those already signalled per single method) include their capacity to reach robust conclusions based on a triangulation strategy or as a way to determine ‘best-practices’ that would later contribute towards the design and assumptions held by their additional methods (Venn, 2005; Cooke, 2007; 2008; Gullbrandsen and Rasmussen, 2012). Other authors employ a mixed methods approach for solving certain methodological issues. For example, Davenport et al., (1998) complemented their interviews with econometric analysis to address the problem of attribution and reduce the effect of the project fallacy.

Finally, some of the disadvantages of the mixed methods approach, besides those method-specific, include:

- Giving some consideration to the notion of persistence of the behavioural effects. However, for practical reasons the analysis is often confined to short-term measurements (e.g. Davenport et al., 1998; Gulbrandsen and Rasmussen, 2012).
- Some reports perform *deadweight* calculations labelling these as behavioural change (see for example PACEC, 2009, 2011)²⁵.

²⁵ It could be argued that by defining behaviour simply as either an input or an output of the intervention one removes the necessity of having a concept exclusive for behaviour and between input and output additionality, thus simplifying the task of evaluating interventions. However, it is important to observe that the concept of *behavioural additionality* was precisely developed to explain those intervention’s effects that the input and output frameworks cannot (see Buisseret, Cameron and Georghiou, 1995; Larosse, 2004; Clarysse et al., 2004; Georghiou and Clarysse, 2006; OECD, 2006; Gök, 2010; Gök and Edler, 2012, also this research, Chapters 1.2 and 1.3). For example, for Georghiou and Clarysse (2006) the input and output additionality are useful to describe the tangible and financial outcomes of an intervention, while the *behavioural* dimension should be related to aspects such as knowledge acquisition and business strategy.

Other non-experimental approaches to behavioural additionality

A small subset of reports proposed the use of different tools and techniques to analyse behavioural changes. These include:

- Social Network Analysis (Breschi et al., 2009 and Protogerou et al., 2013).
- Cluster Analysis (Nauwelaers and Pellegrin, 2004 and Fernández de Lucio et al., 2005).
- Participatory approaches and workshops (Reeve, 2007, 2009).
- Logic frameworks (SQW Consulting, 2009a, b).

Protogerou et al., (2013, p.3) present a justification for government intervention that serves to summarise the rationale shared by the reports listed above. Accordingly, Public subsidies “should” target *behavioural additionality* by “promoting collaborative learning, reinforcing the linkages between the different types of agents involved in the innovation process and supporting an extensive diffusion of knowledge” (Idem.).

Another similarity shared by these reports is their representation of behavioural change either as the modifications of the firm’s position in a network or as detailed collaboration outcomes. Several reports (Fernández de Lucio et al., 2005; Breschi et al., 2009 and Protogerou et al., 2013) argue that some of the consequences of public support include an improvement in the company’s knowledge, capabilities or strategic planning. Other authors (see SQW 2009b) describe an additional impact relating to the type of clusters the firms would eventually adhere to after receiving a subsidy.

The works which employ Social Network Analysis (SNA) and Cluster Analysis follow a similar methodological approach for constructing their samples. First, they use descriptive statistics to identify similarities amongst the actors in the population, and then, they integrate groups for comparison, concluding with a description of the policy effect.

In some instances (e.g. SQW Consulting, 2009a, SQW Consulting, 2009b) the representation of behavioural changes is outcome-driven and more related to input than to *behavioural additionality*. For example, SQW Consulting (2009b, p.3) argues “effective interventions will see their inputs converted into outcomes in the form of changes in the behaviour, capacity and performance of stakeholders”. According to the authors, these transformations are “likely to address the market failures that prompted the intervention” (Idem.).

Another characteristic of the reports using SNA is their role as formative evaluations (see Breschi et al., 2009 and Protogerou et al., 2013). Moreover, and despite representing a novel approach for *behavioural additionality*, the reports working with SNA offer null or limited evidence of behavioural change. For example, the work of Nauwelaers and Pellegrin (2004) can be critiqued for its use of an appreciative scale with a high degree of subjectivity for assessing behavioural changes²⁶. Similarly the report by Breschi et al., (2009, p.852) explicitly acknowledges to “not perform[ing] behavioural additionality test in the strict sense of the term”. Consequentially more work using SNA is required to judge its potential for *behavioural additionality*.

3.5 Variables representing *behavioural additionality*

The previous section addressed the questions what, for whom and under which circumstances *behavioural additionality* methodologies work. This section complements the analysis by describing the set of variables employed across the different methodological practices to represent behaviour.

The reports explored in this chapter include at least twenty-seven different variables to represent *behavioural additionality*²⁷. Due to their composition, it is possible to categorise them into five groups representing behaviour:

1. *Collaboration*
2. Modification of specific *individual traits* or *personal attitudes*, related to innovation
3. *Organisational changes* at a micro level
4. As *inputs* and *outputs*
5. *Project additionality*

A complete description is provided for each group below.

²⁶ The scale adopted four possible values indicating additionality: ‘0’, ‘+’, ‘++’ and ‘+++’.

²⁷ It is important to indicate that some of the reports include more than one variable to represent behaviour in their analysis. As a consequence, the number of variables does not correspond to the total number of analysed reports.

Behavioural additionality as collaboration

A first category represents changes in behaviour as a modification of some aspects of the *collaboration* experiences that the firm had after receiving a subsidy. In this category, *subjective parameters* (e.g. managerial attitudes towards collaborating with specific partners) represent behaviour (Falk, 2007). Other characterisations include *cooperation patterns* (Feldman and Kelley, 2003; Clarysse et al., 2004; Aschhoff et al., 2006; Busom and Fernández-Ribas, 2008 and Marzucchi et al., 2013).

Collaboration is also observed as the *output* of a process. Under this perspective, the variable usually adopts the shape of the propensity that firms have to collaborate with others²⁸ (Busom and Fernández-Ribas, 2008; Teirlinck and Spithoven, 2010; Afcha-Chávez, 2011a, b; DAMVAD, 2011 and Marzucchi et al., 2013).

By using collaboration as an indicator of behavioural change, different conclusions have been reached. Fier et al., (2006, pp.142-143, 145) suggest that after receiving a subsidy, some firms modified the type of cooperation arrangements they had, while others did not. This decision was observed to be exclusively dependent on the type of prior collaboration arrangement and not on the subsidy itself. Busom and Fernández-Ribas (2008), IDEA Consult (2009) and Tierlinck and Spithoven (2010), arrive at a similar conclusion.

Fier et al., (2006, p.16) also found that the cooperative agreements tended to last after the subsidies finished. Based on these findings, Fier et al., (2006) conclude that the decision to continue with a collaboration arrangement is independent of the firm's size and the sector where the firm operates. This conclusion can be directly contrasted with the findings of Hsu et al., (2009), who conclude that the size and sector of Taiwanese firms, do play a crucial role when firms decide to continue with a particular collaboration arrangement. The implication of this finding is important, because Hsu et al., (2009) concluded that those firms which belonged to the biotechnology and pharmaceuticals industries, generated less *behavioural additionality*, as these firms decreased their collaboration patterns after receiving a subsidy.

²⁸ This category also includes the works of Wong and He (2001); Rhodes (2003); Clarysse et al., (2004); Falk (2004, 2006, and 2007); Schibany (2004); Fernández de Lucio et al., (2005); Aschhoff et al., (2006); Hyvärinen (2006); Madsen and Brastad (2006).

Behavioural additionality considered as a modification of specific individual traits or personal attitudes, related to innovation

The reports that focus on personal traits and individual performance (two topics heavily linked with behavioural psychology and behavioural economics) have represented behaviour mainly as three differentiated concepts:

1. The influence of the subsidies on a set of firm *skills* or *individual traits*

In terms of the person and their skills, Madsen and Brastad (2006) offer some evidence identifying pro-active entrepreneurs who are capable of recognising market opportunities (e.g. being the first on the market) as those who will take more advantage of the subsidies, therefore, causing bigger behavioural impacts for their organisations. Kim and Song (2007) pose a similar argument. They propose that certain personal characteristics (e.g. age, gender, education) of the research leader condition the success of the subsidy. Even though both works propose the role of the individual as a central element for generating transformations in behaviour neither describe the process by which this occurs.

On a more aggregate level, several reports document a positive relationship between government subsidies and the set of skills that the firms generate. One example of an effect of this type includes an increase in skilled labour to conduct R&D identified by several reports (PACEC, 2001, 2003, 2009, 2011; Rhodes, 2003; Knockaert and Spithoven, 2009; Marino and Parrota, 2010; Regeneris Consulting, 2010 and Antonioli et al., 2012, 2014).

Evidence provided by Albors-Garrigos and Rodriguez Barrera (2011, p.1315) serves to complement the above finding. The authors found that only those firms with a more sophisticated innovative behaviour (which they identify as having prior skills in exploiting external sources and previous cooperation linkages) performed better, in terms of innovation. The authors conclude that behavioural responses are less dependent on size and more on the firm's (prior) innovative behaviour.

2. *Behavioural additionality* as a *legitimisation* process for the formalisation of R&D or innovation activities

Buisseret, Cameron and Georghiou (1995) first recognised this effect, observed as an unintended (yet positive) consequence of subsidies. The authors connected this effect with a sense of accomplishment in the firms (legitimisation).

Several reports also discuss the *branding or legitimisation* effect, some examples including: New Zealand firms (Davenport et al., 1998), (some of) the UK's KTP participants (Regeneris Consulting, 2010) and the beneficiaries of the UK's SMART programme (PACEC, 2009, 2011).

A component related to the legitimisation effect is the condition where subsidies helped firms to formalise their innovation processes. This formalisation is accomplished by systematising the R&D process (KOF, 2004; Malik et al., 2006 and Regeneris Consulting, 2010). For others (Hyvärinen, 2006; Madsen and Brastad, 2006; Shipp et al., 2006; Hsu et al., 2009) the formalisation is either the product of an increase in the levels of trust within policy beneficiaries or because public subsidies helping firms to minimise the risks associated with R&D.

3. Improvement of the *manager's (cognitive) capabilities*

Several studies (Buisseret, Cameron and Georghiou, 1995; Davenport et al., 1998; PACEC, 2003; Clarysse et al., 2004, 2009; Kolbenstvedt, 2007; Borgar et al., 2005; Steyer, 2006; Magro et al., 2010, and Radas and Anić, 2013) have observed a positive relationship between the changes in the attitudes of the firm's managers (after receiving the subsidy) and the manager's innovative performance. This link serves to explain an observed increase in the companies' skill levels (Regeneris Consulting, 2010 and Marzucchi et al., 2013).

The relationship 'subsidy/management's performance' described above has been measured to different degrees and with different indicators by each report²⁹. Though the indicator might be different, the results achieved by the reports are consistent. Most of the reports above reach the conclusion that subsidised firms increase the management's awareness of innovation opportunities represented as an increased probability of accumulating learning and experience (Aerts and Schmidt, 2008; Hall and Maffioli, 2008; Clarysse et al., 2009; Afcha-Chavez, 2012; Marzucchi et al., 2013).

²⁹ For example, Davenport et al., (1998) used three parameters, one measuring the attitude of the R&D management towards cooperation, and perceived factors for failure and success in cooperation arrangements.

Other authors, such as Malik et al., (2006) attempted to link the individual level (managers' performance) with (macro) organisational efforts. The authors found evidence that helped them to determine that the learning originating during different subsidised projects is cumulative and often used in new and additional projects in which the firm engages.

Behavioural additionality as changes at the micro level of the organisation

Some reports observe behavioural changes as a phenomenon that affects organisations as a whole, either because the interventions modified the business strategy, the organisation's productive processes or it helped to create or modify organisational routines.

In terms of business strategy, Busom (2000) and Bayona-Sáez et al., (2013) found evidence of the subsidies impacting the type of R&D strategies adopted by (large) Spanish firms. According to Bayona-Sáez et al., (2013), the companies that received public subsidies increased their capacity to choose between different R&D strategies (in-house, outsourcing, or a mixed approach).

A second approach involves the works of Hyvärinen (2006) and Clarysse et al., (2009) who observed firms in receipt of public support modifying their (R&D) practices, specifically their knowledge absorption capabilities. In addition, Clarysse et al., (2009) found that the type of network that the firm establishes has a positive impact on the amount of knowledge that the firm can access and its subsequent learning opportunities.

Clarysse et al., (2009) also offer additional findings that are of relevance to observe the effect of public subsidies in modifying organisational behaviours. The authors found no relationship between *financial slack*³⁰ and *behavioural additionality*, nor a positive link between subsidy and future innovation spending.

The findings described above are important for several reasons. First, financial slack is often assumed by some works employing a quasi-experimental approach to be a necessary condition for successful behavioural change. Similarly, several econometric exercises observe as a direct consequence of public support an increase in future innovation spending.

³⁰ The capacity to seize emerging opportunities due to the possession of additional financial resources.

In this sense, the conclusion reached by Clarysse et al., (2004) is informative, as the authors argue that, even when the subsidy is present, the firm's decision to change its management practices is related to other factors that go beyond financial availability, including firm's experience and the project's performance.

Third, Clarysse et al., (2009) found a positive relationship between firm size and the degree of change originating in the project's scale and technical specialisation. That is that larger companies tended to use their subsidies better. Although informative, this finding contradicts Clarysse et al., (2004) conclusion indicating that size does not make a difference in terms of *behavioural additionality* (see section 3.4.3).

Finally, a differentiated group of reports introduce the concept of organisational routines as a proxy for measuring behavioural change (see Madsen and Bradstad, 2006; Bergman et al., 2009 and Gök, 2010). However, the only work that explores in-depth the implication of using routines is the work by Gök (2010). He found that government support created a significant constellation of organisational routines for conducting R&D and other innovation activities.

For Gök (2010), these organisational routines had different consequences, as some reinforced the rules and the activities of several processes. Other routines helped to produce or modify the cognitive processes behind these activities. In other instances, the intervention contributed to reducing the uncertainty associated with some innovation activities as it provided a source of learning and organisational stability or it assisted firms in economising cognitive resources.

Behavioural additionality as an input

The tendency to label input additionality as *behavioural* additionality is observed in terms of financial performance. This practice is extensive to several reports across European countries. For example, KOF (2004) found that the FFF's beneficiaries spent an additional 1.40 Euros on R&D for every Euro they receive. DAMVAD (2011) reported that each Euro invested by the government in the EUREKA programme generated an additional €0.03 spent in R&D by Danish businesses. In the UK, the Cowling report (2010) established that local firms spent an additional 1.05 pounds for each one they received. On the other hand, the KTP beneficiaries spent around £4.70 to £5.20 per £1 of public money invested by the sponsors (Regeneris Consulting, 2010).

The reports that observe behavioural changes as an input offer precise values of the *behavioural additionality* effect achieved by the subsidised firms. These reports found a positive link between the subsidy and the increase of scientific personnel in an R&D department (or firm).

For example, Norwegian firms created one additional job per project (Madsen and Brastad, 2006). In contrast, the KTP scheme in the UK, besides having achieved high levels of additionality³¹, also creates (on average) three additional jobs per project (Regeneris Consulting, 2010). Finally, other programmes report having created at least five additional R&D jobs per project (see Marino and Parrota, 2010 and Czarnitzki and Lopes-Bento, 2013).

Other authors indicate the effect that the subsidies have is perceived as the increase in the proportion of the firms' R&D staff. For example, Falk (2004, p. 13) found that 1 % increase in the R&D subsidy induced Austrian firms to enhance their number of scientific R&D staff by 0.07 %. This finding led Falk to conclude that the programme generated low levels of *behavioural additionality*. The author argues that the subsidy would need to rise almost 1,428 % per company to enable Austrian firms to hire one additional employee (Idem.). Another report, done for the same country (Schibany et al., 2004), found that the additionality induced by the FFF programme represented a 2 % increase in R&D staff.

Behavioural additionality as an output

When considered as an output, *behavioural additionality* is measured by a large number of indicators, either:

- *Access to external resources* (David et al., 1995)³².
- An increase of the *company's know-how* (Hyvärinen, 2006) or its *sales* (Allen Consulting Group, 2000).
- *Labour productivity* or *R&D intensity* (Cowling, 2010)³³.
- *Patents* (Branstetter and Sakakibara, 2002)³⁴.

³¹ High additionality when investigated through a cost/benefits analysis.

³² See Also: Benavente et al., (2007); Hsu et al., (2009); Cowling (2010) and OMB Research (2010).

³³ Also: Wong and He (2001); Mateus et al., (2003); Bronzini and Blasio (2006); Özcelik and Taymaz (2008); Huergo et al (2009); Alslev Christensen (2011); Crespi et al., (2011) and Czarnitzki and Lopes-Bento (2013).

³⁴ Also: Veen (2005); Kim and Song (2007); Cooke (2008); Breschi et al., (2009); Huergo et al., (2009) and Albors-Garrigos and Rodriguez Barrera (2011).

- *Product or process innovation* (Madsen and Brastad, 2006)³⁵.
- *Production efficiency* (Clarysse et al., 2004)³⁶.
- *Scientific publications* (Sandberg, 2005)³⁷ or *scientific personnel* (INDECON, 2003)³⁸.

A group of reports employ financial outputs as a representation of changes in the (financial) strategy of firms linking these with modified behaviours. Under this category, Shin (2006, p.177) located that “both government R&D and subsidies to business R&D have a positive effect on private R&D investment”. He argued these effects were greater in the long-term than in the short-term, and lasted up to twelve years (Shin, 2006, p.178). Similarly, PACEC (2009a) and DAMVAD (2011) found a positive relationship between *R&D expenditure* and *private investment*.

Other reports discuss product or process improvement as behavioural change. Hewitt-Dundas and Roper (2010) report that 63 % of subsidised firms improved their products, resulting in 26 % of them increasing their probability to innovate.

Finally, in terms of what would have happened in the absence of the subsidy, some of the following figures are reported for firms achieving full additionality³⁹:

- 28 % of the Spanish firms observed by Consultrans (2005).
- 40 % of Belgian companies (IDEA Consult, 2006; Steurs et al., 2006).
- 43 % of the firms observed by OMB Research (2010).
- 54 % of SMEs in Australia (De Laat et al., 2001; Rhodes, 2003; DITR, 2006 and Playford, 2007).

³⁵ Also: Benavente et al., (2007); Hall and Maffioli (2008); PACEC (2009, 2011) and Radas and Anić (2013).

³⁶ Also: Madsen and Brastad (2006); SQW Consulting (2009a) and Hsu et al., (2009).

³⁷ Also: Chudnovsky et al., (2006); Kolbenstvedt (2007) and PACEC (2011).

³⁸ Also: Schibany (2004); Falk (2004, 2006, 2007); Faugert et al., (2009); Huergo et al., (2009); Cowling, (2010); Roper and Hewitt-Dundas (2012); Czarnitzki and Lopes-Bento (2013).

³⁹ The term *full additionality* is used in the literature to indicate the scenario where the impacts attributed to the policy (intervention or programme) “would not have happened at all” (Consultrans, 2005, p.97). For example, OMB Research (2010, p. 73) used the term “fully additional” to refer to a dimension of ‘Generic Additionality’; defining it as the condition in which “[SFLG users] feel that they probably or definitely would *not* have achieved similar results without the [SFLG] guaranteed loan.” (Idem. Emphasis in the original). This dimension of additionality also might refer to the condition when, without support (R&D) projects would be cancelled (see IDEA Consult, 2006 and Steurs et al., 2006).

- 56 % of the cases (for project additionality: Pentikäinen, 2000; Borgar et al., 2005; Madsen and Brastad, 2006 and Faugert et al., 2009).
- 85 % of the UK firms measured by PACEC (2011).

Behavioural additionality as project additionality

The studies that employ project additionality as a proxy for *behavioural additionality* understand it (usually) as three differentiated components of the project, including its scale, scope or speed. As these elements were covered in-depth in Chapter 2, in this section only a discussion is conducted on the treatment and empirical findings from the reports contained in the review.

Several studies found empirical evidence of their corresponding policies modifying the scale and/or scope of the firm's projects (KOF, 2004; Consultrans, 2005; IDEA Consult, 2006, 2009; Steurs et al., 2006; Falk, 2007 and Cowling, 2010). For example, Falk (2007) found that without the subsidy, a proportion of 36 to 46 % of Austrian firms would have delayed or postponed the starting date of their projects and a large share of the survey respondents (65 to 66 %) would have reduced the ambition of their project's objectives.

Other findings under the same category include a discussion on the relationship between the impacts of the intervention and the speed in which the firms conduct their projects. However, the link is not clear and the available evidence is often contradictory, and in some instances a negative relationship is identified (for example DITR, 2006 and Playford, 2007).

In some studies a fourth dimension of impact is observed, *acceleration additionality* (Feldman and Kelley, 2003; IDEA Consult, 2006; Polt and Psarra, 2006 and Steurs et al., 2006). Nevertheless, in some instances, it is not clear if the concept is a synonym or replaces that of 'speed' additionality (see Feldman and Kelley, 2003).

Finally, with the use of 'project' additionality as a representation of behavioural change, some authors described the relationship between subsidy and firm size. Falk (2007) found a positive correlation between large Austrian firms and the amounts of subsidies they received. While Bergman et al., (2009, p.15) concluded that small businesses tended to experience stronger levels of scale and acceleration additionality in comparison to big business.

3.6 Chapter conclusions

In this chapter, a systematic review was conducted for 145 *behavioural additionality* evaluation reports and scientific publications.

The purpose of the review was to answer two sets of questions related to the methodological practice of assessing behavioural change. The first question addressed the way in which the *behavioural additionality* effect is operationalised, assessed and measured. Accordingly, the practices were classified under a ‘methodological practice tree’ that recognised three main groups of analysis. The second question proposed to identify the advantages and disadvantages of each specific ‘practice branch’.

Based on the review conducted in this chapter, it is concluded that each research design confers the analysis with specific advantages and has its natural limitations (either theoretical or practical). Thus, it is possible to argue that there is no superior methodology to assess *behavioural additionality* as each tool should accommodate the evaluation purpose. Evidently, there are several recognised difficulties in conceptualising and assessing ‘behaviour’. This chapter highlighted some of these difficulties as related to a prevailing absence of a dialogue between reports (even those which follow a similar methodological approach) and to a plurality of variables to represent behaviour.

Similarly, some of the consequences of these problems result in reaching contradictory conclusions regarding the type of behaviour that is modified and the manner in which this occurs. Finally, the review also highlights a problem of concordance or agreement between what is supposed to be assessed and how it is evaluated. Since these difficulties limit the capacity to assess *behavioural additionality*, their presence and effect become the subject of analysis in the next chapter.

Chapter 4. Challenges in the *Behavioural Additionality*
Evaluation Practice

4.1 Introduction

The introduction to this thesis offered a discussion of the challenges that might hamper the advancement of the evaluation of innovation policies and *behavioural additionality*, with two issues highlighted as important: problems with *causality* and conceptual limitations.

More recently, and in addition to the difficulties highlighted above, Gök (2013) identified and discussed at least eleven *issues* in *behavioural additionality*, including the potential effects that complexity, time and the problem of attribution generate in the analysis of behavioural change.

The previous chapter served as an initial step to describe current evaluation practices and prepare a taxonomy which helped to identify the presence of the issues discussed above. The review also enables extending the discussion to include particular instances of the challenges.

Accordingly, this chapter complements the debate presented so far, by describing a set of four challenges particular to *behavioural additionality*. Each of the following sections in the chapter describes each challenge in depth, beginning with the *congruence problem* (Section 4.2), followed by the *project fallacy* (Section 4.3), then the *input - output dichotomy* (or paradigm, Section 4.4) and finalising with the *catalogue of behaviours trap* (Section 4.5). These four topics have been selected because of their relevance to the methodological challenges as described above. Section 4.6 provides the conclusions.

4.2 The congruence problem

The *congruence problem* refers to a problem common to social sciences, consisting of a disagreement between the construct (theoretical concept) and its proposed operational definition. The presence of this problem results in *intersubjective verification*, meaning that the concept, or effect cannot be verified because of multiple approaches to analysing or defining it (Frankfort-Nachmias and Nachmias, 2009).

The intersubjective verification problem features predominantly in concepts with an abstract component. Thus, 'behaviour' is an easy target for this issue. For example, Gök (2010, 2013) observed the *low degree of observability* of behaviour as a possible cause of this problem.

In specific terms, the congruence problem for *behavioural additionality* incorporates two sub-components:

- 1) An arbitrary conceptual definition of behaviour, and
- 2) A problematic understanding of the logic of the intervention.

Based on the characteristics of the *congruence problem*, it is observed as analogous to the 'conceptual disagreement' issue presented in the introduction of this thesis.

In the reports included in the review, the *congruence problem* is often implicit and is not recognised as occurring predominantly in those evaluations using a static, linear or strictly sequential innovation model (cf. Figure 3.2). However, this thesis argues that its presence is strong, as at least 27 different variables were identified to operationalise *behavioural additionality*.

The main effect of an arbitrary use of the concept is leading evaluators to 'guess' the ways in which the policy beneficiaries (mostly firms) would use public support with little connection or resemblance to the organisational reality.

The second sub-component from the above points, lack of understanding of the logic of intervention, is predominantly located in a particular strand of quantitative analysis that offers little or no description of the policy under analysis. When the logic of the intervention is loosely specified, some of the following outcomes are likely to be observed: under specification of the effects of the intervention, overestimation of the (pre-defined) behavioural variables and unrealistic expectations of what a programme might accomplish and when.

As discussed above, the consequence of this multiple understanding generates the problem of intersubjective verification. For example, in the previous chapter, it was described how two different reports adopting a similar methodology observed *behavioural additionality* as *managerial attitudes towards collaboration* and, at the same time, as *entrepreneurial pro-activity* (cf. Madsen and Brastad, 2006 and Bergman et al., 2009).

In other instances, a single collection of methods (such as econometric regressions) might offer several variations of the concept. For example, while some cases represent it as *collaboration* or *organisational learning*, others use *project additionality*, and still others *the real rate of private investment of R&D* or *scientific personnel*. As can be observed, in these examples ‘behaviour’ is represented either as an activity (process), an output or as a magnitude.

In other instances, there is an incongruence between the dimension and the variable selected to represent behaviour. For example, one report defined *behavioural additionality* as including three types of change: *in R&D projects*, *in management capabilities*, and *in collaboration strategies*. Later, the variable selected to measure changes in behaviour was the *probability of participating* in R&D and innovation programmes at the national level of programmes (see Davenport et al., 1998).

In summary, intersubjective verification, when present, increases the difficulty for different researchers to claim to be observing the same phenomenon. Consequently, when the verification problem is present, inconsistent results are produced. The ultimate outcomes are that these findings generate inconclusive arguments about behavioural change.

4.3 The project fallacy

The second challenge, the *project fallacy*⁴⁰ (introduced in Chapter 1) presents a significant methodological problem for the assessment of the *behavioural additionality* effect in innovation policy, since it affects the types of inferences evaluations can make regarding the long-term business strategy (Georghiou, 2004), and “questions the validity of attributing an innovation to a single intervention” (Georghiou and Clarysse, 2006, p. 11).

⁴⁰ The *project fallacy* mimics what social research refers to as the *individualistic fallacy*, consisting of making inferences about “groups, societies or nations directly from evidence gathered about the behaviour of individuals” resulting in inadequate generalisations (Frankfort-Nachmias and Nachmias, 2009, p. 55). The effect in the opposite direction is referred to as the *ecological fallacy*.

Buisseret, Cameron and Georghiou (1995, p. 591) initially considered the fallacy in terms of the challenges an ‘individual R&D project’ faced when employed as a unit of analysis for assessing the impact of public R&D grant support on the behaviour of private firms. The scholars noted such unit of analysis would be helpful for an input and output assessment of impacts, as it provides information related to investment decisions and business’ economic opportunities.

However, ‘individual projects’ are less useful for discussing behavioural impacts, or even considered “not an appropriate unit of analysis” (Buisseret, Cameron and Georghiou, 1995, p. 599). Accordingly, individual projects present different problems. First, “individual projects make sense only in the context of a [...] portfolio of investment opportunities” (Ibid, p. 591), in particular for medium-sized or large firms, where R&D projects are not viewed in isolation. This implies that relying on such units for an impact assessment is likely to underestimate effects.

Second, “at a project level, public support often has a more subtle effect than simply allowing a project to be carried or not, [suggesting] that there are some qualitative effects of government support that should be recognised” (Buisseret, Cameron and Georghiou, 1995, p. 596). These qualitative effects refer to those impacts that go beyond the project level, such as those related to the business strategy or the organisation’s decision-making process (Georghiou, 2004; Georghiou and Clarysse, 2006). The implication is that a thorough *behavioural additionality* assessment should observe these effects, which might not be covered by the project level, thus requiring additional indicators to fully capture the behavioural effects.

In the synthesis of methodological practices (Chapter 3), the *project fallacy* persists, mainly in those reports that employ ad-hoc surveys (such as econometric analysis). Here, the responses a *single R&D manager* provides, are enough to account for the entire behaviour of his/her respective organisation (regardless of its size or industrial sector).

Solving the project fallacy becomes pertinent to the analysis and evaluation of the *behavioural additionality* effect, because in many instances the ‘additionality’ capacity of the innovation policies is never questioned, nor are its implications fully explained (see Gök and Edler, 2012).

In this sense, two opposing views were identified during the systematic review; the first perspective (usually found in quasi-experimental reports) assumes that behaviours follow the principle of additionality. Therefore, behaviours can be quantified and added. On the other hand, a second approach argues that ‘behaviour’ is a response unique to a particular entity; thus, it cannot be added. This characterisation would imply that it is not feasible to provide an explanation of behavioural responses at aggregated levels via the principle of additivity.

Even though the majority of the reports from the synthesis are aware of the potential presence of the *project fallacy*, there is no consensus on how to solve this issue. In this regard, some empirical evidence indicates that contextual differences matter (Shipp et al., 2006; Playford, 2007) and that the individual differences (such as capabilities) determine the potential to respond (or not) to different degrees to a policy incentive.

One example of the above includes Davenport et al. (1998), who observed that relying only on inferences made from interview responses would be likely to incorporate a substantial amount of (project) bias, arguing that, because of this issue, the use of survey data and econometric analysis was necessary to improve their understanding of the impact of the policy under examination.

4.4 The input-output dichotomy

The third challenge in *behavioural additionality*, the *input-output dichotomy*, was first described by Gök (2010)⁴¹. He observed that, in certain evaluations inclusive of *behavioural additionality*, the variable employed to operationalise behaviour consisted of a quantifiable proxy, or other indicators proper for input-output assessments. One example is firm collaboration, which is measured as the change in the resources allocated for collaboration, or as the number of collaborations in the organisation.

⁴¹ Referred to in the introduction as the ‘input-output paradigm’.

In several of the reports analysed in the previous chapter, the ‘input-output dichotomy’ exists. In some instances, it is explained as a natural product of the intervention (see, for example, SQW Consulting, 2009b, p. 3). In other examples, the *input-output dichotomy* is created because of a deliberate choice. One example includes the DITR (2006) report, where the use of a survey question explicitly developed by Clarysse et al. (2004) to determine *input* is also used for *behavioural additionality*, because it offers a “good representation of the firm’s increased awareness of the benefits of R&D and an increased commitment to [these benefits]”⁴² (DITR, 2006, p. 42).

In other instances, the problem is likely to be inherent in some methodologies. For example, some econometric regressions (Shin, 2006; Knockaert and Spithoven, 2009) characterise behaviours following a pre-established order, which assumes that behavioural changes are likely to precede organisational outputs (see Figure 3.2 in the previous chapter).

A fourth group considered the problem to originate from the ‘intangibility’ of behaviours (Falk, 2007), and concludes that it is difficult to control⁴³.

Finally, in some cases, the problem of the *input-output dichotomy* is due to the presence of certain evaluation constraints, or even because of a practical choice. One example is Gulbrandsen and Rasmussen (2012). The authors argued that they preferred to represent behaviours as input and outputs, “given that behavioural changes take a long time to appear. Furthermore, these changes are difficult to measure and their attribution is difficult” (Gulbrandsen and Rasmussen, 2012, p. 489). At a practical level, Gulbrandsen and Rasmussen (2012) argued that programme managers and policy makers are (more) interested in immediate results and outcome measurements, rather than in behavioural effects.

⁴² Other examples that fall into the trap of measuring *input additionality* (specifically crowding-out effects) and labelling the effects as *behavioural additionality* include the works of Benavente et al., (2007); Busom and Fernandez-Ribas (2008); Hsu et al., (2009); Bakhshi, et al., (2013) and Czarnitzki and Lopes-Bento (2013).

⁴³ In some instances, the problem of the intangibility of behavioural outcomes is left without analysis (see, for example, Mungaray et al., 2013).

4.5. The catalogue of behaviours trap

The fourth challenge identified in the practice of *behavioural additionality* assessment is the *catalogue of behaviours trap*. It consists of the tendency of certain research instruments to precondition the respondents' answers towards certain specific behavioural changes.

In the social sciences, particularly in the field of psychology, the trend in predefining behaviours is known as the *common method variance problem*. This problem results from a variance in the results generated by the chosen method and not by the phenomena under investigation (see Lindell and Whitney, 2001 and Podsakoff et al., 2013). This problem appears with greater frequency in those research instruments that rely exclusively on self-reporting techniques (Podsakoff et al., 2013). The common method variance problem becomes an issue since it threatens the validity of the conclusions by generating misleading results and findings that could potentially lead to making *Type I* and *Type II* errors⁴⁴.

Similarly, Podsakoff et al., (2013) argued that two interrelated issues cause the problem: *consistency motives* in the instruments and the presence of *respondent bias*. Both issues involve people appearing to be rational because they provide answers known as *socially desirable responses*. Table 4.1 (below) summarises some of the potential sources of the common method bias as identified by behavioural researchers.

There are several sources that could lead to a bias in the selected method, some of which are related to the source in which the information is pooled (this occurs with the *consistency motif* - see below). Similarly, there is extensive research in the social sciences that links the problems referred to above with the use of particular words to describe an attitude, feeling or knowledge. Hence, elements such as phrasing, question order and wording influence become parameters to identify the problems (Podsakoff et al., 2013).

⁴⁴ False positives and false negatives, respectively.

Table 4.1 Summary of possible sources of common method bias in social research

Bias	Description	Potential cause	Definition
Effects present in the source of data	Refers to any covariance between a predictor and a criterion variable (also referred as the common rater problem). Caused when the respondents provide the same value for both variables.	Consistency motif	The propensity of respondents to try to maintain consistency in their responses to questions.
		Implicit theories	The respondents have certain beliefs about the co-variation of particular traits or outcomes.
		Social desirability	The tendency some respondents have to respond an item based on social acceptability rather than their true feelings.
		Mood states	Refer to the influence temperament has on a particular response and how the respondents view the world.
		Acquiescence bias	The propensity to agree (or disagree) with questionnaire items independent of their content.
Item characteristic effects	Any covariance in the artefacts used for research because of the interpretation the respondent has about such items based on its characteristics or properties.	Item social desirability	Items might be written such to reflect socially desirable attitudes, behaviours or perceptions.
		Item demand characteristics	Items might convey hidden cues on how to answer them.
		Item ambiguity	Items with this characteristic allow respondents to answer based on their heuristic and not as intended by the item.
		Common scale anchors	A repeated use of words such as 'extremely', 'always' or 'never' in a questionnaire.
		Positive and negative item wording	The use of positive (or negative) wording may produce artificial responses on the questionnaire.

Source: Adapted from Podsakoff et al., (2003, p.882)

In the reports under analysis, the 'catalogue of behaviours trap' has two manifestations: 1) pre-conditioning effects by pre-defining them, and 2) the respondent's bias. Each component is analysed in-depth.

Pre-conditioning responses by predefining them

An important source of difficulties originates from pre-conditioning the respondents to select pre-defined categories for behavioural effects.

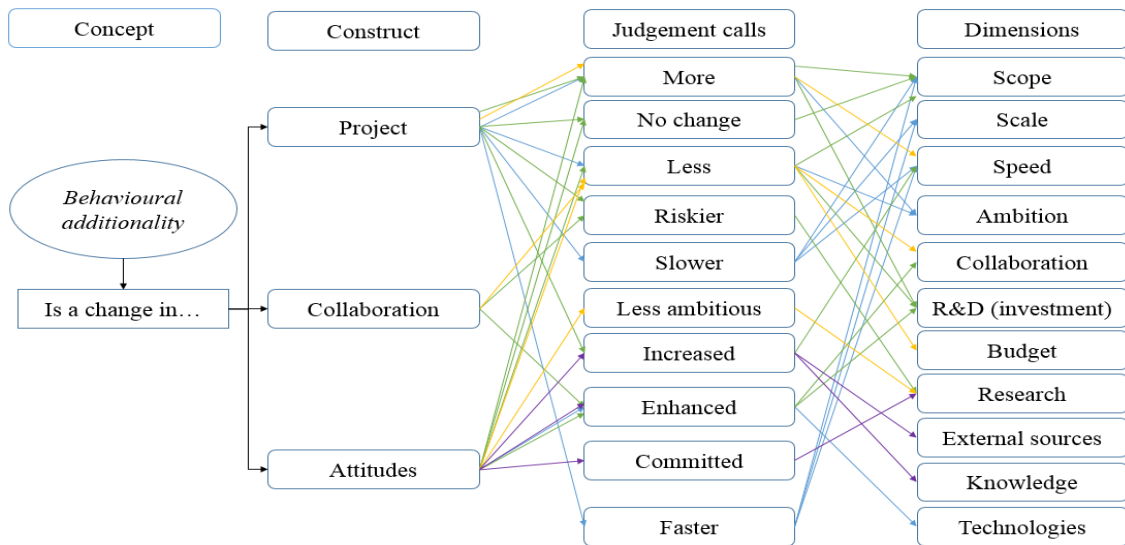
Some *behavioural additionality* reports that employed surveys suffered from a pre-definition problem (see Clarysse et al., 2004; Benavente, et al., 2007; DITR, 2007; Falk, 2007; and Busom and Fernandez-Ribas, 2008), producing a closed set of behavioural categories which then impacts the conclusions reached from these instruments (see Figure 4.1 and explanation below). This effect was also identified (to a lesser extent) in questionnaires, fundamentally because the constant use of *self-reporting* as a data collection technique inherent in them. For example, in several evaluation reports using surveys (Ship et al., 2006; Falk, 2007; DITR, 2007), self-reporting tools are employed⁴⁵. However, these reports also argued that their surveys' respondents tended to over-emphasise the merits of the support.

Figure 4.1 presents a graphical representation of the *behavioural additionality* construct in survey designs from five reports⁴⁶. The surveys describe changes in behaviour perceived as modifications at the level of projects, collaboration or attitudes. Each of these constructs then employs several categories of judgement calls (presented in the third column in the diagram), which serve to assess the effect of the programme. These judgement calls include magnitude scales (more or less), the speed of the change (slower or faster) and attitudes (riskier, ambitious, and committed).

⁴⁵ Shipp et al., (2006) referred to the self-reporting bias as 'socially desirable answers'.

⁴⁶ The figure includes evidence from Clarysse et al., (2004); Benavente et al., (2007); DITR (2006, 2007) and Falk (2007).

Figure 4.1 *Behavioural additionality* construct in survey exercises



Because each survey (used to construct the figure) contains a limited set of behavioural questions, there is a small number of combinations of the different categories per case; thus, ten different categories were observed, including five positive (more, increased, enhanced, committed and faster), four negative (less, riskier, slower and less ambitious) and one neutral (no change). In the diagram, these categories are connected (through the coloured lines) with the dimensions of expected impact that include aspects such as project additionality, financial terms (such as budgets, R&D investments, external resources) and collaboration.

As can be observed, the analysis of *behavioural additionality* with instruments such as those shown in Figure 4.1 presents several problems. The most evident is the omission of unanticipated changes in behaviour, as well as missing the indirect effects of the intervention. Their omission occurs because these are firm-specific and are difficult to define *a priori* without the knowledge provided by the instrument's respondents. Another difficulty is that several of the ad-hoc surveys are not explicitly created to account for behavioural change; instead, they are adapted versions of pre-existing instruments. Similarly, these categories assume similar behavioural responses (homogeneity) and force some respondents to choose between effects, even if the categories do not resemble what occurred in the firms. This problem is acute if there is no middle or neutral value. The consequence is that the respondent's bias is increased.

Table 4.2 (below) presents an additional example of the pre-conditioning problem; here, the constitutive elements of two survey questions for exploring *behavioural additionality* are compared in terms of the influence of language when assessing changes in behaviour.

In terms of construction, both reports in the example below employ the counterfactual to attribute behavioural changes. Similarly, both include similar categories to measure change as output/outcome indicators, such as differences in budget and resources, collaboration and (non-specific) technical applications.

Table 4.2 Comparing behavioural questions

Report	Question	Categories	Scale
Clarysse et al., (2004)	If the project would not have received IWT R&D subsidies, then.	<p>The project would have taken place with the same budget.</p> <p>Instead of the subsidies we would have allocated an equal/smaller amount of internal/external financial resources</p> <p>The project would have taken place with a smaller budget</p> <p>The project would not have taken place at all.</p>	<p>1. Disagree</p> <p>2. No opinion</p> <p>3. Agree</p>
DITR (2007)	If the R&D project had not received an [R&D] Start grant [or] the R&D Tax Concession, then the R&D project would have proceeded? (Choose an option).	<p>With a smaller budget.</p> <p>More slowly.</p> <p>With less external collaboration.</p> <p>With less ambitious outcomes.</p> <p>With a smaller range of potential applications.</p>	<p>1. Disagree strongly</p> <p>2. Disagree</p> <p>3. No change</p> <p>4. Agree</p> <p>5. Agree strongly</p>

Source: Own elaboration based on Clarysse et al., (2004, p.54) and DITR (2007, p.40), emphasis in the original.

As can be seen, both cases employ similar measurement scales; however, Clarysse et al. (2004) included a three-point agreement scale that forces respondents to choose, while DITR (2007) included a five-point appreciative scale with a middle value. Arguably, the questions in the table above suffer from a positive and negative item wording bias (see Table 4.1, above).

The source of the bias in the instruments referred to above occurs because of:

1. The inclusion of adjectives that express decreasing effects (negative wording): smaller, slowly, less ambitious/less external.
2. Repeated use of a common anchor scale.
3. The interpretative nature of the questions.
4. In the case of Clarysse et al. (2004), the questions and the answers emphasise specific words (such as ‘would not’, and ‘instead’).

Another problem with the instruments is the presence of the item demand characteristics bias (Podsakoff et al., 2003); for example, in the responses given by the interviewees (firms’ managers) in Clarysse et al., (2004). It is open to debate whether the 46 % of respondents from their sample agreed with the categories and thus perceived no (behavioural) change, or whether the interviewees did not perceive these categories to represent their situation, accounting for the level of responses obtained.

Secondly, the instruments have questions that require extensive interpretations; that is, the interviewees need to verify whether the categories representing the behaviours are meaningful to them (or to their experiences). This interpretation is either based on some previous experience or arrived at through a subjective process. After the respondent answers, it is the turn of the researcher to interpret the responses. A double interpretation process reaches the conclusions. Thus, it can be argued that the higher the degree of subjectivity present in the instrument, the more difficult it is for the researcher to attribute *behavioural additionality*.

Who possess the knowledge? The respondents’ role

A second element of the *catalogue of behaviours trap* originates in the bias incorporated by the selected respondent answering the questions intended to determine behavioural change. In *behavioural additionality* practice, this problem is an important issue.

Georghiou et al., (2004, p. 20) argued that, because of its presence, researchers need to consider “which part of a firm or person in a firm should be surveyed”. Accordingly, Georghiou et al., (2004) considered that some questions addressing behavioural change are likely to go beyond the judgement capacity of a research manager, either because the questions are too broad, unrelated to their activities or because of ignorance. Thus, many aspects of change require the inclusion of different agents, or broader levels of organisational aggregation.

Based on the analysis of the evidence presented in Chapter 3, in *behavioural additionality* practice two preferred types of respondents exist: senior top-level managers or Chief Executive Officers (CEOs), and managers working at the level of R&D departments.

According to evidence from different surveys (Clarysse et al., 2004; Falk, 2004, 2006, 2007; DITR, 2006), two main reasons justify the selection of top-level managers as respondents. One argument considers that senior top-level managers have privileged knowledge about the R&D processes in each of their corresponding organisations. The other perspective argues that, because they represent the highest level of organisational authority, CEOs are better suited to answer the questions (Georghiou, 2004; Hsu et al., 2009).

Similarly, by agreeing to use the respondents described above, the reports also assume that: (1) The managers’ perceptions accurately reflect the position of the entire organisation, (2) managers’ changes in behaviour can be directly homologous to an organisational change, and (3) behaviour can be stored; when this occurs, it concerns the leaders of the organisation.

When the assessment of behavioural changes relies exclusively on the managers’ perceptions or reduces the organisational behaviour to the responses provided by the manager, as occurs in the first and second assumptions above, the *project fallacy* is often present. Another problem is the type of generalisation they make, as managerial attitudes or perceptions are likely to suffer from a respondent and strategic behaviour bias.

Some of the deeper implications of failing to account for the tenure of the individuals and their roles in the organisation correspond to a potential assessment problem while evaluating the programme's effects, principally on those occasions when it is difficult to determine whether the individual was present (or not) during the time the firm received a subsidy. The immediate implication is that, when this situation arises, any subject in the organisation is capable of answering with responses that are likely to be as valid as those formulated by the CEO. Another issue with the use of top-level managers as respondents includes their capacity to memorise and recall the processes of change, a process that is complex in some cases, as it might have occurred in the distant past (see DITR, 2006).

The third assumption above also has important implications. Firstly, this assumption implies that behaviours can be stored and that managers are the repository. According to this view, 'behaviour' is discussed as a tangible entity that is analogous to the idea of organisational memory; by following this approach, the instruments are reduced to the *input-output dichotomy* while falling into the *project fallacy*.

Secondly, this assumption expects managers to solve the problem of attribution, as they are capable of isolating the effects of policy intervention in different scenarios. Finally, this statement becomes problematic when the size of the organisation is under consideration.

4.6 Chapter conclusions

This chapter described four challenges found in the evaluation of the *behavioural additionality* effect, observing that these challenges are interrelated and can occur at any given time, producing specific impacts on different areas of evaluation.

The *congruence problem* affects the relevance of the conclusions and findings derived from the analysis, leading to a problem known as intersubjective verification. The *project fallacy*, caused by oversimplifying the organisational reality, leads to a generalisation problem, especially when no consideration of context is given. The *input-output dichotomy* is related to the two challenges described above and generates an estimation problem, either by overestimating the effects or by minimising their impact. In some instances, this problem was observed as a deliberate methodological choice or occurring unintentionally.

Finally, the *catalogue of behaviours trap* refers to the act of constraining the type of (behavioural) effects that are measured with the developed instruments, leading to two potential effects: 1) an increase in the capacity to establish clear parameters for the evaluation, and 2) increasing the potential respondent's bias, and thus missing important effects, most of them unanticipated.

Based on the evidence provided in this chapter, it can be established that the effect of these challenges varies, affecting the instruments designed to assess behavioural changes (the *catalogue of behaviours trap*), the unit of analysis selected to represent behaviour (the *project fallacy* and the *input-output dichotomy*), and the explanations (or inferences) derived from the analysis (the *congruence problem*). Therefore, the evaluation methodology produced for this research needs to be aware of these elements and to learn from the evidence examined so far.

In the next chapter, the research design intended to guide the process for developing the methodology and its related assumptions is presented, followed by the presentation of the methodology itself (Chapter 6).

Chapter 5. Research Design

5.1 Introduction

Chapter 2 discussed the concept of *behavioural additionality*, including a definition, the dimensions of impact, and theories behind the concept. The assumption adopted by this thesis is that public intervention changes beneficiaries' organisational routines.

Chapter 3 identified the methodological limitations of the different approaches, and together with the discussions provided in Chapter 4, identified and discussed the effects of the *congruence problem*, the *project fallacy*, the *input-output dichotomy* and the *catalogue of behaviours trap* in the evaluation of the *behavioural additionality* effect.

The current chapter uses the lessons learned so far to present the research design employed to develop the proposed evaluation methodology for the *behavioural additionality* effect of innovation policies. Therefore, this chapter has the following aims:

1. To describe the way in which the methodology was constructed
2. To describe the 'setting' in which the methodology is tested and validated
3. To explain the manner in which the Case-Based Method and the Theory-Based Evaluation approach are used as tools for evaluating the *behavioural additionality* effect

The remainder of this chapter is firstly, oriented towards describing the philosophical position adopted in the research, as well as the relationship between the research question and the CBM/TBE approaches (Section 5.2). Secondly, the main components of each framework in the methodology are explained, including an analysis of the CBM, TBE and evidence-based approaches (Section 5.3). After reviewing these approaches, the procedure to construct the methodology is explained (Section 5.4) and the setting (or case study) where such methodology is tested is described, finishing with a brief description of the steps followed to validate the methodology (Section 5.5).

5.2 Research orientation and scope

5.2.1 Philosophical position of the thesis: an epistemological middle ground

George and Bennett (2005, p. 6) have argued that “statistical methods have been so prominent in recent decades that scholars’ understanding of case studies is often distorted by critiques based on the assumptions of statistical methods”. A similar point of view was raised by Blatter and Haverland (2014, p. 9), who argued that case study research has been, since the 1970s, “dominated by methodological advice that is rooted in the same epistemology that underlies large-*N* studies [those studies using random selection, large data sets, usually with more than 30 elements], which draw causal inferences with the help of statistics”⁴⁷. Thus, for both George and Bennett (2005) and Blatter and Haverland (2014) it becomes important to distinguish between the epistemological and methodological roots guiding case study research and those of statistical methods, in order to fully exploit the explanatory advantages of case studies.

In this sense, George and Bennett (2005) argued that case studies share a similar epistemological logic with statistical methods,⁴⁸ but are methodologically different in terms of the ways cases are selected, modelling choices and the use of inductive and deductive logic to arrive at conclusions.

On the other hand, Blatter and Haverland (2014, p. 9) observed “three major [philosophical] ‘camps’ with respect to ways of understanding knowledge creation in the social sciences” in which case study research can be situated: 1) Empiricism/Positivism, 2) Constructivism, and 3) Pragmatism. However, the authors noted that each philosophical position leads to approach case study research differently, at a methodological level. Thus, Blatter and Haverland (2014), arguing in favour of a pluralistic and problem-solving oriented approach⁴⁹, adopt an ‘epistemological middle ground’. This ‘epistemological middle ground’ is defined as a “rejection of all fundamentalist [...] epistemological positions” (Blatter and Haverland, 2014, p. 13), ideologically placed between the three major philosophical ‘camps’ discussed above.

⁴⁷ Alkin (2013), adopting a similar position as Blatter and Haverland (2014), has referred to the tendency in evaluation practice to prefer a particular method (i.e. experimentalism) over others as the ‘paradigm wars.’

⁴⁸ According to George and Bennett (2005) both methods aim to develop logically consistent models or theories, and from these, derive observable implications which will later serve to modify the original models.

⁴⁹ For a similar posture, see Harvey (2013) and Pawson (2013).

This ‘epistemological middle ground’ relies on an “intensive reflection on the relationship between empirical evidence and abstract concepts” (Blatter and Haverland, 2014, p. 13), or theory-led interpretation, to draw causal inferences. Similarly, this position assumes that empirical evidence can be used to judge the adequacy of concepts and theories in providing meanings of the social world. Furthermore, the ‘epistemological middle ground’ observes that “social scientists can reduce the complexity of social reality by focusing on events, structures, actions, and mechanisms that are relevant for social practices” (Ibid, p. 14). Finally, given its pragmatic approach and rejection of fundamentalist philosophical positions, the ‘epistemological middle ground’ is capable of pairing a study’s research question with an epistemological position which is coherent with the necessities of the research.

Based on the characteristics described above, this research follows the ‘epistemological middle ground’, thus placing special interest in discussing first, the research question and its relationship with the methods proposed to investigate it.

5.2.2 Relationship between the research question and the proposed research design: orientation and scope

The driving question in this thesis is how can the *Case-based Method* and *Theory-Based Evaluation* approaches, as potential research designs, be used for evaluating *behavioural additionality*? The research question tries, on one hand, to understand how behavioural changes occur (evaluating behaviour), and on the other, to assess such (anticipated) changes with a particular set of methods (CBM and TBE).

This question assumes that the Case-based Method and the Theory-Based Evaluation approach would work, and could work together for the assessment of the *behavioural additionality* effect, especially when considering some of its characteristics.

Several scholars (see Georghiou and Clarysse 2006; Miles and Cunningham, 2006; OECD, 2006; Georghiou, 2007; and Gök and Edler, 2012) have noted that “a variety of *behavioural additionality* effects can be induced by government funding” (OECD, 2006, p. 7). These effects are “concerned as much with building capacities as with short-term impacts” (Georghiou (2007, p. 751) and range “from legitimisation to operational learning” (Gök and Edler, 2012). Thus, according to Gök and Edler (2012) these broad range of effects generates a complexity which needs to be accounted for.

Furthermore, Georghiou and Clarysse (2006, p. 11) observed that “an accurate evaluation of the contribution of the government support to business innovation would [...] focus not on the achievement of the contracted deliverables, but rather the contribution the public support made to the firm’s broader objectives”.

Similarly, other scholars (Miles and Cunningham, 2006) argued that the assessments employing the *behavioural additionality* concept should focus less on its ‘additionality’ component and more on the process of change. For Miles and Cunningham (2006, p. 160) “it is not that innovation would not have taken place anyway, albeit to a lesser extent. It is that, the ways in which the innovation process is taking place have been transformed that are most significant”. This last element is aligned with the idea that “the *behavioural additionality* approach recognises that public funding of R&D interacts with firm strategy and needs to be understood in this context” (Georghiou, 2007, p. 747).

Thus, based on the above mentioned characteristics, the assessment of the *behavioural additionality* effect requires a set of methods capable of addressing: 1) a broad range of effects, 2) the issue of complexity (of these effects), and, 3) placing the focus of analysis beyond the input and output towards the relationship between the intervention and the organisation’s innovation process. In this sense, CBM and TBE are assumed to work well for addressing these elements for a number of reasons, which are described below.

First, the Case-Based Method has been employed in several disciplines of social research. Some examples include: American politics, comparative politics and international relations (see George and Bennett, 2005); foreign policy (Allison, 1971 in Yin, 2014); business and international business (Gibbert et al., 2008), and evaluation (see Yin, 2014).

In the disciplines highlighted above, CBM has served several purposes; from developing and testing theories regarding social entities (Thomas and Myers, 2015); explaining key historical developments and the corresponding choices made by incumbent actors (Allison, 1971 in Yin, 2014); as well as generating frameworks for explaining how things work (process-tracing, see George and Bennett, 2005).

Second, and as initially discussed in Chapter 1, CBM works well for in-depth analysis of social phenomena. Given that CBM is “uniquely predisposed to taking into account a broad and diverse set of explanatory factors” (Blatter and Haverland, 2014, p. 5), including historical and contextual factors (De Vaus, 2013), and because of their capacity to collect “finely grained empirical evidence” (Blatter and Haverland, 2014, p. 8), CBM is well positioned to “understand the perceptions and motivations of important actors and to trace the processes by which these cognitive factors form and change” (Blatter and Haverland, 2014, p. 6).

Third, George and Bennett (2005, p. 19) argued that case studies are very useful in identifying and assessing the indicators that “best represent” abstract concepts (such as culture, democracy, and power), that is, CBM provide “high levels of conceptual validity” (Idem.).

Fourth, case study is considered “an appropriate approach for designing and conducting evaluations” (Stufflebeam and Shinkfield, 2007, p. 242). For example, in innovation programme evaluations, Miles and Cunningham (2006, p. 141) noted that case studies have been used to “provide in-depth investigation of a particular aspect of the innovation programme and its reasons for success or failure”. In this sense, Yin (2014) has suggested four different applications of CBM for evaluation:

1. To explain the presumed causal links in real-world interventions that are too complex for survey or experimental methods.
2. To describe an intervention and the real-world context in which it occurred.
3. To illustrate certain topics within an evaluation.
4. To enlighten those situations in which the intervention being evaluated has no clear, single set of outcomes.

Finally, Chapter 3.4.3 of this research explored the use of case studies in the evaluation of the *behavioural additionality* effect. The evidence highlighted the capacity the CBM has to give detailed accounts of the experiences firms have and the processes occurring after receiving the government’s assistance. It is this emphasis on processes that leads Gök (2010) to the conclusion that case studies should help in solving the ‘black-box’ problem.

Similar to CBM, the Theory-Based Evaluation approach is also assumed to work for the assessment of the *behavioural additionality* effect. Some reasons for this assumption are explained below.

First, TBE approaches have been widely adopted for evaluating: community change initiatives, disease control and prevention programmes, health, human services, international development, military operations and public health programmes (Coryn et al., 2011). In general terms, choosing and developing a TBE approach occurs to a number of reasons. Coryn et al., (2011, p. 211), in a review of 45 cases employing TBE, found that “the most frequently occurring motive for selecting a theory-driven evaluation approach was ideological”.

Other claims found by Coryn et al., (2011, p. 211) included that TBE “is one of the only means by which the underlying theoretical propositions of a programme or intervention can be systematically tested using a scientific method” (Idem.). Finally, a third reason is because the approach is “useful for improving internal validity inferences and reducing certain validity threats by permitting tests of more complex causal hypotheses than is typically permissible with many traditional evaluation methods or approaches” (Idem.).

Second, the TBE approach is capable of accommodating different policy goals and rationales. Similarly, TBE observes reality is stratified, that is, it observes multiple cause-effect points in a single entity (Rogers, 2008).

Third, TBE is considered to be capable of explaining not only if programmes work, but also how they work (Weiss, 1997; Chen, 2005; Rogers, 2008; Coryn et al., 2011).

Finally, recent empirical efforts (see Joly et al., 2015) demonstrate how to combine both approaches (CBM and TBE) into methodologies for an impact assessment. Joly et al. (2015, p. 441) developed an ex-post research impact assessment methodology based on “standardised case studies” and “a theory of impact inspired by innovation studies, more specifically [...] Actor Network Theory” (Idem.). Among the advantages of combining both approaches, Joly et al. (2015) argued that “[CBM] shed light on the translation mechanisms underpinning the innovation process while recognising its non-linearity and complexity” (Ibid, p. 444), while TBE “allows identification of critical mechanisms at stake along the different steps of the impact pathway” (Ibid, p. 451).

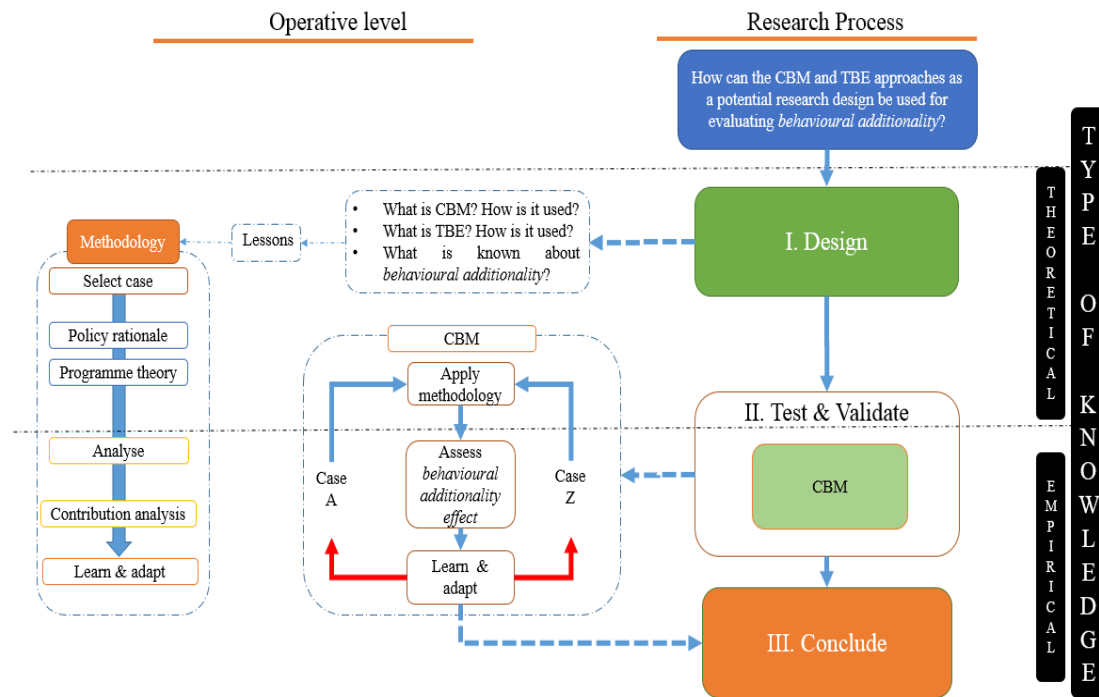
Additional advantages of using both methods can be found below (see Sections 5.3.1, for CBM, and 5.3.2, for TBE).

Finally, to answer the research question, the following research design is proposed (see Figure 5.1, below). The thesis operates at an embedded or nested (Lieberman, 2005) level, working within two types of knowledge: theoretical and empirical. Similarly, the research design includes three processes:

1. Designing the evaluation methodology.
2. Selecting a case with which to test and validate it. Through testing and validating the methodology, two products are anticipated: evidence on *behavioural additionality* and a set of methodological lessons regarding the usefulness and reliability of the methodology. In this sense, it can be argued that if a specific case is chosen, then, an explicit theory for the explanation might be pre-assumed. However, and following De Vaus (2013, p. 239), this is not problematic as “case study designs involve selecting cases for theoretical and targeted purposes”.
3. Learning from the methodology application to improve its use.

As can be observed, case studies are used on two different occasions, for theory-testing and as a component of the methodology.

Figure 5.1 Embedded research design employed in the thesis



The development of the methodology is based on a set of lessons learned from the literature review, reinforced by an exploration of how CBM/TBE is useful for theory-testing and methodological development. Further details on the procedure for constructing the methodology and the explicit lessons learned from the literature are found in section 5.4 below.

5.3 Main components of the research design: The CBM, TBE and evidence-based approaches

5.3.1 Main components of the Case-Based Method (CBM)

The Case-Based Method (also, case-based research) refer to the “classic” case study design used in research (Perri and Bellamy, 2012; Yin, 2014).

In CBM, the focus is placed on “cases defined by interactions between factors that may not work independently” (Perri and Bellamy, 2012, p.103). The approach also “looks for effects emerging, often in complex ways, from the whole set of interactions rather than from the principal or independent contribution of one, or a few, variables” (Idem.).

Cases are used to understand the richness, complexity and “nuances of a holistically conceived social life” (Perri and Bellamy, 2012, p.103) by observing, in considerable depth and as comprehensively as possible, a single ($N=1$) or few cases (*small-N research*).

In simple terms, cases have two main uses: developing theories and testing them. The difference between these uses depends on whether the case study uses and links to the assumptions from previous research (theory-testing) or whether the observations are developed independently of prior evidence (theory-development) (Thomas and Myers, 2015).

Because of CBM's focus on one or a few elements, it is often argued that the purpose of this approach is to *develop* theory rather than *test* theory. However, Flyvbjerg (2006) has observed that the tendency to prefer theory-developing cases has the consequence of generating explanations that are context-independent. Thus, current research also recognises CBM's potential to *test* theories (Flyvbjerg, 2006; De Vaus, 2013; Blatter and Haverland, 2014; Yin, 2014; and Thomas and Myers, 2015), since the case study might benefit from the prior development of theoretical propositions to guide data collection and analysis.

Moreover, Hakim (2000), George and Bennett (2005), and Mark and Henry (2013) all suggest that case study research generates sufficient evidence to test the conceptual validity of any proposed model, predominantly when done in an applied setting. These scholars also argue that, once validated, these type of cases can then be used to effectively probe the causal effects of programmes and other interventions.

For this thesis, the definition adopted for *case study* is based on the characteristics described above. Therefore, CBM refers to the in-depth analysis of a contemporary phenomenon, studied holistically using one or more methods and employing a small number of cases with ample empirical observations.

The Case

As mentioned above, a *case* is the central subject of study in CBM (Ragin and Becker, 1992). However, there exist diverse, often conflicting definitions of a case, although some similarities between definitions exist (De Vaus, 2013). For George and Bennett (2005, p.17), a case is defined as “an instance of a class of events”. Moreover, Perri and Bellamy (2012) understand a case as a unit of analysis that:

- Answers a question about a particular phenomenon, either empirically and inductively or theoretically and deductively.

- Is defined and bounded by the researcher in such a way that the values of a particular phenomenon may change over the period of study or present a contrast between different elements.
- Is sufficiently internally complex so as to enable within-case analysis of interactive forces.

Several scholars observe a case as a “concrete entity” (De Vaus, 2013; Yin, 2014; Thomas and Myers, 2015), which means it refers to individuals, organisations, institutions or programmes. Similarly, cases are not related exclusively to tangible aspects; they can also cover decisions, processes or events of historical interest, such as revolutions or ‘government types’ (George and Bennett, 2005). Moreover, cases are also observed as complex systems because they are “fuzzy realities with autonomously defined complex properties” (Byrne, 2013a, p.105).

Adding to the above elements of a case, Thomas and Myers (2015, p.55) provide a useful distinction for ‘case’ based on the difference between the case’s subject and its object. Here, the subject is a “practical, historical unit” while its object is the “analytical and theoretical frameworks” integrating them.

Steps in designing a case study

Following Yin (2014) and Thomas and Myers (2015), the phases included in designing a case study are summarised as follows:

1. Formulation of the question guiding the case, including its propositions and unit of analysis. Following this process, a subject (i.e. case) and an object (theory-testing or theory-building) is determined for the case.
2. Selection of the type of case study (single or multiple).
3. Determination of mechanisms for theorisation (if any), data collection and analysis.

The second element of importance when designing a case study is to determine the quantity and treatment of the unit of analysis in the case (Yin, 2014). Studies using a single unit of analysis are known as *holistic*, whereas those using multiple units of analysis are referred to as following an *embedded* design.

Types of case studies

It is possible to combine the number of cases (single or multiple) with the number of units of analysis. When combined in such way, a 2 x 2 matrix is produced. This matrix includes four different case study typologies (Yin 2014, p. 50) (see Table 5.1 below).

Table 5.1 Typologies of case studies

Number of cases	Unit of analysis	
	Single (Holistic)	Multiple (Embedded)
Single ($N = 1$)	Type I	Type II
Multiple (small- N research)	Type III	Type IV

The typologies presented in the table above can adopt different combinations⁵⁰, depending on the focus of the case and the level of analysis. As such, there can exist cases with an embedded approach that place their attention on specific elements⁵¹.

Issues in case selection

According to different scholars, selecting the total number of cases to include in a study is a ‘central issue’ for CBM designs (cf. Perri and Bellamy, 2012; De Vaus, 2013; Yin, 2014). However, there is little agreement on the correct number of cases to include (De Vaus, 2013).

Accordingly, current research has concluded that there is no correct number and that the actual number of cases to include are determined by the goals of the researcher and the research questions to be solved (Perri and Bellamy, 2012; De Vaus, 2013; Yin, 2014).

To resolve the lack of conceptual agreement described above, some authors have suggested the use of different strategies to facilitate case selection. One of these strategies is to determine *optimal situations* (or information-oriented selection, Flyvbjerg, 2006). According to Yin (2014), using this strategy means that the number of cases is selected according to a set of previously specified expectations about the information that the cases will provide.

⁵⁰ For example, De Vaus (2013) recognises 64 different types of case study design. Comparing different typologies, Thomas and Meyers (2015) propose a different typology based on the thinking process observed during a research design. The authors include the subject, purpose, approach and process guiding the case as main categories for their typology.

⁵¹ De Vaus (2013) provides an example of the distinction: a case observing gender perspectives on marriage. Here, the holistic level is ‘marriage,’ whereas the female/male attitudes represent the embedded level.

Based on an optimal situation approach, a single case study design is ideal for either: critical, unusual⁵², common or revelatory situations⁵³, and for longitudinal studies.

Yin (2014) argues that each particular type of single-case design follows a specific rational. A critical case would be appropriate for testing specific theories or theoretical assumptions. An unusual case is done to reveal more “insights about normal processes” (Yin, 2014, p. 52) in alternative contexts. A common case captures the “circumstances and conditions of an everyday situation” (Idem.). The opportunity to use a case for a revelatory situation arises when a situation “previously inaccessible to social science inquiry [becomes accessible]” (Idem.). Finally, a longitudinal case is useful when the study is looking at two or more points in time.

In contrast, a multiple-case design is selected when there is a need to either *replicate* similar results (literal replication) or contrast these findings with an existing, guiding theory (theoretical replication)⁵⁴. Similarly, Yin (2014) suggests that having two cases instead of one is preferable because the “analytic conclusions independently arising from two cases, as with two experiments, will be more powerful than those coming from a single case [...] alone” (Yin, 2014, p. 64).

Perri and Bellamy (2012) suggest a second approach for selecting cases, based on the inclusion of an *adequate diversity* of factors. These factors can either be present in the *outcomes*, or in the *processes* that are expected to be *causally* significant in the *contextual settings* of the cases. Independent of the strategy followed to select between designs, a recurrent question faced by case study researchers is related to the number of cases “deemed necessary or sufficient” (Yin, 2014, p.61) for the study. Accordingly, to decide on the number of replications, it is suggested to apply discretionary judgement (Idem.), with the decision based on the perceived strength of the design.

⁵² Referred as ‘extreme’ by Perri and Bellamy (2012), and as ‘outlier’ by Thomas and Myers (2015).

⁵³ For Perri and Bellamy (2012) this means that the situations are *illustrative* of ‘real-life’ practice (e.g. cases in business education). Thomas and Myers, (2015) disagree with Yin (2014) in the status of a case as ‘typical’, instead adding another type, the ‘local knowledge case’, which results from the researcher’s familiarity with a particular situation.

⁵⁴ Theoretical sampling can be defined as the “process of making explicit the contribution that the cases make to the development of theory, by showing why their particular features are of theoretical interest” (Perri and Bellamy, 2012, p.113).

Strengths and limits of the CBM approach

In terms of strengths, case studies are considered an ‘ideal’ research design when the need is in-depth investigation and the production of knowledge relevant at the managerial level (Tellis, 1997; Gibbert et al., 2008). The approach has also been described as being suitable for studying internal relationships within a system, rather than looking only at ‘disembodied variables’ (Stake, 1978, p.8 and DANIDA 2012, p.51).

The CBM approach is also perceived as having an increased sensitivity to temporal and contextual effects, as it focuses on dynamics. In doing so, cases enable the understanding of interactions between factors and their configurations, allow the identification of causal processes and their mechanisms, and help in identifying emergent outcomes and properties (Perri and Bellamy, 2012).

Finally, one of the most cited strengths of CBM is its ability to capture the “full significance of a complex data set” (Perri and Bellamy, 2012, p.104). Thus, a case study is assumed to be particularly robust at generating *ideographic* explanations (De Vaus, 2013), that is, the method provides a sensible and plausible account of events. Moreover, case studies also help determine the meanings of actions and events for the different participants in the study (Tellis, 1997; Perri and Bellamy 2012; De Vaus, 2013; Yin, 2014). This last element increases the internal validity of the research design.

In terms of the limitations of CBM, George and Bennett (2005, p.31) cite three common issues that limit the approach: 1) reaching theoretical parsimony, 2) establishing explanatory richness, and 3) keeping the number of the cases under study manageable.

CBM is also sensitive to the problem of verification bias, or the “tendency to confirm the researcher’s preconceived notions,” which results in a study with “doubtful scientific value” (Flyvbjerg, 2006, p. 234). However, Flyvbjerg (2006, p. 237) has also claimed that this verification bias is “not greater than that present in other methods of inquiry”, and with case study containing “a greater bias toward falsification of preconceived notions than toward verification” (Idem.).

The strongest criticism against case study research is that it is unable to contribute to scientific development, being prone to producing particularistic insights with unclear relevance in different contexts. That is, a case study is subject to problems with *generalisation* (Flyvbjerg, 2006; Perri and Bellamy, 2012).

According to Byrne (2013a), De Vaus (2013) and Yin (2014), the generalisation problem in CBM is unfounded, as current research on CBM agrees that the type of generalisation achieved through the use of case study methods is not statistical but rather *analytical* (Yin, 2014; *naturalistic* for Stake, 1978; 2000; 2010; Byrne, 2013b). This type of generalisation is useful for corroborating, modifying and advancing theory or for identifying new concepts (Yin, 2014).

Similarly, these authors observe that cases are concerned with *generalising* rather than *universalising*, which are different activities, with the former “best understood as involving careful attention to the setting of scope” (Byrne, 2013a, p.9). Therefore, determining the scope of a case helps in solving the generalisation problem, as it “sets empirical and theoretical limits on the extent to which an inference can be generalised” (Goertz and Mahoney, 2013, p.307).

To establish limits for cases, Goertz and Mahoney (2013, pp.307-08) suggest asking the following question: “How generally do the findings of (this) case study apply?” Depending on the type of analysis, answering this question generates either *conceptual limits* or *causal homogeneity*, with the former referring to the achievement of measurement stability across all unit and variables within a theory, and the latter referring to the stability of the causal relationships at different levels of conceptual aggregation (Goertz and Mahoney, 2013).

More recently, Thomas and Myers (2015, p.40) have concluded that the case study “has found difficulty in meeting [the generalizability criterion],” adding that “to seek generalisable knowledge, in whatever form – everyday or special – is to miss the point about what may be offered by certain kinds of inquiry, which is exemplary knowledge” (Ibid, p.41).

Therefore, although the problem of generalisation exists in CBM, current research has determined that achieving statistical representativeness is outside the scope of the case study approach. Moreover, the approach’s main capacity is to provide ‘exemplary knowledge’ (Thomas and Myers, 2015)⁵⁵ that validates the observations made regarding the phenomenon under analysis, thus yielding consistent results if applied in different contexts and conditions.

⁵⁵ Thomas and Myers (2015, p. 48) use the word ‘exemplary’ to represent “an example viewed and heard in the context of another’s experience [...] but used in the context of one’s own”.

The next section describes the TBE component of the research.

5.3.2 Main components of the Theory-Based Evaluation (TBE) approach

The theory-based evaluation approach generates a “set of beliefs or assumptions that underlie action and programme activities” (Weiss, 1997, p.503). For this thesis, the TBE approach is understood as the process of developing logic models to assist with the evaluation (Weiss, 1997; Chen, 2005; Rogers, 2008).

Evaluation Theory and Programme Theory

There are two interrelated components of the TBE approach that are of importance for this research: *evaluation theory* and *programme theory*. Although sometimes used interchangeably, these concepts are differentiated for this thesis.

Evaluation theory is a set of rules, prescriptions, prohibitions and guiding frameworks used in evaluation practice (see also Molas-Gallart and Davies, 2006), while *programme theory* refers to the nature of the programme itself and the development of the key questions included in the evaluation design (Alkin, 2013; Donaldson and Lipsey, 2013). The TBE approach suggests that a programme theory incorporates, as a phased sequence, causal relationships and the beliefs and assumptions underlying an intervention. These theories assist researchers in understanding not only how much change has occurred but also its predicted sequence (Weiss, 1997, 2000; Pawson, 2013).

Evaluation theories are important for different reasons, such as providing a *language* (words and concepts) for the evaluation exercise, as well as generating the *knowledge* base that assists evaluators in developing explanations about how the world works⁵⁶ (Shadish, 1998).

The importance of considering evaluation theory when formulating evaluation methodologies was established by Shadish (1998), who argued that evaluation practitioners, and those commissioning the evaluation, might benefit from reflecting on the way the assessments were conducted, while also explicitly including the assumptions guiding the analysis⁵⁷.

⁵⁶ Shadish (1998) also considers programme theories to provide a common *understanding*. Similarly, they offer a set of *values* and feelings towards evaluands. Similarly, theories create a sense of *identity* around a particular set of practices, which in turn serves to generate the *themes* (or topics) that are of importance for professionals and scholars.

⁵⁷ To guide the reflection, Shadish (1998) proposes a set of ten questions guiding interventions.

Following Shadish's (1998) argument, an evaluation theory in the domain of science, technology and innovation (STI) policy should attempt, firstly, to understand the theory underpinning R&D and innovation, as recent research suggests that those actors who commission STI policy evaluations are primarily concerned with short-term and direct impacts of their interventions (Molas-Gallart and Davies, 2006). In this sense, it is recognised that STI policies have transitioned from understanding innovation as a linear process with the aid of supply-push and demand-pull models (Bush, 1945), to a non-linear, i.e. innovation system's perspective⁵⁸ (Molas-Gallart and Davies, 2006).

Secondly, an STI innovation theory should attempt to incorporate, as a reflexive exercise, a description of innovation, and the way the innovation world is assumed to work. This description is inclusive of an understanding of the policy rationale that is, what is planned against what is delivered (Rigby, 2005), and based on the role that the key actors in the system are assumed to play to deploy their creativity and achieve their objectives (Rigby et al., 2013).

Developing Programme Theories

Programme theories are often expressed as logical arguments, with causal links assumed between different components. To develop a programme theory, the suggested approach follows three basic steps (Weiss, 1997; Donaldson, Christie and Mark, 2009):

1. Develop the (assumed) impact theory.
2. Formulate and prioritise evaluation questions, describing the methods to analyse the programmes (mechanisms to deploy resources) and incorporating multiple sources of information, for example, documents, people, prior research and logical reasoning.
3. Describe the (potential) usefulness of the evaluation, and answer the evaluation questions.

⁵⁸ Compare the theoretical development of the *behavioural additionality* concept (Chapter 2.4) and the tools and methods employed for assessing the *behavioural additionality* effect as presented in Chapter 3, which suggests following a similar trajectory of development.

To understand the process of developing an impact theory and to later discuss the framework's strengths and advantages, consider the following example: a government creates a programme to educate people (provide information) on the benefits of leading a healthy lifestyle (eating more nutritious food). The programme theory for such intervention, as a logical argument, would adopt the following form⁵⁹ (Weiss, 1997, p.503): 'K→A→P'.

The argument presented above is interpreted as follows: it is believed that the proposed intervention will eventually increase the available knowledge (K) regarding nutrition, leading to attitudinal changes (A) toward the programme beneficiaries' diets. Finally, it is expected these changes will result in modified eating practices (P) because more information on nutrition helps beneficiaries to select and eat healthier foods.

The previous example contains the essential elements of TBE. As can be observed, programme theories generate a set of assumptions about the way interventions work. These assumptions articulate the intentionality (e.g. leading to, helping to) of the interventions, expressed as the (causal) arrows. The analytical task for the evaluator using TBE is to transform these assumptions (or masses of raw data, as referred to by Weiss, 1998, p.271) into a coherent account of events.

To accomplish the above, and to judge whether the programme theory has served its purpose, an evaluation practitioner needs to determine whether, and under what specifications, the expected chain of events occurred through an interpretation of the theories of change generated by the different sources of information (Donaldson and Lipsey, 2013).

Strengths and limits of programme theories

Programme theories become stronger if they rely on various sources of information, such as the vision of beneficiaries, the evaluator's interpretation of these visions and data on the programme's performance. However, this reliance on subjective accounts and descriptions also increases the theories' susceptibility to being 'flawed' or eventually being proved to be 'wrong' (Weiss, 1997, 1998, 2000).

⁵⁹ Another tool for representing the intervention is a logic model. As these models can be more complex, a logic argument was considered sufficient for the purposes of the example. Other tools include "path analysis, causal modelling; observations of the programme in action or interviews with staff to uncover implicit assumptions about how the programme works" (Astbury and Leeuw, 2010, p. 365).

Rather than being a limitation, however, this situation is one of the major strengths of TBE (Weiss, 1997, 1998), since it forces programme theories to generate feedback loops through a reflexive process that enables the theory to learn from the programme. It also assists the evaluating practitioner in deciding whether the intervention needs to be reformed or an alternative theory is required. This process is known as *programme theory refinement*.

Other advantages of the TBE approach include its capacity to manage the presence of unanticipated effects, either *prospectively* and *retrospectively*, by remaining alert to the unintended consequences during the fieldwork phase. This can also happen through the inclusion of questions that seek to understand what occurred and how it was different from the expected change (Weiss, 1998; Stame, 2004; Astbury and Leeuw, 2010).

TBE incorporates two additional advantages for developing evaluation methodologies: 1) the approach is compatible with different data collection techniques, regardless of their qualitative or quantitative orientation, and 2) programme theories produce “useful kinds of knowledge” about the way programmes operate (Weiss, 1998, p.278).

As Weiss (1998) suggested, programme theories produce knowledge that assists evaluators and policy makers in understanding the process of change by providing “at least provisional guesses, or new hypotheses, about what processes the programme sets in motion” (Weiss, 1998, p. 277). The knowledge generated through a programme theory also creates “a structure for analysis of evaluation data” (Ibid, p. 288). These types of knowledge are useful for evaluation as they supply “empirical evidence about the effectiveness of [different programmes and their components]” (Ibid, p. 282) that facilitates the decision-making process (e.g. continue a programme or modify some or all of its components)⁶⁰.

⁶⁰ The topic of evaluation usefulness is very important in the field of evaluation. However, given the magnitude of the topic, its exploration is out of the scope of this thesis. For a very interesting discussion in the field one can refer to Patton (2012), Pawson (2013), and Shaw, Greene and Mark (2013). In STI policy and *behavioural additionality* refer to Amanatidou et al., (2014).

Finally, the TBE approach is considered to be “more useful than the most sophisticated experimental evaluations to explain what factors were responsible for the programme’s success or failure” (Weiss, 1997, p.502). This is because, for many programmes, random assignment is not feasible (Weiss, 1997). Thus, the approach tries to obviate the use of control groups by determining the “the time order of occurrences” (Weiss, 1997, p.514), that is, the sequence in which the suspected causal links occurred and how.

In terms of limitations, Weiss (1997) recognises at least two. First, the constructs developed for programme theories are prone to measurement errors, due to the problems of *indeterminacy* (data is problematic to quantify or measure) and practicality (analysis is a time-consuming activity).

In summary, the Theory-Based Evaluation approach adopted for this thesis can be described as an iterative process of creating, analysing and revising programme theories and assumptions about the logical links assumed to describe the way interventions work.

The methodology proposed by this research is strengthened by answering three analytical questions proposed by Shadish (1998) for evaluation theory, adapted for the topic of *behavioural additionality*. Because of their reflexive nature, these questions are used to validate the methodology, and are thus presented in Section 5.5.3 below.

The next section describes the evidence-based approach adopted for the thesis.

5.3.3 Main components of the evidence-based approach, as used in the thesis

The approaches in applied research and evaluation (i.e. problem-based or solution-oriented research in ‘real world settings’), which are grouped under the description ‘evidence-based,’ include a set of tools and techniques for collecting ‘credible’ or ‘adequate’ information about the performance of a social programme that is helpful for the decision-making process involved in policy making (Donaldson, Christie and Mark, 2009; Hawe et al., 2009).

The elements of credibility and adequacy have generated intense debates regarding what counts as *credible evidence* for decision and policy making (see Donaldson, Christie and Mark, 2009 for a complete discussion on the topic). Given that this thesis adopts the epistemological middle ground (as described in Section 5.2.1), the discussion in this section relates exclusively to the use of the evidence-based approach as a process for generating credible evidence, as observed for the CBM and TBE approaches and innovation policy.

In CBM, evidence-based approaches play a significant role since “theory-oriented case studies [...] are needed to identify and cumulate the lessons of experience into usable knowledge for policy making” (George and Bennett, 2005, p.275).

Several CBM scholars agree that the concepts of *validity* and *reliability* serve as useful criteria for judging the quality of a research design (Riege, 2003; Gibbert et al., 2008; Perri and Bellamy, 2012; De Vaus, 2013; Yin, 2014)⁶¹. In simple terms, these concepts try to anticipate and solve any potential *measurement errors* that might be present in the conclusions of the study and justify the capacity of an inference to generate warranted explanations and a consistent use of, and faithfulness to, the data (De Vaus, 2013).

In this sense, case studies as a research framework provide a set of tools and techniques for increasing the reliability and, as argued above (see Section 5.3.1), the internal validity of the inferences made through the cases. For example, Yin (2014) suggests the use of four basic tactics, including 1) using multiple sources of evidence (or triangulation strategies, Tellis, 1997; Yin, 2014) to establish a *chain of evidence*, 2) keeping a research journal, 3) relying on replication logic, and 4) designing and using a case protocol (steps followed to reproduce the cases).

For TBE, creating evidence is inherent to the method, as its theoretical approach and use of logic models to represent a phenomenon is based on the premise that pattern matching and ‘explanation building’ is strengthened through the incorporation of multiple sources of information and perspectives from different stakeholders (Trochim, 1989; Weiss, 1998; Mark, 2009).

⁶¹ For a similar posture in evaluation practice see Lincoln and Guba (1986) and Denzin and Lincoln (1998).

In this sense, the construction of reliable programme theories depends on “a combination of procedures, [...] discussion with the programme people, observation of the programme in action, review of evaluations of similar programmes, and logical reasoning, followed by discussions and modifications until practitioners and funders are satisfied” (Weiss, 1997, p. 509).

Finally, in the field of innovation and R&D policy, an evidence-based approach is considered, in some instances, to be a pre-requirement for understanding the operative components of the innovation system and for generating a useful ‘repository’ for future policy making decisions (Georghiou, 2004; NESTA, 2012). For this particular type of evaluation practice, the challenge of identifying *good*⁶² (that is, reliable) evidence to base decisions on is similar to those described in CBM and TBE above, with the added difficulty inherent in the evaluation of innovation policy: complexity, causality issues (attribution), and methodological challenges (as described in the introductory chapter of this thesis), in tandem with the role that innovation theory has played to shape evaluation practice (Molas-Gallart and Davies, 2006).

In summary, to develop its evaluation methodology, the thesis follows an evidence-based approach, applied as a systematic review of previous work in the relevant policy domain (Pawson, 2002). Therefore, the lessons learned from the literature reviews conducted in the preceding chapters are integrated into one instrument for assessing *behavioural additionality* effects. This process is explored in-depth in the following section.

5.4 Procedure for constructing the methodology and main assumptions

Based on the above discussion, the main procedure for developing the methodology is illustrated in Figure 5.2 below.

⁶² Compare this position to what Ruegg and Feller (2003, p.25) suggest are “*good evaluations*” of R&D and innovation policy: “[evaluations are good because they] follow the dictates of good scientific research,” that is, their methodologies set “explicit hypotheses and research protocols, make public the documentation used and delineate the tests of impact or causation, statistical or otherwise, used to formulate conclusions.”

Figure 5.2 Procedure for developing the evaluation methodology

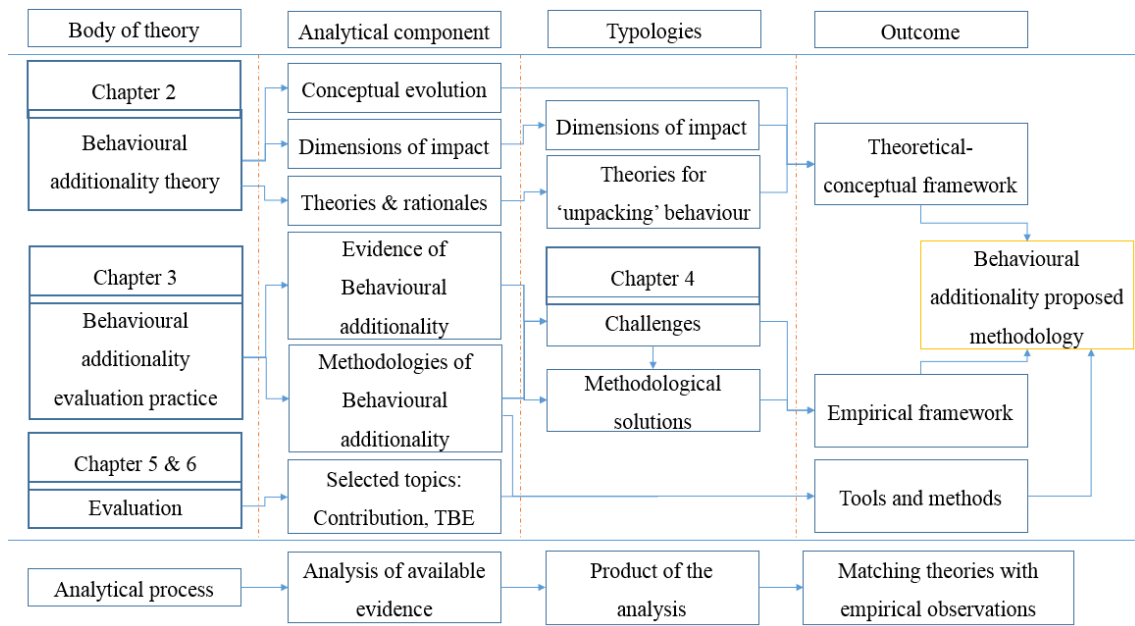


Figure 5.2 has two main components:

1. At the top of the figure, the different elements for developing the methodology are presented. These included the body of theory under analysis, its analytical component of importance, the typologies developed from its analysis and the outcome of conducting the review.
2. At the bottom of the figure, the analytical process is found. The process consisted of an analysis of available evidence, a comparison with plausible rival explanations and a matching of theories.

The methodology was then constructed using different bodies of theory (i.e. lessons generated from Chapters 2 and 3) to select a concept and dimensions for *behavioural additionality*, with the particularity that these needed to avoid falling into the potential traps described in Chapter 4. The development of the methodology also benefitted from informal conversations with academics from the University of Manchester whose work was related to the development of the *behavioural additionality* concept⁶³. The following lessons were employed in the development of the methodology.

⁶³ These informal conversations included a discussion with Dr Abdullah Gök on the evolutionary framework of *behavioural additionality* and the components of his new theory on the subject, They also included a conversation with Mr Hugh Cameron, co-author of the paper that first described the *behavioural additionality* dimension (Buisseret, Cameron and Georghiou, 1995) in using the counterfactual scenario for measuring changes in behaviour.

Lessons learned about the behavioural additionality concept

Chapter 2 provided important lessons regarding the concept of *behavioural additionality*, the dimensions of anticipated change and theories associated with the concept. These lessons are summarised as follows:

1. There are important levels of conceptual disagreement in the practice of evaluating the *behavioural additionality* effect. However, the current research indicates that the concept requires two components: a persistence of effects and innovation considered holistically (the effects go beyond R&D and innovation).
2. The dimensions where *behavioural additionality* effects are expected are also many. The selection of an appropriate level of analysis is thus conditioned by the definition adopted and avoidance of the challenges of the ‘project fallacy,’ the ‘black-box problem,’ and the ‘input-output dichotomy’.
3. Chapter 2 concluded that the evolutionary approach for *behavioural additionality* was appropriate for the analysis.

In Chapter 2, the market failure approach as the sole justification for government intervention was confronted with the notion of bounded rationality (see Chapter 2.4.3). Since the principle of bounded rationality limits the use of frameworks based on neo-classical economics assumptions (comparative statistics), different frameworks for the assessment of *behavioural additionality* need to be accounted for.

In this sense, the economic evolutionary-structuralist perspective for *behavioural additionality* (Gök, 2010), based on bounded rationality, shifts the analysis of behavioural changes from a strictly market problem to a systemic problem. Thus, actor’s motivations (choices and behaviour) are not only explained by how well the actors respond to price signals. Other characteristics, such as the actor’s cognitive capabilities and the relationship between knowledge production and assimilation become important elements of the analysis. This shift in focus recognises cognitive differences between actors, and thus, introduces variation into the system, leading also to a different understanding of the role of government intervention. Therefore, the methodology proposed in this thesis suggests the use of the evolutionary approach (based on Gök’s framework, 2010) for *behavioural additionality*. Such a framework relies on organisational routines as the unit of analysis to represent behaviour.

Based on the above, *behavioural additionality* is understood as the persistent modification of the organisational routines of the beneficiaries of an innovation policy (Nelson and Winter, 1982; Becker, 2008a, b; Becker and Lazaric, 2009). Similarly, the framework defines organisational routines as *repetitive, recognisable patterns of interdependent actions involving multiple actors* (Pentland and Feldman, 2005, 2008a; Knudsen, 2008).

Within this framework, organisational routines are composed of three fundamental aspects: 1) a human actor and its actions, 2) an idea of how to act, and 3) an object. These components are referred to respectively as the *performative, ostensive* and *artefact aspects* of the routine (Pentland and Feldman, 2005). Further details of the unit of analysis are provided in the following chapter.

The adopted framework for *behavioural additionality* also considers the following (Gök, 2010; see also Section 2.4.3):

1. *Behavioural additionality* has an effect on people's cognitive resources
2. The tangible or physical aspects of a routine are necessary but not sufficient conditions to represent them.

These components determine the dimensions of the effects, propose that they affect organisational routines, and explain that these changes manifest as capabilities and organisational strategies.

Lessons learned about the assessment of the behavioural additionality effect

The proposed methodology employed a set of assumptions described in different sections of the thesis (see Sections 1.1.4; 2.4.3; 3.6 and 4.6) that guided the methodology:

1. The goal of government interventions in innovative settings is to modify the behaviour of the individuals and organisations that benefit from the policy.
2. The contexts of the innovation policy and the beneficiaries are essential for the analysis.
3. Innovation policies are complex systems; this complexity is also observed in organisational settings.
4. Complexity increases the variability of innovation behaviours in the system, which produces emergent situations that (often) generate unanticipated outcomes.

5. Given the organisational context, *behavioural additionality* effects might be simultaneously beneficial and potentially harmful to the organisation.
6. *Behavioural additionality* effects involve a process of change. This implies that certain types of quantitative indicators might be limited when trying to measure behavioural changes, because they tend to oversimplify the organisational reality.
7. In contrast, qualitative-based indicators and methodologies have the advantage of producing in-depth descriptions of behavioural change. However, their major limitation is that qualitative data is time consuming to collect and difficult to assess.
8. Some instruments constrain the type of *behavioural additionality* effects intended to be assessed. When these instruments do not try to understand the programme rationale, they might produce assessments that do not represent the organisational reality, instead producing unrealistic causality links.
9. Current research on the evaluation of the *behavioural additionality* effect (see Section 3.4.3) considers methodologies such as case studies and ethnographic research as being capable of opening black boxes of behaviour and generating indicators that are less prone to the project fallacy.
10. The problem of attribution of effects is also found in the evaluation of *behavioural additionality* effects.

Lessons learned from CBM

1. CBM is perceived as a reliable approach to analysing interventions considered to operate under conditions of complexity, as case studies can observe the evolution of processes over time. Similarly, CBM has the capacity to focus on internal relationships within a system, and to observe social realities as holistic processes.
2. CBM approaches are limited, as they suffer problems with verification. However, the inclusion of protocols to conduct case studies and replication strategies serve to minimise this problem. Similarly, and as discussed in Section 5.3.1 above, current research on case studies suggests that the type of generalisation achieved by cases consists of providing particular examples of a phenomenon that is *generalising* (Byrne, 2013a; Goertz and Mahoney, 2013) and providing *exemplary knowledge* (Thomas and Myers, 2015).

Lessons learned from TBE

1. TBE explicitly represents the logic of an intervention or the programme rationale through a logic model. The approach relies on multiple sources of information to strengthen the programme theory developed through it. Similarly, the approach is useful for describing unanticipated effects.
2. The interpretative character of TBE increases its subjectivity. Thus, the method is also subject to the verification problem present in CBM, as well as measurement problems. To solve these problems, feedback loops are integral to TBE. These feedback loops are integrated as a programme theory refinement process, the reflexive stage that enables learning from the programme.
3. Generating credible programme theories requires the combination of different sources of evidence, inclusive of discussions with different stakeholders, logical reasoning, and information from prior evaluations.

Two tools explicitly incorporated into the methodology (their selection derived from the analysis of the TBE approach) were ‘contribution analysis’ (Mayne, 2008; 2011; 2012) and the ‘logic framework approach’ (Team Technologies, 2005), a type of logic model used to develop programme theories. These were both included in an attempt to solve the problem of attribution.

Contribution analysis is also relevant to the methodology because recent research has found it to be “naturally linked” to CBM, with both approaches being “excellent at providing evidence that covers the whole theory of change [and providing] rich information about the first logical links” (Delahais and Toulemonde, 2012, p.285). As these tools are integral part of the methodology, they are presented in Chapter 6.

The following section presents the case study by which the methodology was tested and validated.

5.5 Designing a case study to test the methodology

The preceding section presented the procedure for designing the evaluation methodology. In this section, the case study intended to test the methodology is proposed. First, a policy intervention (programme) was selected and from there the cases were chosen.

5.5.1 Selecting a policy intervention

The literature review offered in Chapter 3 of this research indicated that the measurement and assessment of the *behavioural additionality* effect has been extended from initially covering schemes in Northern European countries to encompassing a broader range of countries and programmes around the globe (see Chapter 3, Section 3.2). Thus, an initial step in designing the case study to test the methodology was to narrow the scope of the analysis to a specific country.

Deciding the country of focus for the analysis represents a scope problem. According to Yin (2014, p.28), selecting the cases to focus “needs sufficient access to the data for [the] potential case [that] most likely illuminate [the] research questions”. Similarly, in Chapter 1.3 of this research it was indicated that case studies are strong for studying a contemporary phenomenon that is, obtaining information from living subjects. In this sense, to solve the scoping problem, and select a country for analysis a pragmatic approach was used. Thus, factors such as convenience, practicality and resource constraints faced by the research, as well as the proposed research question were considered to inform the decision for country of choice.

Given that the researcher was based in the UK while the methodology was developed, the access to data and subjects from the same country was facilitated. Similarly, in terms of practicality, focusing on a UK policy enables approaching the subjects of analysis in several occasions, helping to accomplish the research objectives of refining the methodology, while maintaining the robustness of the approach, as a similar context can be maintained through the entirety of the research. Based on these elements, this research focuses on a UK policy for its analysis.

Following the selection of the country in which to perform the analysis, the second step was to select the programme. This included determining a number of factors important to the research and analysing the set of UK policies against these parameters. These factors included the programme context, the temporality of the programme, the programme’s beneficiaries (actors), the degree of accessibility to the programme’s information, the policy goals, and the evidence of the instrument as provided in this research (see Box 5.1 below).

The criteria presented in Box 5.1 were used to assess a list of potential UK instruments that might be suitable for analysis. The result of the assessment is offered in Box 5.2 below (full details can be found in Annex C.2).

Box 5.1. Optimal situations/suitability criteria for selecting a programme		
Elements	Information	Justification
Context	Is the policy related to an innovation or collaboration policy? Is it related to other schemes? Is it related to the <i>behavioural additionality</i> dimension?	Asks the question: why is this programme assumed to be necessary for the identification of <i>behavioural additionality</i> ?
Temporality	For how long has the programme been running?	Programme with longer trajectories are observed as more stable, thus little variance in goals would be faced while conducting the research.
Actors	Who benefits?	Test the methodology under conditions of system dynamics and complexity.
Accessibility	Programmes, which are rich in publicly available information, are preferred.	Increase the possibility to study them from multiple perspectives and include a triangulation technique.
Policy goal	Based on the ‘goal-oriented approach’ (Edler et al., 2013), a typology for classifying innovation policy instruments according to seven major policy goals based on primary innovation effects, such as increase of R&D spent or increase of non-financial capabilities ⁶⁴ .	Relevance of the overall orientation and the stated goals of innovation policy, measured as having a strong, moderate, or low relevance.
Existing evidence	Refers exclusively to evidence available from this research in Chapter 3. Focuses on the question: Did the review from Chapter 3 identify any evaluations covering the programme? Any report using CBM or TBE-based methods?	Evaluations available of the programme, provide a repository of evidence which is used to integrate the programme theory used in Chapter 7 of the research.

⁶⁴ The categories in the typology are: (1) increasing research and development investment; (2) augmenting skills; (3) enabling access to expertise; (4) strengthening system-wide capabilities and exploiting complementarities; (5) enhancing innovation demand; (6) improving frameworks for innovation, including regulation and standards; and (7) facilitating exchange and dialogue about innovation (see Edler et al., 2013, p. 7).

Box 5.2. Assessment of policy instruments						
Instrument	Context	Temporality	Actors	Accessibility	Policy goal	Evidence
Business Links	Collaboration	1980/2003	[I], SMEs	M	+++ [SC] + [AE] + [R&D]	Y
CR&D programme	Collaboration	2004	Firms, Academia	M	+++ [SC] + [AE] + [R&D]	Y
Creative Credits	Access to finance	2013	[I], SMES, Academia	M	+++ [R&D]	Y
Growth Accelerator	Technical Service and Advice	2012	SMEs	M	+++ [AE]	N
Knowledge Transfer Networks	Collaboration	2004	[I], Firms	H	+++ [SC] + [R&D] + [AE]	N
KTP Scheme	Collaboration	1975/2003	[I], Firms, Academia	H	+++ [SC] + [R&D] + [AE]	Y
Innovation Vouchers (IV)	Access to finance	2009	Start-up, SMEs	M	+++ [R&D]	N
SFLG	Access to finance	1981	Small Firms	M	+++ [R&D]	Y
SMART	Access to finance	1998	SMEs	L	+++ [R&D]	Y
SBRI	Access to finance/enhance demand	2001	Government, Firms	H	++ [R&D] +++ [I]	N
UK Innovation Investment Fund (UKIIF)	Access to finance	2009	Firms	H	+++ [R&D]	N

Notes: For Actors: [I]: Individuals. For Accesibility, H: High; M: Medium; L: Low. For Policy goals: +++: Strong; ++: Moderate ; +: minor relevance. R+D: incentivise firms to increase R&D spending; [I]: to enhance demand for innovation; [AE]: to increase non-financial capabilities (access expertise); [SC]: systemic capabilities and complementarities. For Evidence: Y: Yes; N: No.

By applying the selection criteria presented in Box 5.1 (above) and assessing a set of UK innovation policies (as summarised in Box 5.2), this research preferred to use the *Knowledge Transfer Partnerships* (KTP) Scheme as the programme to use in testing the methodology.

5.5.2 Selecting the individual cases for analysis

Following the selection of the KTP scheme as the programme with which to test the methodology, it was possible to design the case study to accomplish the main research goals. The steps suggested in Section 5.3.1 (Yin, 2014; Thomas and Meyers, 2015) to design the case studies, select specific cases and determine the data collection and analysis techniques were followed.

Case study questions, propositions, unit of analysis and object of the case

The following main question addressed by the case study is: How successful is the methodology in identifying and assessing the *behavioural additionality* effect of a government intervention intended to foster collaboration between firms and Higher Education Institutions (KTP scheme)?

The definition adopted for the *behavioural additionality* concept and several of the assumptions (presented in Section 5.3.3 above) indicate that the *behavioural additionality* dimension is a potential effect produced by government interventions at the organisational level. Similarly, the unit of analysis to be incorporated into the methodology is organisational routines. Finally, because of its proposed use and its reliance on existing theory to develop the relevant assumptions, the case study can be characterised as a theory-testing case. The basic premise of the theory is that government interventions modify organisational routines.

Based on these elements, the object of the case study can be described as testing the capacity of an evaluation methodology (fully described in next chapter) to identify the changes in the organisational routines of the beneficiaries of the KTP scheme (the subject). This first step toward accomplishing this goal was to produce a pilot case study to refine the data collection plans, to test the initial questionnaire regarding changes in organisational routines, and to collect information to develop the initial programme theory. Following the pilot case, the rest of the cases were applied. The rationale for selecting the cases is presented below.

Type of case study: multiple design (Small-N)

The discussion in Section 5.3.1 (Flyvbjerg, 2006; Perri and Bellamy, 2012; Yin, 2014; Thomas and Myers, 2015) provided a theoretical framework for the selection of the cases. Accordingly, the following strategies were employed: the ‘information-oriented selection’ strategy (Flyvbjerg, 2006; Yin, 2014, Thomas and Myers, 2015), the principle of ‘theoretical – analytical replication’ (Yin, 2014), and the inclusion of an ‘adequate diversity of factors’ (Perri and Bellamy, 2012; Yin, 2014).

According to the information-oriented selection strategy, a single-case study should follow a specific rationale when selecting the case (see Section 5.3.1 above). Thus, from the set of potential case choices, a ‘critical’ case needs to be incorporated, as it is appropriate for testing specific theories or theoretical assumptions. However, as mentioned previously, a two-case design is preferable to a single case if the opportunity arises to have more than one case (principle of theoretical-analytical replication).

Moreover, for this case study, the theoretical-analytical replication process is important for three reasons: firstly, an incremental design is useful in locating the influence of the KTP scheme on diverse organisational settings, thus incorporating different organisational routines; second, an incremental design offers the opportunity to replicate the findings (uses of the methodology) and to duplicate the conditions (assumptions) of the first case in the subsequent cases; and third, by replicating the process in different cases, the methodology becomes more robust and its instruments can be refined, thus offering an instrument with the added value of being a potential policy learning device.

Finally, the selection of specific companies used for the cases was based on an adequate diversity of factors (Perri and Bellamy, 2012; Yin, 2014). The factors included were 1) the programme’s operative model and its beneficiaries, 2) its contextual characteristics (size of the organisation, industrial classification, characteristics of the KTP project and knowledge supporting the KTP project), and 3) accessibility (whether there was enough information and cooperation of the CBP).

Annex C.2 presents in full detail how these factors were applied. Thus, in this section, only the outcome of the process is reported below (see Box 5.3).

Box 5.3			Selecting cases for analysis	
Strategy	Factors affecting the decision		Justification and outcome	
Analytical-theoretical replication	Logic of replication		Leads to a small- <i>N</i> case study design	
Information-oriented strategy	Critical case	Case A	Suitable for testing theory.	
	Revelatory cases	Case B Case D Case E Case F	Suitable for replying the methodology in different contexts. Cases D, E, and F also serve as replicators.	
	Unusual case	Case C	Considered ‘unique’ and the ‘first in its kind’ from the perspective of the partners integrating the project (see Annex B).	
Adequate diversity of factors (boundaries of cases)	Programme’s beneficiaries		Focus on companies	
	Programmes operative model		Focus on KTP projects	
	Feasibility (Organisation size)		Small and medium-sized organisations	
	Accessibility		Multiple sources of information are available.	
	KTP project (characteristics)		The company must have participated (at least) in one KTP project.	
	Industrial classification		Profit and non-for-profit organisations.	

Box 5.3 includes the three strategies considered for use in guiding the case selection. Based on these strategies, a small-*N* design was selected to test the methodology. This implies that, besides the single ‘critical’ case (Case A) to test the theory, additional cases were included. Relying again on the information-oriented selection strategy, a second type of case included in the design was a ‘revelatory’ case (Yin, 2014, see Section 5.3.1), used to observe the performance of the methodology under different contexts (Case B). The difference in context is revealed by considering the diverse factors suggested above.

A third case (Case C) was also chosen in an attempt to include an ‘unusual’ case (Yin, 2014; Thomas and Myers, 2015) for demonstrative purposes. To determine whether a case is ‘unusual,’ evidence from the case is analysed. Because of the current study’s theory-testing approach and to increase the robustness of the methodology, three additional cases, operating in different contexts, were included (Cases D, E and F). Due to resource constraints⁶⁵, it was not feasible to conduct additional cases, resulting in a total of six cases included in the design. A more thorough description of the cases is provided in chapter 7 and Annex B (portfolio of evidences).

Analytical components of the case: data collection procedures and sources of information

The data collection procedure involved two phases, one for the pilot case and a second for the final cases.

The main sources of information developed for the pilot case are shown in Tables 5.2 and 5.3 (further details are found in Annex B). Table 5.2 specifies the sources of information used to refine the data collection plans, identify key respondents, establish potential contacts with the organisations and refine the research instruments. Table 5.3 specifies the sources of information used to develop the KTP programme theory.

⁶⁵ Single researcher, based in the UK.

Table 5.2 Sources of information employed in the pilot case

Type of source	Source of information	Description (Contents)	Lessons generated (Use)
Observation (Assistance to specialised conferences)	Entreprise Futures (2012)	Leading Entrepreneur event, with the aim to illustrate the possibility of starting a business as a student or graduate entrepreneur. Aimed principally at postgraduate students and research staff. Jointly run by the University of Manchester, University of Salford and Manchester Metropolitan University (Phillips, 2013).	Identify potential respondents, find potential cases for analysis and test instruments
	KTP Associates Conference (2014)	Hosted by the University of Brighton, the conference attempts to show the benefits and successes of the KTP scheme from the Associate's perspective. Attended by different KTP stakeholders (Associates, KBP representatives, companies interested in the scheme) (University of Brighton, 2014).	
Interviews	Different KTP stakeholders, including: <ul style="list-style-type: none"> • KBP academic advisers • Associates • Company representatives 	Face to face, telephonic and on-line interviews	<ul style="list-style-type: none"> • Test initial questions • Identify potential cases and respondents
Informal conversations	Same as above	General discussions on the KTP programme with different stakeholders.	<ul style="list-style-type: none"> • Familiarise with KTP programme • Identify potential cases (as above)

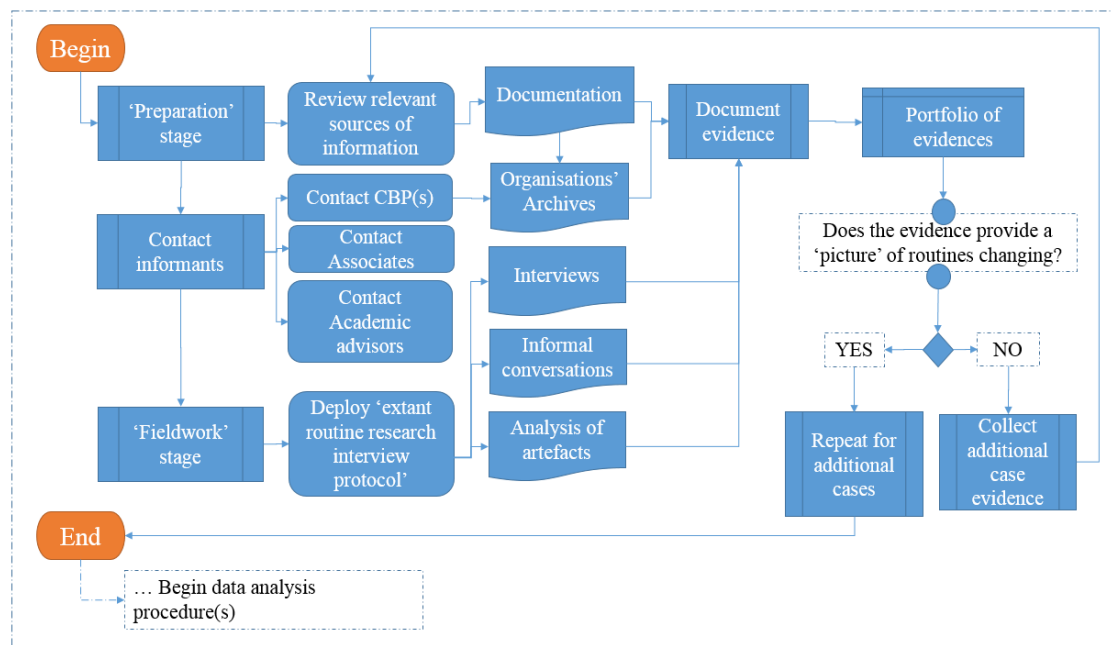
Table 5.3 Sources of information used to develop the KTP theory of change

Type of source	Source of information	Description (Contents)	Lessons generated (Use)
KTP Programme documentation	On-line resources: programme data	The basic programme layout and rationale.	Stores the <i>programme memory</i> as it is a repository for the programme's activities.
Existing evaluations	Regeneris Consulting (2010)	Strategic review of the programme performance.	Establishes the rationale for the scheme as a market failure approach.
	CM International UK (2011)	Input additionality and performance evaluation of KTPs (in Wales).	It serves as a benchmark for programme performance, albeit in a regional context.
	Ternouth et al., (2012); NCUB (2013a, b; 2014; 2015)	These reviews, performed for the CIHE group, identify best practices for knowledge transfer and the generic model for an 'ideal' KTP.	Describes the 'KTP+ model' which demonstrates the barriers considered by the programme managers to be obstacles to successful knowledge transfer and thus, influence the programme rationale.
Interviews with KTP stakeholders	<ul style="list-style-type: none"> • KTP regional adviser • University KTP office • Associates • CBP representatives • Academic advisers 	Face to face and telephonic interviews (additional to those elaborated for the case study). Generate the theory of change and as an initial test for the propositions.	Reinforce learning from the documents under analysis, generated a preliminary theory of change, and corroborated programme's propositions.

Several outcomes were obtained from the pilot case: a refined set of questions to be used during the cases, a set of potential topics of interest regarding the impact of KTP, some preliminary elements of importance to consider in the development of the KTP programme theory, and the identification and establishment of one contact from the KTP associates conference, which became Case A. Following the pilot case, additional cases were identified through the KTP web resources (KTP 2014a, b). Further details of the interviewees are provided in Annex B.2.

During the second phase of the data collection process, the refined theory of change was developed and applied, and further refinement of the research instruments occurred. Figure 5.3 illustrates the data collection procedure.

Figure 5.3 Data collection procedure for the cases



The data collection process used to develop each case involved two complementary stages: 1) 'preparation' (prior fieldwork), and 2) 'fieldwork-related' data collection. The main difference between stages was in the purpose of using the information sources. While the 'preparation' data collection stage used archival records and publicly available documentation to construct an 'organisational history,' the 'fieldwork-related' stage employed observations *in situ* (where possible), informal conversations and interviews to generate an in-depth learning of specific components of the process of change.

Priority was placed on interviewing different individuals participating in the KTP project. When this was not possible, secondary sources of information were incorporated to reconstruct the ‘contribution story’.

The main sources of information (Yin, 2014) used to collect information from the cases are presented in Table 5.4 below, and Annex B provides additional details about them.

Table 5.4 Sources of information included in the cases

Source	Elements	Case(s)
Archival records	Company’s documentation (manuals and procedures)	Cases A, B, C,D, E, F
	Company’s websites	Same as above
	Company’s press releases	Cases B, C, F
	Marketing material related to the KTP scheme and its specific projects	Only for those available.
Direct observations	Organisational practices (field notes)	Cases A, B, F
Documentation	On-line material related to the partnership (news, bulletins, KTP website, various sources, including KTP, 2014a,b,c; NCUB, 2015)	Cases A, B, C, D, E, F
	Case studies on the same KTP, produced by third parties (various sources, online, and printed material)	Only for those available. Cases B, C, D, E, F
	Scientific publications (KTP Outputs)	Cases C, E, F
Informal conversations	Other members of the organisation	Cases A, B, C, D, E, F
Interviews (Face-to-face, telephonic and online)	Companies (different members)	Cases A, B, C, D, E, F
	KTP Associates	Cases A, B, C, E, F
	Academic advisors	Cases A, B, C, D, E
Physical and other artefacts	New products	Cases B, F

Regarding the ‘fieldwork stage’ (interviews, informal conversations, *in-situ* observation, and use of artefacts), the interviews adopted the form of open-ended conversations in which the interviewees reflected on the activities and changes incorporated into the organisation from the KTP, according to their role in the project and their position in the business. Since the objective was to test the methodology, several interactions with the same people were required (to refine the questions). Thus, in many instances, telephonic interviews were conducted and questions were sent electronically.

The informal conversations occurred with different members of the case organisations, with the aim of triangulating evidence and identifying key players for the cases. The *in-situ* observation occurred in those cases in which it was possible to visit the respondents on company premises (Cases A, B, and F). Field-notes were taken to document the organisational routines in action. Finally, it was possible to observe different artefacts (physical products and online technologies or operative manuals) produced as a result of the KTP project. These artefacts were used as ‘tangible’ evidence of the type of outcomes produced by the partnerships.

Further detail regarding the questionnaire used to gather information about the cases can be found in Annex A (case protocol). Similarly, further detail about the type of evidence provided by the information sources, and how these were integrated into the cases can be found in Annex B and C.

5.5.3 Validating the methodology

In Section 5.3.3 (above), the concepts of validity and reliability were described as useful for judging the quality of a research design. However, the process of validation should be observed under the context of CBM. In this sense, generating valid research designs refers to “the extent to which the structure of a research design enables us to draw unambiguous conclusions from our results” (De Vaus, 2013, p. 28) or internal validity.

Moreover, case studies are often described to “achieve excellent internal validity by providing a profound understanding of a case” (De Vaus, 2013, p. 237). Thus, for this research, validation serves the purpose of answering the research question as proposed in the case study (presented at the beginning of Section 5.5), while producing ‘exemplary knowledge’ (Thomas and Myers, 2015) which leads to consistent results if applied in different contexts and conditions (as discussed in Section 5.3.2, above).

Therefore, the methodology validation process includes a series of reflective steps. This reflective process works at different analytical levels. Firstly, it reflects on the type of evidence provided by the case study and its potential uses. This first process is aided by two sub-elements: the incremental approach adopted by the case study and the analytical question presented in Figure 5.3. The former was useful in the current study because the logic of replication enabled crafting the cases in parallel and the return to the evidence when required. The latter served to determine whether the evidence collected provided a ‘picture’ of the organisational routines changing, that is, a description of their development and variation and thus a guideline for deciding when the work was completed for each case.

Secondly, the validation of the methodology includes a series of reflective exercises intended to determine, on one hand, the lessons to be learned from the case study, and on the other hand, its impact on the evaluation theory (see Section 5.3.2 above). For the former, Goertz and Mahoney’s (2013) question regarding the scope of the cases (see Section 5.3.1 above) was used as a guideline, while the latter attempted to answer the three questions proposed by Shadish (1998) and adapted for the assessment of the *behavioural additionality* effect (see Section 5.3.3 above). The questions were:

- What are the steps, or logical sequence of concepts, followed by the evaluation methodology to make value judgements related to the *behavioural additionality* dimension (connect data to value judgements)?
- Does the longevity of the programme under analysis (KTP scheme) make a difference in terms of the components included in the assessment?
- What effect does the size of the intervention (e.g. a local project within a bigger programme or a small element within a project) have on the study’s conclusions?

Thirdly, the inclusion of a framework to judge the quality of the CBM/TBE research design also aids in its validation. This framework integrates the concepts of *validity* and *reliability* (see Section 5.5.3 above) with a discussion of the different tools used in the methodology. These include multiple sources of evidence to establish a *chain of evidence* through triangulation, adhering to a theory of change to increase the internal logic of the instrument, following a replication logic and including the case study protocol and portfolio of evidences.

Because of their reflective nature, the steps described above are discussed in Chapter 9, following the application of the methodology. Thus, the methodology is presented first (Chapter, 6), and applied by presenting the case study narratives (Chapter 7) to discuss the potential uses of the instrument in assessing the *behavioural additionality* effect of the cases selected from the KTP scheme (Chapter 8).

Chapter 6. Proposing a Methodology for Evaluating
the *Behavioural Additionality* Effect of Innovation
Policies

6.1 Introduction

In the previous chapter, the theoretical components of the CBM/TBE approaches and the procedure used to construct the methodology were provided from an evidence-based perspective. These elements are used in this chapter to design and propose an evaluation methodology to assess the potential *behavioural additionality* effect generated by those organisations that benefited from receiving support from the KTP scheme.

The chapter includes six sections; Section 6.2 presents the methodology and its operative phases, as well as the main assumptions contained in the model. The methodology is conducted as an iterative, 3-step, theory-refinement process:

1. A planning step (case-based component).
2. Contribution analysis, which has three phases.
 - a. A *knowledge construction phase*,
 - b. an *analytical phase*, and,
 - c. a *behavioural additionality* assessment phase.
3. Decision-making step.

Following the presentation of the methodology, the rest of the chapter describes each phase in-depth. Section 6.3 focuses on the first stage of the methodology, the planning step. Section 6.4 describes the second phase, contribution analysis. Section 6.5 presents the third and final phase in the methodology, the decision-making phase, where the evidence obtained from the previous step is used for various objectives, such as policy learning.

After presenting the methodology, Section 6.6 briefly describes the way the methodology addresses the challenges in the evaluation of the *behavioural additionality* effect as identified in Chapter 4. Finally, Section 6.7 provides the conclusions.

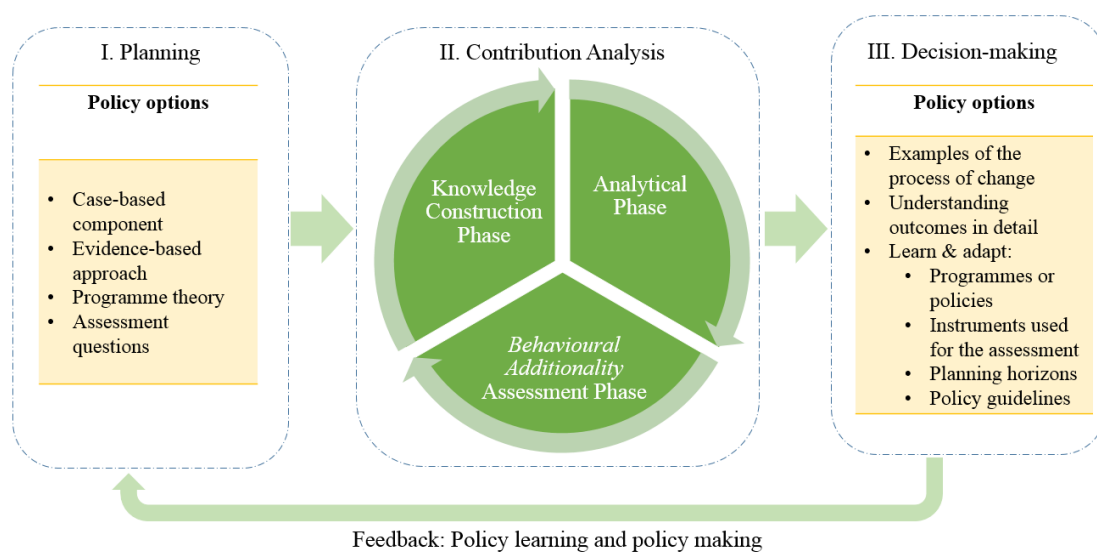
6.2 Proposed evaluation methodology for the *behavioural additionality* effect

The proposed evaluation methodology, introduced in the preceding section, is an iterative process (see Figure 6.1, below) with the aim of understanding the difference the innovation policy makes to the behaviour of its beneficiaries. This additionality question is answered through the incorporation of a systematic process inclusive of three steps: planning, the proper analysis of the policy, or the *contribution analysis*, and a *decision-making* process.

Each of these phases has an associated objective and combines a set of tools and methods to accomplish this. Similarly, the methodology can be expressed as an iterative process, that:

1. Helps with the selection of an innovation policy to study, to understand its rationale and to then choose a set of beneficiaries to analyse the manner in which this rationale unfolds (the planning component).
2. Performs a contribution assessment, oriented to determine if and when the activities lead to changes in organisational routines and thus generate the (*behavioural*) *additionality* effect.
3. Generates lessons related to the process of change in the cases under analysis and, through a *programme theory refinement*, has the capacity to learn and develop policy lessons.

Figure 6.1 Proposed *behavioural additionality* evaluation methodology



Unit of analysis and main assumptions incorporated in the methodology

Before establishing the evaluation methods to perform the analysis, two elements were considered: the operative definition adopted for behaviour, and the criteria considered to determine when an organisational change is additional, as these elements form the core elements of the methodology.

Accordingly, based on the evidence analysed in the previous chapters of this research (condensed in Chapter 5, see Section 5.4), this methodology understands organisational behaviour as organisational routines (see Chapter 2.2). The operative definition for the *behavioural additionality* concept is the persistent change in the behaviour of the firms because of government intervention (see Chapter 2.4.3). Therefore, the logic of the intervention, when assessing the *behavioural additionality* effect, anticipates that public interventions might change the organisation's routines (see Chapter 5.4).

For the purposes of this methodology, organisational routines have certain characteristics. Routines are defined as a repetitive, recognisable pattern of interdependent actions involving multiple actors (Pentland and Feldman, 2005, 2008a; Gök, 2010). At the same time, organisational routines are integrated by three fundamental aspects: a human agent and its actions, an idea of how to act, and an object. These aspects are referred to respectively as the *performative*, *ostensive* and *artefact aspects* of the routine (Pentland and Feldman, 2005, 2008a; Knudsen, 2008; Gök, 2010; Parmigiani and Howard-Grenville, 2011).

Furthermore, each aspect refers to specific elements in organisations; as such, the *performative aspect* (also referred to as *effortful accomplishments*) is a specific action taken by specific people at specific times. The *ostensive* aspect is the abstract or generalised understanding of the actual routine. Finally, the *artefact* aspect is the physical manifestation of routines, including rules, procedures, technologies or machines (Pentland and Feldman, 2005, 2008a; Knudsen, 2008; Gök, 2010; Parmigiani and Howard-Grenville, 2011).

Organisational routines are constrained and shaped by a variety of organisational, social, physical and cognitive structures in which the organisational members enact particular performances. Thus, routines integrate generative systems that persist in space and time (Becker, 2008a; Miner et al., 2008) but, as these represent the memory of the organisation, they change with every new performance. Similarly, routines are effortful accomplishments, implying that people have the choice to perform or amend organisational routines, depending on their organisational objectives and the role they occupy in the organisation (Cohen and Bacdayan, 1994; Gök, 2010).

Routines are collective entities; however, individuals play a fundamental role in shaping them as they own the knowledge that modifies and creates the cultural and social mechanisms that integrate the aspects of routines (Aime et al., 2010; Massini, 2010; Felin and Foss, 2011). In this sense, individuals provide the initial ‘cues’ for the organisations to act, and help to manage adaptive tension and transfer knowledge back to the organisation (Lewin et al., 2011).

Finally, regarding the methodology, the assumption is that organisational routines can “originate either through effort or by chance, that is, through managerial design or as an unintended consequence” (Pentland, 2011, p. 285). This assumption implies that any organisational process has the potential to be classified as a routine; thus, a criteria to identify when these processes are suspected to shape organisational routines is required (Pentland et al., 2011):

- Criterion I: They are repetitive and recognisable patterns (necessary condition)
- Criterion II: They have an abstract element (rule) generated through the actor’s experience (sufficient condition).

Following the presentation of the *behavioural additionality* concept adopted by the methodology and the main assumptions, the rest of the sections of this chapter describe each phase of the methodology in detail.

6.3 First step of the methodology: Planning

The first step of the methodology is the planning stage. This stage has the main goal of determining the assessment questions and choosing the evaluation tools intended to answer these questions.

To accomplish the objective of this step, a quick review of the programme's rationale and aims is suggested. Similarly, the identification of existing evidence on the performance of the programme's beneficiaries to incorporate in the analysis is conducted.

This stage might include the following questions: What type of innovation behaviour is the programme trying to modify (if any)? does the programme try to modify behaviour explicitly?; how are these behavioural changes produced?; why are they produced?; and what types of effects have been observed previously (if any, both intended and unintended)?

For this step, an evidence-based approach might be employed to identify the relevant information required to address the questions above. The method of choice for collecting data and preparing them for analysis is through case studies (case-based component, see Chapter 5.3.1). The method to perform the analysis as suggested by the methodology is contribution analysis (Mayne, 2012). This method is central to the second phase of the methodology, and is explained in the following section.

6.4 Second step of the methodology: Contribution assessment

The review of the programme or policy performed during the previous phase is considered *rapid* because it serves as a basis for the in-depth analysis performed during this second phase, the contribution assessment.

Accordingly, the main objective of this second phase is to determine the suspected contribution to the organisational behaviour in the cases under analysis as a result of government intervention. The tools and methods guiding the process for accomplishing this aim will be explained in further detail.

6.4.1 General components of the contribution analysis framework

Contribution analysis (Mayne, 2001; 2008; 2011; 2012) is a type of theory-based approach, an evaluation methodology with the objective of generating a 'credible contribution story', or an assessment of the anticipated changes incorporated into a programme by an intervention (Mayne, 2012; Delahais and Toulemonde, 2012; Patton, 2012; Wimbush et al., 2012).

For the contribution analysis, a ‘credible’ contribution story is one which is compared to alternative explanations generating plausible explanations regarding the phenomenon under analysis (Mayne, 2001; 2008). In this sense, the credibility of an argument (therefore a solid causal explanation) is determined by the interrelationship of three elements: prior evidence (or data) collected from the programme, the level of coherence between the logic statements developed through the programme theory and the contribution story, and the level of agreement reached between the contribution story and the stakeholders’ experiences of the programme.

As recent research in the use of contribution analysis for evaluating interventions indicates, contribution analysis is “less about precision and more about increasing understanding and knowledge [...] thereby reducing uncertainty” (Mayne, 2001, p. 5).

The uncertainty referred to above can be present in many aspects of evaluation practice (such as a capacity to refine the causal links suspected to operate in an intervention), or the outcomes of the analysis (formulating better policies). The presence of this uncertainty has a practical implication in contribution analysis, as the term ‘causality’ is intentionally avoided, preferring the use of the word ‘contribution’ when discussing the effects of an intervention (Mayne, 2012).

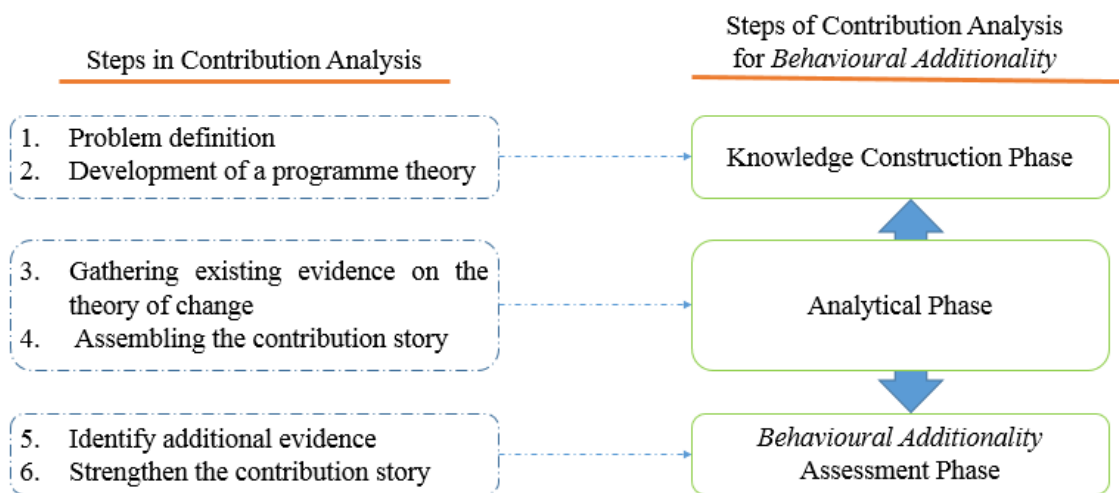
To analyse interventions, contribution analysis includes six iterative steps operating as a *mechanism refinement process*: problem definition, development of a programme theory, gathering evidence, assembling the contribution story, identifying additional evidence and strengthening the contribution story (Mayne, 2012; Delahais and Toulemonde, 2012).

Contribution analysis has been adopted as a tool to perform impact evaluation (Wimbush et al., 2012), as an approach to determine causality without necessarily relying on experiments (Delahais and Toulemonde, 2012) and for analysing complexity in social systems (Patton, 2012).

6.4.2 Adapting contribution analysis to the assessment of *behavioural additionality* effects

Based on the elements described in the previous section, this research has adopted contribution analysis as a method to detect the *behavioural additionality* effects of STI policies. The six steps of contribution analysis are integrated into specific steps relevant for the analysis of behavioural change (see Figure 6.2).

Figure 6.2 Steps of contribution analysis for *behavioural additionality*



The six steps in contribution analysis have been condensed in three phases for the assessment of *behavioural additionality* to generate an analytical framework that is specific to assessing behavioural changes related to innovation. In this sense, Mayne (2012, p. 271) has noted that “those who have made use of contribution analysis have usually modified these steps to best suit the circumstances they face and the specific analytic methods they have used”. Thus, the suggested analytical framework for *behavioural additionality* maintains its relationship to the more general contribution analysis framework upon which it is based as “a structured approach to the analysis [...] part of an iterative approach to building the logic and evidence for claiming that the intervention made a contribution” (Idem.).

Each phase of the contribution analysis for *behavioural additionality* is presented next.

Knowledge construction phase

The main objective of this phase is to develop a programme theory (or theory of change)⁶⁶. The procedure to construct the *behavioural additionality* programme theory for innovation policies includes three steps: Develop the (assumed) impact theory, formulate and prioritise evaluation questions, and answer the evaluation questions.

The tool suggested to develop the impact theory is the logic framework approach (PCI, 1979; Solem, 1987; NORAD, 1999; Bakewell and Garbutt, 2005; Team Technologies, 2005), as it provides the basic components for generating a programme theory presented as a set of premises related to the programmes' performance.

As initially described in Chapter 5 (see Section 5.4), additional details of the logic framework approach and its suggested use for *behavioural additionality* are provided below.

The strongest advantage conferred by the methodology is that it forces evaluation practitioners to think through a theory of change (Bakewell and Garbutt, 2005) and allows different stakeholders to participate in the formulation of the theory of change. Other advantages include its capacity to ensure that the fundamental questions are asked and the programme's weaknesses are analysed; this analysis provides decision makers with better and more relevant information, such as a better basis for systematic monitoring and the analysis of the effects of projects (Team technologies, 2005).

The major limitation of the approach is its perceived rigidity (Bakewell and Garbutt, 2005); however, this aspect has been contended (see Team technologies, 2005). In this sense, Team technologies, (2005) argued that the method, because of its iterative nature, can modify its theory of change.

⁶⁶ The concepts *Theory of Change* and *Programme Theory* are used interchangeably.

The Logical Framework Approach suggests producing a project matrix to understand programme rationales, an analytical tool for objectively oriented project planning and management, as well as the basis of an evaluation design (PCI, 1979; NORAD, 1999; Bakewell and Garbutt, 2005). Several approaches to construct a project matrix can be found; however, this methodology is closer to the approach suggested by Team Technologies (2005), as it explicitly determines how to use the tool for analysing R&D and innovation programmes because of two additional characteristics: Flexibility is a core element of the approach, and it might be developed by an individual.

For the purposes of the analysis of the *behavioural additionality* effect, the logic framework needs to explicitly incorporate questions related to the logic of the intervention and to the anticipated behavioural effects that the programme tries to generate (integrating the questions developed during the planning phase).

To develop programme theories, multiple sources of information are preferred (see Chapter 5.3.2). Similarly, as programme theories and case studies are naturally linked (see Chapter 5.3.3), they can share data collection tools and data analysis techniques.

Additional tasks included for developing the programme theory involved reflecting on the context in which the policy beneficiaries operate (context awareness), and identifying whether the policy beneficiaries receive additional government support (in other words, do they participate in other policies that might influence their innovation behaviours, either implicitly or explicitly?).

Table 6.1 below offers the programme theory⁶⁷ considering the *behavioural additionality* concept and its related assumptions as employed by the methodology.

⁶⁷ This programme theory served as the basis for the project matrix presented in the next chapter.

Table 6.1 *Behavioural additionality* theory of change: Changes-Capabilities-Routines Framework

<i>Stage</i>	<i>Description</i>	<i>Consequence (modification of)</i>
Organisational Change (C)	After receiving a subsidy, Organisations (might) <i>change</i> .	Organisation (holistic level)
Organisational Capabilities (C)	Occurs when these <i>changes</i> are manifested as one (or all) of the following organisational <i>dimensions</i> .	The strategy (direction), technological choices, or the innovation capabilities.
Influence on Organisational Routines (R)	These <i>dimensional changes</i> form <i>repetitive, recognisable patterns of interdependent actions</i> (organisational routines) .	<p>The following impacts are anticipated:</p> <ul style="list-style-type: none"> • In the members (<i>individuals</i>) of the organisation, their memory to act and their (innovation) <i>activities</i>. (Performances). • In the <i>rules or procedures or scripts</i> to conduct such activities, also strategies. (Ostensive). • In the <i>tools, methods or technologies</i> aiding them (Artefact). <p>These <i>patterns</i> of (inter)<i>action</i> could be <i>entirely new</i> or <i>improvements</i> to previous ones. Organisations might have (or develop) specific mechanisms to respond) learn, select and modify them according to their necessities. Thus, routines can be original, mutations of previous processes, or processes migrated from other entities (variation, selection, retention process).</p>

The *Changes-Capabilities-Routines* (CCR) framework presented in Table 6.1 above corresponds to a general theory of change that describes, as a series of interrelated steps, the transition from receiving a policy incentive to generating different innovation capacities, strategies or technological choices in the organisations, concluding with the formation of organisational routines.

The CCR framework, as a theory of change, is used to explain the logic of the intervention by developing the suspected *behavioural additionality* effects (intentional and unintentional) produced by the intervention. This theory of change, results in the integration of a knowledge base, leading to the second phase of contribution assessment.

Analytical phase

The analytical phase follows the development of the programme theory. This second phase involves investigating the way the theory of change manifests itself in the programme under analysis. Therefore, the aim of the analytical phase is to transform the assumptions generated by the programme theory into a coherent account of events.

Accordingly, the main product of the analytical phase is a contribution story, a coherent description of the way the theory of change is manifested in the organisation. Therefore, the contribution analysis for the *behavioural additionality* dimension investigates the way the individuals in the organisation adapted to change and its corresponding impact as organisational routines⁶⁸.

Two main tasks are performed during the analytical phase: gathering existing evidence for the theory of change and assembling the contribution story. In this sense, gathering existing evidence for the theory of change requires first considering the beneficiaries of the programme (level of analysis), and then collecting data aimed at identifying organisational routines and characterising organisational behaviours.

To assemble the contribution story, the use of a narrative analysis strategy is suggested. Narrative analysis is perceived as being appropriate, since ‘narratives’ help to explore organisational tasks as sequential structures of processes that later serve to locate and characterise organisational routines (Pentland and Feldman, 2007, 2008b; Rerup and Feldman, 2011). Similarly, to assemble the contribution story, the inclusion of the context in which the policy operates and the history of the beneficiaries using the instrument, in addition to the type of the beneficiaries’ innovation capabilities, is recommended.

⁶⁸ The contribution stories are organised as narratives and can be codified in tables ready for analysis (see example in Annex C.3).

In summary, the analytical phase of contribution assessment produces a contribution story detailing the process of change as experienced by the policy beneficiaries. The stories include an analysis of the changes, the consequences and the element of the organisation in which the change has had an impact concluding with the integration of organisational routines. The data collected as a contribution story are ready to be analysed during the *behavioural additionality* assessment phase.

Behavioural additionality assessment phase

Following the integration of the contribution stories during the analytical phase, the next step is to conduct the *behavioural additionality* assessment phase. Accordingly, the *behavioural additionality* assessment phase has two interrelated goals: to describe routines, explaining the variation, selection and retention (VSR) process observed in them, and to compare this information to the assumptions included in the theory of change.

To accomplish the goals of this phase, two interrelated tasks are performed: identifying additional evidence and strengthening the contribution story.

From an analytical perspective, the questions guiding this step first require considering whether the changes observed results in repetitive and recognisable patterns of interaction (first criterion of routines, see Section 6.2, above), and then, whether these patterns have an abstract element generated through the actor's experience (second criterion of routines, see Section 6.2, above). Following this analysis, some questions to reflect on the contribution of the intervention are: what aspects of the organisational routines were modified as a consequence of the programme or policy? and how did these changes occur?

Identifying routines from organisational settings is a simple task. However, assessing routines is more difficult for a number of reasons. The first is because of the presence of the abstract elements that integrate the *ostensive* and the *performative* aspects. The second is because these aspects are distributed over time and in space, and their assessment is idiosyncratic; that is, it depends on the examiner's point-of-view⁶⁹.

⁶⁹ Either etic or emic perspectives. Etic refers to the outsider's point of view, while an emic category considers the actor's experience.

Considering the elements above, some practitioners using Pentland and Feldman's framework have provided different alternatives. Some of these are explored below.

Examining the *ostensive* aspect by employing an outsider's perspective (*etic*) that analyses the actor's specific performances (Pentland and Feldman, 2008a). Moreover, the ostensive aspect is argued to be correctly captured if represented through *narratives* (Feldman and Pentland; 2003; Pentland and Feldman, 2005; Pentland et al., 2012).

To examine *performances*, some researchers⁷⁰ have used *analogies*. Examples of this tendency include making routines analogous to *languages* (Pentland, 1995; Cohen et al., 1996; Pentland, 2000; Pentland and Feldman, 2008a), or *shared understandings* (Feldman and Rafaeli, 2002). Narrative analysis also is supported as method of choice to examine performances (Dutta et al., 2003; Hales and Tidd, 2009).

Current research on organisational routines argues that the “canonical artefact for an organisational routine is the Standard Operating Procedure (SOP)” (Pentland and Feldman, 2008a, p. 289). However, the authors recognise that other artefacts are also important (such as telephone files, or assembly lines), which only become relevant given the particular context of analysis (Miner, 1991; Lazaric and Denis, 2005; Pentland and Feldman, 2008a; Breuker and Matzner, 2013). Two additional suggestions are important regarding using artefacts as a proxy for the entire organisational routine: relying exclusively on them produces incomplete representations or routines (‘naïve top-downism’ (sic), Pentland and Feldman, 2008b, p. 245) and managers “design artifacts, not routines” (Pentland and Feldman, 2008b, p. 249).

Finally, in order to identify changes or variations in routines, Pentland and Feldman (2005; 2008b) suggested the use of an interview protocol known as extant routine research⁷¹. The interview protocol identifies changes in the ostensive aspect of a routine by analysing its specific performances.

⁷⁰ Some examples include Adler et al., (1999); Hutchins (1991; 1995); Pentland and Reuter (1994); Narduzzo, (1998); Edmonson et al., (2001); and Feldman, (2000, 2004).

⁷¹ The interview protocol appears throughout Pentland and Feldman's research. For example, a preliminary version appeared in a study done to compare the variability of four sub-units at Citi Group United States Citi banking Centre (Pentland, 2003; see Turner and Rindova, 2012, for an in-depth discussion). Based on the contents and the structure of the interview protocol employed by Gök (2010) to study behavioural additionality, it can be argued that his instruments resemble the extant routines research interview protocol. Three applied examples of the protocol include: D'Andrea, Hobday and Prencipe (2012); Turner and Fern (2012) and Turner and Rindova (2012).

The interview protocol requires the interviewer to ask informants, in a sequential order, about the following. The first is a typical performance (or activity) described from the informant’s perspective. The second is the process for modifying the performances previously described, including information on what changed, who was involved and the ways to accomplish the change. The third is the particular mechanisms the informants have developed for dealing (or coping) with change.

Based on the discussions above, the following tools and methods to identify organisational routines are suggested (see Table 6.2, below)⁷².

Table 6.2 Suggested tools and methods for investigating organisational routines with the CCR framework

Aspect	Operationalisation	Method
Performative/Ostensive	Narrative analysis (Scripts)	<ol style="list-style-type: none"> 1. Learn about shared understandings, memoirs and histories (tales of winners and losers). 2. Describe functional events.
	Extant routines research interview protocol	<p>A three step process guides the interview.</p> <p>The questions included in the instrument, ask, in a particular sequence, about typical activities, variation and mechanisms developed for coping with change.</p>
Artefact	(Emergent) Alternatively: contextual objects	Artefacts can be represented as physical manifestation of the routines (e.g. ATMs for a banking routine) or abstract (e.g. SOP in a fire department). Given their emergent character, the appropriate artefact to analyse is determined during the fieldwork phase.

The methods suggested in the table above assist in extracting, from the contribution stories integrated during the previous stage, the data relevant to detect routines and assess the impact of the programme, represented as the modification of different aspects of organisational routines. As such, narrative analysis helps to describe functional events and learn about shared understandings in the organisational setting (the idea behind a routine, or its ostensive aspect).

⁷² It should be noted that, although a particular method is suggested for each aspect, the evidence available for organisational routines demonstrates that the aspects overlap. Thus, there is a possibility of identifying one aspect (ostensive) while searching for another (performances). The methodological recommendation corresponds to avoiding naïve top-downism (Pentland and Feldman, 2008b).

Furthermore, the extant routine research interview protocol provides information related to specifying who, what and how the variation in the aspects of routines occurred. Finally, the physical manifestation of the routine in the organisational setting represents the artefact aspect.

The data collected from the narrative analysis related to organisational routines might be codified in a table inclusive of some qualitative categories, such as a before-and-after description of the status of the particular dimension of change by participating in the programme (see example in Box 6.1, below).

Box 6.1 Codifying and preparing information for the contribution assessment

Example 1. Table codifying organisational routines and aspect impacted (as detected from the cases)

<i>Case A</i>		
Aspect	Routine	Description (data) for each aspect
	Ostensive	
	Performative	
	Artefact	

Example 2. Table containing the elements to characterise behaviours

Case	Dimension	Status	Characterisation		
			Before	During	After
A	Routines	Description	Existed/Not existed	Variation or No variation	Variation or No variation

Finally, once the *behavioural* aspect of the process of change is characterised, its *additionality* component is then characterised (see Table 6.3, below). This process corresponds to the integration of plausible explanations regarding the variation process, as suggested by contribution analysis. To perform this assessment, plausible explanations are eliminated. Thus, the procedure in the methodology to integrate the data and to perform the value judgement consisted of an *iterative* and *incremental* process involving seven steps:

1. Confirmation of the ‘status’ of the routine at the beginning of the analysis
2. Description of the modification of specific components of the organisational routines

3. Validating the process of change according to elements such as time and relationship with other components of the organisation
4. Description of the case circumstances, before, during and after the programme occurred, considering context and externalities
5. Description of potential rival explanations
6. Contrast and compare, discarding potential rival explanations
7. Establish the suspected degree of contribution and refine the explanations

Table 6.3 Criteria for judging the additionality dimension of observed changes

Elements	Description
Component	Potential plausible explanations
Standards of performance	<ul style="list-style-type: none"> • Case specific • Context specific Both determined before during the development of the theory of change
Data (case observations)	<ul style="list-style-type: none"> • Organisational capabilities, organisations' previous processes • Organisations' systems and culture and people and management structures • Potential effect of other programmes • Unanticipated behavioural effects which might be produced by the programme and behaviours not modified by the programme • Economic or social trends
Criteria of Merit	<ul style="list-style-type: none"> • Relevance to the organisation's context • Consider aspects such as the organisation's capabilities and its history • Role of the actors in the organisation Assessment: Interpretative scale based on the observations done to organisational actions and in-depth interviews, as well as the analysis of other secondary sources of information. Employs a triangulation technique.

Based on the points above, it is possible to assess the degree of contribution generated by the programme. Accordingly, to be considered as a *behavioural additionality* effect, the organisations should have transcended the threshold values before the assessment of the process of change started, indicating that some variation in the process was observed, and eliminating explanations until the plausible explanation is that the government intervention led to the changes observed.

Finally, the data gathered for the contribution assessment can be codified in a table (see example in Box 6.2).

Box 6.2		Documenting the contribution				
Example 1. Table containing the information for the <i>behavioural additionality</i> contribution assessment						
Case	Aspect (what changes)			Dimension	Difference	Alternative explanation (observed difference)
	O	P	A	LOCATION (origin of change)	Variation/No variation (Aspect)	Data
A	Y/N	Y/N	Y/N	Description	Variation/No variation : (Aspect)	Data
Notes: A: artefacts, O: ostensive aspect, P: performances. Y indicates the aspect was modified (presence), N indicates an absence of the aspect.						

In summary, the third and final phase of the contribution assessment step includes an analysis of the evidence (the contribution story) to determine if (and how) the government intervention generated the *behavioural additionality* effect. The contribution story uses the narratives to identify the organisational routines existing in the organisation, as well as the process of change that are then compared to the set of alternative explanations (verification means) generated as part of the contribution analysis exercise.

6.5 Third step of the methodology: Decision-making

Following the contribution assessment step, the methodology concludes with a *decision-making* step. During this step, all the evidence generated from the cases and the product of the contribution analysis are employed to generate policy lessons, such as modifying the programme theory, or concluding if and how the programme requires change, as well as a knowledge base to decide future directions.

The future directions referred to above might include deciding if (from the set of beneficiaries analysed) new areas of analysis, or the necessity to investigate a particular characteristic, are present (or absent) from the cases. Thus, the main aim of this phase is to generate a knowledge base for future policy making. In this sense, some questions that serve to reflect on the future steps following the exercise might include:

Did the programme accomplish what was intended? How did the beneficiaries use the programme? What type of organisational routines were created? Was the theory of change specified correctly? Are there any relevant or unusual effects that need future research?

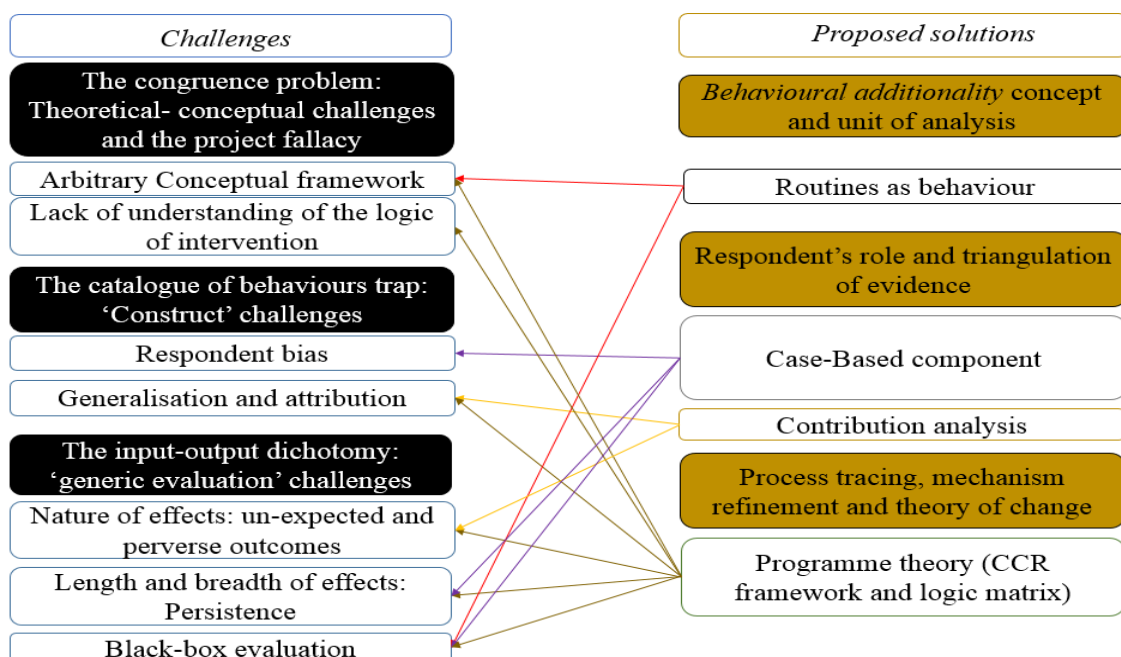
In terms of analytical procedures, the following needs to be considered. The first is to produce a coherent account (narrative) of the transformations produced by the programme. The second is to generate a feedback loop to learn from the programme and to refine the assumptions. The third is to modify the theory of change as required, and the fourth is to decide future directions.

In summary, the decision-making phase of the methodology attempts to produce a knowledge system, inclusive of a set of examples in which the programme contributed to modifying behaviour, where it did not, and the process of change described from them. As the process is iterative, it might be repeated based on the decisions made during the planning phase, and when the activities performed during the final phase contribute to generating useful policy-making knowledge.

6.6 Addressing the challenges in assessing the *behavioural additionality* effect through the methodology

Thus far, the chapter has presented the methodology intended to analyse behavioural change. Figure 6.3 links the methodology to the challenges existing in the practice of evaluating the *behavioural additionality* effect and the proposed solutions.

Figure 6.3 Addressing challenges in *behavioural additionality*



In Figure 6.3, the solutions proposed by the methodology include the use of organisational routines as a unit of analysis for representing behaviour, and the tools and methods incorporated during the contribution assessment phase of the methodology: the case-based component, contribution analysis and programme theories.

The capacity of these tools to address these issues was explored previously in Chapter 5 (see Sections 5.3 and 5.4), and for routines in Section 6.2, above. In summary, ‘organisational routines’ as a unit of analysis helped to access the organisational memory and helped to determine if the changes were persistent. Similarly, the case-based component of the methodology, that is the in-depth focus and exploration of the programme and its beneficiaries under analysis, attempted to cover the respondent bias problem (see Chapter 4.5) and to open the ‘black-box’. Finally, the TBE components of the methodology (contribution analysis and the programme theory) assisted with understanding the logic of the intervention and helped to establish the paths that the assessment followed.

6.7 Chapter conclusions

This chapter proposed an evaluation methodology to detect and assess the potential *behavioural additionality* effect of government instruments intended to foster innovation and collaboration.

The methodology, an iterative process, was composed of three basic steps to understand *behavioural additionality* as the persistent modification of the organisational routines. The purpose of the instrument was to understand the programme’s rationale, to locate the ‘behavioural’ and ‘additionality’ components of the intervention, and to reflect upon the lessons learned to generate better policies. The map used to navigate organisations, and to facilitate the detection of organisational routines and their components, was the logic framework (although different logic models are equally useful). Similarly, the analytical framework that enabled the determination of the difference the policy made to the behaviour of the beneficiaries is the contribution analysis.

Following this chapter, the methodology is applied for the cases and through the procedures described in Chapter 5 (see Section 5.5). The next chapter (7) develops the KTP case study, constructs the KTP programme theory and presents the cases’ narratives as the subject of analysis in Chapter 8.

Chapter 7. A Case Study on the Experiences of Six
Company Based Partners with the Knowledge
Transfer Partnerships Scheme

7.1 Introduction

In the previous chapter, the evaluation methodology to assess the potential *behavioural additionality* effects of government interventions was presented. The focus of the chapter was on offering a tool with the capacity to address innovation policy effects in general.

This chapter in turn uses the evaluation methodology in a specific government-supported policy instrument designed to stimulate and promote collaboration: the Knowledge Transfer Partnerships (KTP) Scheme.

In this thesis, the KTP scheme has been discussed on two previous occasions: First, in Chapter 3, where a number of evaluations trying to assess the *behavioural additionality* dimension were presented, and second, in Chapter 5, where the scheme's suitability for testing the methodology was described.

Therefore, this chapter uses the KTP scheme as a case study to test the methodology and its associated components and, by applying it, to understand the usefulness of the CBM/TBE approaches as a tool to assess the *behavioural additionality* effect. In this sense, the scope of this chapter corresponds to the development of the KTP's programme theory and the contribution stories of the companies selected as cases.

The remainder of the chapter is constructed as follows. In Section 7.2, the KTP programme theory is developed; this process corresponds to the knowledge construction phase of the methodology. Following the formulation of the KTP's theory of change for the generation of the *behavioural additionality* effect, Section 7.3 presents the cases and develops the narratives that integrate the contribution stories, describing the rationale the companies followed to engage in a partnership (and select their partners) and the activities developed as part of the KTP project, as well as the outcomes of the project.⁷³ Following the presentation of the narratives, Section 7.4 provides the conclusion.

⁷³ One feature of CBM is that further evidence can be incorporated into the analysis that would strengthen the conclusions reached by the case study. However, for the purposes of the current research the evidence incorporated in this chapter was considered as suitable and sufficient to answer the proposed research question.

7.2 Case study setting: the KTP scheme

The KTP scheme is part of the innovation policy portfolio of the UK; the programme tries to provide incentives for companies to collaborate with universities and other research institutions to access specialised knowledge and to thus, foster their innovation capabilities (Innovate UK, 2015a).

7.2.1 Components of the KTP scheme

The KTP scheme benefits three groups: the invitation is open to firms in the UK (Company-based Partners, CBPs), of any size, from any industrial sector, including for-profit and not-for-profit companies, Knowledge Based Partners (KBPs) including both public or private higher education institutions and research centres, and finally Associates, which include recent graduates and highly skilled individuals.

The main components of the programme, such as its operative model, funding mechanism and the elements that constitute a partnership, are presented in Box 7.1 below.

The programme has been shown to generate high levels of input additionality to its beneficiaries (CBPs). For example, a recent impact evaluation of the KTP scheme⁷⁴ (at the regional level) determined that, without the programme's assistance, 62.5% of the firms supported by the scheme would not have been able to accomplish their proposed objectives (CM International UK Ltd 2011). Similar levels of additionality are consistently reported in Northern Ireland (63 % of supported firms) and at the country level (58.5% of firms) for the entire UK (KTP, 2014a). Moreover, for every £1 m of government money invested in the KTP during 2012-13, "32 new jobs were created, 269 staff were trained, £0.84 m was invested on average by companies in plant and machinery and £1.15 m in R&D" (Knowledge Exchange, 2014, p. 3).

⁷⁴ Impact evaluation of 125 classic partnerships from Wales, which participated in the KTP scheme between 1st April 2007 and 31st March 2011. The evaluation included an examination of the scheme's economic rationale (ROI calculus), the effectiveness of the activities versus the stated objectives (assessed via a telephone survey and interviews with programme managers) and calculations for the value of money and additionality levels of the programme.

Box 7.1 Main components of the KTP scheme	
Aim	UK-wide funded programme with the goal of transferring the tacit knowledge existing in a particular individual to a recipient company; the process is supported and supervised by a Higher Education Institution. A capability building programme observed to produce open innovation (‘transformational change’) in participating companies.
Length of time in operation	Its immediate antecedent is the Teaching Companies Scheme (TCS) of 1975. The scheme was rebranded (as KTP) in 2003. Since 2007, the scheme has been managed by Innovate UK (formerly Technology Strategy Board).
Volume (Funding mechanism)	Innovate UK serves as the basic funding partner, together with 12 additional government partners across the UK. The sponsors provide monetary incentives to firms to promote collaboration links between CBPs and KBPs. The funding partners provide firms with (up to) half of the monetary resources for integrating the partnership; the CBP matches the other half. These monetary resources are used for two main purposes: to hire the Associates, and to cover the research-related expenses of the academic partners.
Partnership length	Projects last between six and 36 months. Partnerships are classified according to their lengths, either as ‘short-term’ partnerships, lasting up to eleven months, or ‘classic’ partnerships (long-term or strategic partnerships), lasting between 12 and 36 months.
Current levels of support	The KTP scheme currently supports over 500 companies, with a total number of 664 active projects ⁷⁵ . The programme occupies an essential place in terms of the national budget for innovation, corresponding to (over) £85 m of government expenditure ⁷⁶ .
Cost	The total annual cost of a KTP on average is £60 k.
Operative model	Through the partnership, the business and its UK knowledge-based partner implement the agreed 6-36 month project, and hire the Associate to deliver the project. The Associate is based at the business and is supervised by the Academic adviser.
Performance	Recent official data on the performance of the programme revealed that, during 2013-14, businesses participating in the KTP scheme gained on average a £1.3 million one-off increase in profit before tax, £11.6 million anticipated annual increase in profit post-completion, £2.2 million invested in plant and machinery, three new staff members employed (including the Associate) and £3 million invested in R&D activities.

Source: Own elaboration based on Knowledge Exchange (2014); KTP (2014a, b, c); Innovate UK (2015b).

⁷⁵ Latest available figure for the years 2013-2014: The number reached 778 partnerships (for the same period) when short-term projects (those lasting less than a year) are included (KTP, 2014).

⁷⁶ Last available data for 2013-2014 financial year (Innovate UK, 2015b). This is aligned with Innovate UK’s strategy, as it helps to a) accelerate the journey between concept and commercialisation, and b) to connect the innovation landscape (KTP, 2014a).

According to recent research (Ternouth et al., 2012) the benefits of participating in a partnership extend beyond CBPs and include benefits for the rest of the partners, such as KBPs having additional opportunities to test research in applied settings, and the Associates being provided with the capacity to gain job related experience.

In this sense, the Associate's role is unique to the scheme, as Associates are hired by both parties, working directly for the CBP and managing one of the CBP's (innovation) projects under the supervision of the academic partner.

The role of the Associates in KTPs

Associates are seen as a fundamental component for the development of partnerships (Regeneris Consulting, 2010; Ternouth et al., 2012; Koh, Clegg, and Hall, 2013; NCUB 2013a) because they are perceived as being the agents that generate value and enable collaboration to occur (Ternouth et al., 2012). Moreover, Associates are considered as the "embedded resource which forms part of the business's absorptive capacity" (Ternouth et al., 2012, p. 36) and the agent that "allows the business partner to supplement their in-house resources" (NCUB, 2013a, p. 15).

Another role attributed to the Associates includes their capacity to become 'conflict solvers' capable of giving partnerships a structure (Koh, Clegg, and Hall, 2013). However, Associates are, at the same time, also perceived as "relatively inexperienced in handling projects, especially those involving cross-boundary collaboration" (Koh, Clegg, and Hall, 2013 p. 189).

Although fundamental to the performance of the partnerships, as far as this research is concerned, little research has been dedicated to evaluating the role of the *Associates* as agents of change (see for example Siora et al., 2015).

7.2.2 Programme rationale

Box 7.1 above described the KTP as a collaboration scheme with the purpose of building knowledge-transfer capabilities in the participant firms. However, when examining the programme's rationale (cf. Ternouth et al., 2012 and KTP, 2014a), two different perspectives are found.

One of these perspectives holds that the KTP scheme operates under a market failure rationale; thus, the programme’s aim is to compensate for numerous information and co-ordination failures existing in firms. One example, according to this perspective, refers to the missed commercial opportunities firms experience when trying to access or exploit (new) basic knowledge that is produced by a university. Therefore, government intervention is required to reduce the information asymmetry firms might have and to close the gap between technology/knowledge development and its potential commercial use (Regeneris Consulting, 2010).

A second complementary perspective holds that the KTP scheme helps firms to generate and transform their knowledge-transfer capacity (Regeneris Consulting, 2010; Ternouth et al., 2012; Ternouth, 2014; NCUB, 2013a, 2014). According to this perspective, such knowledge transfer capacities are generated through the ‘KTP+ model’ (Ternouth et al., 2012; NCUB, 2013a).

The ‘KTP+ model’ is an iterative process⁷⁷, where firms are assumed to base their decisions to participate in the scheme on the strategic opportunities partnerships offer to generate specific capabilities. The model also contains a group of ‘generic, good-practices’ for transferring knowledge. Accordingly, firms that engage in a KTP partnership have five different areas of opportunity to generate five absorptive capabilities (see Box 7.2, below).

Box 7.2 ‘The KTP+ model’		
Competences	Absorptive capabilities	Barriers ⁷⁸
Company opportunity	Awareness	Lack of awareness
Co-recognition	Acquisition (of knowledge)	Confidentiality issues
Co-formulation	Assimilation (knowledge)	Relationships and trust
Co-creation	Transformation (knowledge)	Business learning
Commercialisation	Exploitation	Intellectual Property Rights

Source: Adapted from Ternouth et al., (2012)

⁷⁷ The stages in the ‘KTP+ model’ are expression of interest, proposal development, Associate recruitment, project implementation and the final report.

⁷⁸ Ternouth (2012; also in NCUB, 2013a) list several other barriers grouped under each competency, these were summarised for presentation purposes.

The 'KTP+ model' presented in Box 7.2 above helped Ternouth et al., (2012) to conclude that government intervention provides partners with an 'effective management system'; that is, the interplay between the KTP advisers and the different partners helps to decrease the effects of the barriers and to promote the generation of the proposed absorptive capabilities. Similarly, the model helps to ensure that those companies with any of the five absorptive capabilities are highly likely to produce 'good and successful'⁷⁹ partnerships (Ternouth et al., 2012). In this sense, all partnerships have the potential to become successful if certain conditions are present, including the partners promoting the more efficient use of resources, demonstrating a strong commitment to each other, sharing a strategic vision and having compatible targets (Ternouth et al., 2012).

The second perspective above is complemented by research that describes that the aim of the KTP scheme as being to 'embed culture change within a firm' (NCUB, 2013). In this sense, the role of the Associates becomes fundamental as it is argued that "someone not 'native' to [the] business environment is likely to be more effective in facilitating change" (NCUB, 2013a, p. 13). Similarly, according to this view, firms engage in a KTP as a way of compensating for their lack of required attributes to innovate (that is, to obtain knowledge-transfer capacities).

The rationales presented so far appear to coexist as an integral framework that justifies the existence of the KTP scheme⁸⁰. However, only the second rationale is relevant to the objective of the analysis, as it is oriented towards a systemic approach for capability development, and thus its aim is to explicitly modify the behaviour of the companies who engage in a KTP.

7.2.3 Articulating the KTP theory of change: logic framework and propositions

A project matrix articulating the KTP theory of change is given below (see Figure 7.1); this was developed based on the analysis of the information presented in the previous sections. In the figure, the components of the programme, as described in Section 7.2.1, serve to describe the activities, outcomes and purposes of the programme, while the programme rationale, presented in Section 7.2.2, helps to integrate the programmes' goal.

⁷⁹ Successful partnerships were defined as those that generated benefits for all three partners (Ternouth et al., 2012).

⁸⁰ This thesis verified that the market failure rationale prevails by exploring the different sources of information, as presented in Chapter 5.

Figure 7.1 Proposed logic matrix for the KTP scheme

	NARRATIVE SUMMARY	KEY PERFORMANCE INDICATORS	MEANS FOR VERIFICATION	ASSUMPTIONS
GOALS	The set of capabilities and skills that enables companies to develop <i>open innovation strategies</i> and to generate persistent collaboration.	<ol style="list-style-type: none"> 1. Open innovation strategies from participating companies. 2. Collaboration trends (with other firms, with other providers, and with the knowledge base). 3. Problem-solving capacities (related to the problem that prompted the KTP). 	<ul style="list-style-type: none"> • Company reports. • Industry reports. • UK Innovation Survey (on the topic of collaboration) • Stakeholders' and beneficiaries' interviews. 	<p>The companies generate rules for embedding the open innovation model into its activities.</p> <p>The open innovation model is explicitly discussed during the KTP.</p> <p>Knowledge transfer has occurred.</p> <p>The company generates performances to adapt the available knowledge from the partners to its activities.</p> <p>The company is receptive to new or modified knowledge.</p>
PURPOSE	The companies have adopted collaboration as a persistent practice and the actor's specific activities have permanently modified the innovation practices of the host company.	Collaboration strategy (developed).	Stakeholders' perceptions (companies, Associates) captured through interviews.	Collaboration is demonstrated as a positive element that contributes to the organisation's capacity to innovate.

Figure 7.1 (continued)

	NARRATIVE SUMMARY	KEY PERFORMANCE INDICATORS	MEANS FOR VERIFICATION	ASSUMPTIONS
OUTPUTS	<p>Generate Organisational capabilities:</p> <ul style="list-style-type: none"> ○ Knowledge absorption ○ The level of responsiveness is modified (according to cues from the environment). ○ (Help to generate an) open innovation culture in the organisation. <p>Create organisational collaboration related skills:</p> <ul style="list-style-type: none"> ○ Good business practices to overcome collaboration barriers. ○ Long-term collaboration. <p>Motivate the development of strategic changes:</p> <ul style="list-style-type: none"> ○ Companies' performance (activities, process) ○ Productivity (machinery, technology) ○ Competitiveness (strategic resources) 	<ol style="list-style-type: none"> 1. Artefacts (outputs) 2. Performances 3. Description of the collaboration process 4. Productivity performance 5. Rules and procedures in the company 	<ul style="list-style-type: none"> • Narratives • Triangulation of sources of evidence 	<p>Artefacts and performances related to knowledge absorption are produced.</p> <p>The components the company lacks to absorb knowledge are generated.</p> <p>The company has a positive experience with the collaborating partner.</p> <p>The company is exposed to 'good business' practices.</p> <p>The company 'learns' the benefits of long-term collaboration.</p> <p>Learning-by-collaborating.</p> <p>The company integrates the new processes or activities as a strategy that impacts its performance, productivity and competitiveness.</p>
ACTIVITIES	<ul style="list-style-type: none"> • Match the appropriate candidate with the required organisation. • Generate a KTP system (a managed risk environment) and offer challenging projects (to the Associate). • Encourage an ongoing relationship beyond project completion between partners. • The host organisation includes the Associate in the companies' activities. The Associate possess the relevant know-how. This knowledge is transferred to the organisation as actions, practices, and daily performance. 	<ol style="list-style-type: none"> 1. KTP details of the partnership (website) 2. Companies' case studies 	<p>Stakeholder's perceptions (companies and Associates) captured through interviews, observation and document analysis.</p> <p>Archival data from the companies</p> <p>Other forms of documentation (press releases)</p>	<p>The Associate's knowledge is transferred through actions, practices, and daily relationships within the company.</p> <p>The appropriate Associate is paired within the appropriate company.</p> <p>The academic and the Associate have the relevant knowledge for the success of the partnership.</p> <p>The objectives of the partnership are clear and shared between the partners.</p>

Based on the project matrix and the evidence provided in the previous sections, the main assumption is that the KTP scheme has the potential to modify the behaviour of the companies engaging in the programme.

Given that there are many potential organisational behaviours that can be changed by engaging in a KTP, a second assumption used for this research specifies that the primary goal of the programme is to generate a set of capabilities and skills that will enable participating companies to develop open innovation and collaboration strategies.

Based on the second assumption, three different programme effects are anticipated. Accordingly, by participating in a KTP, the CBPs have the potential to:

1. Produce a set of organisational capabilities related to
 - a. Knowledge absorption
 - b. Organisational responsiveness (regarding its innovation requirements)
2. Modify their organisational skills related to collaboration by
 - a. Generating persistent relationships with the Knowledge-based Partners
 - b. Generating business practices oriented to overcoming collaboration barriers
3. Generate transformational change
 - a. Generate open innovation strategies aimed at improving competitiveness, productivity and performance

The elements above correspond to the types of changes expected to be found in the cases, while the narratives correspond to the way these changes unfolded. Finally, reconciling these anticipated effects with *behavioural additionality*, it is expected these changes would lead the CBPs to integrate distinct organisational routines related to these effects.

7.3 Six case studies from the KTP scheme

Following the presentation of the KTP theory of change, this section presents six cases narrating the experiences of six different CBPs engaging in KTP projects.

7.3.1 Case A: Middle-sized manufacturing firm

This first case study (case A) describes the experiences of a middle-sized manufacturing company of agricultural components with the KTP scheme. Specifically, the case follows the process of change that occurred in the company as a result of engaging in two KTP-related projects. One was under the Teaching Company Scheme (TCS) during the 1990s, and the other under the KTP. The former project included, as KBPs, the Advanced Manufacturing Research Centre at the University of Sheffield, while the latter saw the firm working with the Faculty of Arts, Computing, and Engineering & Sciences at Sheffield Hallam University.

Case context: Company Description and Background

The firm from case A was established in 1945 in Sheffield⁸¹. The current structure of the company is due to a series of mergers and acquisitions of different companies from the same region as the company, resulting in a business with over seventy employees. The firm's main business is to design and produce unique machinery components for agricultural purposes, including 'wear-resistant pieces and hard facings'. Today, the company sells these products to its various clients, original equipment manufacturers of agricultural components, located in the UK and continental Europe (France, Germany, Italy, Poland and Spain).

Since its foundation, the company has considered product and service innovation to be an essential component of its strategy, and one that has enabled the firm to survive in the market, mainly because the firm has learned to anticipate different market needs through innovation.

Thus, to become competitive, over a period of sixty years the company has developed an organisational culture built around three main pillars: investment in new technologies and modern machinery to innovate on a constant basis, certifying its design processes, and collaborating with the universities from the region. The organisation describes the resulting organisational culture as being 'totally committed to R&D'.

⁸¹ Given the strategic nature of the KTP project, all the information related to this firm is treated as confidential as per the request of the interested stakeholders. The sources of information relevant for this case are presented in Annex B.

The company has practised collaboration with academic institutions since the 1970s. Accordingly, the company sees its involvement in collaborative projects as a way of obtaining valuable knowledge that it would not have been able to produce on its own from external sources, and to incorporate it into the firm's product development process. For example, one collaboration with the University of Sheffield led to the development of the company's range of 'coating products'.

The knowledge produced by the company's collaboration projects is effectively transferred to the company through the organisational practice of 'codifying and retaining the knowledge produced through their partnerships as technical back-ups (for new designs), manuals, and standard operating procedures (SOPs)'.

Engagement with the KTP project: Participating partners and the firm's motivation for selecting them

As described above, the firm has participated on two different occasions in the KTP scheme. The first partnership, the TCS project, had the objective of developing and implementing marketing plans for accessing new international markets and exporting their agricultural wear parts. The project began in 1993 and was successfully completed.

Initially, the idea to work through the KTP model originated through an informal⁸² conversation between the company's management and the (future) academic partner. During this conversation, both partners discussed their research interests and potential benefits from the collaboration. Similarly, the idea of forming a partnership through the KTP programme was coherent with the company's strategic interests, and was compatible with the organisational culture (as explained above).

A second partnership, this time under the KTP scheme, had the objective of developing and embedding advanced computer-assisted design and manufacture (CAD/CAM) methods for the full forging of agricultural components. The project was initiated in 2013 and was scheduled to finish in 24 months. However, due to its success, the project was extended for eight additional months.

⁸² Olmos-Peñuela et al., (2013, p.3) characterised 'informality' as "the absence of any legal agreement of any form underpinning a collaboration between an academic institution (public research organisation or university) and a non-academic partner (firms, government agencies, non-profit organisations etc.)" and where "no aspect of the collaboration is or has been visible to the administrators in the academic organisation" (Idem.). For the cases in this chapter, the relationships became formal through the integration of the KTP.

The firm was fully aware that the researchers working at Sheffield Hallam University had the necessary knowledge for developing the particular product. The relevant know-how required by the company concerned the use of computer-assisted design and manufacture (CAD/CAM, respectively) for the forging process employed by the firm. In addition, the partners wanted to develop their relationship further, as previous collaboration projects between them had proved successful and had served to establish a mutual communication link that helped the partners to become familiar with each other.

The KTP project: activities at a glance

The Associate who became involved with the KTP project was selected as he had the relevant academic expertise in developing theoretical CAD/CAM models in different manufacturing scenarios. He was incorporated as part of the design team under the supervision of the manager of the Design Department, and had the task of conducting the relevant modelling, variable analysis and applied research required by the company. The KTP project is a smaller component of a bigger company strategy to introduce new products into the market.

The design process in the firm is a sub-activity of a larger ‘forging process’, consisting of nine different ISO-standardised and interdependent steps, involving (at least) twenty individuals, from production managers to designers and floor operators.

The production process in the company for one ‘agricultural component’ involves an initial ‘tool making and design phase’, followed by the ‘laser-cutting’ process and concluding with a ‘testing phase’. Each phase has a specialised team of experts and SOPs; thus, for the purposes of this case study, only the procedures in the design phase are presented.

Before a specific component of a machine reaches the design phase, a blueprint (‘approved drawing’) of the component, generated as a combined effort between a representative of the firm and its clients, is produced. This blueprint specifies the treatment that the client desires the component to receive. In addition, this ‘drawing’ is confidential and the intellectual property right for the component remains with the client.

During the design phase, an in-house tool design and manufacture team, composed of ten highly skilled individuals including technical specialists and trained engineers, retrieve the blueprints from the company’s standardised product portfolio to test how different metal alloys would affect their ‘durability’ and ‘strength’.

Following the design phase, once the appropriate coating technology has been determined, the blueprint is taken into the 'laser-cutting' process. This activity is followed by the 'full heat treatment' and 'hard-facing' activities that provide the manufactured piece with a special mineral coating, unique to the company. Finally, the process concludes with the forging, where the component is shaped to fit the specifications provided by the blueprints.

The KTP Associate was included in the design activities of the firm with the specific task of developing applications for 'simulation'. The Associate explained that, before properly conducting the KTP project activities, he had to familiarise himself with the company products, processes (such as buying procedures) and design-related technologies, while also assisting with company presentations at which the company owner and chief manager were present, meeting top, middle and upper management personnel on a monthly basis.

The Associate's activities during the KTP project included 'identifying CAD/CAM solutions for tool manufacture and forging, developing and applying methods of geometric design and segmental tool manufacture, minimising tooling costs, and identifying, procuring and applying finite element analysis software suitable for optimising the design process'. According to the Associate, the activities described above were recurrent practices for the organisation, with the exception of simulation. However, he felt these tasks had 'little impact' on the actual design process, resulting in him having additional time to allocate to other KTP-related activities, such as training.

On one occasion, the Associate had the opportunity to visit the design floor, where he noticed that most of the complex calculations involved in the development of the blueprints were done almost entirely manually. Because of his theoretical understanding of the different applications and potential benefits of integrating CAD/CAM into operative processes, he realised the company could save important resources and time if it adopted the Associate's suggestion of first modelling, then simulating and finally manufacturing the companies' products.

As a side-line to his regular activities, he tested his idea of creating simulation models for every aspect of the company and presented his proposal during one of the monthly meetings attended by the top-tier management. Initially reluctant, the management required further proof of the benefits that incorporating simulation into all of the design activities would bring to the business before deciding to introduce it as a standardised practice. Thus, using the recently acquired software, the Associate began by simulating some of the company's past design 'blueprints' in a faster, more cost-effective way than the first time these were developed.

By demonstrating alternative uses of simulation for the entire forging process, and showing the top-tier management the potential cost saving and fast solutions that simulation might offer the different areas of the company, the Associate convinced the management to modify the KTP project's original objectives, resulting in the company modifying the scope of the original project; because this new direction was unplanned and incidental, they had to extend the KTP for an additional period of eight months.

The extended project focused on the full development of simulation as a new design process. At first, it required the Associate to identify potential solutions for tool manufacture and forging. Secondly, after developing these solutions, the Associate had the task of training the relevant design personnel in order to transfer the tacit elements of his expertise to the company.

Outcomes of participating in the KTP project

The outcome of the first TCS project in which the company participated led the company to expand and service additional overseas markets (mostly in continental Europe, as highlighted above). Given that this first partnership was perceived as successful for the partners involved, the company commissioned other projects with the University of Sheffield (the coating project explained above).

As mentioned earlier, the project was originally commissioned for 24 months; however, given the Associate's activities, it was extended for an additional period of eight months. For the firm, an immediate outcome of the project consisted of the integration of computer simulation techniques into the entire design process.

The partnership has produced material for publication⁸³. Another outcome of the project was the generation of the ‘simulation-based capability’ integrated into a system composed of a human part (the Associate), a technological part (design software) and a set of practices (drawing activities). This capability had the ultimate outcome of generating a fully automated design process, resulting in important cost reductions, as well as increasing the organisation’s overall productivity by reducing the risk of fracture of each tool.

The Associate documented the process to introduce the new technologies and practices, following the standard procedure in the company and, at the request of his (design) supervisor, in the form of new SOPs. Similarly, he documented the knowledge related to drawing an agricultural component with the assistance of a computer.

The activity of routinely codifying the tacit components of new knowledge was customary for the firm. Thus, the only significant difference in this particular instance was the methodology employed by the Associate, which enabled him to demonstrate the potential benefits of simulation. Currently, the Associate is conducting training for the design staff as part of the extended period of the KTP, and has been hired as a design manager⁸⁴.

Finally, the introduction of new production processes had an initial impact on the individuals, and later on the organisation itself, since meeting the new production requirements required several transformations, including the (re)organisation of the layout of the manufacturing floor, and the specific order in which the productive processes happened.

7.3.2 Case B: Small-sized BID

Case B focuses on a small-sized, not-for-profit organisation and the two KTP partnerships they established (both concluded by November 2013) in the area of environmental sustainability with academics from two departments at the University of Hertfordshire, the School of Engineering & Technology and the Centre for Sustainable Communities.

⁸³ Strategic, not disclosed for confidentiality reasons.

⁸⁴ At the time of writing the case study, this process had not been completed; thus, it is not reported as an outcome of the case study in Chapter 8, nor are the short-, middle- or long-term implications for the company known.

Case context: Company Description and Background

The organisation in case B, founded in 2005, is organised as a Business Improvement District (BID), currently representing and expressing the interests of 560 businesses in three Boroughs of Central London, and generated revenue of £2.5 m during the 2014 fiscal year. Official documentation from the organisation defines the BIDs as a ‘business-led organisation set up to improve the commercial well-being of a specific geographical area’⁸⁵.

The BID in case B has a lean structure, employing five persons on a full-time basis, and a small team of self-employed contributors who work part-time in the organisation. The staff of the BID is completed by specialists in project management and service provision (their number varies), and other staff obtained by forming partnerships with different commercial entities (for example, companies providing cleaning-related services) aimed at delivering the BID’s bespoke service to its clients.

In this particular case, the BID’s services include programmes for reducing crime rates and anti-social behaviour, ‘enhancing safety and security, assisting business and leisure visitors, providing local information and improvements to the local environment’. It also assists in improving the environment via different services, such as maintenance, cleaning or logistics, protection of the local biodiversity, corporate social responsibility and sustainability strategies (such as waste management and recycling) and a carbon emission reduction programme. All of these services aim to increase the value of conducting business in the London Boroughs in which it operates.

BIDs are elected via a democratic ballot process (implemented by the businesses the BID represents) and are eligible to serve for a five-year term, hereafter they can stand for re-election. These types of organisations are funded via a levy on ‘Business Rates’, their specific projects and the project delivery.

⁸⁵ The information used to develop this case study can be found in Annex B.

In terms of organisational culture, the BID's CEO considers the organisation's strongest commitment to be towards generating innovative solutions for service activities. Since the BID's establishment, and prior to engaging in the KTP project (before 2010), the company has slowly but steadily increased its membership size from a few affiliated business to 560. This increase in clients has motivated the company to become more professional; that is, to embrace new challenges (sustainability projects) and to offer greater support to its customers. During this rapid expansion period, the carbon reduction programme described above has been integral to accomplishing the organisation's main objectives, proposing its strategic plans and developing its business model.

Engagement with the KTP project: Participating partners and the firm's motivation for selecting them

The BID has participated in two KTPs, almost in tandem. The first project, lasting from September 2010 to January 2013, had the objective of developing a carbon reduction and supply chain system.

The organisation had no prior experience working in collaborative projects with academia before engaging in the KTP projects; thus, the motivations of the company to engage in the scheme were incidental and resulted from an informal meeting between the company's CEO and the (future) academic partner.

The company's CEO and the academic partner had the opportunity to discuss the BID's most recent strategic interest in generating a carbon reduction plan and the academic partner's vast experience in carbon reduction systems during a social event organised by the BID (related to carbon reduction goals). During their conversation, the discussions covered different topics from the BID's carbon reduction goals as a potential cost-saving strategy and the academic's familiarity with the KTP (through a marketing campaign from his university). It was the academic adviser who suggested applying for funding through the programme.

The KBP was selected because the university had the relevant and specific know-how required to lead the project to a successful outcome, and because the academic adviser had an essential understanding of urban sustainability principles, as well as practical experience in the development of urban development systems and CO₂ reduction models, and project management in the area of sustainability.

Finally, the company was required to rely on external agents (rather than on its employees), as no one in the firm had the required technical expertise with carbon reduction systems. The BID was also seeking the input of the academic institution and wished to give a recent graduate the opportunity of gaining ‘real work experience’.

Due to the outcomes of the first partnership, the BID applied and obtained support for a second project. The second project served to continue developing the carbon capability process initiated during the first KTP. The second KTP, beginning in December 2012 until November 2013, had the specific objective of developing a strategic capability for assimilating a low carbon urban design and a development model. The PA to the CEO explained that their KTP officer matched them with the University of Hertfordshire to work specifically on this project.

The KTP project: activities at a glance

The academic adviser introduced the Associate, who held a Master’s degree in Manufacturing and Mechanical Engineering and who had prior academic and work experience with carbon reduction systems, to the project. The expertise of both the Associate and academic adviser became fundamental to the successful accomplishment of the objectives of the partnerships.

The first KTP required the partners to determine the organisation’s actual understanding of sustainability policies and to locate those activities that would integrate the new carbon reduction system. Subsequently, the partners employed the BID’s databases on (business) waste reports to construct a model for recycling patterns; this model served as the first step towards integrating a cohesive information system for future decision making.

The particular contribution of the Associate to the project consisted of building an online tool that condensed the BID’s information on carbon emissions, including data on waste collection routes and taxis’ and couriers’ carbon emissions. This new software-based technology was termed a ‘carbon emission calculator’, since it computed real-time data on emissions as a quantifiable number with greater accuracy.

Following the development of the new technology, the CEO became interested in training the remaining personnel to use and update the data. A second objective included supplying maintenance to the carbon emission calculator; therefore, the partners considered it necessary to apply for a second KTP grant.

Despite some initial success with the training programme, the organisation's management soon observed that few of the BID's employees would benefit from learning detailed information about the technology, mainly because the rest of the team would not use it as part of their daily activities, and because of the costs of training. Therefore, the management decided to conclude the training programme and to use those resources to hire the Associate instead.

Outcomes of participating in the KTP project

The KTPs generated two main outcomes: A 'radical' innovation in the form of the carbon emission calculator; according to the organisation's management, this technology is unique to the BID. Secondly, the Associate was hired as the organisation's sustainability manager, a position that did not exist in the company previously, and which required the creation of a new sustainability department.

Official marketing material produced by the BID, the Associate and the CEO office indicate that the carbon calculator is a success, within the company and with its clients. This success is partially attributable to the calculator's capacity to integrate a vast amount of information that is available for making strategic decisions in one comprehensive, user-friendly interface. For example, the carbon calculator has enabled the BID to deliver its business sustainability strategy, generating waste savings (nearly 6,500 tonnes of waste diverted from landfill) and carbon savings (7 m kg of CO₂) for its consumers (in 2014). The carbon emission savings results, obtained from the carbon calculator, are issued to all of the BID's clients via quarterly reports.

The information obtained from the carbon calculator is used to measure the success of the BID's sustainability programme; combined with data from carbon reduction statistics, and other surveys developed by the BID, it has generated an increase in the BID's capacity to make strategic decisions to develop its new planning strategies with greater accuracy. For example, based on the savings reported by the calculator, the BID proposes to reduce its client's carbon emission by an additional 20% from the levels reported during 2014.

Linked to the above, the organisation produced new measurement/evaluation methodologies for calculating carbon reductions with greater precision, and the marketing department generated appropriate promotion channels for diffusing the new technology, both within the organisation and amongst the organisation's customers.

Ultimately, the decision to hire the Associate has led the company to secure a highly skilled individual dedicated to overseeing the performance of the calculator and to generate the corresponding sustainability strategies.

Once the second KTP had concluded, the company ceased its collaboration with its academic partner. However, the company has initiated other collaborations with other private corporations.

7.3.3 Case C: Small-sized charity

Case C represents an ‘unusual case’ (see Chapter 5). The case includes the experiences of a charity that provides artists with suitable residential and working spaces, and the KTP integrated with Central Saint Martins College of Art and Design, University of the Arts London. The partnership, a long-term, 36-month project (2010-2013), had the objective of developing the documentation detailing the studio provisioning system. According to the Associate (see also Echarte, 2014), this is a ‘unique’ partnership, because it is ‘the first time fine art practice has been the subject of a KTP’.

Case context: Organisation Description and Background

The organisation focus of case C is a registered society under the Co-operative and Community Benefit Societies Act 2014, established in London in November 1972. It is a small-sized charity with sixteen employees, and with a net surplus for the fiscal year 2013 of £154,274 (after expenses)⁸⁶.

The charity was established by a group of graduates, fine artists from Reading University, who believe in the ‘value of mutual support’; that is, sharing their knowledge and experience, with other institutions and managing agencies to ‘help develop affordable studios’. Since its foundation, the charity has supported nearly 5,000 artists. The information regarding these artists has generated a vast database of clients.

The organisation has three main objectives: providing accommodation for non-commercial fine artists (its ‘clients’) in London, allocating combined working and living space (studios) and advancing the arts by the provision of bursaries and awards for its clients.

⁸⁶ According to the organisations’ annual report (2013), its main source of income was generated from rent income received from their letting activities, registration fees, a grant for being an Arts Council England National Portfolio Organisation, and revenues from other investment activities. For all the relevant sources of information used in this case study, refer to Annex B.

To accomplish its goals, the charity provides non-residential studio space that is affordable, high-quality, accessible and secure, strategic advocacy work with other agencies to increase the supply and standard of affordable space, and conducts research activities to improve the quality of its study provision.

Engagement with the KTP project: Participating partners and the charity's motivation for selecting them

Since the 1970s, the organisation has had an established collaboration practice that has enabled it to engage in various knowledge transfer projects. Examples include the collaboration between the charity and SPACE, supported by the Arts Council of Great Britain (1975), and the International Residency Programme (dating from the 1980s), in which the organisation collaborated with academic institutions from Canada and the USA.

The charity has also established different learning mechanisms, some of which include the development and integration of 'studio briefs', documents detailing the design specifications and management of the studios.

In 2008, the (future) academic advisers approached the charity with an idea for a 'studio-based research fellowship'. Further discussions followed regarding potential sources of funding. These discussions were also about the current practices existing in the industry for procuring studios and the potential benefits of collaboration between the charity and the (future) academic advisers from the University of the Arts London. During this conversations, the academic partners suggested working under the KTP scheme, given their prior experience with it. Subsequently, following these events, the CEO decided to formalise the relationship. The CEO explained that the 'concept for the project' was developed first and the appropriate funding mechanism was sought later.

In terms of the charity's management, the KTP scheme represented the opportunity to analyse the current studio procurement system and to generate feedback to match supply and demand, thereby increasing consumer satisfaction. Similarly, the partnership was considered to be an opportunity to improve the charity's collaborative links with academia. A final strategic advantage of engaging in a partnership was to improve the charity's decision-making system through a better, in-depth understanding of its beneficiaries' needs.

The academic partners at the University of the Arts were selected because of their knowledge and experience in contemporary practices for studio design and because the academics' perspective on the function of 'studios' was compatible with the charity's perspective. Finally, by collaborating with the university, the company was investing in potential future clients represented by the university's graduates.

More importantly, by engaging in the KTP, the company expected to fix one persistent problem in the organisation. Prior research conducted regarding its studio procurement system demonstrated that, although it consistently achieved occupation levels of 99 % (2009-2010), many resources were wasted as the allocation process was non-systematic and anecdotal.

The charity established a partnership with the University of the Arts London (including two professors from Central Saint Martins College of Art and Design) and an Associate (with a PhD in Arts and Design) from the University of West England.

The KTP project: activities at a glance

As indicated above, the organisation's management expected the KTP project to offer solutions to the studio-procurement approach. The KTP project had the specific aim of 'develop[ing] design specifications to continue providing artists' studios following the characteristics and specifications of the studios'.

The partners hired a professional (the Associate) to accomplish the objective presented above because of her academic training and experience (she is an artist who holds a PhD in Visual and Performing Arts from the University of West of England, where she served as lecturer). Once appointed, the Associate became the project's R&D adviser and was based full-time at the charity.

The partners (CEO, the academic adviser and the Associate) met on a regular two-weekly basis to manage the project and to discuss the business planning. The Associate suggested following a 'practice-based approach'; that is, approaching the artists and becoming involved with them by conducting a series of activities to understand the decision-making process for selecting tenants used by the company, and thus influence the studio briefs. These activities included both field and market research, requiring the partners to identify the critical factors characterising the function, use and role of the studio, as provided by their clients.

Additional activities performed during the partnership included the integration of a photographic catalogue documenting studio use, a parallel audio-visual study (overseen by two independently contracted artists) and a series of (recorded) interviews with 31 tenants discussing several factors that influenced their use of the studio.

By studying the decision-making system, the partners were in a position to propose some radical changes to it, such as relying on an information system and introducing the use of information technologies oriented to understanding the necessities of the artists. The last element fed directly into the new design specification briefs and formed the basis for an online tenant survey.

Outcomes of participating in the KTP project

As described above, an immediate outcome of the project was the integration, launch and broadening of scope of an on-line ‘tenant survey’, an instrument inquiring about all aspects of the service provided by the organisation, including studio building performance, provision benefits, income profiles and public engagement activities of the studio tenants. The data provided by the survey are used to improve the quality of the provision and management systems, and to provide a more refined understanding of the charity’s clients. Based on its initial success, the charity has further plans to commission a new survey every two years⁸⁷.

Another outcome of engaging in the KTP project was the integration of a two-year Associate Studio Programme Partnership with CSM, which commenced in October 2013. The programme consists of an award given to eight recent graduates, providing an open-plan studio at one of the charity’s managed accommodations. Furthermore, the Associate is now working as a full staff member at the charity as the Senior Research and Development Officer. In addition, the partnership has produced scientific publications (Echarte, 2014) and a book (Ellard and Harvey, 2015).

⁸⁷ According to the Associate, the second edition of the survey was postponed due to the other projects developed by the charity during 2012-2013. However, the survey will be launched next year.

The outcomes indicated above have impacted on the organisation in several ways: Through the integration of the on-line survey, the KTP project accomplished its objectives and, as the Associate observed, the charity's decision-making process used to allocate studio space is now evidence based ('less anecdotal'), as it is based on substantial information concerning the artists. Thus, it is more systematic, with the added benefit of increasing decision-making accuracy.

The 'successful' outcomes of the project led to the integration of an extended collaboration programme between the KTP partners that includes 'multi-dimensional collaborations' (that is, it involves property developers, architects, policy developers and researchers at other institutions). According to the Associate, the academic adviser and the charity's CEO, the successful extension of their collaboration efforts is due to the integration of 'creative dialogues' - a system of shared beliefs based on a common language and similar objectives.

Another consequence of the utilisation of the 'studio-design reference brief' was the production of new 'client briefs', a set of documents serving as the main database for potential design projects, based directly on the knowledge generated during the KTP.

The main outcome of this KTP was the proposal of an entirely new 'studio-design reference brief', which builds on the work conducted during the KTP, specifically on the in-depth interviews and the scientific publication cited above. According to the charity's CEO (see Ellard and Harvey, 2015), what distinguishes the production of the 'new' design brief from previous efforts is 'the application of formal research methodologies through the KTP, including data analysis and direct feedback'. This document helped the charity to plan, propose and secure the funding to open a new studio building.

This document has been employed to secure additional (not KTP-related) partnership projects. One example includes the 2013 project in which the charity, funded partially by the Arts Council England, developed a new studio building in partnership with a private corporation. The building is in Essex, and includes 39 studios and four work/live units. The building had a low construction budget and was awarded three RIBA Regional Awards⁸⁸. Another example includes the 24 new-build permanent studios project developed in association with a private corporation.

⁸⁸ Royal Institute of British Architects Champions. The awards are given on a yearly-basis to different categories of architectural endeavours.

7.3.4 Case D: Small-sized design start-up

Case D focuses on a premium sportswear manufacturer and the partnership it established with a team of academic advisers from the Design against Crime Research Centre (DAC) at the University of the Arts London, Central Saint Martins. The project, an 18-month KTP (concluded in 2012), had the objective of establishing the manufacturing parameters that would assist in the development and growth of the clothing brand.

In this case, the firm was a start-up that began operations six months before the KTP project began. Its main brand began trading in 2011. At the time of writing this case study, the company was operating as a functioning private corporation. However, in November 2014, the start-up and its design brand were acquired by Reebok International Ltd⁸⁹.

Case context: Company Description and Background

The firm, a South London manufacturer of hi-tech sportswear, had a staff (during the period of the KTP project) of 10 core employees, in addition to a team of designers and ‘brand ambassadors’. The company’s main business was to design and sell premium-wear apparel and related accessories to specialised consumers (martial artists) through an online platform. The brand had three main product lines: professional wear, fighting wear and training wear.

The immediate antecedent of the firm can be traced to Brazil, where the company’s founder had been living and working 13 years in another of his projects, a charity, before returning to the UK and establishing the start-up. While in Brazil, he researched life in a ‘favela’ (or shantytown) and, in an attempt to make a difference, decided to establish a boxing gym and academy in Rio de Janeiro (Brazil) in 2000. Based on the initial success of this charity, verified by an independent evaluation conducted by the University of Edinburgh, upon his return to the UK the entrepreneur established a second academy in 2007, this time in Woolwich, South London. The charity, an organisation that aims to help young people to avoid violence (joining a local gang), offers alternative education (martial arts) in established academies.

⁸⁹ All the relevant sources employed in this case study can be found in Annex B.

As stated via different media outlets, the entrepreneur claims he established the firm for three reasons: Firstly, he perceived there was a niche for advanced performance training wear, secondly as a way of ‘paying homage’ to those he met during his time in Brazil and, finally, as an attempt to generate revenue and give half of it to the charity.

Given that the entrepreneur had no formal training in design or marketing (his background is in Social Anthropology at the University of Edinburgh), he initiated a search to identify a relevant partner that had the technical expertise he lacked. He first approached an online research institute (Metrix Lab), interviewing over 300 martial artists and fitness personnel. The interviews were oriented towards understanding the types of sports gear the athletes were using and what needed improvement.

Following the interview stage, he initially approached big clothing companies. However, as he ‘felt’ these companies had different values from his, the entrepreneur decided to focus his search on local universities in London, eventually approaching the University of the Arts London because he was ‘aware’ that this university was amongst the leading experts (of the London colleges) in the fields of textiles, design and marketing.

During one of his visits to the university (c. 2009), the entrepreneur was referred to the DAC located at Central Saint Martins because the university perceived that the entrepreneur’s technical and expertise requirements matched the skills mastered by the DAC. The similarity in approaches was based on the methodology adopted by the DAC, known as the ‘practice-led approach,’ which challenges crime by producing socially responsive, purposeful design.

The Deputy Centre Director at DAC was appointed as the main partner for the project due to his expertise in the areas of design, urban utility and design against crime, as well as his expertise in several collaborative projects.

After formalising their collaboration link, the first project embarked on by the partners (referred to as the ‘first sprint’ by the DAC director), starting six months before the KTP project, involved gathering information about the technical (design) aspects of the garments to be produced and, based on these models, to then generate the production blueprints. Accordingly, the project had two phases: data gathering and manufacture.

During the ‘first sprint’, the support provided by the academic partner became fundamental to the establishment of the start-up. According to the project report from CSM (UAL, 2012, see Annex B), the development of the sportswear collection ‘combined the academic adviser’s research agenda (collaborative socially responsive design for social innovation) with his professional design practice’. Moreover, the academic adviser indicated that he and his research team conducted the relevant market research while also performing sample collections and a cost-benefit analysis. An important contribution to this project was adapting the ‘asset-oriented approach’ to the start-up’s processes and manufacturing philosophy. In this regard, the academic partner argued that the ‘asset-oriented approach’ allowed the ‘smooth’ transition of proven ‘academic’ methodologies to practical settings that have no prior design or manufacturing experience.

The activities during this project involved in-depth discussions with martial artists, which helped the partners to identify three elements important to incorporate in the fabric used: freedom of movement, temperature control and durability. Based on these characteristics, the design team decided to incorporate specific technologies into the clothes, such as ‘Airtex’ antibacterial technology and ‘rash guards’ lighter than those used in the average type.

The outcome of this ‘first-sprint’ was the production of a first (clothes) collection, co-designed by the academic adviser. By selling some of the clothes from this collection, the entrepreneur managed to inject capital into the project and establish the business.

Engagement with the KTP project: Participating partners and the firm’s motivation for selecting them

Immediately after the ‘first sprint’ was concluded, the entrepreneur invited the academic partner to continue his business venture, this time with the objective of increasing the magnitude of production generated by the start-up. The main intention of this second project was to introduce the start-up’s ‘advanced performance fight wear and training wear into a specialised market’.

Due to the success of the ‘first sprint’, the entrepreneur suggested following a similar working arrangement for a second project. However, the academic partner, who had other research commitments, declined the invitation, and instead suggested they continue their collaboration under the KTP scheme.

The KTP was a mechanism that would enable them to continue their partnership, with the added benefit that an Associate (with experience in design) could monitor the project with both the entrepreneur and the academic partner serving as external consultants, thus saving significant resources. Convinced of the benefits of the KTP, the entrepreneur agreed to this new form of cooperative agreement between the partners. Therefore, the partners embarked on a classic partnership with the objective of ‘launching a lifestyle clothing brand to support a charity involved in community-based projects’. Formally, the KTP project started six months after the ‘first sprint’ had concluded.

The KTP project: activities at a glance

The KTP project ran from July 2010 to January 2012. According to the partners, the main activities of the KTP project consisted of trying to integrate the design methodology into the design process; that is, to formalise it and to experiment with the products following the specifications provided by professional athletes in partnership with sport apparel designers and fabric technicians.

The partners anticipated that their new partnership would result in the establishment of an entirely functional sportswear design organisation. Thus, they focused their efforts on three core elements: (1) Training of the personnel involved in the project, (2) increasing the scale of the project, and (3) developing the brand through an intensive marketing campaign based on the ‘asset-oriented approach’, an ‘approach linked to the development of models of design innovation and social innovation methods, informed by society’s needs to deliver socially responsive design and innovation’.

The Associate was hired for the task of managing all of the above and for solving specific technical problems related to the decision-making process involved in the design phase. For this purpose, she assumed the role of creative director for the brand, meaning that she had to make all the relevant decisions related to the production process and technical requirements. This included developing the identity of the brand, working with the main consumers of the brand to evaluate the existing product and to develop new concepts, creating and managing the product development calendar, communicating with factories, agents and suppliers, and managing a team of external graphic designers.

Outcomes of participating in the KTP project

Before the KTP started, the people in charge of design in the start-up adopted the ‘asset-driven design’ methodology provided by the academic partner; thus, during the tenure of the KTP project, the design team in the company had the opportunity to experiment with and to then master the ‘asset-oriented approach’. Since the ‘asset-oriented approach’ is a product of the academic adviser, its modification rests on the feedback provided by the research conducted when using it. Thus, many of the technical advancements incorporated into the design process during the KTP originated from different research projects that were conducted by the academic adviser during the same timeframe.

Most of the activities of this KTP served to increase the production from a start-up to a small scale manufacturer, serviced mainly through its online store and through a physical store (recently closed) located in Central London.

In terms of the people collaborating in the project, the Associate managed the project for 11 months; after that, she went on to accept a position at a (major) clothing manufacturer as the Senior Designer. After the project had concluded, the start-up and the academic partner ceased their collaboration. In addition, the company has not engaged in any further collaboration projects with academia after its experience with the KTP.

Following the KTP, in 2013 the company started selling its product in the USA through its on-line store (now inactive), and as mentioned earlier, the brand currently operates as a subsidiary of a multinational apparel corporation.

7.3.5 Case E: Small-sized IT consultancy

Case E focuses on an IT and software development consultancy located on the Sci-Tech Daresbury Innovation Campus (Cheshire, Northwest England), and the KTP established between them, an academic from the University of Manchester (School of Electrical and Electronic Engineering) and two Associates, one from the same university as above, and the other from the University of Strathclyde.

Case context: Company Description and Background

The firm, established in 2003, is a 23-employee spin-off company from the School of Electrical and Electronic Engineering at the University of Manchester. With a turnover of over £1 m, the company ‘develops process and condition monitoring software for use within various manufacturing environments where continuous and batch processes are run’.

The company’s family of products, mostly software solutions, are aimed at identifying areas of opportunity for improvement to maintain a lean factory, operating at optimum manufacturing levels for its clients. The products include tools for off-line analysis, on-line process improvement and industry-specific toolsets; these are grouped as a ‘predictive control and diagnostic suite’.

The control suite is offered to the company’s clients, mostly ‘blue-chip’ companies in the UK, Europe, North America and Australasia. Some of the company’s current partners are large pharmaceutical and nutritional manufacturing companies (Pfizer, Abbott, Wyeth Nutritional), and telecommunications companies (Siemens Ltd.).

The knowledge that serves as the basis for the predictive control and diagnostic tool forms part of the research agenda on ‘monitoring processes’ that the company’s founding partners (two academics from Manchester and one entrepreneur) have been conducting over a period of twenty years. The partners explained that nearly half of that time was allocated to basic research in the university’s laboratory, and the rest of the time to creating the pilot products and commercialising them.

Over time, the firm has developed some characteristics that are relevant for understanding the KTP project. Firstly, all of its personnel have expertise in monitoring and control systems with all of the company's engineers being GAMP certified⁹⁰, meaning that the engineers have a comprehensive knowledge of the basic principles for the validation of computerised systems. Secondly, the firm's processes are ISO certified, positively impacting on its quality and delivery. Finally, since its foundation, the company has had an extensive history of collaborating with different academic institutions, including formal alliances with the Universities of Cambridge, Newcastle, Manchester, Strathclyde and TU Delft.

Engagement with the KTP project: Participating partners and the firm's motivation for selecting them

Immediately after its foundation, the firm participated in a TCS project overseen by one of the company founders. This project served to develop the first version of the commercial software package and helped the company to obtain the financial resources it required to become more competitive in the market. In addition, this project provided the first lesson in engaging in collaborative projects.

After the project had concluded, the company decided to engage with the KTP model since the company's CEO recognised that the business needed to update its current line of products while incurring the minimum risk possible, with a cost efficient solution to access new industrial sectors (by widening the product's range of applications) and to increase the company's profits.

The firm's managers were aware that, in order to remain competitive, the company had to develop two specific technologies: 'batch-processing' and 'multivariate analyses of complex systems'. The problem the company faced was that these technologies require a trained specialist in 'control loop monitoring', which it did not have. Furthermore, the company determined that training its current personnel would represent a significant expenditure for the firm.

⁹⁰ Good Automated Manufacturing Practice is a standard certifying the knowledge of computer and other controlled processes (see Annex B).

The firm predicted that the introduction of the 'control loop monitoring' process would have a positive impact on the quality of the company's services, as it would be capable of performing more complex operations in real-time. A direct consequence of developing this capacity would include a more efficient decision-making process.

Finally, the company considered its previous collaborative experience (the TCS project) to have been positive, and given its personal relationship and nexus with the University of Manchester, decided to focus on another industry-academic cooperation with it through the KTP scheme.

The company engaged in two 'classic' KTPs; both projects involved incremental innovation and ran with a seven-month interval. The projects were conceived as a strategic plan to improve the company's products and, as a consequence, to increase the range of applicability of its software to new industrial sectors. The ultimate goal was to increase the firms' market share.

Therefore, the firm integrated a first partnership (running from August 2003 to October 2005) with the objective of developing the next generation of products for process monitoring used in batch processing environments and a second KTP (from May 2006 to October 2008) with the goal of developing a complete process control package that would generate an integrated control and monitoring solution for industrial delivery.

Both partnerships involved working with the same KBP, the School of Electrical and Electronic Engineering at the University of Manchester. The company's management took the decision to work with the same academic partner for three main reasons: the academic's relevant expertise in control loop monitoring, his vast experience of managing (other) KTP projects, and his connections with experts in relevant technologies who would be likely to be incorporated as Associates.

The Associates who worked on the projects had backgrounds in electrical engineering (first partnership) and process control (second partnership). The company selected the first Associate because it had a prior working relationship with him, originating from the time during which the Associate was studying at the University of Manchester.

On the other hand, the second Associate had no prior relationship either with the firm or with the academic partner, but decided to apply for the position after seeing the job vacancy in an advertisement placed on the KTP's website, and because she was aware of the close collaborative links between her university (Strathclyde) and Manchester (particularly between the software research groups). The company selected the second Associate because of her expertise in 'control loop monitoring' in a variety of laboratory settings.

The KTP project: activities at a glance

Both projects had similar tasks and required acquiring specific know-how to apply these to a new software product. To accomplish the objectives, during the first partnership, the academic adviser acted as 'consultant, assisting the company engineers to generate the new software-based product, while the Associate contributed to the area of data analysis process'.

With regard to the firm, the fact that the model was generated and first tested in a controlled setting (that is, the university laboratory) served as a safeguard against associated risks (misinterpreting readings or damaging a production batch), thus decreasing its potential market failure and encouraging its innovation endeavours.

To accomplish the objectives of the second KTP, the partners employed 'complex control theory' and statistical techniques to estimate the performance of the control system and the quality of the sensor measurements used within the controller. Thus, the partners concentrated on optimising the processes for three specific elements of the company's existing 'analysis process': (1) 'Integrated control' and 'condition monitoring' - during this step, the abnormalities in the process are detected. (2) 'Data reconstruction techniques' - this second step consists of analysing and interpreting the anomalies present in the process. (3) Finally, the 'optimisation processes' are where the anomalies are fixed.

Outcomes of participating in the KTP projects

The partnerships produced several outcomes. Through the first partnership, a new software product ('control suite') was developed. The software was shortlisted for an Institution of Engineering and Technology Innovation and Engineering Award because of its innovative characteristics.

Initially, this new 'control suite' attracted the attention of several large companies, most of them pharmaceuticals; these potential clients were interested in applying 'batch processing' to their manufacturing processes. Despite this opportunity, the company was not ready to offer the product to these customers because the partners had not had time to perform simulations on pharmaceutical processes and had not mastered the 'control loop' process required for such processes. As a consequence of the lack of time for testing the product in different settings, the company was only able to sell one unit to a medium-sized fragrance company, as the majority of the other pharmaceutical companies lost interest in an untested product.

The event above highlighted the need for the firm to establish the second partnership; however, even after the second project was concluded, the company had not generated the relevant set of capabilities and skills related to 'batch-processing analysis'. It was only after the company applied the 'control suite' in fields outside of its area of expertise that the company generated a thorough understanding of 'signal monitoring' and 'data reconstruction' techniques. This understanding occurred some years after the second KTP project had concluded.

The main transformation achieved by the (second) KTP project resulted in the modification of the firms' 'analysis process'. The partners introduced the following changes: For the 'integrated control' and 'condition monitoring' phases, the academic partner and the Associate presented the use of a 'feedback control loop'. This control loop was developed specifically to maximise the chances of detecting any abnormalities in the manufacturing processes. For the 'data reconstruction techniques,' the partners introduced the programming language 'BASIC', which assisted in increasing the complexity of the simulations and enabled them to be performed as real-time processes.

Finally, for the 'optimisation process', the introduction of simulation and the feedback loop increased the flexibility of the product, making it capable of solving both linear and non-linear problems. During this process, a significant contribution resulted in the integration of feedback into the 'lost opportunity assessment' phase.

Other outcomes of the KTP projects included scientific outputs (O'Brien et al, 2011), the company managing to increase its annual sales (turnover) and profit before tax (£400 k), and recently expanding to open a subsidiary office in Singapore (2013), creating new jobs in the firm. Similarly, the company developed a new marketing strategy to promote its products.

In terms of employment, both Associates were offered positions in the company. However, the first Associate left the organisation after three months to pursue a career in academia, while the second Associate has remained as head of the simulation department in charge of 'control loops'. Furthermore, the second project led to the creation of two additional full-time jobs.

In terms of collaboration, after the project concluded, the company reduced its collaboration with the academic partner. However, the company developed a new policy for scouting for talent from the Control Systems Group at the University of Manchester, giving them priority in terms of working opportunities. After concluding its second KTP, the company started recruiting graduate students from the University of Manchester as part of its knowledge identification strategy.

7.3.6 Case F: Middle-sized coffee and tea producer

Case F focuses on a family-owned, middle-sized coffee and tea producer and the two KTPs established between this firm and the Institute of Pharmacy and Biomedical Sciences at the University of Strathclyde. The first project was a means of developing new products, while the second allowed them to develop new production techniques (concluded by 2002).

Case context: Company Description and Background

The company in this case is a £2.5 million profit, middle-sized coffee and tea producer with headquarters in Glasgow, and offices and training academies in London and Dublin. The company serves UK-wide residential and commercial clients, with a wide range of products including tea, coffee, brewing machinery and training courses (commercial and industrial customers). The firm was established in Glasgow in 1864, mainly selling tea and spices to retailers from the same area, and its management board still includes members of the founder's family.

The company summarises its history as ‘three unfolding episodes’⁹¹, marked by the introduction of new products and capabilities. For example, the first episode (1864-1950), saw the introduction of tea, and later of coffee (1950). During the second period (1950-1995), the firm started vending services for retail and catering outlets in Scotland, eventually expanding to cover a UK-wide market (c. 1980), adding bulk-brew coffee machines for the catering sector and introducing an espresso machine into its product range. Finally, in its third episode (1997-present), the company focuses on developing its ‘espresso’ capabilities by creating a dedicated store, introducing the ‘first Fairtrade espresso bean’ in the UK, and engaging in the two KTP projects.

Engagement with the KTP project: Participating partners and the firm’s motivation for selecting them

The rapid expansion process that the company experienced during its third episode is linked to two events, the arrival of its current Technical Director and a process of organisational restructuring to orient the company towards the ‘espresso bean’ market.

Firstly, the arrival (in 1993) of the company’s current Technical Director, a former graduate from the University of Strathclyde, who at that time was also teaching a series of courses at this university at an undergraduate and at a master’s level, led to the opportunity to conduct research under a research grant. The idea of conducting research under the KTP scheme originated from a discussion between the Technical Director and the (future) academic adviser (c. 1994), during which the future partners discussed the programme, and the academic explained the operative mechanisms and opportunities available by participating in the scheme. This conversation helped the firm’s management to consider the KTP scheme as the programme that would assist them to solve some of the problems faced by the company in its ‘coffee sourcing practice’.

Secondly, the restructuring process initiated by the firm to focus on espresso coffee following a business trip (1995) made by the former CEO, a member of the founding family of the company, to Portland, Oregon, led to the development of the company’s R&D strategy.

⁹¹ The relevant sources of information can be found in Annex B.

The gradual systematisation of the R&D process led the company to increase the amount of resources allocated to product innovation. The rise in resources for the department's professionalisation has resulted in a business that considers research and collaboration as strategically important for accomplishing its objectives and has had an influence on the firm's product innovation rate.

For example, over the past twenty years, the company has introduced a different brand of coffee almost every year. Similarly, the systematisation process has helped the company to achieve several certifications, such as the Fairtrade, Organic and Rainforest Alliance labels for its products (1997) and to become accredited as an 'ethical' employer (Investor in People). Because of these certifications, the firm has made a commitment to quality that requires them to deliver the product to the end consumer within seven days of the initial 'roasting' process to ensure product freshness. Thus, being 'quick and efficient' while maintaining 'quality' roasting and packing became two fundamental objectives in the organisation, justifying the need for introducing novel techniques and methods.

In addition to the systematisation process as described above, the firm's collaboration strategy has impacted on the company's knowledge production. For example, the courses taught by the Technical Director as mentioned above have enabled the company to solve different organisational problems by using some of the teaching material as applied case studies for some of the company's problems.

Another effect of the collaboration strategy concerns the feedback process developed via training and working with suppliers (mostly Latin American and African coffee growers). In its training courses, the company often teaches methods for sustainable farming, assists local farmers with the purchase of specific technologies (such as 'drying beds') and helps them to incorporate specific know-how into their production processes. A side-effect generated by training local farmers is the improved understanding the company obtains regarding different production techniques, and (of greater consequence for the business' activities) securing the production of higher-quality coffee blends (as the origin and production process can be verified), thus increasing the satisfaction of its UK customers and ultimately increasing the company's sales.

An added benefit of the collaboration strategy between the firm and the supplier corresponds to the company's capacity to outsource some of the steps of its 'coffee sourcing practice'. This practice involves thirteen steps (vertical integration model), over which the company has maintained direct control of the last three stages: roasting, packing and product delivery.

Two additional factors influenced the firm's decision to engage in the KTP scheme, namely an increase in the complexity of the relationship with its consumers, who were gradually becoming more expert regarding coffee, and the dynamism of the coffee market and its competitive pressure.

Following the events described above, the Technical Director and the company's board decided to engage in a KTP. This was for three main reasons: geographical proximity to the academic partner, the academic adviser's applied research experience in the food and beverages industry (whisky) and his past expertise with the KTP scheme, and the 'shape of the scheme'; that is, its financial support and the capacity to hire a graduate as an Associate.

The company participated in the first TCS project (from February 1998 until August 2000) to develop a 'new range of speciality coffees'. Immediately after concluding this project, the company decided to engage in a second TCS project (from August 2000 to September 2002), specifically developed to continue the research conducted during the previous partnership, with the objective of implementing 'new technologies in the roasting and packing processes of the company (quenching, cryogenic grinding, and modified atmospheric packaging using nitrogen)'. The ultimate goal of both projects, as an integral research and development agenda, was to use these technologies to increase the quality of the company's products.

The Associates who participated in the projects were selected because both had studied at the University of Strathclyde where they became experts in 'sensorial science', a type of know-how that was essential for determining the qualitative characteristics of coffee, and thus for accomplishing the objectives of the projects.

The KTP project: activities at a glance

According to the technical director, the KTP projects provided the company with different learning opportunities, which enabled them to understand coffee from the point of view of the consumer.

The first project involved the creation and development of statistical models and support groups with consumers and consumer panels, in which the partners studied the preferences of 100 coffee consumers (including male and female subjects from the company staff and students from the University of Strathclyde). Through this study and a coffee tasting workshop, the partners developed sufficient information to map their consumers' 'internal preferences'.

This map of 'internal preferences' (coffee aroma, flavour and freshness) enabled the partners to understand which particular blends (types) of coffee to develop according to the specific preferences of specific consumers and, more importantly, to understand the specific technology that they would need to develop more precisely.

After the workshop was concluded, the R&D department worked to develop a bag (container) with improved sealing capacity to prevent oxidation ('staling') and to allow the carbon dioxide, released as part of a natural process from the roasting process, to be expelled from the container as it impacted negatively on the quality of the product.

The second project extended this research, as the company analysed the effects of 'whitening' and 'sweetening' on filter coffee with the purpose of determining the specific levels preferred by the consumers (with regard to these parameters), and subsequently developing products with characteristics suitable for home consumption.

The activities and processes of the second project were similar to those of the first partnership. However, for this particular project, the partners relied on the expertise of 13 assessors (recruited from Strathclyde).

The knowledge obtained from the workshop also helped to determine a set of specific product characteristics related to 'taste', and through the new understanding generated, the company was capable of legitimising the use of traditional roasting methods as these tend to preserve certain desirable qualities better than do industrialised processes.

Before the KTP, the company had maintained its decision to use traditional roasting methods because the company was familiar with them, and because of the positive experiences the company had when using traditional roasting methods. At the same time, the results of the KTP project justified the incorporation of nitrogen and cryogenic (cold) grinding into the production process, two technologies that would not interfere with traditional roasting, as the project demonstrated that, under the appropriate conditions, the technologies had a minimum effect on the flavour of coffee.

Outcomes of participating in the KTP project

The company generated several outcomes from participating in the partnerships. The first TCS project generated a new information system that served to map the company's clients' preferences in terms of different 'espresso blends'. This map of preferences helped the firm to create a decision-making process to match a particular coffee blend with a particular 'type of consumer'. By the time the project had concluded, the partners had integrated the findings of this partnership into a new research agenda, leading to a second KTP project.

The first partnership also led to the production of a scientific publication (Cristovam et al., 2000) which provided the firm with preliminary information on espresso coffee preferences, and the way in which milk changed the preferences of the company's clients.

The second project saw the company developing a new packing technology, which eventually led to the development of several new products. However, the majority of the changes incorporated during the second project occurred in the roasting and packaging activities of the firm, as the company introduced new grinding technologies and developed several technologies (nitrogen, valves, and a triple walled laminate packaging) to extract the air from its products. The company also added an additional sub-process into the packing activity, referred to as 'cryogenic grinding' (or cold chopping), which employs nitrogen to reduce the temperature of the grinder blades, producing a finer grain, and thus improving the final quality of the product.

There were mixed outcomes in terms of the people involved in the project. The company offered a position to the first Associate, who after a period of working for the company left to work in academia, while the Associate working during the second project was not hired.

Finally, due to the retirement of the academic adviser, the company ceased its collaboration with the University of Strathclyde, with no intention of renewing it at the moment, or until an appropriate scientific partner is found.

Through the KTP projects, the company generated two types of innovation, service innovation through its programme 'Roasted to Order', which guarantees the freshness of its products, and a radical product innovation, introducing the first Triple Certified espresso, Fairtrade, Organic and Rainforest Alliance product (2004). Finally, during its third period of development, the company established additional offices and training academies ('barista centres') in London and Dublin, which use the products of the KTP projects to train individuals and professionals in brewing techniques, coffee preparation and understanding the quality and preparation of espresso coffee.

7.4 Chapter conclusions

The focus of this chapter was placed initially on the first phase of the methodology, the development of the KTP programme theory that anticipates that the CBPs participating in the scheme would produce a set of organisational capabilities related to innovation, modify their organisational skills related to collaboration and generate transformational change (open innovation strategies).

The second focus of the chapter was on conducting an empirical investigation of six cases by describing their experiences with the KTP scheme. The cases provided several examples of the way in which different external agents introduced, in a bounded environment (KTP project), variability into the organisation's practices to varying degrees, as some of them were one-off changes with subsequent implications in the pattern of activities of the firms. It is this set of changes that offers a window of opportunity to determine the influence of the KTP project on the organisations' behaviour, not as a set of project outcomes (which are firm and context-specific), but rather as the process of influencing and developing organisational routines following the engagement in a KTP project.

The next chapter uses this chapter's narratives to summarise the application of the methodology and to determine the contribution to the behaviour of the cases as a result of engaging in the KTP scheme.

Chapter 8. The methodology as an Instrument for
Detecting and Assessing *Behavioural Additionality*

8.1 Introduction

The preceding chapter was concerned with applying the first two steps of the contribution assessment phase from the suggested methodology, presenting the programme theory and the case narratives. This chapter presents different examples of the uses and capacities the methodology offers when assessing *behavioural additionality* effects, while also dealing with the final step of the methodology, the learning and adapting phase.

Following this introduction, Section 8.2 exemplifies how the methodology can be used as a tool for describing the process of change. Section 8.3 is the main focus of the chapter, as it offers several examples of the applied mechanisms to detect *behavioural additionality* from the cases. Section 8.4 provides information on the capacity the methodology has as a policy learning tool. Finally, section 8.5 presents some conclusions.

8.2 The methodology as a tool for describing organisational change

8.2.1 Moving from outputs and outcomes of the KTP projects to organisational change

Chapter 3 presented evidence of different methodologies assessing the *behavioural additionality* effect through the outputs of collaboration, while arguing this choice is useful and practical. This methodology has a similar capacity, as it can describe the outcomes obtained by the organisations when engaging in a KTP project. Table 8.1 (below) presents the actual outcomes as observed from the cases. However, as argued during the introduction (see Section 1.2) and in Chapter 4 (see Section 4.4), using outcome indicators alone generates an assessment problem, the input-output dichotomy, as the evaluation practices that tend to focus more on effects, rather than the way changes occurred, only provide partial representations of the *behavioural additionality* effect.

Table 8.1 Partnership outcomes

		Tangible	Intangible
CASES	A	<ul style="list-style-type: none"> • Job created (for the Associate) • Modified layout for the design floor • New design manuals and standard operating procedures created & new design software (purchased) 	<ul style="list-style-type: none"> • Generation of computer assisted design-capabilities • Modification of the activities comprising the organisation’s design process
	B	<ul style="list-style-type: none"> • Job created (for the Associate) • New technology developed leading to a new product (carbon calculator) • New organisational department created 	<ul style="list-style-type: none"> • Technological capability generated • Introduction of technical terms (e.g. ‘sustainability’) into the organisation’s daily language • New corporate strategies developed
	C	<ul style="list-style-type: none"> • The introduction of IT (On-line survey) into the organisation’s processes • Job created (for the Associate) • New studio design reference brief and new series of seminars run by both partners • Reorganisation of the firm’s structure • Scientific publication (Echarte, 2014) and a published book ((Ellard and Harvey, 2015)) 	<ul style="list-style-type: none"> • Collaboration links between the partners strengthened and formalised • KTP products employed as building blocks for additional projects • Modified organisation’s decision-making process • Persistent collaboration with the academic partner
	D	<ul style="list-style-type: none"> • New product developed 	<ul style="list-style-type: none"> • Brand development
	E	<ul style="list-style-type: none"> • Increase in annual sales turnover (reported as over £400k) and value of exports (reported as anticipated to rise by £200,000 a year) • Jobs created (for the Associate and two engineers in ‘product control’, all full time) • New software product developed • Scientific publication (O’Brien et al., 2011) and technical training material produced 	<ul style="list-style-type: none"> • Decreased collaboration with the academic partner • New marketing strategy developed • New procedural recruitment policy and new human resources scouting strategy (procedure) • New batch-processing skills and capabilities starting to be embedded in the company
	F	<ul style="list-style-type: none"> • Job created (for the Associate) • New information system and new packing technology developed and modified products • Scientific publications (Cristovam et al., 2000; Narain et al., 2003; 2004) 	<ul style="list-style-type: none"> • Capability to apply the new technology to the organisation’s packing process

The presence of intangible outcomes of the partnerships, as those presented in Table 8.1, has two methodological implications. First, it is difficult to design an instrument which specifies them correctly *a priori* without a considerable amount of background history on the specific case. Second, because certain outcomes take a long time to develop, capturing the effects of the intervention might require more than one interaction with the organisation.

One example of these problems is exemplified by case B. As can be observed, the partnership generated different outcomes. Amongst these, it produced several *intangible* effects. If focusing exclusively on effects of the partnerships, one of the intangible effects that would be particularly difficult to assess is the integration of new *languages* into the organisation's culture.

In case B, the activities of the KTP project led to the development of a new technology, the carbon calculator. To successfully diffuse this technology, and to popularise its use, both in the organisation and amongst the BID's clients, the project partners saw it necessary to develop a diffusion strategy. The partners realised this strategy was required as, in its original form, the technology included a significant amount of technical terminology and its use required some technical expertise. Thus, the partners developed a specialised language that aimed to simplify the technical terminology associated with its use by replacing it with lay terms, achieving a higher degree of adoption of the technology.

Therefore, the methodology deemed it necessary to move from describing only the outcomes to describing the process of change (in this particular example, this entailed describing the process that helped to generate this language). The description of change corresponds to the organisational change (first) stage of the CCR framework (cf. Table 6.1) which expects that after receiving a subsidy, organisations (at a holistic level) change.

8.2.2 Detecting the process of organisational change from the cases

In the cases under analysis, the process of change experienced by each company was different and varied. The degree of change ranged from minor modifications to project-related components, such as specific activities, to modifications to the entire organisational structure.

For example, in cases A, B and F, the changes had major repercussions for the organisation as a whole (cf. Table 8.1), including major transformations of the organisation's design processes (case A), the organisational structures (case B), or were perceived as product innovation (case F).

Table 8.2 (below) summarises the observed change, its consequence, and the dimension (or location) in which the change was observed for the cases under analysis. The information from the table is employed to generate an in-depth discussion (for each case) of the way in which change occurred and a description of the mechanisms of adaptation (referred to as organisational responses) to accomplish such change. The topics of discussion include the actors (who), their actions (how) and the dimensions of impact (where).

Based on the information from the table, it is possible to observe specific instances of organisational change (when this occurs), as seen in cases A, B, C, E and F, and one instance where no change was detected during the time the KTP project was conducted (case D). Further details of each specific process are presented below.

Table 8.2 Patterns of organisational change for companies engaging in a KTP project

Case	Change (driven by)	Consequences	Dimension of impact
Small Manufacturer (A)	Managerial reaction to an unanticipated outcome: simulation	The design process had a major impact in the organisation's transformation.	Technologies, people and strategy: design.
BID (B)	Externally driven (by associate)	A major transformation of the organisation structure, although the capability resided in the associate.	Technologies, people and strategy: Carbon capability.
Charity (C)	Change as a collaborative effort	The collaboration dimension was persistently modified.	Technologies, people and strategy: studio procurement.
Design Start-up (D)	No radical change observed. Other minor modifications introduced by the external actor.	No radical change observed (during or following the KTP).	The design process suffered minor alterations.
IT consultancy (E)	Externally driven (by partners)	Capability building process in place.	Technologies, people and strategy: Batch-processing analysis.
Coffee and tea producer (F)	Managerial design from a set of anticipated outcomes.	Changes of major consequence for the organisation.	Technologies, people and strategy: roasting and packing.

Case A provides an example of the way managers might react when their collaboration projects generate unanticipated consequences. In this instance, the manager recognised the value of integrating the Associate (and his know-how) into the production processes of the company. For the company, the act of hiring the Associate led to a series of (necessary) transformations, from minor software acquisitions to major redevelopments of the organisation's structure.

In case B, the Associate was the actor who introduced variation into the organisation's processes. Despite this, his presence alone does not explain why and how the organisation was able to react as it did. Therefore, it is necessary to understand the role that management played in recognising the value of the actor's know-how (this relationship is explained in further detail below).

For case C, all the partners became engaged with the project and demonstrated a genuine interest in completing it successfully. Their efforts were synergetic and the changes that led to transformations in the organisation were incorporated gradually as the project demonstrated positive outcomes. The positive outcomes of the process led to persistent modifications of the collaboration links between the organisation and its academic partners.

In case E, the capability-building process began even before the first TCS project started in the organisation. However, it was not until the KTP project that the necessary transformations to the company's technology and processes began to occur, the majority of them driven by the external partner's efforts. In this particular case, it was the academic and the Associate partners' knowledge and activities that helped to introduce the changes in the company. This was accomplished by modifying specific activities of the monitoring and optimisation activities (such as information feedbacks, or simulation through computer software) pre-existing in the company.

Finally, the majority of the changes in Case F occurred as introductions of new technologies in specific activities throughout the organisation. As described in the case study, the introduction of a new information system (based on mapping the consumer's preferences) led to a change in the organisation's decision-making process, as it helped it to match the appropriate production process (grinding/ roasting method) with the relevant client's preference.

Another capacity of the methodology, derived from the in-depth analysis of organisational change per case, corresponds with the identification of the consequences of accomplishing such change. In this sense, it is possible to observe patterns of change with (some) similarities in the cases. Cases A, B and F serve as examples as, in these cases, the event that triggered change was the Associate's activities.

The process of change in the above cases entailed a series of logical sequences involving, first, the Associate developing a technology; second, the company making certain adjustments to the technology, and concluded with an adoption process that involved some activities of the organisation or technological innovation (case F).

Based on the description of the process of change provided by the narratives, sequences of change (an outcome implicit to the TBE approach) per case can be determined (see Table 8.3, below)⁹².

Table 8.3 Dimensions of change (sequence)

Case	Sequence of organisational impact	Length (in time)	Magnitude
A	Technologies→ People →Strategy Tool design process (and department)	During the KTP	New technologies and people, modified strategy
B	Technologies→ People →Strategy Sustainability department (carbon reduction)	Spanning two KTPs	All new for the organisation
C	Technologies→ People →Strategy Studio procurement activities	During and after concluding the KTP	New technologies and people, modified strategy
D	Marginal, non-persistent or variable alterations to the design process	Predating the KTP	New technologies
E	Technologies→ People →Strategy Batch-processing analysis	Previous to KTP, spanning two partnerships, capability established after (and outside) KTP	Improved technologies, new people, improved strategy
F	Technologies→ People →Strategy Roasting and packing activities (coffee)	Spanning two KTPs	New technologies, modified strategy

Describing the process of change is relevant in methodological terms for three main reasons. Firstly, it demonstrates how companies receiving a similar treatment (that is, all of the cases that participated in a KTP project) produce different outcomes. Secondly, this process demonstrates the problem of attributing effects without using mediating factors. Thirdly, it provides a set of logical arguments that can be used as means of verification during the contribution assessment step and to compare these against the theory of change.

⁹² These sequences of change correspond to the level of *Capabilities* from the CCR framework (see Chapter 6).

8.3 The methodology as an instrument for *behavioural additionality* contribution assessment

Chapter 6 suggested (see Sections 6.3 and 6.4) that the methodology is capable of identifying organisational routines and, from these identifications, determine the degree of contribution to the organisational behaviour that the KTP project generated. Further details are presented below.

8.3.1 Configuring organisational routines

Table 8.4 presents a routine identified through the analysis of the evidence provided by the set of cases, as well as its corresponding aspects. The configuration of organisational routines corresponds to the third stage in the CCR framework, and thus, each of the routines presented in Table 8.4 below met the criteria for integrating routines (cf. Chapter 6.2).

Table 8.4 Organisational routines and aspect impacted

Case	A	B	C	E	F
Routine	Tool design	Carbon Reduction capability	Studio procurement	Batch-processing	Packing
Artefact	CAD/CAM software	Carbon Calculator	Online survey	Product, software and related support	Valves, triple-walled laminate packaging, cryogenic grinder
Performative	Design procedure and simulation process	Carbon emission data collection	Observing the artists in their environment	From single to multi-batch processing	Adaptable to consumer's needs
Ostensive	Manuals and SOPs	N/A	Decision-making process	Decision-making process	Packing process and decision-making

8.3.2 Characterising behaviours for each case

A second outcome of applying the methodology consists of the capacity to determine whether the organisational routines existed before the companies participated in the KTP (see Table 8.5, below). The table also offers information about the process of change (variation) of the organisational routine during the KTP project and the consequences of such change.

Table 8.5 Characterising behavioural dimensions per case

Cases	Organisational Routines	Status	Characterisation (from the KTP position)		
			Before	During	After
A	Tool design	The tool design routine is part of a larger routine: forging	Existed in the organisation	Variation (A-P)	Not observed
B	Carbon Reduction capability	The carbon reduction capability is completely new	Not existed before	Creation (A)	Variation (P-O)
C	Studio procurement	Studio procurement was composed of three non-systematic activities	Existed in the organisation	Variation with all aspects	Variation: (A-P-O)
D	Design methodology	Design methodology created through collaboration	Introduced by the academic partner	Minor alteration to design (P)	No variation
E	Batch-processing	'Batch-processing' part of a 'single-process evaluation' routine	Not existed	Introduction (P-A)	Variation (O)
F	Packing	'Roasting' & 'Packing' part of a larger routine: 'coffee-sourcing.'	Existed in the organisation	Variation (A-P)	Variation (O)

Notes: Artefacts (A), Performances (P) and Ostensive aspects (O)

8.3.3 Contribution assessment

In Sections 8.3.1 and 8.3.2, the capacity of the methodology to locate routines and their aspects was explained. Complementing this potential, a third characteristic of the methodology is discussed by providing examples of the identification of the *additionality* component of the changes observed through the analysis. The information used to perform the assessment is presented in Table 8.6 (below).

Table 8.6 *Behavioural additionality* assessment

Case	Aspect (what changes)			Dimension (Origin of the change)	Difference ¹	Alternative explanations
	O	P	A			
A	N	Y	Y	Technological priorities	Variation: (A.P)	Prior practice to codify knowledge as SOPs.
B	Y	N	Y	Technological priorities	Variation: (P-O)	The company's personnel lacked the relevant technical expertise to use the technology.
C	Y	Y	Y	Strategy, technological priorities	Variation: (A-P-O)	The company had prior collaboration experience.
D	N	N	N	None affected	No variation	All changes occurred before the KTP project.
E	Y	Y	Y	Organisational capabilities	Variation: (O)	The company had built a knowledge absorption capability over the years. The company had the relevant technical expertise.
F	Y	Y	Y	Strategy, technological priorities & organisational capabilities	Variation: (O)	Other collaboration projects producing knowledge similar to that of the KTP.

Notes: A: artefacts, O: ostensive aspect, P: performances.

Y indicates the aspect was modified (presence), N indicates an absence of the aspect.

¹ Based on the characterisation of behavioural dimensions (presented as Table 8.5)

The fifth column in Table 8.6 above contains a specific element of the methodology: the alternative plausible explanations that serve to determine the degree of contribution to the organisational behaviour of the process of change.

For example, the company in case A had developed, prior to the KTP, a process for codifying all the knowledge acquired from their participation in collaborative projects as SOPs. The company took advantage of this practice to facilitate transferring the tacit component of the Associate's knowledge to the organisation and, as an outcome of this knowledge transfer process, the company is modifying its entire forging process.

Another example of the importance of alternative explanations includes the company in case B, which had limited experience in collaboration, and had thus not developed a knowledge absorption capacity before the KTP. This company found that, in order to acquire the knowledge generated from the KTP, it was less expensive to hire the Associate than it was to offer the relevant training to its personnel. The implication of this decision is fundamental to explaining the contribution of the KTP to the behaviour of the company.

Two additional examples of the application of contribution analysis as suggested by the methodology in the evidence provided by the cases are provided below.

Case D represents a situation in which the changes in the company's behaviour were not due to a contribution of the KTP scheme, as the evidence from the case serves to determine that:

1. The company created a design routine, and modifying this routine was one of the objectives of the partnership.
2. The routine was originated before the company participated in the KTP.
3. No aspects of the routine were modified as a result of the activities of the partnership.
4. The individuals associated with the KTP project (and in charge of modifying the design routine) left before the project was concluded.
5. Minor alterations to the components of the design routine (as used by the company) occurred during the KTP project. However, these changes were produced outside of the KTP, by the academic partner, via conducting research in different collaboration projects (with other companies). These changes reached the company through the academic partner (given that the routine was based on his design methodology).

In this case, the most plausible explanation for the modification of the organisational routine is explained by point five in the list above: The design routine that effectively changed during the KTP (thus accomplishing the partnership objectives) was optimised through research conducted elsewhere.

Case F represents a company that modified its behaviour through the KTP. The evidence suggests that:

1. The company modified its roasting and packing routines (previously existing in the organisation) by creating new technologies and associated processes, ultimately impacting on the decision-making process of the firm.
2. The company had a formal R&D department in place, created before the KTP projects started, and the partners (who collaborated in this project) had worked together on prior occasions and trusted each other.
3. The specific research agenda that produced the new technology was a direct product of the KTP project.
4. The associates and their related know-how, which enabled the introduction of new technologies, processes and cognitive capacities, were directly obtained by engaging in a KTP project.
5. Similarly, the KTP project showed no effect in terms of the collaboration capabilities of the organisation, and the decision to continue collaborating with the academic partner was dependent on external factors outside of the control of the firm.

The most plausible explanation for the change in the artefact aspect of the routine in this company is explained by the presence of the KTP project; however, as these are mediated by contextual factors, the KTP changed the behaviour of this company to some extent.

As explained using the examples, the methodology is capable of determining, via contribution analysis, those cases in which the *behavioural additionality* effect was generated (cases A, B, C, E and F) and why this effect was not found for case D (as observed from the example above). Similarly, it is capable of establishing the degree of contribution for each instance. In specific terms, in those cases where *behavioural additionality* was detected, it contributed to:

- Generating new organisational routines (cases B and C).
- Helping the host organisations to re-combine their existing know-how with the practices of the external partners (cases A and C).
- Enabling the firm to migrate one or more essential performative aspects located in an external practice (such as the Associate's know-how). This migration was accomplished through the project's activities incorporated into the firm's process (cases E and F).

The changes in routines indicated above were not uniform and were dependent on some contextual factors (initial conditions), such as the company's background, its motivation to participate in the programme, and the factors that influenced the selection of its partners. Similarly, in the cases above, the Associates and academic advisers played fundamental roles in shaping the organisational routines. These actors served as vectors of change during and after the KTPs, as they possessed the relevant knowledge to transform the companies according to their own idiosyncrasies (or practices) that served to solve an explicit organisational problem, such as developing a specific technology or conducting applied research.

It is important to note that the external actors played an active role in pushing the organisations to incorporate their performances and to create new artefacts. For example, the partners from cases A, B and F (specifically the CBPs) demonstrated a significant ability to manage adaptive tension, manifested as the capacity to recognise future commercial opportunities for the application of new ideas (case A), the potential value of the Associate's know-how (case B) and by sharing the knowledge produced during the partnership within the organisation (case F). Similarly, in cases C and F, the organisation's managers learned and co-created relevant operative knowledge in conjunction with their partners.

Identifying the roles of the partners is important for the methodology because, as described in Chapter 6 (see Section 6.2), individuals (and their activities) shape organisational routines through their knowledge by providing the initial signals that organisations require to act and to manage tension (Lewin et al., 2011).

The evidence for behavioural change obtained by the methodology can be further described to extract lessons that are important for future analysis and policy learning. This is accomplished in the third phase of the methodology, as this phase has the capacity to refine the instruments of the research, as well as to extract analytical generalisations based on the cases.

8.4 The methodology as an instrument to learn about the *behavioural additionality* effect from the cases

8.4.1 Learning about the *behavioural additionality* effect from the cases

Based on the CCR framework, the process of behavioural change as identified in the cases is understood as follows: The main cue leading to organisational change is represented by the introduction of new people and diverse practices into the organisation. In the context of the KTP, these cues involved the introduction of the Associate and academic partners into the organisational structure to solve a KTP-related problem.

Once the organisations faced change, the firms responded by introducing different mechanisms for coping with variation, including emergent or planned managerial responses. Other mechanisms for managing change included a combined effort of the management with its partners (collaborative) or by the initiative of external actors in those instances in which the organisation lacked the capability to respond to uncertainty.

The mechanisms for coping with change resulted in two interrelated organisational effects: technological impacts and impacts on the organisation's information systems. The technological impacts followed a process in which the knowledge embedded in the external actor was effectively transferred to the organisation and new technologies were created (or existing ones were modified). On the other hand, the changes in the information systems were facilitated by the efforts of the different partners participating in the project. Both changes are explained in detail (see below).

1. Artefact change as a consequence of participating in the KTP project

In cases A and B (although to a lesser extent in the former), change was initially driven by the modification of a specific *artefact aspect* from one of the routines previously existing in the organisation.

In case A, the process of change was incidental; that is, the introduction of new computer-assisted software, through the ingenuity of the associate, was followed by the integration of new performances or simulation activities. After documenting these performances as manuals and SOPs, other activities of the firm not directly related to the KTP project were modified.

On the other hand, the changes as experimented by the firm in case B were introduced following the CEO's plan to introduce their new technology into the market. As a direct result of this strategy, the organisation modified its structure to complete the knowledge transfer process and adopt the Associate's expertise into the operative processes of the firm.

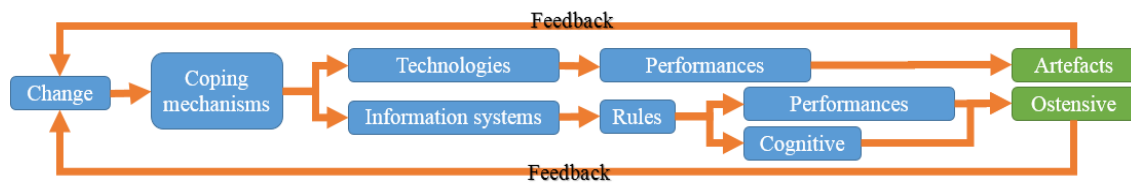
2. Ostensive changes as a consequence of participating in the KTP project.

Those companies (cases C, E and F) that experienced similar ostensive changes suffered a similar pattern of modification in the overall organisational routine that was relevant to the decision-making process. In these cases, the process of change impacted on the information systems employed by the organisations first, producing a more accurate understanding of the company's clients or productive processes as a consequence of the change. Following this transformation, the companies eventually modified some of the modular components of the rules guiding the decision-making process (see the example of the organisational routine in case F, presented in Section 8.4.3, above). Ultimately, the modification of the different rules that comprised the routine led to an optimisation process of the organisation's cognitive resources and, as a parallel consequence, a redistribution of the organisation's activities.

Each of the variation processes described above was initiated either by members within the organisation (endogenous change), by an actor external to the organisation (exogenous change) or was produced as a collaborative effort by sharing responsibility for triggering the organisation's responses towards change.

In summary, two changes in specific aspects of organisational routines were observed as consequence of participating in a KTP project in the cases under analysis, 1) a modification of the artefact aspect, and 2) a change in the ostensive aspect. The process of changing aspects of routines can be represented as a diagram (see Figure 8.1).

Figure 8.1 Changes in organisational routines resulting from KTP projects



8.4.2 Learning from the KTP theory of change from the cases

Using the evidence from the cases, and with the considerations observed so far, it is possible to learn from the assumptions contained in the first iteration of the KTP theory of change. The theory of change developed in Chapter 7 determined that those company partners engaging in the KTP scheme would produce three major effects, including generating organisational capabilities for innovation and (open) innovation strategies, as well as creating persistent collaboration links with their corresponding partners. Some lessons are described below.

1. Generation of organisational capabilities for innovation

The evidence from the cases suggests the KTP scheme is a capability-building programme. In several cases (A, B, C, E and F), it was possible to observe the integration of organisational capabilities for innovation linked to the specific areas of expertise of the companies participating in the KTP. For example, by introducing improved products into the market (such as new blends of espresso coffee in case F), or as differentiated capacities to anticipate market needs (cases B, C, E and F).

In those cases where an organisational routine existed before the CBP engaged in the KTP project (cases A, C and F), participating in a KTP project helped the organisations to introduce new ways of doing things (performative aspects) based around specific technologies (artefacts). On the other hand, in those cases where a routine was created as a consequence of participating in the KTP project (cases B and E), different knowledge absorption mechanisms were developed as a consequence of integrating the know-how owned by the Associates into the organisations and its processes.

2. Modification of organisational skills related to collaboration

The cases provide different information regarding the ways the organisations collaborated through the KTP projects, with one instance generating a persistent change in its collaboration strategies (case C). However, the KTP was not perceived to influence the integration of organisational routines related to collaboration.

3. Generation of open innovation strategies

Based on the evidence provided by the cases, it is possible to determine that the companies under observation did not generate organisational routines related to open innovation strategies.

8.5 Chapter conclusions

In this chapter, the contribution of the KTP scheme to generating *behavioural additionality* in six firms was explored through the methodology proposed in Chapter 6. In conclusion, the evidence originating from the different case studies suggests that, by engaging in the KTP scheme, the company-based partners managed to generate changes that led to *behavioural additionality*.

Specifically, the programme generated persistent modifications to the organisational routines of some of the participating companies (in one case, the contributions to the routines were marginal). Based on the evidence presented in this chapter, it is possible to describe some of the capabilities of the proposed methodology to detect the *behavioural additionality* effect.

The methodology is a useful instrument to identify and describe the outputs and outcomes of collaboration. At the same time, it can go beyond output-outcome indicators, as it is capable of describing the process of change occurring in the participating companies and detecting *variety* in the process of change.

Secondly, the methodology can identify routines and establish the contribution of the policy to behaviour via an elimination process based on an in-depth analysis of the cases.

Finally, the methodology provides the capacity to learn from the innovation policy under analysis. This occurs as the feedback process of the third phase forces the researcher to return to the initial assumptions included in the programme theory, refining them as based on the evidence provided by the cases.

Following the presentation of the potential uses of the methodology, the next chapter presents a series of methodological discussions intended to determine the strengths and weaknesses of the approach.

Chapter 9. Methodological Discussion: Approaching
Behavioural Additionality through the Use of the
Case-Based Method and Theory-Based Evaluation

9.1 Introduction

In the previous chapter, the KTP scheme was found to assist a group of company-based partners in generating five precise instances of *behavioural additionality*. In the cases in which behavioural changes occurred, it was experienced as either the transformation of the company's artefacts (technology development), or as the modification of the firm's decision-making processes regarding innovation (or their ostensive aspects).

Due to the success of the previous chapter in finding evidence of *behavioural additionality*, the research question proposed by this thesis can be fully addressed and the elements and characteristics that need to be considered to evaluate *behavioural additionality* through the proposed CBM/TBE research design can be identified. Therefore, the objective of this chapter is to discuss the evaluation methodology and its corresponding components.

Following this introduction, Section 9.2 describes the methodological implication of the findings identified through the case studies. Section 9.3 forms the core part of the chapter and complements the discussion by analysing the range of methodological issues present in the use of the CBM/TBE approaches in *behavioural additionality*.

In Section 9.4, a set of solutions for the methodological challenges identified in the thesis is provided. Following this analysis, Section 9.5 judges the quality of the research design. Section 9.6 discusses the strengths and weaknesses found in the methodology. Finally, Section 9.7 presents the chapter's conclusions.

9.2 Findings from the case study: methodological implications of the use of CBM and theories of change

Methodological implications of the findings

The evidence originating from the case studies suggests that, by engaging in the KTP scheme, the company-based partners managed to generate changes that led to *behavioural additionality*. The following observations were made:

1. *Behavioural additionality* was present in five of the six cases
2. One of the CBPs did not generate any changes in behaviour through the KTP

The points above are, in terms of results, less relevant for methodological purposes because it is evident that some cases will exhibit behavioural changes, while others will not. Hence, the methodological relevance of the findings identified above, and as discussed in the previous chapter, is related to three main elements: the methodology's capacity to identify *behavioural additionality*, its descriptive power regarding the specific process of change (how and why), and its capacity for establishing the degree of contribution to the behavioural change of the organisation as a result of the policy.

KTP Programme Theory refinement as a consequence of the evidence provided by the cases

One of the final topics of discussion in Chapter 8 regarding the usefulness of the methodology concerned its capacity to redefine programme theories. For example, through the evidence provided by the cases, it is possible to corroborate the scheme's capacity to impact on the organisation's strategies related to innovation. Similarly, the evidence provides the opportunity of redefining the assumptions contained in the programme theory, for example, re-evaluate the assumption that the programme has the capacity to generate open innovation strategies.

This theory refinement process is required for two possible reasons, either:

1. The KTP scheme *does* generate open innovation strategies, *albeit* the cases under analysis did not generate them, or
2. The assumption is incorrectly specified and needs to be modified.

The first interpretation above has some methodological repercussions, as it would imply that the theory of change was specified correctly. According to this scenario, the inclusion of additional cases in the analysis would serve to test if this is the case. On the other hand, the second interpretation has major methodological implications for the theory of change, as it would indicate that the assumption was not representative of the cases.

Based on the evidence provided by the cases, a reinterpretation of the KTP programme theory is offered. For this purpose, one should compare the initial KTP programme theory (cf. Figure 7.1) with its modified version (see Figure 9.1, below). Whereas the initial programme theory was generic, the refined KTP programme theory (modified logic matrix) is constructed with the lessons learned from the cases. Thus, the modified logic matrix explicitly focuses on the mechanisms that integrate and modify specific organisational routines. Specific differences are described next.

- At the level of *activities*, the first logic matrix focused on the different ways the organisations engaged in collaboration within the KTP scheme, whereas, the modified logic matrix focuses on the mechanisms to adapt to change. Accordingly, the key performance indicators and the assumptions from the modified logic matrix reflect these changes, and thus, are related to the variation process in the organisational setting.
- At the level of *outcomes*, the first logic matrix assumed three potential effects from participating in the KTP project. On the other hand, the modified logic matrix anticipates organisations might develop organisational routines represented by technological changes and modified decision-making processes. These changes reflect the evidence of *behavioural additionality* as located from the cases.
- At the level of *purpose*, the initial project matrix anticipated the major effect would be perceived at the collaborative dimension. In the modified project matrix, the collaborative dimension is equally important and present. However, the programme's purpose is also understood to be capable of producing a set of organisational capabilities related to the knowledge absorption process and different innovation strategies.
- At the level of *goal*, the initial matrix anticipated the KTP scheme would generate in its beneficiaries persistent changes in the collaborative dimension and the integration of open innovation strategies. On the other hand, the modified project matrix is oriented towards the integration of organisational routines and the creation of ostensive aspects for engaging in additional KTP projects.

Figure 9.1 Modified logic matrix: *behavioural additionality* in the KTP scheme

	Narrative Summary	Key performance indicators	Means for verification	Assumptions
Goal	The companies engaging in the KTP generate new rules for engaging with the scheme.	<ul style="list-style-type: none"> • Collaboration trends • Open innovation strategies • Types of artefacts developed by firms participating in the KTP scheme • Typology of decision-making styles 	<ul style="list-style-type: none"> • Industry reports • UK Innovation Survey (on the topic of collaboration) • Patent registry and databases • Innovation performance (reports) 	Firms recognise the value of collaborating with the knowledge-based partners, as it helps them to generate strategic assets that facilitate the knowledge transfer/absorption process.
Purpose	<p>Incentivise firms to produce a set of organisational capabilities, related to:</p> <p>a) Absorb technical/specialised knowledge</p> <p>b) Increase the organisation's responsiveness towards its innovation requirements</p> <p>c) Innovation strategies</p> <p>Foster the integration of persistent collaboration relationships between the partners</p>	<ul style="list-style-type: none"> • Collaboration projects with the same partner in similar or additional knowledge areas • Companies' requirements in terms of demands for specific knowledge • New firms applying to the scheme • Firms reapplying to the scheme 	<ul style="list-style-type: none"> • Company performance reports • Collaboration fairs & other networking events • KTP reports • Promotional & Marketing instruments • Success and failure histories 	The knowledge transfer agent might modify on a permanent basis the innovation practices of the host company.
Outcomes	Organisations integrate new or modified technologies and decision-making processes into their structures.	<p>New or modified:</p> <ul style="list-style-type: none"> • Technologies in the firms • Information systems • Operative rules • Shared organisational understandings • Shared organisational cultures 	<ul style="list-style-type: none"> • Firm's documented procedures, SOPs, manuals, codes, plans • Organisational 'homogeneity' in the understanding of specific rules • Technological priorities 	<p>Specific routines at the micro level are originated, mutated, migrated or retained, in relationship to its artifact and ostensive aspects.</p> <p>Responses to organisational change are idiosyncratic and context-specific.</p>
Activities	<p>Organisations develop specific mechanisms to react to the variation introduced by external actors.</p> <p>Organisations participating in the KTP scheme experience change by incorporating new practices produced by external agents.</p>	<ul style="list-style-type: none"> • Activities and procedures of the individual • Firm's Innovation strategy • Individual skills • Investments in intangible assets • Language & costumes • Management styles & SOPs 	<ul style="list-style-type: none"> • KTP reports • Firm's archives. • Organisation's manuals • Technological diversity) • Status & characteristics of products and services before the intervention 	<p>Organisations:</p> <ul style="list-style-type: none"> • Learn (adapt)-Select a technology (choice)-Modify (performances) • Learn (adapt)-Develop a new information system-Create new rules-Modify (performances, procedures or scripts and understandings)

9.3 Methodological discussions: incorporating the CBM and TBE approaches in evaluations of *behavioural additionality*

This section complements the discussions presented in Section 9.2 above by discussing some of the observed potential applications of CBM and TBE for assessing the *behavioural additionality* effect intended for future research.

Methodological discussion 1. Type of questions the method is empirically capable of addressing and proposed solutions to Shadish's (1998) inquiries

Using the empirical evidence, the methodology addressed two sets of questions related to *behavioural additionality* (see Chapter 5). The first question was the 'quintessential' additionality question, while the second was introduced as part of the strategy to open the 'black-box' of behaviours, as it focused specifically on the mechanisms to accomplish change:

1. What difference does the KTP scheme make to the behaviour of its beneficiaries?
2. How is *behavioural additionality* accomplished in those cases in which it was detected?

The empirical cases served to answer the questions above, first theoretically and deductively with the assistance of the TBE, and then empirically and inductively via the identification of instances and mechanisms that led to behavioural change (CBM). Accordingly, a logical connection was established between the research questions and the data collection methods. In this sense, it was observed that the qualitative approach adopted by the thesis was sufficient to produce meaningful evidence of behavioural change derived from the cases.

A second topic of interest, in terms of questions addressed by the methodology, corresponds to determining the relevance that programme theories have for aiding the discussion. Thus, Shadish's questions (proposed in Chapter 5) will be answered.

The first question stated, what are the steps followed by the evaluation methodology to make value judgements in *behavioural additionality*? As explained in Chapter 5, making value judgments requires indicating when a piece of evidence is observed as a 'better' or 'worse' situation when compared to a previous stage. Chapter 6 presented the sequence of seven steps used by the methodology to connect the raw data from the narratives to produce the *behavioural additionality* assessments.

Finally, through the analysis of the evidence presented in Chapter 8, specific examples of situations suitable for the application of these steps are presented. For example, the technical director of the coffee and tea producer (case F) indicated that, without the knowledge provided by the academic adviser through the KTP project, it would have been very difficult for the company to create its own level of expertise in terms of product development.

Evidence, such as that described above, is subject to a high degree of subjectivity, relating directly to the respondent's bias as described in Chapter 4. The methodological solution was to incorporate different perspectives (such as those of the Associates), and secondary sources of information to develop the case narrative. Accordingly, the contribution story for the cases (see Section 7.3.6 for the story of case F) contained all the elements to use the seven step process to assess changes in behaviour.

However, the final step of the procedure (to establish the suspected degree of contribution and to refine the explanations) is also observed to increase the degree of subjectivity in the analysis. To minimise this effect, it is observed that the theory refinement process becomes necessary, because without proper controls, this would pose a challenge to the validity of the findings derived from the methodology. In this sense, two types of control were included to reduce the problem of verification: triangulation and replication.

Triangulation included the logical arguments produced by the theory of change and the alternative plausible explanations produced via a combination of direct and indirect sources of information from the cases, producing greater reliability in judging the degree of contribution of the policy to the behavioural change. The second control, replication, became fundamental to validate the methodology because each case provided different types and degrees of access to the organisational routines; despite this variability, consistent results (identification of routines and their aspects) were achieved across the cases.

The second question asked, does the longevity of the programme under analysis make a difference in terms of the components included in the assessment? Answering this question is important, as it is assumed (Rossi and Freeman in Shadish, 1998, pp. 15-16) that newer programmes “have less background information and fewer past evaluations, [while] well-established programmes, on the other hand, may be more ready for outcome evaluation, and they may have greater wealth of information already available on them”.

The question has implications for the assessment of *behavioural additionality*, and thus, its impact on the KTP scheme requires analysis. The fact that the KTP scheme exists since 1975 (see Chapter 5) represented an analytical advantage, given the amount of publicly available information from the programme. Therefore, for the KTP case, the longevity of the programme did make a difference on the type of information required to collect from the cases in order to analyse behavioural changes, as this information, in conjunction with the past evaluations performed to the KTP scheme, served to integrate a comprehensive portfolio of evidences, as verification mechanism and to incorporate the triangulation strategy that served to validate the case studies.

The last of Shadish's (1998) questions considered for this research is what difference the size of the intervention (such as a local project within a bigger programme or a small element within a project) makes in the conclusions derived from the study. The cases showed that the effect of the programme at a local level and its unit of analysis, routines, operate at a micro level. However, the cases included companies located at different regions and both small and medium-sized firms. Based on the evidence, it was observed that, in each firm (regardless of location or size), the process of change and the rate of diffusion of change had significant differences, which leads to the observation that organisational context and the people involved with it are important elements to include in the analysis.

Methodological discussion 2. Case selection: issues and considerations

According to the discussion presented in Chapter 5, little consensus exists regarding the adequate number of cases that are considered *sufficient* to explain (social) phenomena. By analogy, the same argument is extended to the use of CBM for *behavioural additionality*.

Therefore, a central issue the methodology tries to solve corresponds to the selection of an 'adequate' number of cases. The discussion centres on discussing the strategy to determine the number of cases to be added to the study.

Identifying an 'adequate' number of cases for behavioural additionality

In terms of generating criteria for including specific types of cases, two strategies were observed as useful: Optimal situations (behavioural features of the population under study), and adequate diversity of factors. These strategies can be applied in tandem as they consider similar elements (see Table 9.1).

Table 9.1 Strategies to select an adequate number of *behavioural additionality* cases

Strategy	Factors affecting the decision	Condition	Cases to be included
Optimal situations	<ul style="list-style-type: none"> Evidenced-based Approach Information-oriented selection Prior evidence on the subject Temporal conditions Typologies of behaviour (previous and current) Type of policy or intervention under study (e.g. collaboration) 	<ul style="list-style-type: none"> Longitudinal study Critical, unusual, or revelatory situations 	Single case
		Replication logic	Small- <i>N</i> design
Adequate diversity	<ul style="list-style-type: none"> Anticipated versus observed outcomes: tangible and/or intangible Factors or processes that are causally important Information-oriented selection. Routines under observation Set of pre-defined factors congruent with theories and concepts Type of policy or intervention under study 	<ul style="list-style-type: none"> Routines under observation Number of actors (organisations) Level of aggregation of the study (micro, meso, macro) 	Single case
			Small- <i>N</i> design

The optimal situation strategy is related to the principle of heterogeneity, which implies that the types of cases to be included as part of any study need to account for the diversity inherent in them. The proposition implies that the choice between conducting a single and a small-*N* design is conditioned by the numerous routines that might exist in the organisations.

When focusing on a single case design, an in-depth discussion of one, or several routines can be performed, with their evolution comprehensively monitored. On the other hand, when facing a small N -design, a choice between focusing on a single routine across organisations, or multiple routines across multiple organisations, is made. For example, because the empirical case studies conducted for this thesis developed a small- N design inclusive of six cases, and numerous routines were introduced per case, resulting in the increased complexity of the overall analysis. The solution to this situation was to focus on single and unique routines per case.

Linked to the argument presented above, the second strategy in the table, adequacy of factors, is related to the proposition that a characterisation of behaviours becomes a desirable feature in any case study. The pre-defined typologies need to be created in such a way that the values of particular phenomenon may change over the period of study, and present a contrast between different elements of the typologies. In this sense, even though complete typologies depicting actor-routines are useful, a simpler analysis, that of the congruence between the rationale for the intervention and the presupposed outcome, might be sufficient. For example as the initial step for a *behavioural additionality* assessment, or as part of a recursive evaluation of a single programme.

After selecting between focusing on a single case, or on replicating cases, a final issue concerns the generation of limits for the cases. The following components were considered useful for establishing the case boundaries:

1. Aspects of routines to be analysed and followed, either partial (one), complementary (two) or full (all of the three aspects) analysis.
2. Prior *behavioural additionality* assessments, typologies or theories of change (if any of these exist), which signal the creation/modification of specific routines.
3. Spatial constraints. These refer to the organisations' structures, sizes and the location of the carriers of the routine. From the empirical analysis, it was observed that both small and medium-sized firms had a similar potential to vary their behaviour.
4. Timing (of the evaluation), corresponding to the period of analysis (this element is considered further in Section 9.4, below).
5. Type and quantity of the organisational activities under investigation.

Methodological discussion 3. Constructing indicators for assessing behavioural additionality through organisational routines

Chapter 8 began with an exposition of the usefulness of the methodology to detect the outputs/outcomes produced by firms participating in a KTP project. Accordingly, several difficulties of their use as prime indicators for *behavioural additionality* were identified. Some of these difficulties arose because the use of outcomes generated partial assessments or incorporated high levels of variability, which resulted in inconsistent and unreliable indicators. Consequentially, this thesis distanced itself from using outputs/outcomes as indicators for *behavioural additionality*. However, moving from the *outcomes* level to the *routine* level created additional difficulties:

Firstly, the indicators used in the cases were constructed based on the observed presence or absence of a specific component of the routine and its variance in time; in order to judge them, a combination of the contextual factors and the sources of information included in the analysis were employed. Secondly, because of the emergence of effects, the causal links between intervention and change are varied and, in some instances, vague. Thirdly, the constructs used for the analysis are prone to measurement errors because of the problems of indeterminacy and practicality (both problems were previously explored in Chapter 5).

Therefore, one of the pressing tasks of the study of *behavioural additionality* consists of constructing indicators that manage to solve the limitations observed above. In this sense, the assessments performed for the cases focused on the people and their actions, the technological choices these people made and the rules or general procedures they produced to govern such artefacts and themselves.

Based on the discussion presented above, Table 9.2 (below) contains a series of indicators derived from the cases included in this thesis.

Table 9.2 Indicators for *behavioural additionality*

	Artefacts	Performative	Ostensive
Indicators	Data (archives) on firm's performance	Activities and procedures of the individual	Attitudes towards collaboration
	(Organisational) Language codes	Cognitive structures of individuals in the organisation	Innovation strategy
	Path-dependencies/ technological lock-in	Experience (in doing something)	Institutional arrangements
	(New or modified) Products (tangible)	Mobility of professionals within the organisation	Formal statements of organisation's philosophy ⁹³
	SOPs	Investments in intangible assets ⁹⁴	Group norms: standard and values
	Technological diversity		
	Technological commitment/priorities	Organisational capabilities	Rules
		Organisational, social, and physical structures	
		Outsourcing practices	Shared understandings (of the organisation's reality)
		Styles of management	
Skills of the personnel involved in the organisation			

The indicators presented in Table 9.2 are mostly related to processes, or allow the observation of variation in qualitative/descriptive aspects.

Some of the proposed indicators above can be assessed with few complications, either qualitatively or with the aid of quantitative methods, for example data on the firm's performance or the activities and procedures of the individual.

⁹³ The elements: 'Formal statements of the organisation's philosophy', 'group norms: standard and values', and 'language (organisation)' can be grouped under the term 'organisational culture' (see Schein, 2010).

⁹⁴ An intangible asset includes additional and complementary components that go beyond R&D. Such as computerised information (software and databases), innovative property (Scientific R&D, copyright and licence costs, and other product development) or economic competencies (brand equity, firm-specific human capital and organisational capital) (OECD, 2010). According to the report's authors, more work is needed to harmonise the definition of intangible assets.

Since some of the indicators might be representative of outputs of an organisational process, care must be exercised when using them for the identification of the *behavioural additionality* effect. One example includes investments in intangible assets, which can be codified either as the amount of the investment (a number) or as the act of investing. Note, however, the indicator is classified under the performances column. This classification is deliberate and indicates that the type of information required is related to the act itself, or the organisational practice, and not to a quantity. Other indicators require further interpretation. Particular examples include the languages and cognitive structures of the individuals in the organisation.

Languages, as demonstrated via the case study, represent a system of internal codes and messages to communicate complex ideas in specific organisational settings. Thus, their identification requires identifying symbols and their associated meanings, or breaking them down into further components. However, it is useful to remember that, when these indicators are fragmented, an input-output dichotomy problem might arise as small ‘black boxes’ might be created.

Cognitive structures of the individuals in the organisation refer to the representation of the ostensive and performative aspects of the routines that the individual has. These representations vary from person to person (in the same organisation), and in time. Because these elements vary, their identification requires assisting the individuals to make the meaning of their actions and the understanding of them explicit. To aid in this process, logic maps are useful.

Methodological discussion 4. The particularity of the insights derived from the case study

As discussed in Chapter 5, the type of generalisation achieved through the CBM design was *analytical* or *naturalistic*. Therefore, the findings from each case (the kind of organisational change impacting on a specific routine) are particular to each observed instance. Consequently, the observed changes in routines are unique and are not representative of the universe of firms participating in the scheme, nor of clusters of firms.

However, neither the object of the proposed evaluation methodology nor the case study necessitated making generalisations at the level of statistical representativeness. Its strength is located precisely in its capacity to consider the context and the scope (conceptual and causal homogeneity) of the cases, and of those conditions that contribute to generating the case's uniqueness (such as the presence of the Associate, or the boundaries of the KTP projects). Thus, the methodology provides examples of the variation process, represented as the creation and modification of organisational routines, as generated by a set of cases when engaging in the KTP scheme (see Chapter 8.3.3).

9.4 Solving the methodological challenges identified in *behavioural additionality*

In Chapter 4, the four challenges in *behavioural additionality* were first introduced, while the anticipated solutions that the methodology would provide were presented in Chapter 6. This section gives further consideration to these challenges.

The congruence problem

Basing the selection of the unit of analysis employed by the methodology on prior research, organisational routines were identified as a potentially useful means by which to address the congruence problem (see Chapter 6, Section 6.2). However, using them as the unit of analysis created two interrelated methodological problems: Their study and identification are resource-intensive and the concepts, particularly the aspects of the routines, use technical and theory-specific concepts.

The study of routines is resource intensive, because following a single aspect of a routine in the organisations (even in a small-sized firm) was time consuming and required an extensive focus on a single organisational activity.

The second problem corresponds to the technical language included in the concept. It was necessary to develop a conceptual framework to translate routines and their components into non-technical language to make these accessible during the interviews.

The project fallacy and the catalogue of behaviours trap

Interrelated with the challenge described above, it was important for the methodology to avoid the *project fallacy*, given that the entry point to the cases was the KTP projects. In this sense, by focusing on organisational routines the project fallacy was avoided as this helped to establish the contribution of a single project to the modification of organisational routines while moving between different organisational levels.

Accordingly, the best strategy to move between organisational levels was accomplished by following an iterative strategy with the guidance of the CCR framework.

The CCR framework provided a logical and sequential description of behavioural changes with the emphasis on understanding *behavioural additionality* as a process that observed changes, capabilities and routines, in that specific order. To investigate this process, the interview protocol developed in Chapter 6 (see Section 6.3 and Annex A.3) was followed. It is argued that use of the interview protocol with the data collection instrument employed for primary sources of information (see Annex A, Section A.2) forced the interviewees to think creatively about the transformations observed in their organisations, and to then narrow the explanations to the particular activity that generated them. The inclusion of different respondents, and the triangulation of evidence, also served to minimise the dangers of committing the *project fallacy*.

The inclusion of different interviewees was also useful for avoiding the *catalogue of behaviours trap*. Their inclusion also required the generation of a data collection instrument that could be adapted to different respondents, thus justifying the inclusion of a *modular questionnaire*.

Finally, it was also useful to recognise that the responses provided were biased to different extents. The firm's employees and the Associates were biased in favour of their own contributions and performance (whether at the individual or collective level), whereas the academic advisers were more open about and critical of their roles in the KTP project.

The input-output dichotomy

Two tools helped to solve this problem, the incorporation of the theory of change and contribution analysis, as well as the use of routines. Chapter 8 also addressed the input-output dichotomy by arguing the additional uses that were assigned to the methodology for describing change and thus, opened the 'black box' of organisational behaviour.

However, by opening the 'black box' of organisational behaviour, it was observed that similar problems to those highlighted for the *congruence problem* (above) exist, namely that the evaluation process becomes resource-intensive and that it requires an iterative process of constant verification of the assumptions.

Causality, timing and evaluating in isolation

The thesis proposed, in terms of causality, that establishing direct linear causation is difficult and is not advisable given the inherent complexity (uncertainty) and the dynamic nature of the innovation processes. In this sense, the KTP scheme was considered as a system in perpetual change, in which the relationships between the agent's actions (contribution stories) were mapped (through the logic framework) against the anticipated outcomes produced via the theory of change, thus explaining the contribution.

A second issue of importance, as demonstrated by the case studies, is the timing of the evaluation; that is, determining the appropriate time to assess the programme to identify changes in behaviour. The methodology collected data from cases with KTP projects that had already concluded; thus, it was possible for the research to deduce, from the evidence, when the contribution to the organisational behaviour was on an *ex-post* basis. In this sense, the methodology is best suited for *ex-post* analysis, as routines and their consequences can be fully appreciated and mapped, and their dimension of impact can be measured. However, the methodology might be suitable for an *interim* evaluation by providing a systematic and detailed description of the evolution, in real-time, of a routine and its aspects. Moreover, the methodology phases related to planning and knowledge construction activities were useful for producing the set of assumptions that would later serve as the basis for future evaluations.

Finally, the methodology considered the problem of evaluating programmes as isolated events; thus, the research incorporates a reflection of contextual settings in the analysis (see Chapter 6, Section 6.2, and Annex A) by including a brief history of the organisations, and thus discovering the companies' involvement with different programmes. For the cases in question, this task was attempted explicitly in the narratives when describing the organisational culture and trying to identify, for example, if the company saw itself as collaborative and if it was engaged in other projects.

9.5 Assessment of the quality of the research design for behavioural additionality

Chapter 5 proposed (see Sections 5.3.3 and 5.5.3) two criteria for increasing the quality of the research design: the criterion of validity (internal, external) and the criterion of reliability, with a set of corresponding tools including triangulation strategies, relying on research journals and on replication logic (Tellis, 1997; Yin, 2014).

Correspondingly, in this research, some of the tools referred to above were incorporated while designing the cases, and when collecting and analysing the data obtained from them (see Table 9.3, below).

Table 9.3 Criteria for increasing the quality of the approach

Phase	Approach	Use	Impact
Data collection	Case study protocol	Guided the data collection in each case (see Annex A).	Reliability
	Portfolio of evidence and research journal	Repository of the evidence (see Annex B).	
	Multiple sources of evidence	Triangulation (see Annex A).	Construct Validity
	Extant routines research interview protocol	Used for identifying the mechanisms behind the organisational change (see Chapter 6 and Annex A).	
Research Design	CCR Framework	The theoretical-conceptual model for translating the empirical evidence into the theory (see Chapter 6).	External Validity
	Replication logic	Increased the range of analytical generalisations (see Chapter 5.5).	
	KTP theory of change	Mapped the logic of intervention and guided the assumptions behind the analysis (see Chapter 6.4.2 and Chapter 7.1).	Internal Validity
Data Analysis	Contribution analysis	Alternative to solving the attribution problem. Generated evidence and alternative evidence of <i>behavioural additionality</i> (see Chapter 6 and 8).	

The approaches contained in Table 9.3 impacted on the reliability and the validity of the research to different extents.

For example, in terms of the construct validity, the CBM/TBE approach in this thesis did not include a single (or umbrella) question to identify the *behavioural additionality* effect; instead, a set of *modular topics*, adaptable to different respondents, was included in the instrument. The impact on the construct validity, in this specific case, corresponds to the use of the routine interview protocol for generating the research instruments.

Overall, the combination of the tools included in the criteria presented in Table 9.3 generated, for this research, evidence of the *behavioural additionality* effect in the set of cases, which is qualitative in nature, descriptive of certain process of change, with a reduced ‘respondent’ bias (due to the triangulation strategy) and a control of the potential ‘interpretative’ biases present in the study (through the KTP programme theory).

9.6 Strengths and weaknesses of the CBM/TBE approach for *behavioural additionality*

Using the CBM/TBE approach for *behavioural additionality* made it possible to identify several strengths and several limitations of these methods. This is presented below.

Strengths of the approach

The use of the CBM approach generated *ideographic* explanations about the additionality of the cases. In other words, it offered in-depth, detailed evidence about the consequences of participating in a KTP project. Simultaneously, the TBE approach served to map the interactions between the partnership’s actors with their equivalent organisational dynamics. Through this matching process, the mechanisms leading to *behavioural additionality* were identified. Moreover, the use of programme theories minimised the *congruence disparities* between the (behavioural) concepts and their empirical counterparts, and served to discard alternative explanations related to the contribution of the KTP-scheme.

The methodology as a tool combining CBM and TBE offers, in its third phase (*decision making*), the capacity to learn from the analytical lessons provided by the cases and to adapt these lessons to suit different objectives, either as a policy-learning or as a policy-making tool.

Weaknesses of the approach

One of the fundamental limitations of the CBM approach is that it is prone to *verification bias*. As explained in Chapter 5.3.1, this limitation is present when the cases under analysis tend to confirm the researcher’s preconceived assumptions about the studied phenomenon. However, this problem has different potential solutions oriented to confirm or dispute the assumptions from the case. These include reflecting on the results, learning and modifying assumptions accordingly, distributing the case amongst independent reviewers (involved and not involved with the cases) to validate the cases results, and conducting additional cases.

A limitation found with the TBE approach is that the theories of change are idiosyncratic and are therefore subject to be biased to the ideas and experiences of those actors conducting the evaluation. This situation becomes problematic in two foreseeable scenarios. First, when the theory of change for one programme is forced to explain other programmes without a revision of the assumptions constituting the original theory of change. Second, when the theory of change fails to include different perspectives or sources of information. Thus, potential solutions to these issues include (see Chapter 5.3.2), first, revisiting the assumptions and adapt the theory of change for each intervention under analysis. Second, account for different perspectives (e.g., beneficiaries or prior evaluations) when integrating the theories of change.

Finally, two additional practical limitations were identified. Firstly, CBM needs to keep the number of cases to be studied relatively *manageable*. As explored earlier in this chapter, a related problem is the subjectivity of the term; thus, deciding the number of cases depends on the objectives and questions of the study. Several strategies for resolving this issue were provided in this chapter.

Secondly, the study of routines was found to be resource intensive. Since routines are systems in the making, their components might not be completely shaped by the time that the study was conducted; thus, the analytic instruments for discussing routines need to include detailed and complete specifications of the different aspects of the routine.

9.7 Chapter conclusions

This chapter focused on discussing several characteristics of the proposed CBM/TBE research design and its derived methodology to evaluate *behavioural additionality*.

Based on the discussions provided in this chapter, the case study approach developed for this thesis can be characterised as a methodology that triangulated different sources of qualitative data, focusing on the dynamics of organisational change as an iterative process. The analytical aspect of the methodology included the identification of the effect of different emergent, contextual and temporal factors on change.

In addition, it was determined that, in order to incorporate the CBM and TBE approaches, as suggested by the research, some considerations were required:

To select a sufficient amount of cases, two strategies were integrated: optimal situations or the adequate diversity of factors. For both strategies, determining the context setting of the cases was important.

Other advice regarding the methodology, derived from this chapter, corresponds to the necessity of using *behavioural additionality* indicators that go beyond the outputs/outcomes dimension. This suggestion derives from the observation that focusing exclusively on the results of an intervention was observed to increase the possibility of biasing the estimations and producing errors in the assessment of the effects. Several indicators of routine performance were suggested to avoid this problem.

In conclusion, by incorporating the CBM/TBE approaches to the evaluation of the *behavioural additionality* effect, the problems of causality and attribution were minimised. Both challenges were reduced through increased contextual-temporal sensitivity, through the programme theory refinement process and the management of unintended consequences observed during the fieldwork phase, and those described as anticipated/achieved changes.

Chapter 10. Conclusions

10.1 Introduction

Governments expend considerable resources assisting firms to become more innovative, either by providing them with sufficient information to make better informed decisions, by facilitating opportunities to collaborate with academic institutions or by solving different problems present within the innovation system. At the same time, companies are interested in taking advantage of the instruments that governments offer, as innovation can be difficult and costly.

Despite government efforts to understand how its actions generate changes in organisational behaviour, evaluating behavioural change is difficult. Reasons for this difficulty include: confusion regarding exactly what is meant by innovative behaviour, the presence of many beneficiaries in the system with different, yet complementary goals, and the fact that these stakeholders benefit differently and to different degrees. Other challenges in assessing the potential behavioural changes potentially generated by innovation policies include: the use of tools and methods that oversimplify the organisational reality, relying exclusively on input or output indicators to assess behavioural changes, and the existence of predetermined ideas regarding changes in behaviour that do not reflect the organisational reality of those benefiting from the support.

In an attempt to minimise the consequences of the challenges presented above, and to aid policy makers in conducting an evaluation of the behavioural changes (*behavioural additionality*) potentially incorporated by the policy in question, this research aimed at answering the question how can the Case-Based Method and Theory-Based Evaluation approaches as a research design be used for evaluating *behavioural additionality*?

This conclusion builds upon the question above by interlinking the different discussions presented through the nine preceding chapters of this research. Following this introduction, Section 10.2 discusses the uses identified in the methodology. Section 10.3 discusses the three challenges indicated above. Section 10.4 explores the contribution of this research to the body of existing knowledge. Section 10.5 presents the recommendations for future practice, and outlines the use of policy implications as a set of evaluation guidelines. Finally, Section 10.6 discusses the limitations of this research and proposes a further research agenda.

10.2 Uses of the CBM/TBE approaches for evaluating the *behavioural additionality* effect of innovation and collaboration policies

This research proposed an iterative, incremental three-step evaluation methodology for the *behavioural additionality* dimension of innovation and collaboration policies. The methodology delivers an alternative to the approaches typically offered in evaluation practice, by relying on the Case-Based Method (CBM) and the Theory-Based Evaluation (TBE) approaches as a potential research design. It also incorporates Gök's (2010) concept of *behavioural additionality* and contribution analysis (Mayne, 2012) as mechanisms for attributing policy effects. The process of attribution was aided by the triangulation of different sources of qualitative data, which focused on the dynamics of organisational change, with its analytical component occupied with the identification of the *behavioural additionality* effect across different emergent, contextual and temporal factors.

The methodology was tested in a case study of the UK's Knowledge Transfer Partnerships (KTP) scheme, including six cases and focusing on the experiences of different participating organisations. For evaluating the *behavioural additionality* effect of the KTP scheme in the cases under analysis, the *behavioural additionality* concept was defined as the persistent modification of the organisational routines of the policy beneficiaries that the government intervention contributes to change (Gök, 2010).

Operationally, the methodology condensed Mayne's (2012) six-step contribution analysis into three steps, coherent with the approach of TBE (Weiss, 1997; Donaldson, Christie and Mark, 2009): (1) understand the programme's rationale, (2) locate the 'behavioural' and the 'additionality' components of the intervention and craft the contribution story and based on the lessons provided, (3) reflect upon the contribution anticipated against the one observed and learn to generate better policies or stronger theories of change.

Based on the research findings, the methodology is observed as containing four main features, as described in Chapter 8: (1) identifying and describing the outputs and outcomes of the collaboration processes, and similarly, (2) going beyond the output dimension by describing the process of change. (3) Furthermore, provide evidence of the creation or variation of organisational routines, and (4) serve as a reflexive exercise that gives the evaluation practitioner the potential to learn from the assessment, generating policy learning.

This research provides different forms of evidence that support the use of CBM and TBE approaches as a potential research design for the evaluation of the *behavioural additionality* effect. To be specific, the CBM approach employed for this research offered the opportunity to study a contemporary phenomenon (*behavioural additionality* in the KTP) and generate an in-depth description of the subjects under analysis, placing special focus on the boundaries of the phenomenon. TBE, on the other hand is relevant because it helps to explain the extent and scope of the observed organisational change with an increased sensitivity towards temporal and contextual effects, by translating raw data (Weis, 1998) concerning the KTP theory of change, into evidence of the mechanisms generating behavioural transformations.

The use of CBM/TBE methodologies helps, mainly, in two interlinked ways to better understand *behavioural additionality*: the phenomenon itself, and its assessment. First, in terms of understanding the *behavioural additionality* phenomenon, CBM helps to highlight those organisational characteristics or initial conditions and behavioural responses to a government intervention that are unique to the organisation. These elements have implications for the assessment of *behavioural additionality* as this would indicate that: a) prior capabilities need to be accounted for by the instruments which try to assess behavioural changes, and b) data collection instruments need to prioritise understanding these initial conditions and contextual settings, in order for data analysis tools to fully comprehend the impact of the interventions at the level of organisational routines.

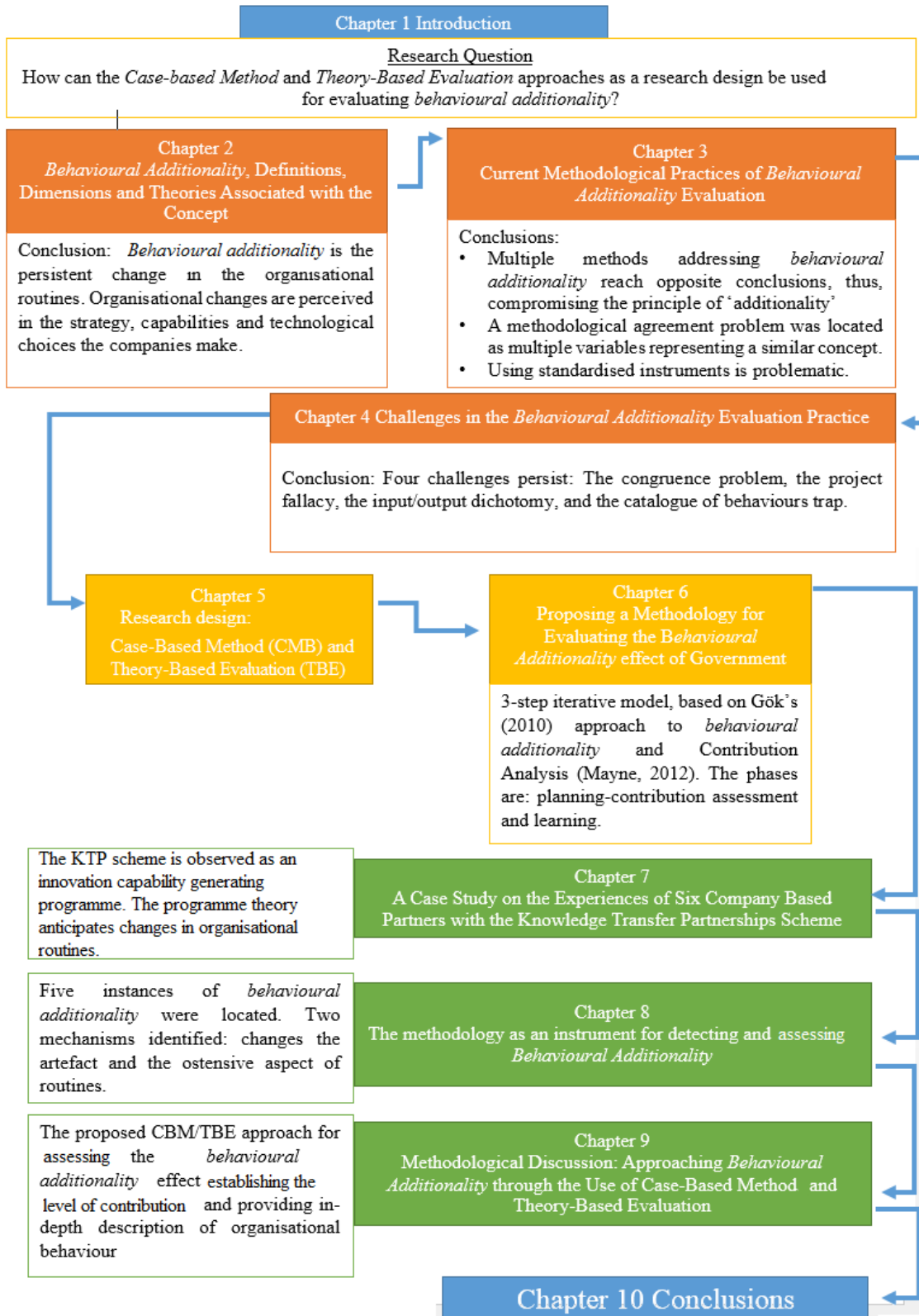
Furthermore, by relying on contribution analysis (Mayne, 2008, 2012) a mechanism for attributing the policy effects was developed which did not required to rely on experimental or quasi-experimental designs. Moreover, the use of CBM/TBE in tandem increased the methodology's sensitivity to the contextual elements in which the cases operated, helping in turn with the management of unintended consequences (Weiss, 1998) and serving as a theory-refinement process (Weiss, 1998; Donaldson and Lipsey, 2013) which becomes the basis for a learning exercise.

Finally, the analytical tools incorporated into the methodology, which facilitated the detection of organisational routines and their components, were the logic framework approach (Team Technologies, 2005), an interview protocol adapted from recent research in the assessment of organisational routines (Pentland and Feldman, 2005; Turner and Rindova, 2012) and the data collection techniques belonging to CBM (Yin, 2014).

The methodology was used as a way to access the organisational memory, enhance the understanding surrounding the process of change occurring within the organisations, and detecting *variety* in the process of change, to then compare and contrast these processes of change against the set of outcomes anticipated by the programme theory, mapping the logical links guiding the intervention and including a feedback process assisting in enhancing the methodology learning capacity.

The application of the methodology as explained above enables discussing in greater detail the causes and effects of the evaluation challenges described above, and in particular, observing its influence when the topic of the evaluation exercise is the *behavioural effect* of the KTP scheme. Figure 10.1 contains the thesis plan with the principal conclusions derived from these observations, explained in the following section.

Figure 10.1 Thesis plan with conclusions



10.3 Considerations on the CBM/TBE methodology for addressing three methodological challenges when evaluating the *behavioural additionality* dimension of innovation and collaboration policies

Restating the core argument of this thesis, important conceptual progress has been achieved in the 20 years since the *behavioural additionality* concept was introduced, however, for its assessment three challenges remain: a conceptual disagreement, methodological challenges, including the ‘black-box’ problem and the project fallacy, and challenges regarding the unit of analysis, in specific developing assessment instruments with predefined ideas regarding the behavioural change of the beneficiaries that do not correspond to their reality. Concluding arguments are provided below.

10.3.1 Effect of the conceptual vagueness and its treatment

One of the fundamental problems faced in the assessment of the *behavioural additionality* effect is the conceptual vagueness associated with the concept, manifested as a confusion regarding exactly what is meant by innovative behaviour. As described in the introduction of this research (see Amanatidou et al., 2014 in Section 1.2), the conceptual vagueness problem has a negative effect in the evaluation practice, as its presence increases the possibility of justifying any policy outcome, regardless of its effects.

Moreover, this research determined that, far from being solved, the conceptual disagreement problem existing in the *behavioural additionality* concept is extended, both in the academic and evaluation praxis (see Gök, 2010; Gök and Edler, 2012 in Section 2.2), with the effect of generating four conflicting definitions, with the consequence of producing programmatic black-box-type evaluations that impact the validity of the findings of the evaluation regarding behavioural change (see the typology presented in Figure 2.1).

Therefore, this research, recognising the importance of the conceptual vagueness problem for the assessment of the *behavioural additionality* concept, explored first, its causes to offer potential solutions from the perspective of CBM/TBE. Amongst the causes, Chapters 2 (Section 2.2) and 4 (Section 4.2) presented a summary of findings offered by recent research (Gök, 2010; Gök and Edler, 2012), suggesting that the conceptual vagueness problem has its origins in the theoretical under-development of the concept, as well as a conflicting and diffuse understanding of behaviour, which increased when there is a failure to comprehend the logic guiding the intervention.

The exploration of current practices in the measurement and assessment of the *behavioural additionality* effect conducted as the systematic review of Chapter 3, helped to highlight the presence of the conceptual vagueness in the reports explored in those sections. Accordingly, the problem was found to be recurrent, as in the 145 reports under exploration at least 27 different variables used to conceptualise *behavioural additionality* were found. Furthermore, given its characteristics, this problem was linked to what in the evaluation practice in social sciences is referred to as the congruence problem (see Frankfort-Nachmias and Nachmias, 2009 in Section 4.2).

Based on the problems above, the solutions offered by this research included adopting an evidence-based approach (see Chapter 5), which helped to determine that the concept requires a definition that would include the persistence of effects and that understands innovation holistically. Based on this, it was possible to start addressing the theoretical disagreement problem by linking the assessment of the *behavioural additionality* dimension with Gök's (2010) evolutionary–structuralist perspective. Accordingly, this perspective offered the potential benefits of focusing on the process of knowledge production and dissemination, while also recognising the heterogeneity in the system, as well as considering the dynamics underlying the innovation process of those engaging in its generation.

The incorporation of the evolutionary–structuralist perspective had important consequences for assessing the *behavioural additionality* dimension because innovation is observed as a holistic phenomenon. Recognising that policies operate under the effects of complexity and systemic dynamics, the concept is understood as composed of two dimensions, a 'behavioural' aspect and its 'additionality' component, and 'behaviour' is defined as 'organisational routines'.

The idea of organisational routines is central to the methodology, because it is through the interrelationship of its aspects (the 'performative', 'ostensive' and 'artefact' components of the routine, see Pentland and Feldman, 2005, 2008a; Knudsen, 2008; Gök, 2010; Parmigiani and Howard-Grenville, 2011 in Section 6.2) that it was possible to explain when government interventions are observed to generate 'additionality', when the interventions generate the process of origination (variation, selection and retention), adoption and retention of routines as presented in Figure 2.2 (see Chapter 2).

Furthermore, relying on organisational routines to represent behaviour reduced the conceptual vagueness existing in the *behavioural additionality* concept, first, as this framework (as described in Section 6.2) provides a unit of analysis that is transversal to a set of different actors at the organisational level, but which is based on the contributions played by the individual (Aime et al., 2010; Massini, 2010; Felin and Foss, 2011; Lewin et al., 2011). Second, because it considers the context where organisations exist and innovations might thrive and third, because it assumes that however diverse economic actors are, they have similar goals as they strive to survive by learning from their environment (Nelson and Winter, 1982; Gök, 2010, see Section 2.5).

In terms of the KTP scheme, as described in Chapter 7, the KTP scheme benefits not only companies (profit and not-for-profit organisations), but its primary beneficiaries include academic partners and the Associates as well. These actors have diverse understandings regarding what constitutes ‘innovative behaviour’. For example, differences were observed in this research between a small-sized manufacturing company and a charity providing housing space in the creative sector. Their products and services were different, so were their rationalities to, and expectations for, engaging in collaboration. However, the evaluation methodology needed to be inclusive of these actors and account for their variability. Thus, having a clear definition of behaviour became a necessity to understanding the type of *behavioural additionality* effects that are anticipated from the programme. To this extent, the use of the organisational routines framework opened the possibility of observing the process of change from three different perspectives: either its human component, its technological aspect or at a higher level of abstraction, the organisational rules and procedures.

Once the conceptual vagueness problem has been by-passed, the methodology is capable of addressing, to different extents, the remaining problems, most of which are of methodological origin, present when trying to assess the *behavioural additionality* effect.

10.3.2 The project fallacy and the black-box evaluation problems

Minimising the use of tools and methods that oversimplify the organisational reality

A second difficulty in the evaluation of behavioural changes is the use of tools and methods that oversimplify the organisational reality. While this problem is interrelated with the vagueness when defining the *behavioural additionality* concept, this research observed that it manifests more clearly through what receives the name of project fallacy (see Buisseret, Cameron and Georghiou, 1995; Georghiou, 2004; Georghiou and Clarysse, 2006).

The synthesis presented in Chapter 3 (see also Sections 4.3 and 4.5) enabled observing that the project fallacy occurs, mainly, in those reports using ad-hoc surveys to assess behavioural change, and has an effect over certain instruments, such as interviews (Davenport et al., 1998) generating inadequate generalisations about behavioural change. Similarly, the different reports under analysis present a generalised awareness of the fallacy, albeit there being no consensus on its solution.

One mechanism observed in the synthesis to try to address the project fallacy is provided by the following example. As described in Sections 3.4.3 and 4.3, Davenport et al. (1998) proposed a solution to the project fallacy, consisting of strengthening the evidence obtained from their initial method of choice (interviews) with an econometric analysis of survey data. This suggestion implies that the adoption of a secondary method would help reduce the respondent bias introduced by the interviewees (R&D managers) because of the capacity to cross-validate answers between methods and the use of statistics to draw causal inferences. Furthermore, Davenport et al. (1998)'s recommendation (see Section 4.3) to combine a qualitative and quantitative dimension into their analysis, responds to the necessity for improving their understanding of the impact of the policy under examination.

The assumption above serves to strengthen the argument in favour of the importance of TBE in the evaluation of the *behavioural additionality* dimension. Because the first problem observed by Davenport et al. (1998) is due to a partial understanding of the policy under analysis, the incorporation of logic models addresses this situation from the beginning of the evaluation. This is because, as explained in Chapter 5, logic models and programme theories begin by determining the suspected impact of the policy underlying the action and programme activities (Weiss, 1997; Chen, 2005; Rogers, 2008), thus leading to an improved understanding of the logic of the intervention, followed by the development of the key questions included in the evaluation design (Alkin, 2013; Donaldson and Lipsey, 2013).

A second problem with the assumption above is that it rests on the implicit preference of statistics over the qualitative approach. As argued in Section 5.2.1, when this position is taken to the extreme, its effect is to reduce the usefulness of the evaluation exercise because an artificial division between the explanatory capacity of the quantitative over the qualitative method is created (Harvey, 2013; Pawson, 2013; Alkin 2014; Blatter and Haverland, 2014).

This artificial division need not to be a concern for those evaluation practitioners intending to assess the *behavioural additionality* dimension, because current research in the field (see Sections 3.4.3 and 5.4) have demonstrated the power of case studies and other qualitative-oriented approaches as valid tools for analysing *behavioural additionality*. Similarly, this research offers six examples in the case studies that highlight the capacity of the CBM/TBE approach to minimise the effect of the project fallacy, while using qualitative data collection and analysis techniques.

Moreover, the methodology addresses some of the causes of the individualistic fallacy, in terms of its consideration of the actors, the assumptions it makes about the type of behavioural responses they have, and the attribution mechanism.

First, in terms of actors, the methodology as previously explained, is framed under Gök's (2010) approach, which assumes heterogeneity as an inherent characteristic of the innovation system. The case studies included heterogeneous actors (see Section 5.5.2) deliberately to observe the variability of organisational responses in different organisational contexts. In this sense, the case studies identified four different organisational responses when engaging in a KTP project (see Table 8.2): led by the organisation as a planned activity, externally driven, as a shared responsibility effort and as a reactive process.

Moreover, while integrating and testing the KTP programme theory, it was observed that across different individuals, for example different Associates, there were different understandings of their role in the scheme, indicating that integrating a single programme theory was not feasible, nor advisable.

The methodological implication from these findings is that *a priori*, organisational responses cannot be assumed to be homogeneous and *behavioural additionality* effects need to be expected to vary. Similarly, these findings support Pentland's (2011) observations that organisational routines can be originated either through effort or by chance.

Second, the case studies were built around the importance that context and the individual have in determining the responses of the organisations (see Edler et al., 2013, in Chapter 1; Shipp et al., 2006; Playford, 2007, in Chapter 3; Lewin et al., 2011, in Chapter 6.2). As described in Chapter 8, the changes incorporated in the organisations, following their engagement in the KTP project, were observed as effortful accomplishments (see Cohen and Bacdayan, 1994; Gök, 2010, in Section 6.2) of either the organisation's management or the external personnel who participated in the project.

Finally, the methodology avoided making direct inferences about the organisations directly from the evidence gathered about the behaviour of the individuals; rather, the process relied in the reconstruction of the process of change and its influences in the three aspects of the organisational routines, thus, not only performances were considered; similarly, artefacts and organisational rules.

The elements described above help to position the role that different tools intended for collecting and analysing data have when analysing the *behavioural additionality* dimension of innovation and collaboration policies, and in particular for the KTP scheme.

While it is important to recognise the problem of oversimplifying the organisational reality, the problem, as suggested by this research, is less related to the type of tool and method selected for collecting data and analysing behaviour, rather than with the first essential evaluation steps, which correspond to understanding the organisational reality, that is the programme's context, anticipated effects and potential beneficiaries' reaction. By doing this, the problem by-passes the artificial qualitative/quantitative division, and places importance on developing the logic of intervention, from which a more accurate assessment of the tools that reduce the organisational reality can be performed.

Behavioural black boxes

An additional challenge to the assessment of the *behavioural additionality* dimension corresponds to the use of input or output indicators to assess behavioural change with limited attention to the way the effects occurred (Astbury and Leeuw, 2010), this tendency has the effect of producing a paradigm, represented as the creation of programmatic black-boxes of behaviour (Gök, 2010; Gök and Edler, 2012; Amanatidou et al., 2014).

As indicated in Section 2.3, the presence of the input–output paradigm has been observed to occur (Gök, 2010) when the *behavioural additionality* dimension is considered to manifest itself, exclusively, in terms of results following a particular order in time (Falk, 2007; Clarysse et al., 2009; Wanzenböck, Scherngell and Fischer, 2013) and linked to certain methods, such as surveys (Gök, 2010, see Section 3.4.3).

The synthesis of Chapter 3 (see also Section 4.4) highlighted some of the instances where the input–output problem was observed. Accordingly, it occurs as a deliberate choice (DITR, 2006; Gulbrandsen and Rasmussen, 2012), unintentionally (SQW Consulting, 2009b), or to be inherent to the method that serves to determine behavioural change (Shin, 2006; Knockaert and Spithoven, 2009). If untreated, the input-output dichotomy generates two assessment difficulties; either an overestimation of the intervention's effects, or a potential misrepresentation of its impacts and outcomes. Both due to a simplification of the behavioural dimension (see Section 4.4).

The implication in this research to attempt to open programmatic black boxes was to exploit the capacities offered by the CBM and TBE approaches in tandem with the organisational routines approach. In Chapters 1 and 5, both CBM and TBE were observed to be helpful in describing, in depth, the way programmes work, by understanding the emergent outcomes originated by the factors assumed to produce change, and their interaction with their context (Stake, 1978; Tellis, 1997; Gibbert et al., 2008; Astbury and Leeuw, 2010; DANIDA 2012; Perri and Bellamy, 2012; Yin, 2014).

In practical terms, for this research, one way of opening programmatic black boxes was to access the organisational memory by means of the organisational routines. This required understanding the different aspects of a routine through the actions of the agents within the organisation and the different outcomes of KTP partnerships (see Tables 8.2–8.5). This understanding generated ideographic explanations (De Vaus, 2013) about the process of change in the cases, represented for example by the pattern ‘Technologies → People → Strategy’ (see Table 8.3).

As described above, the ‘black-box’ problem also has implications over the type of indicators employed to represent *behavioural additionality* effects. This research circumvents the ‘black-box’ problem by avoiding inferring *behavioural additionality* through the outputs and outcomes of firms supported by the KTP scheme and rather describing the process of organisational change with the help of organisational routines and their aspects that were created or modified from engaging in a KTP project. In this sense, the choice to move from outputs to processes supports Astbury and Leeuw’s observation (2010) that reality is stratified, meaning that programme outcomes are but a minor aspect of a larger reality, specified through the existence of certain (unobservable) underlying mechanisms. In the context of this research, this required a systematic, iterative, and incremental analysis that returns to the same evidence to produce new meanings at various points throughout the analysis.

10.3.3 Predetermined notions regarding changes in behaviour

A final problem located in assessing the *behavioural additionality* effect is having predefined assumptions regarding the type of behavioural changes achieved by the policy beneficiaries that do not correspond to their reality, and thus are not feasible to achieve. In this research, this situation was described as the *catalogue of behaviours trap* (see Section 4.5), which referred to the tendency of certain research instruments, using self-reporting tools, such as surveys and questionnaires, that precondition the respondents' answers towards certain specific behavioural changes. This problem was linked to the common method variance problem (Lindell and Whitney, 2001; Podsakoff et al., 2013) found in the field of psychology.

In the same chapter, the common method variance problem was described as more frequent with those instruments relying exclusively on self-reporting techniques, and caused by inconsistencies with the instruments used for the research and respondent bias (Podsakoff et al., 2013).

In the practice of evaluating the *behavioural additionality* effect, the *catalogue of behaviours trap* was observed to manifest when the respondents had, as the only possible choices, to select from the data collection instruments intended to assess behavioural changes, predefined categories of behavioural effects. In Chapter 3 (see also Section 4.5) this tendency was observed in surveys, as the instruments cannot include those changes that are contextual and particular to the beneficiary, as these types of effects cannot be determined before applying the instrument without losing some level of sample representativeness (Shipp et al., 2006; DITR, 2007; Benavente et al., 2007; Clarysse et al., 2004; and Falk, 2007; Falk, 2007; DITR, 2007; Busom and Fernandez-Ribas, 2008).

A second manifestation of the *catalogue of behaviours trap* is due to the respondent's bias, or the respondent's role. The implication for the assessment of the *behavioural additionality* dimension is to consider explicitly who is the intended respondent and why is this person assumed to offer relevant information about the suspected behavioural change. In this sense, it is important not to assume that higher levels of authority in the organisation would correspond to a holistic understanding of what and how organisations change (Clarysse et al., 2004; Falk, 2004, 2006, 2007; Georghiou, 2004; DITR, 2006; Hsu et al., 2009) and thus, relying exclusively on the accounts of CEOs and senior top-level managers to investigate behavioural change. This is especially true when considering that the role of managers is to design artefacts (Pentland and Feldman, 2008b, see Section 6.2), while contributing to shape the organisational routine as other members of the organisation.

In the KTP case study, the role and relationship between the different personnel integrating the partnership were useful guides to determine a suitable candidate for the interviews. Moreover, the inclusion of different interviewees was useful for avoiding the *catalogue of behaviours trap*, as different points of view could be incorporated. Their inclusion also required the generation of a data collection instrument that could be adapted to different respondents, thus justifying the inclusion of a modular questionnaire.

The discussion in this section has centred on the capacity of the CBM/TBE approach of addressing three interrelated problems when assessing the *behavioural additionality* effect: the conceptual disagreement problem (Gök, 2010), the 'black-box' evaluation problem (Astbury and Leeuw, 2010; Gök, 2010), and its related 'project fallacy' (Buisseret, Cameron and Georghiou, 1995; Georghiou, 2004), as well as the *catalogue of behaviours trap*. The methodology incorporates, as solutions to address these challenges adopting an evidence-based approach, while also maintaining a focus on the practical nature of evaluation. These elements made possible the development of an approach coherent with the notion of innovation as a systemic process, and linking the approach to the naturalistic research programme (Stake, 2010, Patton, 2011) as complexity and context became important for generating explanations about organisational changes in behaviour.

Ultimately, it is observed that, by addressing these challenges, an initial step has been taken for producing evaluations of the *behavioural additionality* effect that are coherent with the idea of innovation as a holistic and systemic process, where careful attention is paid to the logic of the intervention, and which considers the role played by the different beneficiaries of the programme in shaping organisational change.

10.4 Contributions to the existing knowledge

The research contributes to existing knowledge in three ways: 1) through a mitigation of the potential *conceptual disagreement problem* defined in the Introduction, 2) through the integration of a methodology for the assessment of the *behavioural additionality* effect based on the CBM/TBE approaches, and 3) by determining under which conditions the methodology is capable of identifying *behavioural additionality*.

In terms of the conceptual disagreement problem, Chapters 2 and 3 succeeded in this regard, as the lessons learned from the literature review helped to generate a theoretical–conceptual framework for the study of *behavioural additionality* (see Table 6.1). This framework combined a theory of behavioural change based on microfoundations (Gök, 2010) with a Theory-Based Evaluation approach. This framework represents a novelty on the assessment of the *behavioural additionality* effect, as the approach is theory-based and evidence-based.

Another contribution to the existing knowledge was derived directly from the discussion presented in Chapter 3, which focused explicitly on addressing the question of what works, for whom, and under which circumstances for the methodological practices reviewed in that chapter. This consisted of the classification method illustrated by the *behavioural additionality* practice tree presented in Figure 3.1. Furthermore, Chapter 3 also highlighted non-experimental research designs by showing that these types of designs have a similar capacity for producing relevant and meaningful inferences regarding behavioural change to that of experimental and quasi-experimental designs.

Moreover, the analysis performed through the qualitative-systematic review, presented in Chapter 4, served to confirm previous findings related to the existence of several challenges in evaluating *behavioural additionality*, such as the tendency of some evaluation reports to produce ‘black-boxes’ of behaviour (as described by Gök, 2010; 2013; Edler et al., 2013; Amanatidou et al., 2014), the danger caused by falling into the project fallacy (described by Georghiou and Clarysse, 2006) and the prevalence of conceptual disagreement in the *behavioural additionality* concept (Amanatidou et al., 2014), even among evaluation reports following similar research designs and methodological frameworks.

Furthermore, the analysis in Chapter 4 centres the discussion around one additional challenge for those typically addressed by evaluation reports: the catalogue of behaviours trap. This effect, perceived in several ad-hoc surveys adapted to assess *behavioural additionality* (see Section 4.5), generates measurement problems when left untreated by narrowing the types of behavioural changes anticipated to occur.

Another contribution to the existing knowledge is provided in the case study (presented in Chapter 7 and analysed through Chapter 8), which identified five instances of behavioural change due to two specific mechanisms: artefact change and modifications to the ostensive aspects. In addition, some of the cases included in the research (particularly, cases B, C and D) expand the understanding of *behavioural additionality* effects expected to result from policy interventions in creative industries.

The major contributions generated by this research correspond to the methodological practice of assessing the *behavioural additionality* effect. Accordingly, what this thesis contributes to the existing body of knowledge is a deeper methodological understanding of the advantages and disadvantages of including CBM/TBE approaches for evaluating the *behavioural additionality* effect. The methodology developed a completely novel approach because of its unique combination of different tools and methods on which it is based: its three-step iterative evaluation model (see Figure 6.1), the extant routine research interview protocol, narrative analysis (see Table 6.2) and contribution analysis to aid in attributing policy effects (see Section 6.4.2).

Finally, the research contributes to the existing knowledge in a practical manner, by offering a set of evaluation guidelines (see next section below) for assessing the *behavioural additionality* effect of government interventions.

10.5 Recommendations for future practice and policy implications

Based on the application of the methodology, this section offers a set of methodological guidelines to be included in the evaluation toolkit of those evaluation practitioners and policymakers attempting to assess the *behavioural additionality* effect enacted by their interventions. Because these principles are of a practical nature, they may be observed as a stand-alone document; and their language is intended to convey this practical purpose. First, the methodology is restated, and then the guidelines presented.

To evaluate the *behavioural additionality* dimension of innovation and collaboration policies, an iterative, incremental three-step evaluation methodology is proposed. In the methodology, *behavioural additionality* is defined as the persistent modification of the way organisations conduct their innovation activities because of government policy support. The steps in the methodology are:

- *Planning*, in which a rapid assessment of the policy rationale is performed.
- *Contribution assessment*⁹⁵, in which the logic of the intervention is mapped against the anticipated effects; this makes explicit the logic of the intervention and the steps that lead to the expected outcomes (this process is known as developing a *programme theory*). Then, there is a comparison of the activities of the benefited organisation with the outcomes of participating in the programme and
- *Learning and adapting* (feedback loop), in which a reflective exercise occurs, regarding the implications of the contribution assessment to the proposed programme theory and to the policy under analysis with the aim of strengthening the contribution story, the programme theory and, ultimately, the policy itself.

Policy guidelines for conducting a full evaluation using the suggested approach

In the interest of fully developing the potential of the methodology, the following guidelines are proposed:

1. Attempt to incorporate two different lines of inquiry into the analysis. One is intended to identify the anticipated differences in the organisational behaviour that the policy is expected to enact, and the other is oriented towards understanding how the process of change manifested itself in each case under analysis.

⁹⁵ This step is based on the *contribution analysis framework* (see Mayne, 2012).

2. The basic unit of analysis used by the methodology is, in abstract terms, *the manner in which organisations conduct their innovative activities*. To approach innovation in more tangible terms, three equally important components are integral to the analysis: the agents within the organisation and their activities that result in innovation, the tools or technologies utilised in achieving their goals and the procedures guiding their actions.
3. Opt to use indicators for the assessment of change that reflect upon the history of the beneficiaries, their context and their actions. Similarly, remain open to the possibility that the effects of an innovation policy might influence organisations in unanticipated ways.
4. Consider explicitly the informational difference and the way in which input- and output-based indicators might complement the analysis of behavioural change, as their scope is often limited to specific phases of the innovation process.
5. Because changes in behaviour require different amounts of time and effort to materialise, it is useful to remain open to the possibility of including organisations of various sizes, from various industries, and at different stages of the funding cycle, as these differences provide richer lessons about the way organisations benefit from interventions and change their behaviour.
6. While integrating the programme theory, consider the opportunity to engage with the beneficiaries and include their perspectives and past experiences while using the policy instrument. Similarly, remember to include and give careful consideration to the guiding assumptions, the characteristics of the beneficiaries, and whether other policies might directly or indirectly affect innovation performance.
7. Exploit the methodological advantages offered by the case study approach: case studies provide rich and detailed information about specific cases, and are compatible with different data collection tools and analytical techniques.
8. Develop data collection instruments (for example, an interview protocol or questionnaire) that are flexible (to accommodate the different types of beneficiaries) and remember to ask about the way things were previously carried out within the organisation, how they are currently carried out, and the human reaction to these changes throughout the process.

9. When asking people about organisational change, consider their role within the organisation and the potential impact their answers might have on receiving future support.

In following this methodology, some of the products of the analysis include a set of in-depth descriptions of the process of organisational change. Use this evidence to reflect on the initial set of assumptions developed for the programme theory. In this sense, attempt to determine the contribution the programme has made to organisational behaviour by comparing the assumptions developed during the planning phase against the experiences of the policy beneficiaries. Finally, return to the initial set of assumption and redefine the initial programme theory with the lessons obtained and conduct additional assessments, repeating this process as required.

10.6 Limitations of the current study and further research opportunities

10.6.1 Limitations

The current research has some limitations, mostly with regard to issues present within the CBM and TBE approaches that shape the methodology.

In terms of CBM, two difficulties within the set of limitations evident in the case studies presented in Chapter 5 were relevant. First, keeping the number of cases under study manageable and second, the issue of generalising the research findings.

Regarding the number of cases, the present case study follows a small-*N* design, inclusive of six cases limited to specific periods of the firms' activities. As justified in Chapter 5, this number of cases was considered sufficient for answering the research question, as it enabled testing of the methodology in different settings. However, the implication of this decision is related to the actual number of organisational routines able to be investigated, leading to the exclusion of large or multinational companies from the analysis.

In this sense, to maintain the feasibility of the study, only those organisational routines that were impacted by the activities performed during the KTP were initially explored; and from those, one routine per organisation was investigated (see Chapter 8). This does not imply that the organisations had only one routine, but rather highlights a potential area of research, as more analysis on different routines is able to be performed (see the section on further research below).

Second, the matter of generalising the findings was initially covered in Chapter 5, when it was determined that the CBM can produce exemplary knowledge through the case studies. In that sense, the lessons provided by the case studies are limited to a reconstruction and interpretation of the experiences of the selected organisations before and after engaging in a KTP scheme through primary and secondary sources of information. Therefore, the inferences generated from the case studies serve only to describe operational procedures for analysing changes in behaviour. Moreover, the findings and conclusions are applicable at a methodological and (to a lesser extent) a theoretical level in the evaluation of policies intended to produce the *behavioural additionality* effect.

In terms of the TBE approach, the limitations observed by Weiss (1997) and described in Chapter 5 related to the problem of indeterminacy present in programme theories and the issues of practicality in data collection. Specifically, these two problems occurred because collecting data related to the ostensive and performative aspects of the routines in organisational settings is demanding and time-consuming. Furthermore, the study relied heavily on the interpretation of the primary and secondary sources of information in determining the different organisational routines impacted by the KTP activities. To this extent, the triangulation of evidence was useful.

The KTP programme theory benefited directly from the triangulation strategy; in this research, it served to create a (general) logical framework (see Figure 7.1) with an increased external validity, which was refined and utilised to reflect upon the lessons gained through the research (cf. Figure 9.1). In this sense, an important limitation is present, because the sources of information to produce the programme theory do not include interviews with the KTP programme management. Nevertheless, this limitation does not invalidate the assumptions presented in the KTP programme theory for three main reasons.

First, as indicated in Chapter 5, although programme theories are stronger when they rely on different sources of information, their iterative nature enables the inclusion of different perspectives at later stages of the evaluation exercise. Therefore, the decision to rely on secondary sources of information to represent the view of the programme's management was justified because it helped to maintain the feasibility of conducting the research and focused on the objective of the research, to test the methodology, rather than to conduct an evaluation of the KTP scheme.

Second, the objectives of the KTP programme management are conveyed by the analysis of existing evaluations (such as Ternouth et al., 2012; NCUB 2013a, b; NCUB 2014, see Chapter 5). Third, for the purposes of this research, the views of the programme managers hold a similar value to other sources of information, such as the beneficiaries' view of the KTP scheme in addition to secondary data regarding the programme's performance.

Finally, the methodology is constrained by decisions related to data collection tools and methods. As described in Chapter 5, both CBM and TBE are compatible with different quantitative and qualitative methods for gathering and analysing information. However, for the purposes of this research, the focus is exclusively on in-depth interviews and interpretation of secondary informational sources from the case studies, thus excluding other methods (such as ethnographic approaches or descriptive statistics) that are also employed to analyse behavioural change (as shown in Chapter 3).

Nevertheless, based on the findings provided by the case study approach, it is possible to argue that the methods used in this research are capable of generating evidence that has a high explanatory potential; and when these tools and methods are combined (as suggested in this research) this methodology is better able to determine the *behavioural additionality* effect, as opposed to a mono-method approach (i.e. only conducting in-depth interviews).

Finally, the focus of the thesis was to test a methodology (rather than to conduct a full evaluation of the KTP scheme), focusing exclusively on the *behavioural additionality* dimension and consequentially excluding input or output additionality assessments, as well as any other aspect of performance analysis of the KTP scheme. However, the methodology partially serves as the basis of a pilot assessment of the programme, because testing and validating the methodology in six case studies required approaching different people and organisations and understanding the impact of engaging in a KTP project on the performance of those actors in real settings.

10.6.2 Further research

Based on the thesis findings and the limitations above, it is possible to generate a future research agenda.

First, given the usefulness of the methodology to identify the *behavioural additionality* effect in small and medium-sized firms, a new line of inquiry opens, focused on developing additional case studies on multiple potential routines within a single large or multinational organisation, particularly for the purpose of observing firm-specific mechanisms for developing artefacts or monitoring the decision-making process that governs the organisations. It is anticipated that this line of inquiry would face difficulties related to the *catalogue of behaviours trap*, in particular with the respondent's role, given that the decision-making processes, the operative processes of multinationals and the activities of the organisations are complex, stratified and take place in more than one location. This also increases the resources, such as time and effort, required for the exercise.

In this sense, to reduce the challenges present with the case, one strategy is to begin by producing a theory of change explicitly produced with consideration of the characteristics of large and multinational companies, and the anticipated effects, followed by a rapid assessment of the routines operating in the organisation, which leads to the potential choice of focusing on single routines for the entire organisation, or one routine across departments and sites.

Second, as indicated in the previous section, further research may need to replicate the methodology by refining the tools and methods applied in the thesis for use in different policy contexts. Thus, it would be interesting from both an empirical and a methodological perspective to perform a full *behavioural additionality* evaluation, employing the CBM/TBE approach as suggested in this research for the KTP scheme or another programme (by adopting the principles highlighted in Section 10.4).

A full evaluation of the KTP could focus on covering the six cases presented in the research, in tandem with other cases from similar industries/knowledge areas, to compare and understand the different patterns that generate organisational routines. Another line of inquiry for the assessment of the KTP could focus exclusively on the patterns that generate specific aspects of the routines, either the process of developing artefact changes, or the way in which performances varied from the intervention. If this path is taken, then it is useful to observe that the description would offer a partial representation of the routine, thus, requiring further complementary assessments of the other aspects. However, this line of inquiry would offer several elements that could feed the assumptions in a more holistic programme theory.

A third line of inquiry derived from the research is related to the topic of open innovation as a consequence of engaging in the KTP scheme. Open innovation was proposed as one of the potential outcomes in the KTP programme theory, as it is one of the objectives of the programme. Hence, further research could focus exclusively on identifying the patterns of change that lead to the generation of open innovation strategies in a set of new and varied cases.

In this sense, the KTP programme theory offered by this research becomes useful as an instrument guiding the first steps of the analysis. Following this approach, the inquiry should incorporate questions such as: how does the KTP partnerships embed an open innovation culture, in a set of cases and which organisational routines are developed to engage in open innovation following engagement with a KTP?

One practical challenge faced by this research was determining when sufficient information has been collected regarding a specific routine; that is, identifying the point at which the data collection process has gathered sufficient evidence for claiming that a routine is completely formed. This element is important because it was determined (see Chapter 6) that organisational routines are emergent systems in constant change. This characteristic has implications for the decision regarding when to conduct the evaluation exercise (for example, in a real-time evaluation).

Based on the observations made in this thesis, some further research questions can be formulated with regard to routines, including: Given the emergent character of organisational routines, at which point in time and at which level of detail is it sensible to stop gathering data about routines and determine whether a behaviour is integrated? In addition, at which point does the analysis become conclusive? Future research should, therefore, concentrate on the investigation of the limits of organisational routines.

Finally, further research might explore the usefulness of incorporating different data collection methods and analytical techniques, such as the ones employed in this research, to be combined with the CBM/TBE approach. One particular example is logic models to create programme theories. As mentioned in Section 5.3.2 and restated in Chapter 6, the logic framework matrix is but one of the various tools to map the logic of interventions. Thus, the approach developed for this thesis is suitable to combine with other approaches, such as logic arguments or path analysis (Astbury and Leeuw, 2010) to understand how to assess the *behavioural additionality* effect with the added benefit that the assumptions and policy guidelines presented in this research would serve as a framework to guide the analysis.

References

References

- Adler, P.S., Goldaftas, B., and Levine, D.I., (1999), Flexibility Versus Efficiency: A Case Study of Model Changeovers in the Toyota Production System, *Organization Science*, 10, pp. 43–68.
- Aerts, K., and Schmidt, T., (2008), Two for the price of one? Additionality effects of R&D subsidies: A comparison between Flanders and Germany, *Research Policy* 37 (2008), pp. 806–822.
- Afcha-Chávez, S.M, (2011a), The Impact of Subsidies to R&D: Empirical Evidence on Alternative Assessment Approaches, *Revista CTS*, 17 (6), April 2011, pp.139 -159.
- Afcha-Chávez, S.M., (2011b), Behavioural Additionality in the Context of Regional Innovation Policy in Spain, *Innovation: Management, Policy & Practice*, (2011), 13, No.1 pp.95-110.
- Afcha-Chávez, S.M., (2012), Analysing the Interaction Between R&D Subsidies and Firm's Innovation Strategy, *Journal of Technology Management & Innovation*, 7 (3), pp. 57-70.
- Afcha, S., and García-Quevedo, J., (2014), The Impact of R&D Subsidies on R&D Employment Composition, *Document de treball de l'IEB 2014/22*.
- Aime, F., et al., (2010), The routine may be stable but the advantage is not: Competitive implications of key employee mobility, *Strategic Management Journal*, 31, pp. 75–87.
- Albors-Garrigos, J., and Rodriguez Barrera, R., (2011), Impact of Public Funding on a Firm's Innovation Performance. Analysis of Internal and External Moderating Factors, *International Journal of Innovation Management* 15, 1297-1322.
- Alkin, M.C, (Ed.), (2013), Evaluation Roots: A Wider Perspective of Theorists' Views and Influences, 2nd Edition, SAGE Publications.
- Allen Consulting Group (2000), Evaluation of the [Australian] R&D Start Program, Final Report to the Department of Industry Science and Resources, November 2000.
- Amanatidou, E., et al., (2014), Using Evaluation Research as a Means for Policy Analysis in a 'New' Mission-Oriented Policy Context, *Minerva* (2014), 52, pp. 419–438.
- Amit, R., and Schoemaker, P.J., (1993), Strategic Assets and Organisational Rent, *Strategic Management Journal* 14 (January), pp.33-46.
- Antonioli, D., Marzucchi, A., and Montresor, S., (2014), Regional Innovation Policy and Innovative Behaviour: Looking for Additional Effects, *European Planning Studies*, 22 (1), pp. 64-83.
- Aragón et al., (2014), A Social Capital Approach for Network Policy Learning: the Case of an Established Cluster Initiative, *European Urban and Regional Studies*, 2014, Vol. 21(2), pp. 128–145.
- Arrow, K., (1962), Economic Welfare and The Allocation of Resources for Invention, pp. 604-626.
- Arvanitis, S., et al., (2002), The Effectiveness of Government Promotion of Advanced Manufacturing Technologies (AMT): An Economic Analysis Based on Swiss Micro Data, *Small Business Economics*, December 2002, Volume 19 (4), pp. 321-340.

References

- Aschhoff, B., Fier, A., and Löhlein, H., (2006), Detecting Behavioural Additionality: An Empirical Study on the Impact of Public R&D Funding on Firm's Cooperative Behaviour in Germany, Discussion Paper No. 06-037, ZEIW, Centre for European Economic Research.
- Astbury, B., and Leeuw, F.L., (2010), Unpacking Black Boxes: Mechanisms and Theory Building in Evaluation, American Journal of Evaluation, 31(3), pp. 363-381, SAGE.
- Alslev Christensen, T., (2011), Business Research, Development and Innovation in Denmark - Policies and Effects, in Danish Ministry of Science, Innovation and Higher Education, Denmark.
- Autio, E., Kanninen, S., and Gustafsson, R., (2008), First and Second-order Additionality and Learning Outcomes in Collaborative R&D Programs, Research Policy (37), pp. 59-76.
- Bach, L., and Matt, M., (2002), Rationale for Science & Technology Policy, in Georghiou, L., Rigby, J., Cameron, H. (Eds.), Assessing the Socio-economic Impacts of the Framework Programme (ASIF), Manchester, UK.
- Bach, L., and Matt, M., (2005), From Economic Foundations to S&T Policy Tools: a Comparative Analysis of the Dominant Paradigms, In: Llerena, P., & Matt, M., (eds.) Innovation Policy in a Knowledge-Based Economy: Theory and Practice. Berlin Heidelberg: Springer.
- Bakewell, O., and Garbutt, A., (2005), The use and abuse of the logical framework approach, Final Report for SEKA/SIDA, Sweden.
- Bakhshi, H., et al., (2013), An experimental approach to industrial policy evaluation: The case of Creative Credits, ERC Research Paper No.4, June 2013.
- Barney, J., (1991), Firm Resources and Sustained Competitive Advantage, Journal of Management, 17, pp. 99-120.
- Bayona-Sáez, T., et al., (2013), The Impact of Open Innovation on Innovation Performance: The Case of Spanish Agri-food Firms, Chapter 5 in García, M., (Ed.), Open Innovation in the Food and Beverage Industry, Woodhead Publishing Limited, Elsevier, pp. 74 -96.
- Becker, M.C., (2008a), Handbook of Organizational Routines. Edward Elgar Publishing, UK.
- Becker, M.C., (2008b). The Past, Present and Future of Organizational Routines: Introduction to the Handbook of Organizational Routines, in: Becker, M.C. (Ed.), Handbook of Organizational Routines. Edward Elgar Publishing, UK, pp. 3-15.
- Becker, M.C., and Lazaric, N. (Eds.), (2009), Organizational Routines: Advancing Empirical Research, Edward Elgar Publishing, UK.
- Benavente, J.M., Crespi, G., and Maffioli, A., (2007), Public Support to Firm-Level Innovation: An Evaluation of the FONTEC Program, Working Paper OVE/WP-05/07, Inter-American Development Bank (IDB), Office of Evaluation and Oversight, December, 2007. Washington, D.C.

References

- Bergman, K., et al., (2009), Effects of VINNOVA Programmes on Small and Medium-sized Enterprises - the cases of Forska&Väx and VINN-NU, VINNOVA Analysis, VA2010:09, VINNOVA Finland.
- Blatter, J., and Haverland, M., (2014), Desiging Case Studies: Explanatory Approaches in Small-N Research, Palgrave MacMillan, UK.
- Bloch, C., et al., (2014), Developing a methodology to assess the impact of research grant funding: A mixed methods approach, Evaluation and Program Planning 43, pp. 105–117.
- Boekholt, P., et al., (2001), An International Review of Methods to Measure Relative Effectiveness of Technology Policy Instruments, Final report, JULY 2001, for Technopolis.
- Borgar Hansen, T., Karlsson, T. and Godø, H., (2005). Evaluation of the DEMO 2000 program, RAPPORT 7/2005, NIFUSTEP.
- Branstetter, L., and Sakakibara, M., (2002), When Do Research Consortia Work Well and Why? Evidence from Japanese Panel Data, The American Economic Review, Vol. 92 (1), pp.143-159.
- Breiger, R.L., (2013), On the Duality of Cases and Variables: Correspondence Analysis (CA) and Qualitative Comparative Analysis (QCA), Chapter 13 in Byrne, D., and Ragin, C.C., (Eds.), (2013), The SAGE Handbook of Case-Based Methods, SAGE
- Breschi, S., et al, (2009), Networked Research: European Policy Intervention in ICTS, Technology Analysis & Strategic Management, Vol. 21, No. 7, October, pp. 822 – 857.
- Breuker, D., and Matzner, M, (2013), Statistical Sequence Analysis for Business Process Mining and Organizational Routines, Proceedings of the 21st European Conference on Information Systems, ECIS, 2013, Completed Research Paper 192.
- Bronzini, R., and Blasio, G., (2006), Qual é L'effetto degli Incentivi Agli Invetimenti? Una Valutazione della Legge 488/92, Temi di Discussione del Servizio Studi No. 582, Marzo, 2006, Banca d' Italia, Italia.
- Bush, V., (1945), Science, the Endless Frontier; a Report to the President on a Program for Post war Scientific Research, July, 1945, Washington, DC, U.S. Government Printing Office.
- Buisseret, T., Cameron, H., Georghiou, L., (1995), What Difference Does It Make? Additionality in the Public Support of R&D in Large Firms, Int. J. of Technology Management, Vol. 10, pp. 587 - 600.
- Business Growth Service, (2015), Incorporating Growth Accelerator, [Online], Available from: <http://www.ga.businessgrowthservice.greatbusiness.gov.uk/what-is-growthaccelerator/>.
- Busom, I., (2000), An Empirical Evaluation of the Effects of R&D Subsidies, Economics of Innovation and New Technology, 9(2), pp. 111-148.
- Busom, I., and Fernández-Ribas, A., (2008), The impact of firm participation in R&D programmes on R&D partnerships, Research Policy 37, pp. 240-257.

References

- Byrne, D., (2013a), Case-Based Methods: Why We Need Them; What They Are; How To Do Them, Introduction in Byrne, D., and Ragin, C.C., (Eds.), (2013), The SAGE Handbook of Case-Based Methods, SAGE.
- Byrne, D., (2013b), Evaluating Social Complex Interventions in a Complex World, *Evaluation* 19 (3), pp. 217 – 228.
- Byrne, D., and Ragin, C.C., (Eds.), (2013), The SAGE Handbook of Case-Based Methods, SAGE.
- Centre for Enterprise and Economic Development Research (CEEDR), (2012), Early Assessment of the UK Innovation Investment Fund, BIS, May 2012.
- Chelimsky, E., (2013), The Purposes of Evaluation in a Democratic Society, Chapter 1 in Shaw, I.F., and Greene, J.C., (Eds.), (2013), Handbook of Evaluation: Policies, Programs and Practices, SAGE Publishing, London.
- Chen, H.T., (2005), Theory-Driven Evaluation, in S. Mathison (Ed.), *Encyclopaedia of Evaluation*, pp. 415-419, Thousand Oaks, CA: Sage.
- Chesbrough, H.W., (2003), Open Innovation: The New Imperative for Creating and Profiting from Technology, April, 2003, Harvard Business School Press, USA.
- Chudnovsky, D., López, A., Rossi, M., and Ubfal, D., (2006), Evaluating a Program of Public Funding of Scientific Activity: A Case Study of FONCYT in Argentina, Working Paper: OVE/WP-12/06, November, 2006, Inter-American Development Bank, Washington, D.C.
- Clarysse, B., Bilsen, V., and Steurs, G., (2006), Behavioural Additionality of the R&D Subsidies Programme of IWT-Flanders (Belgium), Chapter 5 in OECD, (2006), *Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality*, OECD Publishing, France.
- Clarysse, B., Wright, M., and Mustar, P., (2009), Behavioural additionality of R&D Subsidies: A learning Perspective, *Research Policy*, 38(10), pp. 1517 -1533.
- Clarysse, B., et al., (2004), Measuring Additionality of R&D Subsidies with Surveys: Towards an Evaluation Methodology for IWT-Flanders, in: Georghiou, L., et al, (2004) (Ed.), “Making the Difference, the Evaluation of ‘Behavioural Additionality’ of R&D Subsidies”. IWT - Observatory no.48, Brussels.
- CM International UK Ltd, (2011), Welsh Government: Evaluation of the Classic Knowledge Transfer Partnership Programme in Wales, Final Report.
- Cohen, M.D., and Bacdayan, P., (1994), Organizational Routines Are Stored As Procedural Memory: Evidence from a Laboratory Study, *Organization Science* 5, pp. 554-568.
- Cohen, W.M., and Levinthal, D.A., (1990), Absorptive Capacity: A New Perspective on Learning and Innovation, *Administrative Science Quarterly*, Vol. 35 (1), Special Issue: Technology, Organizations, and Innovation. (Mar., 1990), pp. 128-152.

References

- Cohen, M.D., et al., (1996), Routines and Other Recurring Action Patterns of Organizations: Contemporary Research Issues, *Industrial and Corporate Change* 5, pp. 653-698.
- Consultrans, (2005), Evaluación del Programa de Fomento de la Investigación Técnica Profit (2000-2003) en el area de Tecnologías de Información y las Telecomunicaciones, Informe Final, Madrid, 2005.
- Cooke, P., et al, (2007), Evaluation Report by the VINNVÄXT International Review Team, VINNOVA Report, VR 2007:11, September 2007, VINNOVA, Sweden.
- Cooke, P., et al, (2008), VINNVÄXT II: Generalist and Specialist Evaluation of Process and Knowledge Development (2004- 2007), VINNOVA Report, VR 2008:12, June 2008, VINNOVA, Sweden.
- Coryn, C.L.S., et al., (2011), A Systemic Review of Theory-Driven Evaluation Practice from 1990 to 2009, *American Journal of Evaluation*, 32 (2), pp. 199- 226.
- Cowling, M. (2010), Economic evaluation of the Small Firms Loan Guarantee (SFLG) scheme, Urn 10/512, Department for Business, Innovation and Skills, Institute for Employment Studies, January 2010.
- Crespi, G., Maffioli, A., and Melendez, M., (2011), Public Support to Innovation: the Colombian COLCIENCIAS' Experience, Inter-American Development Bank, Technical Notes, No. IDB-TN-264, April 2007, BID.
- Cristovam, E., et al., (2000), Gender Preference in Hedonic Ratings for Espresso and Espresso-Milk Coffees, *Food Quality and Preference*, (11), pp. 437-444.
- Cunningham, P.N., and Gök, A., (2012), The Impact and Effectiveness of Policies to Support Collaboration for R&D and Innovation, NESTA Working Paper Series No. 12 /06, March 2012.
- Cunningham, P.N., Gök, A., and Laredo, P., (2012), The Impact of Direct Support to R&D and Innovation in Firms, NESTA Working Paper Series, Compendium of Evidence on the Effectiveness of Innovation Policy Intervention, August 2012.
- Cyert, R.M., and March, J.G., (1963), A Behavioural Theory of the Firm, Prentice-Hall, New Jersey, USA.
- Czarnitzki, D., and Lopes-Bento, C., (2013), Value for money? New Microeconomic Evidence on Public R&D Grants in Flanders, *Research Policy*, 42 (1), February 2013, pp. 76-89.
- DAMVAD, (2011), The Impacts of Innovation Networks in Denmark – An Impact Study on Behaviour and Possible Economical Effects for the Danish Agency for Science, Technology and Innovation (DASTI), May, Final Report.
- DANIDA, (2012), Case Studies in Development Evaluation: Validity, Generalization and Learning: Highlights of an international Workshop: Copenhagen, May, 2012, *Evaluation*, 18(4), October 2012, SAGE publications, DOI: 10.1177/1356389012462939.
- Datta, L-E., The Practice of Evaluation: Challenges and New Directions, Chapter 19 in Shaw, I., Greene, J.C., and Mark, M., (Eds.) (2013), *The SAGE Handbook of Evaluation*, SAGE Publishing, London, UK.

References

- Davenport, S., Grimes, C., and Davies, J., (1998), Research Collaboration and Behavioural Additionality: A New Zealand Case Study, *Technology Analysis & Strategic Management*, 10(1), pp. 55- 68.
- David, P.A., Geuna, A., and Steinmueller, W.E., (1995), Additionality as a Principle of European Funding. Final Report, STOA Programme, European Parliament, 14 June, MERIT, Maastricht University, Nederland.
- De Laat, B., Warta, K. and Williams, K. (2001), Evaluation of ANVAR's "Procédure d'aide au Projet d'innovation", 1993 – 1999, Paper presented at the OECD, Paris, 4 November 2001.
- Delahais, T., and Toulemonde, J., (2012), Applying Contribution Analysis: Lessons from Five Years of Practice, *Evaluation* 18(3), pp. 281- 293.
- De Negri, J., Borges, M., and De Negri, F., (2006), The impact of university enterprise incentive program on the performance and technological efforts of Brazilian industrial firms, Working Paper: OVE/WP-13/06, December, 2006 Inter-American Development Bank, Washington, D.C.
- Denzin, N., and Lincoln, Y.S., (1998), Strategies for Qualitative Enquiry, Thousand Oaks, CA: Sage
- Department of Industry, Tourism and Resources (DITR) of Australia, (2006), Behavioural Additionality of Business R&D Grant Programmes in Australia, Chapter 2 in OECD (2006), *Government R&D Funding and Company Behaviour monitoring Behavioural Additionality*, OECD, France.
- Department of Trade and Industry (DTI), (2003), Strategic Review of LINK Collaborative Research, DTI/Report of the Independent Review Panel, London.
- Deuten, J. and Hiltunen, M. (2011), Peer Review of ZIM, the Central Innovation Programme for SMEs (Zentrales Innovationsprogramm Mittelstand), INNO-Partnering Forum.
- De Vaus, D., (2013), Research Design in Social Research, SAGE Publications Ltd., London, UK.
- DITR, (2007), How R&D Assistance Influences Company Behaviour: A Survey Investigating Behavioural Additionality Effects of the R&D Tax Concession Programme, Common Wealth of Australia.
- Dodgson, M., and Gann, D., (2010), Innovation: A Very Short Introduction, Oxford University Press, New York.
- Donaldson, S.I., and Lipsey, M.W., (2013), Roles for Theory in Contemporary Evaluation Practice: Developing Practical Knowledge, Chapter 2 in Shaw, I.F., Greene, J.C., and Mark, M.M., (Eds.), (2013), *Handbook of Evaluation: Policies, Programs and Practices*, SAGE Publishing, London.
- Donaldson, S.I., Christie, C.A., and Mark, M.M., (Eds.), (2009), What Counts as Credible Evidence in Applied Research and Evaluation Practice? SAGE Publications.
- Dutta et al., (2003), Pricing process as a capability: A resource-based perspective, *Strategic Management Journal*, 24(7), 615.

References

- D'Andrea, D., Hobday, M., and Prencipe, A., (2012), Exploring Organizational Routines in Project-Based Organisations, Working Paper, DRUID 2012, June 19 to June 21, CBS, Copenhagen, Denmark.
- Echarte, A., (2014), The Form and Function of the Artist Studio: A Pioneering Fine Art Knowledge Transfer Partnership Project Developed by Acme Studios and Central Saint Martins College of Art, The International Journal of Social, Political, and Community Agendas in the Arts, 7(4), 2014.
- Edler, J., et al., (2013), Impacts of Innovation Policy: Synthesis and Conclusion, NESTA working paper, 13/21, June, 2013.
- Edmonson, A.C., et al., (2001), Disrupted Routines: Team Learning and New Technology Implementation in Hospitals, Administrative Science Quarterly, 46, pp.685-716.
- Ellard, G., and Harvey, J., (Eds.), (2015), Studios for Artists: Concepts and Concrete. A Collaboration between Acme Studios and Central Saint Martins, Associate Editor Echarte, A., Blackdog Publishing.
- English Partnerships, (2008), Additionality Guide: A Standard Approach to Assessing the Additional Impact of Projects, Method Statement, Third Edition, October 2008.
- Etzkowitz, H., (1998), The Norms of Entrepreneurial Science: Cognitive Effects of the New University-Industry Linkages, Research Policy, 27 (8), pp. 823-833.
- EVAL-INNO (2012), Innovation Policy Appraisals Repository, [Online] Available from: http://www.eval-inno.eu/index.php/external-resources/wiki-pages/#http://www.eval-inno.eu/wiki/index.php/Innovation_Policy_Appraisals_Repository_%28IPAR%29 [In cache].
- Evaltec, (2003), Review of the IDA's Research and Development Capability Grants Scheme, Final Report, Evaltec, Dublin.
- Fagerberg, J., and Verspagen, B., (2009), Innovation Studies: The Emerging Structure of a New Scientific Field, Research Policy, 38(2), pp. 218-233, March.
- Falk, R., (2004), Behavioural Additionality Effects of R&D Subsidies: Empirical Evidence from Austria, Working Paper, Australian Institute of Economic Research (WIFO).
- Falk, R., (2006), Behavioural Additionality of Austria's Industrial Research Promotion Fund (FFF), Chapter 3 in OECD, (2006), Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality, ed. OECD. France: OECD Publishing.
- Falk, R., (2007), Measuring the Effects of Public Support Schemes on Firms' Innovation Activities Survey Evidence from Austria, Research Policy (36), pp.665-679.
- Faugert, S., et al, (2009), Summary: Impact of government Support to Automotive Research – Implications of Research and Renewal for the Competitiveness of the Swedish Automotive Industry, VINNOVA Analysis, VA 2009:02, April 2009, VINNOVA, Sweden.
- Feldman, M.S., (2000), Organizational Routines as a Source of Continuous Change, Organization Science, 11, pp.611-629.

References

- Feldman, M.S., (2004), Resources in Emerging Structures and Processes of Change, *Organization Science*, 15 (3), pp.295-309.
- Feldman, M.P., and Kelley, M.R., (2003) Leveraging Research and Development: Assessing the Impact of the U.S. Advanced Technology Program, *Small Business Economics* 20, pp.153-165.
- Feldman, M.S., and Pentland, B.T., (2003), Reconceptualizing Organizational Routines as a Source of Flexibility and Change, *Administrative Science Quarterly*, 48, March, pp. 94-118.
- Feldman, M.S., and Rafaelli, A., (2002), Organizational Routines as Sources of Connections and Understandings, *Journal of Management Studies* 39(3), May, 2002, pp.309- 331.
- Felin, T., and Foss, N.J., (2011), The Endogenous Origins of Experience, Routines, and Organizational Capabilities: The Poverty of Stimulus, *Journal of Institutional Economics*, Vol. 7, Special Issue no.2, June, 2011, pp.231-256.
- Fernández de Lucio, I., Jiménez-Sáez, F., and Castro-Martínez, E., (2005), Additionality Effects of a Science-Technology Policy: Its Contribution to the Articulation of a Sectoral System of Innovation, Working Paper A098, INGENIO (CSIC-UPV), Valencia, Spain.
- Fier, A., Aschhoff, B., and Löhlein, H., (2006), Behavioural Additionality of Public R&D Funding in Germany, Chapter 7 in OECD, (2006), *Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality*, OECD Publishing, France.
- Flyvbjerg, B., (2006), Five Misunderstandings About Case-Study Research, *Qualitative Inquiry*, vol. 12, (2), April 2006, pp. 219-245.
- Frankfort-Nachmias, C., and Nachmias, D., (2009), Research Methods in the Social Sciences, Fifth Edition, Hodder Education, UK.
- García, J., and Afcha-Chávez, S., (2009), El Impacto del Apoyo Público a la I+D Empresarial: Un Análisis Comparativo entre las Subvenciones Estatales y Regionales, *Investigaciones Regionales. Monográfico*, pp.277-294.
- George, A.L., and Bennett, A., (2005), Case Studies and Theory Development in the Social Sciences, BCSIA Studies in International Security, MIT Press, London, England.
- Georghiou, L., (2004), Evaluation of Behavioural Additionality: Concept Paper, in Georghiou et al., (2004), *Making the Difference, the Evaluation of 'Behavioural Additionality' of R&D Subsidies*, Brussels. IWT – Observatory no.48, Brussels.
- Georghiou, L., (2007), What Lies Beneath: Avoiding the Risk of Under – Evaluation, *Science and Public Policy*, 34 (10), December (2007), pp. 743 – 752.
- Georghiou, L., and Clarysse, B., (2006), Introduction and Synthesis, Chapter 1 in OECD (2006), *Government R&D Funding and Company Behaviour monitoring Behavioural Additionality*, OECD, France.

References

- Georghiou, L., et al., (2004), Making the Difference. the Evaluation of 'Behavioural Additionality' of R&D Subsidies, Brussels.
- Gibbert, M., Ruigrok, W., and Wicki, B., (2008), What Passes as a Rigorous Case Study, *Strategic Management Journal*, 29, pp. 1465–1474.
- Goertz, G., and Mahoney, J., (2013), Scope in Case Study Research, Chapter 17 in in Byrne, D., and Ragin, C.C., (Eds.), (2013), *The SAGE Handbook of Case-Based Methods*, SAGE.
- Gök, A., (2010), An Evolutionary Approach to Innovation Policy Evaluation: Behavioural Additionality and Organisational Routines, Doctoral Dissertation, Faculty of Humanities. Manchester Business School, UK.
- Gök, A., and Edler, J., (2012), The Use of Behavioural Additionality in Innovation Policy-Making, *Research Evaluation* 21, pp.306-318.
- Gulbrandsen, M., and Rasmussen, E., (2012), The Use and Development of Indicators for the Commercialisation of University Research in a National Support Programme, *Technology Analysis & Strategic Management*, 24 (5), May 2012, pp.481 -495.
- Hakim, C., (2000), Research Design: Successful Designs for Social and Economic Research, 2nd Edition, Routledge: London.
- Hales, M., and Tidd, J. (2009). The Practice of Routines and Representations in Design and Development. *Industrial & Corporate Change*, 18(4), pp.551–574.
- Hall, B., and Maffioli, A., (2008), Evaluating the Impact of Technology Development Funds in Emerging Economies: Evidence from Latin America, *European Journal of Development Research*, Taylor and Francis Journals, 20(2), pp.172-198.
- Harvey, D.L., (2013), Complexity and Case, Chapter 1 in Byrne, D., and Ragin, C.C., (Eds.), (2013), *The SAGE Handbook of Case-Based Methods*, SAGE.
- Hawe, P., Bond, L., & Butler, H. (2009), Knowledge theories can inform evaluation practice: What can a complexity lens add? In Ottoson, J.M., and Hawe, P., (Eds.), *Knowledge utilization, diffusion, implementation, transfer, and translation: Implications for evaluation*. *New Directions for Evaluation*, 124, pp.89–100.
- Hewitt-Dundas, N., Roper, S., (2010), Output Additionality of Public Support for Innovation: Evidence for Irish Manufacturing Plants. *European Planning Studies*, 18, pp.107-122.
- Hottenrott, H., and Lopes-Bento, C., (2014), R&D Collaboration and SMEs: The Effectiveness of Targeted Public R&D Support Schemes, *Research Policy*, 43, pp.1055–1066.
- Hsu, F-M., Horng, D-J., and Hsueh, C-C., (2009), The Effect of Government-sponsored R&D Programmes in Additionality in Recipient Firms in Taiwan, *Technovation* (29), pp. 204-217.

References

- Huergo, E., Trenado, M., and Ubierna, A., (2009), Impacto de los Créditos Blandos en el Gasto en I+D Empresarial: La Empresa Española y el Apoyo del CDTI a la I+D+I, Documentos de trabajo (7) CDTI, Universidad Complutense, Octubre.
- Hutchins, E., (1991), Organizing Work by Adaptation, *Organization Science*, 2, pp.14-29.
- Hutchins, E., (1995), How a Cockpit Remember its Speed, *Cognitive Science*, 2 (1), pp.14-39.
- Hyvärinen, J., (2006), Behavioural Additionality of Public R&D Funding in Finland, Chapter 6 in: OECD (Ed.), *Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality*. OECD Publishing, France.
- Hyvärinen, J., and Rautiainen, A-M., (2007), Measuring Additionality and Systemic Impacts of Public Research and Development Funding- The Case of TEKES, Finland, *Research Evaluation*, 16(3), September 2007, pp. 205- 215.
- IDEA Consult, (2006), Study and Evaluation of the Behavioural Additionality of R&D subsidies, (Final Report), IWT, November, 2006, Brussels.
- IDEA Consult, (2009), Does Europe Change R&D – Behaviour? Final Report, European Commission Research Directorate- General, Brussels, 2009.
- Imbens, G., and Lemieux, T., (2007), Regression Discontinuity Designs: A Guide to Practice, NBER Working Paper No. 13039, April 2007.
- Innovate UK (2015a), Guidance Innovation: Get Support and Advice, [Online] Available from <https://www.gov.uk/innovation-get-support-and-advice> [Accessed 12/08/2015].
- Innovate UK, (2015b), Knowledge Transfer Partnerships: Achievements and Outcomes 2013 to 2014, Innovate UK.
- International Economic Consultants (INDECON), (2003), Mid-term Evaluation of Productive Sector Operational Programme, Department of Enterprise, Trade and Employment, Ireland.
- Jaso, M., (2006), Evaluation of Research Collaboration in the Mexican Phyto-Pharmaceutical Sector, Doctoral Dissertation. MBS, University of Manchester, UK.
- Johnson, G., et al., (2007), Strategy as Practice Research Directions and Resources, Cambridge: Cambridge University Press.
- Joly, P-B., et al., (2015), ASIRPA: A Comprehensive Theory-Based Approach to Assessing the Societal Impacts of Research Organization, *Research Evaluation*, 24 (4), pp. 440- 453.
- Kim, E-S., and Song Y-I, (2007), Behavioural Additionality of R&D Evaluation: Empirical Evidence from Korea Public R&D Program, Working Paper PICMET- 2007 Proceedings, 5-9 August, Portland Oregon, USA, pp.2247 -2250.

References

- Knockaert, M., and Spithoven, A., (2009), Collective Research Centres and Behavioural Additionality, in: Spithoven, A., Knockaert, M., Clarysse, B. (Eds.), *Open innovation: The role of collective research centres in stimulating innovation in low tech SMEs* (Research Report). Vlerick Leuven Gent Management School, Belgium.
- Knockaert, M., et al., (2014), The impact of technology intermediaries on firm cognitive, capacity additionality, *Technological Forecasting & Social Change* 81, pp. 376–387.
- Knowledge Exchange, (2014), North West KTP Innovation Case Book, The University of Manchester, [Online] Available from <http://documents.manchester.ac.uk/display.aspx?DocID=22684> [Accessed October 2014].
- Knowledge Transfer Partnerships (KTP), (2014a), Knowledge Transfer Partnerships (KTP) [Online] Available from: <http://ktp.innovateuk.org/> [Accessed August 2012].
- Knudsen, T., (2008), Organizational Routines in Evolutionary Theory, in: Becker, M.C. (Ed.), (2008), *Handbook of Organizational Routines*. Edward Elgar Publishing, UK, pp. 125-151.
- KOF, (2004), Evaluation of the Austrian Industrial Research Promotion Fund (FFF) and the Austrian Science Fund (FWF), Joanneum Research, Technopolis, Universiteit Twente, WIFO, Synthesis Report, April 2004.
- Koh, C.S., Clegg, B., and Hall, M., (2013), The Importance of Team-working in Knowledge Transfer Partnerships, Working paper.
- Kolbenstvedt, M., (2007), Effects of Swedish Traffic Safety Research 1971-2004, Main Report, VINNOVA Analysis, VA 2007: 10, October 2007, VINNOVA, Sweden.
- KTP, (2014b), Current Partnerships, [Online] Available from: <http://info.ktponline.org.uk/action/search/current.aspx> [Accessed August 2012].
- KTP (2014c), Aims, [Online], Available from: <http://www.ktponline.org.uk/ktp-aims> [Accessed 20th January 2014].
- KTP (2014d), Completed Partnerships, [Online] Available from: <http://info.ktponline.org.uk/action/search/complete.aspx>.
- Lane, B.R., and Koka, B.R., (2006), The Reification of Absorptive Capacity: A Critical Review and Rejuvenation of the Construct, *Academy of Management Review*, 2006, 31(4), pp.833-863.
- Larosse, J., (2004), Chapter 3: Conceptual and Empirical Challenges of Evaluating the Effectiveness of Innovation Policies with Behavioural Additionality (The Case of IWT R&D Subsidies), in Georghiou, L., et al, (2004), “Making the Difference, the Evaluation of ‘Behavioural Additionality’ of R&D Subsidies”, IWT – Observatory no.48, Brussels.
- Lazaric, N., and Denis, B., (2005), Routinisation and Memorisation of Tasks, Inside a Workshop: The Case of the Introduction of ISO Norms, Post-Print, HAL-00457079.

References

- Lemola, T., and Lievonon, J., (2008), The Role of Innovation Policy in Fostering Open Innovation Activities among Companies, Report: Vision ERA-NET, 9 April 2008.
- Levitt, B., and March, J.G., (1988), Organizational Learning, Annual Review of Sociology, Vol. 14. (1988), pp. 319-340.
- Lewin, A. Y., Massini, S., and Peeters, C., (2011), Microfoundations of Internal and External Absorptive Capacity Routines, Organization Science, 22, (1), pp.81-98, doi: 10.1287/orsc.1100.0525.
- Lieberman, E.S., (2005), Nested Analysis as a Mixed-Method Strategy for Comparative Research, The American Political Science Review, 99 (3), August, 2005, pp. 435-452.
- Lindell, M.K., and Whitney, D.J., (2001), Accounting for Common Method Variance in Cross-Sectional Research Designs, Journal of Applied Psychology, 86 (1), pp. 114-121.
- Lincoln, Y., and Guba, E., (1986), Research, Evaluation and Policy Analysis: Heuristics and Disciplined Inquiry, Policy Studies Review, 5(3), pp. 546-565.
- Licht, G., (2003), The Role of Additionality in Evaluation of Public R&D Programmes, 11th Annual TAFTIE Seminar, Vienna, November 24-25, 2003.
- Madsen, E., and Brastad, B., (2006), Chapter 10: Behavioural Additionality of Innovation Norway's Financial Support Programmes, in OECD, (2006), Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality, OECD Publishing, France.
- Madsen, E., et al, (2008), Input, Output and Behavioural Additionality: Concepts and Relationships, Working Paper, 25th Celebration Conference on Entrepreneurship and Innovation- Organizations, Institutions, Systems and Regions, Copenhagen, CBS, Denmark, June 17-20, 2008.
- Magro, E., Aranguren, M., and Navarro, M., (2010), Does regional S&T policy affect firms' behaviour. In Regional Studies Association annual international conference, pp. 24-26.
- Malik et al., (2006), in OECD (2006), Behavioural Additionality of the UK SMART and LINK Schemes, Chapter 11 in OECD (2006), Government R&D Funding and Company Behaviour: Monitoring Behavioural Additionality, OECD, France.
- Mamuneas, T.P., and Nadiri, I.M., (1996), Public R&D Policies and Cost Behavior of the US Manufacturing Industries, Journal of Public Economics, Elsevier, 63(1), pp.57-81, December.
- Marino, M., and Parrotta, P., (2010), Impacts of Public Funding to R&D: Evidence from Denmark, Working paper DRUID summer conference 2010: 'Opening Up Innovation: Strategy, Organization and Technology'. Imperial College London Business School, June 16-18, 2010.
- Mark, M.M., (2009), Credible Evidence: Changing the Terms of the Debate, Chapter 12 in Donaldson, S.I., Christie, C.A., and Mark, M.M., (Eds.), (2009), What Counts as Credible Evidence in Applied Research and Evaluation Practice? SAGE Publications.

References

- Mark, M.M., and Henry, G.T., (2013), Methods for Policy-Making and Knowledge Development Evaluations, Chapter 14 in Shaw, I., Greene, J.C., and Mark, M., (Eds.) (2013), *The SAGE Handbook of Evaluation*, SAGE Publishing, London, UK.
- Mark, M.M., Greene, J.C., and Shaw, I.F., (2013), Introduction: The Evaluation of Policies, Programs and Practices, in Shaw, I., Greene, J.C., and Mark, M., (Eds.) (2013), *The SAGE Handbook of Evaluation*, SAGE Publishing, London, UK.
- Marzucchi, A., Antonioli, D., and Montresor, S., (2013), Innovation Cooperation Within and Across Regional Boundaries. What Does Innovation Policy Add? *Papers in Regional Science*, DOI: 10.1111/pirs.12079.
- Massini, S., (2010), Micro foundations of Absorptive Capacity Capabilities: The Role of Individuals in Shaping Organizational Routines, Working paper to be presented at the Summer Conference 2010 on "Opening Up Innovation: Strategy, Organization and Technology" at Imperial College London Business School, June 16 - 18, 2010, DRUID, 2010.
- Mateus, A., et al, (2003), Aviação Intercalar do Programa Operacional da Economia Relatório Final, Agosto Mateus e Associados, CISEP & Price Waterhouse Coopers, Novembro, 2003.
- Mayne, J., (2001), Addressing Attribution Through Contribution Analysis: Using Performance Measures Sensibly, *Canadian Journal of Programme Evaluation*, 16, pp.1-24.
- Mayne, J., (2008), Contribution Analysis: An Approach to Exploring Cause and Effect. ILAC (Institutional Learning and Change) Brief, [Online] Available from: <http://www.outcomemapping.ca> Accessed [20th September 2013].
- Mayne, J., (2011), Exploring Cause and Effect Questions Using Contribution Analysis, in Forss, K., Marra, M., and Schwarts, R., (Eds.), *Evaluating the complex: Attribution, contribution and beyond*. Mew Brunswick, NJ: Transaction Books.
- Mayne, J., (2012), Contribution Analysis: Coming of Age, *Evaluation*, 18 (3), pp.270-280.
- Meuleman, M., and De Maeseire, W., (2012), Do R&D Subsidies Affect SMEs Access to External Financing? *Research Policy* (41), pp.580 – 59.
- Miles, I., and Cunningham, P.N., (2006), SMART INNOVATION: A Practical Guide to Evaluating Innovation Programmes, A Study for DG Enterprise and Industry. ECSC-EC-EAEC Brussels-Luxembourg, 2006.
- Miner, A.S., (1991), Organizational Evolution and the Social Ecology of Jobs, *American Sociological Review*, 56, pp.772- 785.
- Miner, A.S., Ciuchta, M.P., and Gong, Y., (2008), Organizational Routines and Organizational Learning, Chapter 8 in Becker, M.C., (Ed.) *Handbook of Organizational Routines*, Edward Elgar, UK.

References

- Molas-Gallart, J., and Davies, A., (2006), Towards Theory-Led Evaluation: The Experience of European Science, Technology, and Innovation Policies, *American Journal of Evaluation*, Vol. 27 (1), March 2006 pp. 64-82.
- Mole, K., et al., (2006), Economic Impact Study of Business Link Local Service, in Department for Business Enterprise & Regulation Reform, Final Report, URN 07/1169, UK.
- Mosselman, M., and Prince. Y., (2004), Review of Methods to Measure the Effectiveness of State Aid to SMEs: Final Report to the European Commission, EIM Business and Policy Research, European Commission, Directorate-General Enterprise and Industry Unit, November 2004.
- Mowery, D., Oxley, J.E., and Silverman, B.S., (1996), Strategic Alliances and Interfirm Knowledge Transfer, *Strategic Management Journal*, 17, Special Issue: Knowledge and the Firm, (Winter, 1996, pp.77-91.
- Mungaray, A., López, S., and Moctezuma, P., (2013), La Adicionalidad de los Fondos Públicos en la Innovación Empresarial Mexicana: El Caso de Baja California, 2001-2010, *La Educación Superior* Vol. XLII (3), No.167 Julio-Septiembre 2013, 4 (168), Octubre – Diciembre, pp. 41 – 62.
- Narain, C., et al., (2003) , Free Choice and Conventional Profiling of Commercial Black Filter Coffees to Explore Consumer Perceptions of Character, *Food Quality and Preference*. 15 (2003), pp. 31–41.
- Narain, C., et al., (2004), Whitening and Sweetening Influences on Filter Coffee Preference, *British Food Journal*, 106 (6/7), pp. 465-478.
- Narduzzo A., (1998), Organizational Memory, Cognitive Artifacts and Routinization: Suggestions from a Field-study, *Revue Internationale de Systémique*, 12(1), pp. 51-62.
- National Centre for Universities and Business (NCUB) (Ed.), (2013a), Knowledge Transfer Partnerships: A Best Practice Approach to Open Innovation, 21st November 2013, London, UK.
- National Endowment for Science Technology and the Arts (NESTA), (2012), Compendium of Evidence on Innovation Policy, NESTA & Manchester Institute of Innovation Research (MIoIR), [Online], Available from: <http://www.innovation-policy.org.uk>. Accessed [20th January 2013].
- Nauwelaers, C., and Pellegrin, J., (2004), Evaluation des Expériences de Clustering en Région Wallone, MERIT, Maastricht University, Nederland.
- NCUB (Ed.), (2013b), Best practice strategies for successful innovation through university-business collaboration, 2nd December 2013, London, UK.
- NCUB (Ed.), (2014), Successful Engagement in Open Innovation: An Insight into Knowledge Transfer Partnerships for Academics, 16th July 2014, London, UK.
- NCUB (2015), Reports, [Online], Available from: <http://www.ncub.co.uk/reports.html> Accessed January 2015.

References

- Neicu, D., Teirlinck, P., and Kelchtermans, S., (2014), Dipping in the policy mix: do R&D subsidies foster behavioral additionality effects of R&D tax credits?, Working Paper MSI_1409, Faculty of Economics and Business Department of Managerial Economics, Strategy and Innovation, Kuleuven, België.
- Nelson, R.R., and Winter, S.G., (1982), An Evolutionary Theory of Economic Change, The Belknap Press of Harvard University Press, Cambridge, Massachusetts.
- Norwegian Agency for Development Cooperation (NORAD), (1999), The Logical Framework Approach (LFA): Handbook for Objectives-oriented Planning, 4th Edition.
- Okamuro, H., and Nishimura, J., (2014), Not just financial support? Another role of public subsidy in university–industry research collaborations, Economics of Innovation and New Technology (2014), Routledge.
- Olmos-Peñuela, J., Molas-Gallart, J., and Castro-Martínez, E., (2013), Informal Collaborations between Social Sciences and Humanities Researchers and Non-academic Partners, Science and Public Policy (2013), pp. 1-14.
- OMB Research (2010), Small Firms Loan Guarantee (SFLG) Scheme Recipient and Comparison Group Survey Results, URN 10/511, Department for Business, Innovation and Skills, January 2010.
- Organisation for Economic Co-operation and Development (OECD), (2006), Government R&D Funding and Company Behaviour: Monitoring Behavioural Additionality, OECD Publishing, France.
- OECD (2010), Measuring Innovation: A New Perspective, OECD Publishing, France.
- O'Brien, J.P., and Parthiban, D., (2014), Reciprocity and R&D Search: Applying the Behavioral Theory of the Firm to A Communitarian Context, Strategic Management Journal, 35 (4), pp. 550-565.
- O'Brien, M., et al., (2011), Model Predictive Control of an Activated Sludge Process: A Case Study, Control Engineering Practice, Volume 19 (1), January 2011, pp. 54–61.
- Özçelik, E., and Taymaz, E., (2008), R&D Support Programmes in Developing Countries: The Turkish Experience, Research Policy, 37 258- 275.
- PACEC, (2001), Evaluation of SMART (Including SPUR) 2001, Final Report and Appendices, DTI Evaluation Report Series No.3, SBSDTI, UK.
- PACEC, (2003), Evaluation on the Skills Impact of the Smart Scheme, Final Report, Department of Trade and Industry, July 2003.
- PACEC (2009), Evaluation of Grant for Research and Development & Smart, Final Report, URN 09/1059, DIUS/LDA.
- PACEC (2011), Technology Strategy Board Evaluation of the Collaborative Research and Development Programmes Final Report, September 2011. UK.

References

- PAGUNICONSULT, (2007), Survey on Training Projects Within the Measure 2.3 Scheme a) HRDSOP 2004-2006, Final Report, Research International Pentor, June 2007, Department for European Social Fund Management, Ministry of Regional Development.
- Parmigiani, A., and Howard-Grenville, J., (2011), Routines Revisited: Exploring the Capabilities and Practice Perspectives. The Academy of Management Annals 5, pp. 413-453.
- Patton, M.Q., (2004), Naturalistic Inquiry, in Lewis-Beck, M.S., Bryman, A., and Liao, T.F., (Eds.), (2004), The SAGE Encyclopaedia of Social Research Methods.
- Patton, M.Q., (2011), Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use. The Guilford Press, New York. NY.
- Patton, M.Q., (2012), A Utilization-Focused Approach to Contribution Analysis. Evaluation, 18(3), July 2012, pp.364-377.
- Pawson, R., (2002), Evidence-Based Policy: The Promise of 'Realist Synthesis', Evaluation 8(3), pp.340-358.
- Pawson, R., (2013), The Science of Evaluation: A Realist Manifesto, SAGE Publications, Ltd., London.
- Pawson, R., and Tilley, N., (2004), Realistic Evaluation, 7th Edition, SAGE Publications, Ltd., London.
- Pawson, R., et al., (2004), Realist synthesis: an introduction, ESRC Research Methods Programme, University of Manchester, RMP Methods Paper 2/2004.
- Pentland, B.T., (1995), Grammatical Models of Organizational Processes, Organization Science 6, pp. 541-556.
- Pentland, B.T., (2000), Will Auditors take over the World? Program, Technique and the Verification of Everything. Accounting, Organizations and Society, 25(3), pp. 307-313.
- Pentland, B.T., (2003), Conceptualizing and Measuring Variety in the Execution of Organizational Work Processes Management Science, 49, pp. 857-870.
- Pentland, B.T., (2011), The Foundation is Solid, If You Know Where to Look: Comment on Felin and Foss, Journal of Institutional Economics (2011), 7 (2), pp. 279 -293.
- Pentland, B.T., and Feldman, M.S., (2005), Organizational Routines as Unit of Analysis. Industrial and Corporate Change 14, 793 - 815.
- Pentland, B.T., and Feldman, M.S., (2007), Narrative Networks: Patterns of Technology and Organization, Organization Science, 18, pp. 781 – 795.
- Pentland, B.T., and Feldman, M.S., (2008a), Issues in Empirical Field Studies of Organizational Routines, Chapter 13 in Becker, M.C., (Ed.) Handbook of Organizational Routines, Edward Elgar, UK.
- Pentland, B.T., and Feldman, M.S., (2008b), Designing Routines: On the Folly of Designing Artifacts, While Hoping for Patterns of Action. Information and Organization, 18, 2008, p. 235.250.

References

- Pentland, B.T., and Rueter, H.H., (1994), Organizational Routines as Grammars of Action, Administrative Science Quarterly 39, pp. 484-510.
- Pentland, B.T., et al., (2011), The (N)ever Changing World: Stability and Change in Organizational Routines, Organization Science, 22(6), pp. 1369-1383.
- Pentland, B.T., et al., (2012), Dynamics of Organisational Routines: A Generative Model, Journal of Management Studies.
- Pentikäinen, T., (2000), Economic Evaluation of the Finnish Cluster Programmes, VTT Group for Technology Studies, Working Papers, No. 50.
- Pereiras, M.S., and Huergo, E., (2006), La Financiación de Actividades de Investigación Desarrollo e Innovación: Una revisión de la evidencia sobre el impacto de las ayudas públicas, Documentos de trabajo (1) CDTI, Universidad Complutense, Octubre.
- Perri, G., and Bellamy, C., (2012), Principles of Methodology: Research Design in Social Science, SAGE.
- Phillips, R.A., (2013), Enterprise Futures Event Report from Manchester Town Hall, The word, Graduate and Researcher Development Team, University of Manchester, [Online] Available from: <http://www.researchsupport.eps.manchester.ac.uk/theword/?p=5290> [Accessed: September 2014].
- Picciotto, R., (2012), Experimentalism and Development Evaluation: Will the Bubble Burst?, Evaluation, (18), 2, April, 2012, pp. 213 – 229.
- Playford, S., (2007), How R&D Assistance Influences Company Behaviour: A Survey Investigating Behavioural Additionality Effect of the R&D Tax Concession Program, Department of Industry, Tourism and Resources, July, 2007, Australia.
- Podsakoff, P.M., et al., (2003), Common Method Biases in Behavioural Research: A Critical Review of the Literature and Recommended Remedies, Journal of Applied Psychology, 88(5), pp. 879-903.
- Polt, W., and Psarra, F., (2006), Behavioural Additionality of the EU's 5th Framework Programme, Chapter 13 in OECD, (2006), Government R&D Funding and Company Behaviour, Measuring Behavioural Additionality, OECD Publishing, France.
- Practical Concepts Incorporated (PCI), (1979), The Logical Framework Approach: A Manager's Guide to a Scientific Approach to Design & Evaluation, Practical Concepts Incorporated, Washington, D.C. November 1979.
- Protogerou, A., Caloghirou, Y., and Siokas, E., (2013), Publicly-funded Collaborative R&D Networks as Drivers for Promoting Knowledge-intensive Entrepreneurship: an Exploratory Exercise, Paper presented at the 35th DRUID Celebration Conference 2013, Barcelona, Spain, June 17-19.
- Radas, S., and Anić, I.D., (2013), Evaluating Additionality of an Innovation Subsidy Program Targeted at SMEs: An Exploratory Study, Croatian Economic Survey, 15 (1), April 2013, pp. 61-88.

References

- Ragin, C.C., and Becker, H.S. (Eds.), (1992), What is a Case? Exploring the Foundations of Social Inquiry, Cambridge: Cambridge University Press.
- Reeve, D., et al, (2007), First Evaluation of the VINNOVA VINN Excellence Centres NGIL/HELIX/SAMOT and ECO² Together with the STEM Competence Centre CICERO, VINNOVA Report, VR 2007:14, November 2007, VINNOVA, Sweden.
- Reeve, D., et al, (2009), First Evaluation of the Berzelii Centra Programme and its Centres Exselent, UCFB, Uppsala Berzelii, SBI Berzelii, VINNOVA Report, VR 2009:03, February 2009, VINNOVA, Sweden.
- Regeneris Consulting Ltd, (2010). Knowledge Transfer Partnerships Strategic Review, in Technology Strategy Board (TSB), (Ed.), Final Report, UK.
- Rerup, C., and Feldman, M.S., (2011), Routines as a Source of Change in Organisational Schema: The Role of Trial-and-Error Learning, Academy of Management Journal, 54(3), pp. 577- 610.
- Rhodes, P., (2003), Evaluation of the Engineering Technicians Programme, DTI, UK.
- Riege, A.M., (2003), Validity and reliability tests in case study research: a literature review with “hands-on” applications for each research phase, Qualitative Market Research: An International Journal, Vol. 6(2), pp. 75 – 86.
- Rigby, J., (2005), Policy, Theory and Pragmatism: Implementing the UK’s Energy Efficiency Best Practice Programme, Policy & Politics, 33 (2), April 2005, pp.277-296.
- Rigby, J., Nugroho, Y., Morrison, K., and Miles, I., (2013), Who drives innovation?, Chapter 2 in Cox, D., and Rigby, J., (Eds.), Innovation Policy Challenges for the 21st Century, Routledge Studies in Innovation, Organization and Technology, Routledge, UK.
- Roessner, D., (2000), Outcomes and Impacts of the State/Industry- University Cooperative Research Centres (S/IUCRC) Program, Final Report, SRI International.
- Roessner, D., et al., (2010), The Economic Impact of Engineering Research Centers: Preliminary Results of a Pilot Study, Journal of Technology Transfer, 35, pp. 475-479.
- Rogers, P.J., (2008), Using Programme Theory to Evaluate Complicated and Complex Aspects of Interventions, Evaluation, 14(1), pp. 29-48.
- Rogers, J.D., and Jordan, G., (2011), Introduction to a Special section on Approaches to Predicting and Tracing R&D Program Effects for Policy Learning, Research Evaluation 20, pp. 263-266.
- Roper, S., and Hewitt-Dundas, N., (2012), Does Additionality Persist? A Panel Data Investigation of the Legacy Effects of Public Support for Innovation, DRUID Conference 2012, June 19 -21, CBS, Copenhagen, Denmark.
- Roper, S., and Xia, H., (2014), Innovation, innovation strategy and survival, ERC Research Paper No.17, February 2014.

References

- Rossi, P.H., Lipsey, M.W., and Freeman, H.E., (2004), Evaluation: A Systematic Approach, 7th Edition, Thousand Oaks, CA: Sage.
- Rubenstein, A.H., et al., (1977), Management Perceptions of Government Incentives to Technological Innovation in England, France, West Germany and Japan, *Research Policy*, 6(4), pp. 324-357.
- Ruegg, R., and Feller, I., (2003), A Toolkit for Evaluating Public R&D Investment Models, Methods, and Findings from ATP's First Decade. Prepared for Economic Assessment Office Advanced Technology Program National Institute of Standards and Technology Gaithersburg, MD 20899-4710, July 2003. Final Report.
- Sakakibara, M., Branstetter, L., (2003), Measuring the Impact of US Research Consortia, *Managerial and Decision Economics*, Vol. 24, No. 2/3, *Research Alliances and Collaborations* (Mar. - May, 2003), pp. 51-69.
- Salmenkaita, J.-P., and Salo, A., (2002), Rationales for Government Intervention in the Commercialization of New Technologies, *Technology Analysis & Strategic Management* 14, pp. 183 – 200.
- Sandberg, K.E., et al., (2005), Impacts of Neck Injuries Research at Chalmers University of Technology. Summary, VINNOVA Analysis, VA 2005: 05, April 2005 VINNOVA, Sweden.
- Santos, E., (2007), Adicionalidad de Comportamiento asociada a los Estímulos Fiscales en México: 2001-2005, Master Thesis in Economics and Technological Change, UAM-X, México.
- Sapsford et al., (2009), Trend and Cycle in Primary Commodity Prices: A Neo-Schumpeterian Interpretation, *Russian Journal of Economic Theory* vol. 3, pp. 160-169.
- Schein, E.H., (2010), Organisational Culture and Leadership, 4th Ed., John Willey & Sons.
- Schibany, et al., (2004), Evaluation FFF- Impact Analysis Background Report 3.2, Institute of Technology and Regional Policy INTEREG, Research Report Series No. 22, (2004), WIFO.
- Shadish, W.R., (1998), Evaluation Theory Is Who We Are, *American Journal Of Evaluation*, 19(1), 1-19.
- Shadish, W. R., Cook, T. D., and Campbell, D. T. (2002), Experimental and Quasi-experimental Designs for Generalized Causal Inference, Boston: Houghton Mifflin.
- Shaw, I.F., Greene, J.C., and Mark, M.M., (Eds.) (2013), The SAGE Handbook of Evaluation: Policies, Programs and Practices, SAGE Publishing, London, UK.
- Shin, T., (2006), Behavioural Additionality of Public R&D Funding in Korea, Chapter 9 in OECD (2006), *Government R&D Funding and Company Behaviour Measuring Behavioural Additionality*, OECD, France.
- Shipp, S., et al., (2005), Evaluation Best Practices and Results: The Advanced Technology Program, Final Report for the U.S. National Institute of Standards and Technology, May 2005.

References

- Shipp, S., et al., (2006), Behavioural Additionality of the US Advanced Technology Programme, Chapter 12 in OECD (2006), Government R&D Funding and Company Behaviour Measuring Behavioural Additionality, p.219.
- Simachev, Y., et al., (2015), Public Support for Innovation in Russian Firms: Looking for Improvements in Corporate Performance Quality, International Atlantic Economic Society, 2015, Springer.
- Simon, H.A., (1947), Administrative Behavior: A Study of Decision-making Processes in Administrative Organizations, The Free Press.
- Simonin, B.L., (1997), The Importance of Collaborative Know-How: An Empirical Test of the Learning Organization, Academy of Management Journal, Vol. 40 (5), pp.1150 – 1174.
- Siora, G., et al., (2015), KTP Programme: The Impacts of KTP Associates and Knowledge Base on the UK Economy, WECD and Cambridge Econometrics, July 2015. UK.
- SQW Consulting (2009a), Synthesis of Evaluation Evidence: Final report for the Department for Business, Enterprise and Regulatory Reform, 2009.
- SQW Consulting (2009b), Pushing the boundaries of impact evaluation: Report on knowledge development possibilities, April 2009.
- Solem, R.R. (1987), The Logical Framework Approach to Project Design, Review and Evaluation in A.I.D.: Genesis, Impact, Problems and Opportunities, A.I.D. Working Paper 99, Center for Development Information & Evaluation Agency for International Development, Washington, D.C. April 1987.
- Stake, R.E. (1978), The Case Study Method in Social Inquiry, Educational Researcher, 7, pp. 5-8.
- Stake, R.E., (2000), Case Studies, in Denzin, K., and Lincoln, Y.S. (Eds.), Handbook of Qualitative Research, 2nd Edition, pp. 434-454 Thousand Oaks, CA: SAGE.
- Stake, R.E., (2010), Qualitative Research, New York: Guilford Press.
- Stame, N., (2004), Theory-led evaluation and types of complexity, Evaluation, 10 (1), pp. 58-76.
- Steurs, et al., (2006), A Look into the Black Box: What Difference do IWT R&D Grants Make for their Clients?, M&A Studies 56, IWT, Brussels.
- Steyer, S., (2006), Behavioural Additionality in Austria's Kplus Competence Centre Programme, Chapter 4 in OECD (2006), Government R&D Funding and Company Behaviour Measuring Behavioural Additionality, OECD, France.
- Stufflebeam, D.L., and Shinkfield, A.J., (2007), Evaluation Theory, Models and Applications, San Francisco, Jossey-Bass.
- Suchman, E., (1967), Evaluative Research: Principles and Practice in Public Service and Social Programs, New York, NY: Russell Sage Foundation.

References

- Suzuki, J., and Yumitori, S., (2006), Behavioural Additionality of Public R&D Funding in Japan, Chapter 8 in OECD (2006), Government R&D Funding and Company Behaviour Measuring Behavioural Additionality, OECD, France.
- Team Technologies, (2005), The Logframe Handbook: A Logical Framework Approach to Project Cycle Management, Working Paper no 31240, World Bank, Washington, D.C., USA.
- Teece, D., et al., (1990), Firm Capabilities, Resources and the Concept of Strategy, CCC Working Paper no. 90-8, University of California.
- Teece, D.J., Pisano, G., and Shuen, A., (1997), Dynamic capabilities and strategic management, *Strategic Management Journal* 18, pp. 509-533.
- Teirlinck, P., and Spithoven, A., (2010), Fostering Industry-Science Cooperation through Public Funding: Differences between Universities and Public Research Centres, *Journal of Technology Transfer* 37, pp. 676-695.
- Tellis, W., (1997), Application of a Case Study Methodology, *The Qualitative Report*, Vol. 3, September, 1997.
- Ternouth, P., et al., (2012), Key Attributes for Successful Knowledge Transfer Partnerships, Report on behalf of the Council for Industry and Higher Education (CIHE), TSB, August 2012.
- Ternouth, P., (2014), The Power and Reach of the KTP Model, [Online] Available from: <http://www.ncub.co.uk/ktp/the-power-and-reach-of-the-ktp-model.html> [Accessed: 28th August 2014].
- The European Network of Innovation Agencies, (TAFTIE), (2003), Additionality: Making Public Money Make A Difference, 24-25th November, 2003, Annual TAFTIE Seminar, Vienna.
- Thomas, G., and Myers, K., (2015), The Anatomy of the Case Study, SAGE Publications Ltd., London, UK.
- Trochim, W., (1989), Outcome Pattern Matching and Program Theory, *Evaluation and Program Planning*, 12(4), pp. 355.
- Tsai, W., (2001), Knowledge Transfer in Intra-organizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance, *The Academy of Management Journal*, Vol. 44, No. 5 (Oct., 2001), pp. 996-1004.
- Tsipouri, L., et al., (2009), European Innovation Progress Report 2009, DG Enterprise and Industry, European Commission, 2009.
- Turner, S.F., and Fern, M.J. (2012), Examining the Stability and Variability of Routine Performances: The Effects of Experience and Context Change, *Journal of Management Studies*, 49(8), December, 2012.
- Turner, S.F., and Rindova, V., (2012), A Balancing Act: How Organizations Pursue Consistency in Routine Functioning in the Face of Ongoing Change, *Organization Science*, 23(1), pp. 24-46.

References

- University of Brighton, (2014), KTP Associates Conference, [Online] Available from: <https://www.brighton.ac.uk/business-and-community-partnerships/research-and-development/knowledge-transfer-partnership/events.aspx>, [Accessed: November 2014].
- Veen, et al., (2005), Evaluation Leading Technological Institute, Final Report, Technopolis, December 2005.
- Wanzenböck, I., Scherngell, T., and Fischer, M., (2013), How do Firm Characteristics Affect Behavioural Additionalities of Public R&D Subsidies? Evidence for the Austrian Transport Sector, *Technovation* 33, pp. 66-77.
- Weiss, C.H., (1997), How can Theory-Based Evaluation Make Greater Headway? *Evaluation Review*, 21 (4), August 1997, pp. 501-524. Sage Publications, Ltd.
- Weiss, C.H., (1998), Evaluation: Methods for Studying Programs and Policies, 2nd Ed., Upper Saddle River, NJ: Prentice Hall.
- Weiss, C.H., (2000), Which Links in which Theories Shall we Evaluate? Programme Theory in Evaluation: Challenges and Opportunities, *New Directions for Evaluation*, 87, pp. 35-45.
- Wimbush, E., Montague, S. and Mulherin, T., (2012), Applications of contribution analysis to outcome planning and impact evaluation, *Evaluation*, 18 (3), pp. 310-329.
- Winter, S.G., (2003), Understanding dynamic capabilities, *Strategic Management Journal* 24, pp. 991-995.
- Wong, P-K, and He, Z-L., (2001), The Moderating Effect of Firm's Internal Climate for Innovation On the Impact of Public R&D Support Programs, Nelson and Winter Conference, Aalborg, June 12-15, 2001.
- Woolcock, M., (2009), Towards a Plurality of Methods in Project Evaluation: A Contextualised Approach to Understanding Impact Trajectories and Efficacy, *Journal of Development Effectiveness*, Vol. 1, (1), pp. 1-14.
- Woolcock, M., (2013), Using Case Studies to Explore the External Validity of 'Complex' Development Interventions, *Evaluation* 19 (3), 229 – 248.
- Yin, R.K., (2014), Case Study Research: Design and Methods, Fifth Edition, SAGE Publications, Inc. USA.
- Zahra, S., and George, G., (2002), Absorptive Capacity: A Review, Reconceptualization, and Extension, *Academy of Management Review* 27, pp. 185 - 203.

Annex A. KTP *Behavioural Additionality* Case
Study Protocol

A.1 Introduction

This annex contains the protocol employed to design, collect and analyse the data and information composed, initially for Case A to determine if the Company Based Partner generated *behavioural additionality* from its involvement in the KTP scheme. Therefore, the protocol fulfils a significant role in the research. It enables the *replication* of the different tools and methods and strategies for each of the additional cases included in the case study (B, C, D, E, and F).

It is important to highlight that the protocol complements the discussions initially presented in Chapter 5. Therefore, the protocol's focus is related only to present tools and methods as part of a standardised agenda. The protocol contains three sections. Section A.2 provides an overview of the case study and the procedure (flowchart) followed to develop the cases. Section A.3 includes the questionnaire developed as a product of the research and the data collection procedure. Finally, Section A.4 includes the glossary employed in the research.

A.2 Overview of the case study

The aim of this case study is to test a methodology developed to evaluate the *behavioural additionality* of innovation policies in an applied setting. Thus, demonstrating its applicability. That is, assisting to corroborate, modifying and advancing the empirical methods available for studying the behavioural change in organisations.

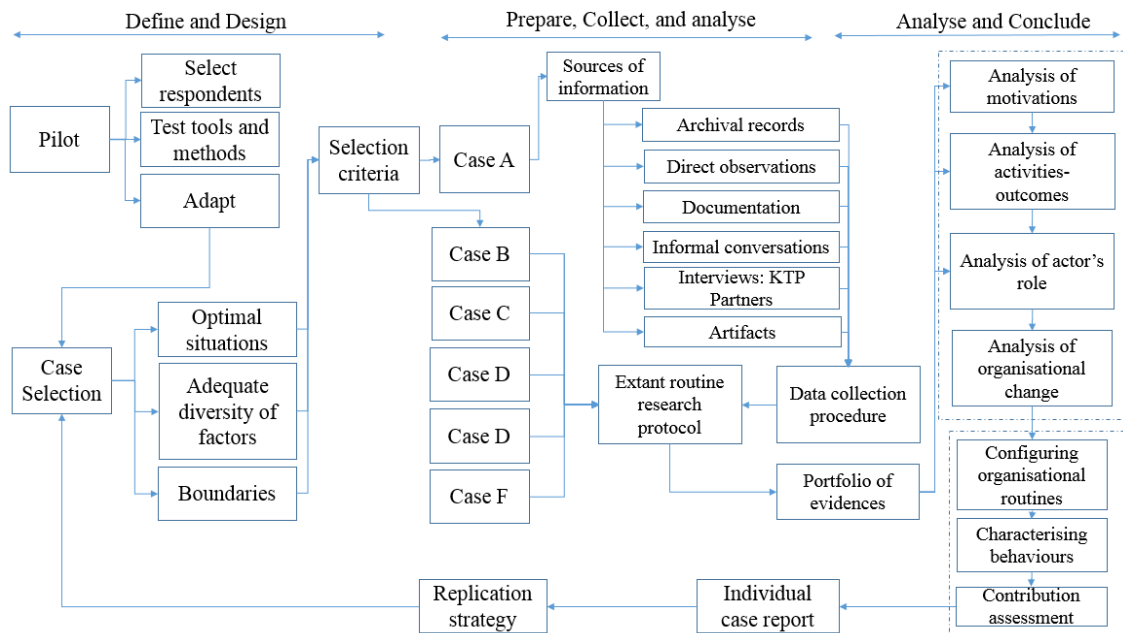
Table A.1 (see below) summarises the key elements that guide the case study.

Table A.1 Summary of components of the case study

Element	Description
Case study guiding question	How does the Knowledge Transfer Partnerships (KTP) scheme generate <i>behavioural additionality</i> within six UK Company Based Partners?
Analytical question (guiding the case study)	What procedure was followed to arrive at the evidence ‘X’ of suspected change ‘Y’ for ‘Case A’?
Typology of case	Type III (Yin, 2014); exploratory, holistic, incremental, multiple-case study (small <i>N</i> -research, six cases).
Object	Methodological framework as presented in Chapter 6.
Generalisation	Analytical
Subject	Beneficiaries of the KTP: Company Based Partners (CBPs) who have concluded at least one TCS/KTP project.
Unit of analysis (cases)	Organisational routines.
<i>Behavioural additionality</i>	The organisational routines of the beneficiaries of innovation policy modified in a persistent manner.

Figure A.1 contains the protocol followed to conduct the case study.

Figure A.1 Protocol for the case study



Source: Own elaboration, diagram adapted from Yin (2014, p.60)

A.3 Data collection instrument

An initial set of questions was developed and refined during the pilot case study, which were applied in Case A and replicated through the different cases.

The final data collection instrument guiding the interviews was integrated in the form of modules. The questions in the instrument have two functions: first, they served as guidelines, that is, they were adapted to suit the respondent (based on their partnership role and position in the organisation). Therefore, not all questions were employed by all the respondents and some were adapted according to the conversations with them. Second, the questions operated at different levels of abstraction, which refers to the individual and their reflections about their activities and place in the project/ organisation and their relationship with their partners, other questions functioned at more aggregated levels such as the project or the organisation as a whole. Table A.2 (see below) presents the final version of the questionnaire.

Table A.2 Questionnaire and its modules developed for collecting data through interviews

Module	Content
1	Rationale for participating in the scheme
2	Personnel (involved in the project)
3	Location of the project within the organisation
4	Expectations
5	Activities developed for the partnership
6	Relationship of the project to other organisational activities
7	Outputs/Outcomes
8	Perceived benefits/disadvantages
9	Organisational change
10	Mechanisms for coping with change
11	Consequences (of engaging in the KTP project)

Module 1. Rationale for participating in the scheme

1. Why opt for a KTP?
2. Why was the KTP integrated [formed]?
3. Who suggested the KTP scheme as a suitable option for the company (internally?)?
4. How was the project originated?
5. (Linked with the question above and exploring different rationales): was it business problem-oriented? Was it to continue previous work? Was it related to a particular issue?
6. *What/who helped deciding to engage in a particular project?*

Module 2. Personnel (involved in the project)

1. Who participated in the KTP project? What was [their/your] impact?
2. *What type of knowledge (Know-how) was required from the Associate/academic?*
3. *What kind of knowledge (Know-how) was required from the project participants?*

Module 3. Location of the project within the organisation

1. *What was the weight of the KTP project in the organisations' project portfolio (i.e. is it the only project, or is it part of a bigger strategy)?*
2. *Is the project complementary to other organisation's projects?*
3. *What is the (current) organisational (managerial/ productive/ innovation) strategy?*

Module 4. Expectations

Questions:

1. *What type of outputs were [you] expecting (to be obtained) from the project?*
2. *What kind of organisational changes were [you] waiting to happen?*
3. *How was the organisation before the KTP project started?/What were the prior [working/project] conditions before the KTP started?*

Module 5. Activities developed for the partnership

1. *What were the KTP objectives?*
2. *What were the primary activities of the KTP project?*
3. *What were [your] responsibilities within the KTP project (as an associate/ academic adviser/project manager)?*

Module 6. Relationship of the project to other organisational activities

1. *Was there any relationship between the KTP project (and its activities) to other projects in the organisation?*
2. *Did they have any similarities/differences, in terms of requirements (technical, knowledge, personnel)?*
3. *Have [you] (or the organisation) ever conducted a similar project in the past?*

Table A.2 Questionnaire and its modules (continued)

Module 7. Outputs/Outcomes

1. *What were the outputs of the project?*
2. *What were the outcomes of engaging in the partnership?*
3. *Was any of these results planned?*

Module 8. Perceived benefits/disadvantages

1. *Who benefited (from obtaining those outputs/ outcomes)?*
2. *Did [you] perceive any disadvantages from engaging in the project/partnership?*

Module 9. Organisational change

1. *What type of changes did the KTP project produce?*
2. *Were these changes expected or anticipated?*
3. *How different were these (changes) from what you were expecting?*
4. *Who experienced those changes? Was it a specific individual/project/whole organisation?*
5. *What role did the team members played in generating (these) changes?*
6. *What was the role of the associate/ academic partner in producing these changes?*

Module 10. Mechanisms for coping with change

1. *How have [you] responded/adapted to the changes?*
2. *How has the organisation responded to the new/ modified situations?*

Module 11. Consequences (of organisational change)

1. *Do [you] perceive any difference in [your] organisation after engaging in the KTP?, Have [you] perceived any changes in [your] company as a result of the KTP project?*
2. *Has any of these changes impacted the activities (e.g. impact of new technologies on the process, ways things were done) of the organisation?*
3. *What has been the role of the KTP project in the differences [you] observe?*
4. *Do [you] find/see any difference between the way 'you' do things now and the way they were done before the KTP?*
5. *Do [you] consider the differences incorporated into the project have also affected the organisation? How?*
6. *Specific: What were the particular tools or methods, or technologies adopted to plan and enact the strategy? Why has the strategy /changes adopted this particular form? Who was involved in the process of designing/ selecting the technologies (technological choice)? When were these strategies deployed (under which conditions and contexts)? How were the technological choices determined?*

Codifying data and integrating the 'portfolio of evidence.'

Once data from each case was collected, it was documented and incorporated into a 'portfolio of evidence'. This portfolio contains the 'raw' data (uninterpreted) which then was codified in a series of tables (see examples below, Table A.3, Annex B and Annex C).

Table A.3 codifying information in the portfolio of evidence (example tables)

Table containing a summary of contextual elements	
Element	Description
Prior relationship between partners	
Nature of the project (intention)	
KTP's environment (context)	

Table summarising the information from the KTP project	
Element	Description
Actor's role	
Brief history of the partnership (setting of the KTP)	
Rationale for integrating the KTP	

Besides the tables presented above, the portfolio of evidence includes the transcripts of three interviews taken from the research journal, one for the CBP, another for the academic adviser and another from an Associate. The elements contained in the portfolio formed a coherent narrative describing the activities during the KTP projects for the cases. The interpretation of the different evidence provided by the respondents was translated into the narratives presented in Chapter 7.

This annex finalises with the presentation of the glossary used in the research.

A.4 Glossary of terms used in the research

Box A.3	Glossary
<i>Case</i>	The unit that is defined and bounded by the researcher. It answers a question about a particular phenomenon. Some of its characteristics include: sufficiently internally complex to enable within-case analysis of interacting forces and their combination. Composed in such a way that the values of a particular phenomenon may change over the period of the study present a contrast between different elements.
<i>Inference</i>	The process of making claims about one set of phenomena that cannot be directly observed, on the basis of what is known about a set of things that have been observed. The choice of research instruments depends on a theory of how those instruments work.
<i>Narrative</i>	Attempt to understand the nature of events, relationships, or processes, by focusing on the dynamics of the operation and the environment surrounding the programme.
<i>Observation</i>	The systematic data collection about behaviour or action.
<i>Reliability</i>	Criteria for judging the strength of the claims, and replicate them in other settings. For every measurement using the same data, the results should be the same.
<i>Routines (organisational)</i>	Repetitive, recognisable patterns of interaction. Contains three aspects (or integrative components): Ostensive, performative and artefact aspects.
<i>Validity</i>	The extent to which the <i>claims</i> approach the 'truth'.
<i>Validity, Construct</i>	It considers the consistency of the analytical units with the theoretical concepts. The degree to which the measures or codes used to operationalise a concept capture what is intended to capture.
<i>Validity, External</i>	Type of generalisations made from single cases denominated as analytical. For this research as naturalistic generalisation: the (harmonious) interpretation (making sense) of the meaning behind observed patterns of social interaction.
<i>Validity, Internal</i>	The power of the conclusions reached for each case.
<i>Warrant</i>	The degree of confidence the research has in an inference's capability to deliver truths about the things that cannot be directly observed.
Based on several authors: Tellis (1997); Weiss (1998); Stake (2000); Johnson et al., (2007); Gibbert et al., (2008); Perri and Bellamy (2012); Balogun et al., (2014) and Yin (2014).	

Annex B. Portfolio of evidences for the Case Study

B.1 Introduction

This annex contains the portfolio of evidences, the summary of the information collected for analysing the cases. The annex contains two main sections. Section B.2 includes the sources of information used for developing the pilot case study, its instruments and the KTP programme theory. Section B.3 specifies the sources of information and related evidence per case. Finally, Section B.4 includes three examples of interviews with different KTP beneficiaries.

B.2 Sources of information and analytical process for conducting the pilot case study

The initial set of questions to detect the *behavioural additionality* effect (see Annex C) was applied to a set of individuals, Associates, academic advisers and company representatives (company based partners who might become potential cases). These interviewees were selected because of convenience. As described in Chapter 5 (see Table 5.2 and 5.3), initially, two settings were used: the Enterprise Futures (2012) and the KTP Associates Conference (2014), followed by a purposeful search of cases.

The outcomes during the Enterprise Futures conference were refining research questions, and locating and interviewing one Associate, however, as no case studies materialised from this process, a second search was performed. From the KTP Associates Conference (2014), three Associates were interviewed. Informal conversations were held with an additional set of five. The interviewees were selected according to the characteristics of their KTP projects and convenience. Following the conference, in addition to the interviews, one firm was contacted using it as a case study (case A, see section B.3 below), and one interview with a KTP regional manager occurred (see Table B.1).

Following the conferences, a search of the remaining potential cases (CBP) was performed. The search used the KTP (2014a) web site: <http://ktp.innovateuk.org/>, complemented with an exploration of the companies' websites (using the google search engine) and interviewing one manager of the Business Engagement Support Team at the University of Manchester (see Table B.1). Using this second strategy, the academic advisers, Associates and companies were identified and interviewed for the pilot phase. Table B.1 contains the information of the interviewees of the pilot phase: one regional KTP adviser, one manager of a Business Engagement Support Team, two CBP representatives, five academic advisers, and five Associates.

Table B.1 Interviews for the pilot phase: Interviewees, settings and outcomes

Interviewee	Information on KTP	Setting	Outcome
Ms. Jan Stringer	Regional KTP Adviser (Essex, Suffolk, Norfolk and London East/Central)	Face to face interview, at London [Liverpool St. Station]. During the interview, questions related to the performance of the KTP were asked. The interviewee offered some examples of success.	Learning on the programme's performance. (All interviewees provided useful elements to refine the theory of change).
Mark Godber	Knowledge Exchange Manager Knowledge Exchange Team, University of Manchester	Face to face interview, at Knowledge Exchange Team premises. During the interview the role of the exchange team was discussed. Questions regarding KTP projects with the University of Manchester were asked and concerning the theory of change.	Case studies and other material related to the case study (Case E), further information and contacts.
CBP 1 (KTP: 7591)	Business Development Manager [sub-contracted by the CBP]	One interview, telephone.	Provided details on the project, refined questions. Potential case study.
CBP 2 (KTP: 2309)	CEO, Owner	One interview, online questionnaire	Refined questions. Potential case study.
Academic adviser (KTP:8994)	Senior Lecturer in Image Processing. King's College London, Division of Imaging Sciences & Biomedical Engineering.	Two interviews, one telephonic and one online (questionnaire)	Refine research questions, potential case study. Provided and contacted Associate.
Academic adviser (KTP: 7689 and 7691)	Professor of Strategic Risk Management Chair in Hospitality Management London School of Hospitality and Tourism University of West London	One interview, face to face at the University of West London.	[Same as above]

Table B.1 (continued)

Interviewee	Information on KTP	Setting	Outcome
Academic adviser (KTP: 8346)	Emeritus Professor of Applied Linguistics	One interview, face to face. Near King's College London premises at Waterloo, London.	Refine research questions, potential case study.
Academic adviser (KTP: 9174)	Head of Business Information Management and Operations at Westminster Business School.	One interview, face to face. University of Westminster premises.	[Same as above]
Academic adviser (KTP: 7249, 74928 and 1414)	Director of Research and a Senior Lecturer in Construction and Project Management in the Bartlett School of Construction and Project Management, University College London	One interview, face to face. University College London premises.	[Same as above]
Associate (KTP: 488)	Research Associate	One interview, face to face	Refine research questions, potential case study. Provided contacts.
Associate (KTP: 8464)	Research Associate	One interview, face to face.	Refine research questions. Potential case study.
Associate (KTP: 8994)	Research Associate	One interview, telephone.	[Same as above]
Associate (KTP: 9069)	Research Associate	One interview, face to face.	[Same as above]
Associate (KTP: 9252)	Research Associate	[Same as above]	[Same as above]

Box B.1 below provides details about the KTPs which were the subject of analysis during the first phase (pilot). The companies and partnerships from the pilot differ from the final cases.

Annex B. Portfolio of evidences for the Case Study

Box B.1	Details from the KTP partnerships explored during this phase
Number	Partnership data
2309	<p>Objective: To develop and implement decision support software to improve the effectiveness of design and production processes used in the manufacture of soap making machinery.</p> <p>Project date: 06 March 1995 - 05 March 1997</p> <p>KBP: Plymouth Business School, University of Plymouth.</p> <p>CBP: Britannia Soap Machinery Company. South West of England. Design, development, manufacture and marketing of soap making machinery. Small-sized firm, 10 to 49 employees</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=2309</p>
488	<p>Objective: To design interventions to promote safety cultures in organisations leading to the development of a consultancy product to address them.</p> <p>Project date: 31 August 2004 - 09 April 2007</p> <p>KBP: Manchester Business School, The University of Manchester.</p> <p>CBP: Specialist Training and Consultancy Services Limited. Provision of health & safety, transport and hazardous goods training and consultancy services. Small-sized firm with 10 to 49 employees.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=488</p>
7591	<p>Objective: To develop and commercialise specialist training protocols for performance enhancement through simulated Altitude Training.</p> <p>Project date: 28 September 2009 - 21 February 2013</p> <p>KBP: Department of Applied Science, London South Bank University.</p> <p>CBP: The Altitude Centre Limited. London. Design, install, commission and service specialist hypoxic air technology, in conjunction with the provision of consulting and training services. Small-sized firm, less than 10 employees.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=7591</p>
7689	<p>Objective: To develop ERM methodology to minimise exposure to losses, by assessing, monitoring and controlling risks associated with core purpose and strategic decisions.</p> <p>Project date: 27 November 2009 - 30 June 2013</p> <p>KBP: Business School, Oxford Brookes University.</p> <p>CBP: InterContinental Hotels Group plc. Located in London. 250+ employees.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=7689</p>
7691	<p>Objective: To develop and test the Business Continuity/Disaster Recovery plans for all Group divisions, thus enhancing resilience through capability to survive disruptions of critical business functions.</p> <p>Project date: 27 November 2009 - 07 February 2012</p> <p>KBP: [Same KBP as above].</p> <p>CBP: [Same CBP as above].</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=7691</p>

Box B.1 (continued)

Number	Partnership data
8346	<p>Objective: To identify linguistic/cultural factors contributing to poorer performance of international medical graduates in the membership examination, and develop new tools to aid training and preparation for it.</p> <p>Project date: 24 September 2010 - 09 July 2013</p> <p>KBP: Department of Education & Professional Studies, King's College London</p> <p>CBP: The Royal College of General Practitioners. London. Charity, membership body of family doctors committed to delivering excellence in general practice and patient care. 50 to 249 employees.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=8346</p>
8664	<p>Objective: To develop a design methodology of turbocharger compressor impellers that are resilient to typical manufacturing tolerances thus maintaining efficiency and reducing manufacturing non-conformance cost.</p> <p>Project date: 09 May 2011 - 04 September 2014</p> <p>KBP: School of Engineering, University of Lincoln.</p> <p>CBP: Napier Turbochargers Limited. Design, manufacture, and support a range of high efficiency industrial turbochargers for medium speed diesel and gas fuelled engines in the marine propulsion, rail traction and power generation markets. East Midlands .250+ employees.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=8664</p>
8994	<p>Objective: To develop a novel e-Health monitoring and recording system for patients, care homes and primary care.</p> <p>Project date: 05 October 2012 - 31 May 2014</p> <p>KBP: Division of Imaging Sciences & Biomedical Engineering, King's College London.</p> <p>CBP: Technomed Limited. Manufacture and distribute a range of medical software products. Design browser-based applications to deliver a range of telemedicine services directly to the private practices of consultant physicians, general practitioners and patients. Based in London. Small-sized firm with less than 10 employees.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=8994</p>
9069	<p>Objective: To expand activities regionally and nationally by developing SROI/ROI impact measurements and implementing successful activities to increase funding and numbers of young participants.</p> <p>Project date: 21 January 2013 - 12 May 2015</p> <p>KBP: Department of Management, London South Bank University.</p> <p>CBP: Construction Industry Trust for Youth. Support disadvantaged young people aged 14-30 into education and work in the construction industry. Run training courses and short 'taster' sessions of different activities to build bridges between communities and the construction industry. Located in Wales. Small-sized organisation.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=9069</p>
9174	<p>Objective: To develop and benchmark a range of new value added services/products to offer to its members.</p> <p>Project date: 20 May 2013 - 12 July 2016</p> <p>KBP: Westminster Business School, University of Westminster.</p> <p>CBP: UKWA Limited. Trade organisation which represents the third party logistics sector. London. Less than 10 employees.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=9174</p>

Box B.1 (continued)

9252	<p>Objective: To develop alternative herb products for the food industry, thus providing a route to sustainable intensification of land, and developing high value, traceable, British products.</p> <p>Project date: 30 May 2013 - 05 January 2016</p> <p>KBP: Department of Food & Nutritional Sciences, The University of Reading.</p> <p>CBP: Valley Produce Limited. Grow herbs and Chinese vegetable crops for food services. South East England. 10 to 49 employees.</p> <p>Source: http://info.ktponline.org.uk/action/details/partnership.aspx?id=9252</p>
------	---

B.3 Sources of information and evidence used for the case study

As mentioned above, Case A resulted from a contact established during the first phase. The remaining cases (B, C, D, E and F) were located and selected, because these cases matched the criteria established in Chapter 5.5.2, through the strategy described above.

Box B.2 presents a description of the cases included in the research.

Box B.2 KTP project characteristics and partners (cases)	
Case	Description
	<p>Partnership number and objective: [3969]. Investigate export market for agricultural wear parts. Develop and implement marketing plans. Evaluate existing manufacturing systems. Implement improved manufacturing systems.</p> <p>Partnership dates (start/end): 08 March 1993</p> <p>KBP: Advanced Manufacturing Research Centre, The University of Sheffield.</p> <p>Grant details (sponsor/ amount): Engineering & Physical Sciences Research Council (50%) Technology Strategy Board (50%)/£110,000</p>
A	<p>Partnership number and objective: [9105]. To develop and embed advanced FEA and CAD/CAM methods for the full forging of agricultural components.</p> <p>Knowledge area/technology (if known): Design</p> <p>Partnership dates (start/end): 02 January 2013 02 January 2015 (extended an additional period of 8 months).</p> <p>KBP: Faculty of Arts, Computing, Engineering & Sciences, Sheffield Hallam University.</p> <p>Grant details (sponsor/ amount): Technology Strategy Board (100%)/£85,191</p> <p>Company: Case A*</p> <p>Business: Design and manufacture a wide range of wear resistant consumable items for agricultural equipment replacing OEM parts with substitute items for use in processes such as ploughing, cultivation and harvesting.</p> <p>Company Standard Industrial Classification (CSIC): Manufacture of other general purpose machinery not elsewhere classified(29240)</p> <p>Size and location: 50 to 249 employees. Yorkshire and the Humber (* Information omitted per request of an interested party)</p>
B	<p>Partnership number and objective: [8191]. To develop a carbon reduction supply chain system for a disparate range of commodities provided to subscribing companies in a designated Business Improvement District.</p> <p>Knowledge area/technology (if known): Environmental sustainability/ sustainable technologies.</p> <p>Partnership dates (start/end): 14 September 2010/16 January 2013</p> <p>KBP: School of Engineering & Technology, University of Hertfordshire.</p> <p>Grant details (sponsor/ amount): Technology Strategy Board (100%)/£81,740</p> <p>Partnership number and objective: [9078]. To develop a strategic capability for assimilating a low carbon 'urban design and development' model for revitalising under exploited business districts.</p> <p>Partnership dates (start/end): 17 December 2012/ 30 November 2013</p> <p>KBP: Centre for Sustainable Communities, University of Hertfordshire.</p> <p>Grant details (sponsor/ amount): Technology Strategy Board (100%)/£84,420</p>

Box B.2 (continued)

Case	Description
B	<p>Company: Inmidtown (Bloomsbury, Holborn, St Giles) Limited.</p> <p>Business: Elected Business Improvement District working on behalf of 560 businesses in Bloomsbury, Holborn and St Giles, Central London. Help the area achieve its full economic potential by enhancing its commercial viability, by developing services to enhance members' performance through operational and marketing initiatives to attract more visitors and improve the local environment.</p> <p>Size and location: 10 to 49 employees. London.</p> <p>CSIC: Activities of business and employers organisations (9111).</p>
C	<p>Partnership number and objective: [7759]. To develop design specifications to continue providing artists' studios which are economic to build, meet changing user requirements and are fully occupied.</p> <p>Knowledge area/technology (if known): Creative industries.</p> <p>Partnership dates (start/end): 13 January 2010/ 25 January 2013</p> <p>KBP: School of Art, University of the Arts London</p> <p>Grant details (sponsor/ amount): Arts & Humanities Research Council (50%) Technology Strategy Board (50%)/£86,162</p> <p>CBP: Acme Artists Studios Limited</p> <p>Business: Charity helping artists in economic need through the provision of affordable non-residential studio space, work/live space and housing, together with awards, residencies and other professional development opportunities.</p> <p>Size and location: 10 to 49 employees. London.</p> <p>CSIC: Other artistic and literary creation and interpretation (92319).</p>
D	<p>Partnership number and objective: [8114]. To launch a lifestyle clothing brand to support a charity involved in community based projects. The charity provides practical alternatives for 'vulnerable' children and youths in disadvantaged communities.</p> <p>Knowledge area/technology (if known): Creative industries</p> <p>Partnership dates (start/end): 19 July 2010/ 10 January 2012</p> <p>KBP: Design Against Crime Research Centre, University of the Arts London</p> <p>Grant details (sponsor/ amount): Arts & Humanities Research Council (100%)/£64,305</p> <p>CBP: LUTA Limited</p> <p>Business: Run a lifestyle clothing brand and financially support for community based projects. An organisation that provides practical alternatives for 'vulnerable' children and youths in disadvantaged communities.</p> <p>Size and location: <10 employees. London</p> <p>CSIC: Manufacture of other wearing apparel and accessories not elsewhere classified (18240)</p>
E	<p>Partnership number and objective: [1405]. To develop the next generation of MonitorMV products, designed for use in batch processing environments.</p> <p>Partnership dates (start/end): 26 August 2003/12 October 2005</p> <p>Grant details (sponsor/ amount): Engineering & Physical Sciences Research Council (50%) Technology Strategy Board (50%)/£70,066</p> <p>Partnership number and objective: [6120]. To develop a complete process control package to provide an integrated control and monitoring solution for industrial delivery.</p> <p>Knowledge area/technology (if known): Electronics, Photonics & Electrical Technologies</p> <p>Partnership dates (start/end): 15 May 2006/ 01 October 2008</p> <p>Grant details (sponsor/ amount): EPSRC Collaborative Training Accounts (50%), Technology Strategy Board (50%)/£70,403</p> <p>KBP: [Same KBP for both KTPs] School of Electrical & Electronic Engineering, The University of Manchester.</p> <p>CBP: Perceptive Engineering Limited</p> <p>Business: Consultancy and development of software technology under the product name ArchitectAPC, which enables process and condition monitoring applications within continuous process manufacturing environments.</p> <p>Size and location: 10 to 49 employees. North West of England.</p> <p>CSIC: Other software consultancy and supply(72220).</p>

Box B.2 (continued)

Case	Description
F	<p>Partnership number and objective: [4857]. To develop a new range of speciality coffees based on differentiation of character and a healthy lifestyle image, through objective measurement of sensory quality in espresso coffees and understanding the bases of consumer choice decisions.</p> <p>Partnership dates (start/end): 06 February 1998/31 August 2000.</p> <p>Grant details (sponsor/ amount): Economic & Social Research Council (50%) Technology Strategy Board (50%)/£63,000</p>
	<p>Partnership number and objective: [5361]. To develop new blends for UK filter coffee market. To reduce roast weight loss by implementing novel (quenching) technology and ensure optimisation of new cryogenic grinding and modified atmosphere packaging (MAP) using nitrogen.</p> <p>Partnership dates (start/end): 29 August 2000/30 September 2002.</p> <p>Grant details (sponsor/ amount): Scottish Funding Council (50%), Technology Strategy Board (50%)/£59,796</p>
	<p>KBP: [Same for both KTPs] Institute of Pharmacy & Biomedical Sciences, University of Strathclyde.</p> <p>CBP: Matthew Algie And Company Limited</p>
	<p>Business: Manufacture and supply of coffee and tea products, and supply and servicing of coffee brewing equipment.</p>
	<p>Size and location: 50 to 249 employees. Scotland.</p>
	<p>CSIC: Processing of tea and coffee(15860)</p>

Source: KTP (2014a); KTP (2014d). See tables below for further details.

The following sections include details about the sources of information employed per case. The evidences for each step (pilot and cases) were gathered following Yin's (2014) identification of strengths and weaknesses of each type of evidence (see Box C.1, following annex).

B.3.1 Case A

Type	Elements	Source
Archival records	Company's documentation (manuals and procedures and other)	Design procedure
	Company's website	Company website
Direct observations	Organisational practices (field notes)	<ul style="list-style-type: none"> Notes were taken during the interview day, with the opportunity to observe the production floor (no pictures were allowed). The opportunity to see some of the design machinery and the design team in action.
Documentation	KTP website, KTP (2014d)	Case A: 3969 KTP (2014) [Online], http://info.ktponline.org.uk/action/details/partnership.aspx?id=3969

Case A (continued)

Type	Elements	Source
Informal conversations	Other members of the organisation	Conversations with two design engineers, about the design process. Conversation with the mechanical project engineer regarding the project.
Interviews (this research, the number of interviews is in parenthesis)	Company	Project manager, (1), face to face, outside of office setting.
	KTP Associates	Mechanical Project Engineer, (3), face to face and follow-up by telephone and e-mail.
	Academic advisers	Academic adviser, professor (1), telephone

B.3.2 Case B

Type	Elements	Source
Archival records	Company's documentation (manuals and procedures and other)	<ul style="list-style-type: none"> Inholborn (2010), <u>01.02.10, Business Improvement District 2010</u>, [Online]. Inmidtown (IMT), (2014a), <u>Business Plan 2015-2020</u>, [Online], Available from the company's website. IMT and University of Hertfordshire, (2014), <u>Greening the BIDs: An Assessment of Existing and Potential Green Infrastructure for the Inmidtown Area</u>, [Online]. Available from the company's website.
	Company's website	<ul style="list-style-type: none"> http://inmidtown.org/ https://www.linkedin.com/company/inmidtown
	Company's press releases	IMT (2014b), <u>Midtown Big Ideas Exchange Coverage</u> , [Online], Available from the company's website.
Direct observations	Organisational practices (field notes)	Observed the process for taking data on 'carbon emissions' near the Holborn Kiosk

Case B (continued)

Type	Elements	Source
Documentation	On-line material related to the partnership (news, bulletins)	<ul style="list-style-type: none"> • IMT (2014c), <u>Consultation 2015-2020</u>, press release [Online], Available from the company's website. • Environmental Research Group, King's College London, (2014), <u>Inmidtown BID Launch Own Monitoring Site</u>, [Online], Available from http://www.londonair.org.uk/london/asp/news.asp?NewsId=InmidtownBID&StartIndex=11. • Shaffi, S., (2013), <u>Business District Become First in London to Calculate Firm's Carbon Savings</u>, London 24, 12 September 2013, [Online], Available from http://www.london24.com/news/business/business_district_becomes_first_in_london_to_calculate_firms_carbon_savings_1_2417679.
	KTP website, KTP (2014d)	<ul style="list-style-type: none"> • http://info.ktponline.org.uk/action/details/partnership.aspx?id=8191 • http://info.ktponline.org.uk/action/details/partnership.aspx?id=9078
	Case studies on the same company, produced by third parties	Nichols, W., (2013), <u>Case study: inmidtown creates a buzz around carbon savings</u> , [Online], Available from http://www.businessgreen.com/bg/feature/2244991/case-study-inmidtown-creates-a-buzz-around-carbon-savings , Incisive Media Investment Limited (2014), Accessed on 2/09/2014.
	Other material (press releases)	<ul style="list-style-type: none"> • Moore, E., (2012), <u>The Job: Carbon Calculator</u>, Financial Times, April 8, 2012, [Online] • Costelloe, L., (2015), <u>£15M Investment Plan Launched for London's Most Significant Commercial District</u>, Press Release [online], 29th January 2015. • University of Hertfordshire, (2010), <u>Job and Person Specification, Project Manager: Food and Economic Development</u>, JOB REF: 010856, [Online]
Informal conversations	Other members of the organisation	<ul style="list-style-type: none"> • BID's Ambassadors customer service team, (2), [outsourced staff], face to face. • Office Administrator, (3), face to face and two online (e-mail).

Case B (continued)

Type	Elements	Source
Interviews (this research, the number of interviews is in parenthesis)	Company	<ul style="list-style-type: none"> PA to CEO, (2), telephone and online. Sustainability Project Coordinator, (1), telephone. Associate, (1), telephone
	Academic advisers	Academic advisers, (1), telephone
Physical and other artefacts	Company products (derived from the KTP)	Carbon calculator, [Image screen of the tool and its function, previously available online]

B.3.3 Case C

Type	Elements	Source
Archival records	Charity's documentation (manuals and procedures and other)	<ul style="list-style-type: none"> Acme Artists Studios Limited (2011), <u>Annual Report and Accounts, Year Ended 31 March 2012</u>, [Online] Acme Artists Studios Limited (2012), <u>25 Years Hosting International Artist's Residencies in London</u>, [Online] Acme Artists Studios Limited (2014), <u>Annual Report and Accounts, Year Ended 31 March 2014</u>, [Online]
	Charity's website	http://www.acme.org.uk/
	Press releases	<ul style="list-style-type: none"> Acme Artists Studios Limited (2009), <u>Supporting the Affordable Artists' Studios Sector</u>, [Online], May, 2009. Acme Artists Studios Limited (2010), <u>Pioneering Fine Art Knowledge Transfer Partnership</u>, [Online]. Acme Artists Studios Limited (2012a), <u>Pioneering Fine Art Knowledge Transfer Partnership, Project Update-Development and Progress</u>, [Online], February, 2012.
	Marketing material related to the KTP scheme and its specific projects	Acme Artists Studios Limited (2012b), <u>Thurrock Set For Landmark Artists' Studio Building</u> , [Online], April 2012.

Case C (continued)

Type	Elements	Source
Documentation	On-line material related to the partnership (news, bulletins,	<ul style="list-style-type: none"> Harvey et al., (2010), <u>ACME/KTP</u>, Presentation given at the Future Space Relationships between higher education and artists' studios conference, Monday 6th December 2010, Birmingham Institute of Art and Design, School of Art.
	KTP website, KTP (2014d)	http://info.ktponline.org.uk/action/details/partnership.aspx?id=7759
	Scientific publications (KTP Outputs)	<ul style="list-style-type: none"> Echarte (2014) Ellard and Harvey (2015) [Book] <p>Full references on the body of the thesis.</p>
Documentation	Other material (press releases, websites)	<ul style="list-style-type: none"> Palmer, S., (2013), <u>Ground-breaking times: the First Ten Years of Acme</u>, a-n The Artists Information Company. [Online], 06 September 2013 Available from https://www.a-n.co.uk/news/groundbreaking-times-the-first-ten-years-of-acme. RIBA (2014), <u>About us</u>, [Online], Available from https://www.architecture.com/RIBA/Aboutus/Aboutus.aspx.
Informal conversations	Other members of the organisation	<ul style="list-style-type: none"> Communications Officer (1), Telephone Professor of Fine Art (1), e-mail.
Interviews (this research, the number of interviews is in parenthesis)	Company	Manager (1), telephone.
	KTP Associates	Research and Development Officer, (3), one telephone, two online (e-mail).

B.3.4 Case D

Type	Elements	Source
Archival records	Company's website	<ul style="list-style-type: none"> • https://www.facebook.com/LutaSportswear • http://www.luta.co.uk/ [redirects to Reebok]
Documentation	KTP website, KTP (2014d)	http://info.ktponline.org.uk/action/details/partnership.aspx?ii=8114
	Other material (press releases, websites)	<ul style="list-style-type: none"> • Dirs, B., (2008), <u>Fight For Peace, Create Champions</u>, BBC Sports, Boxing (29 April 2008), [Online], Available from http://news.bbc.co.uk/sport1/hi/boxing/7369714.stm, Accessed 2014. • Sansom, W., (2012), <u>Wildfire Interview</u>, Contagious Magazine (28), [Online], Available from www.contagiousmagazine.com • Dowdney, L., (2012), <u>Luta Limited: A Model Brand</u>, ANA/WFA Global Marketing Conference, (03/14/12), [Online], Available from http://www.ana.net/miccontent/showvideo/id/v-wfa-mar12-dowdney • Strauss, K., (2013), <u>Fighting for Peace (and Profit)</u>, [Online], Available from http://www.forbes.com/sites/karstenstrauss/2013/08/08/fighting-for-peace-and-profit/, Press release Forbes, 08/08/2013. • DESIS (2014), [Online], Available from http://desis-uk.org/wordpress/?page_id=1 • Beyond Sport (2014), <u>Reebok Partner with Community Heavyweights Fight For Peace and Acquire Luta Sportswear</u>, [Online], Available from http://www.beyondsport.org/articles/reebok-partner-with-community-heavyweights-fight-for-peace-and-acquire-luta-sportswear/. • University of the Arts London (UAL), (2012), <u>Luta Fightwear Collection</u>, [Online], Available from http://ualresearchonline.arts.ac.uk/5417/

Case D (continued)

Type	Elements	Source
Documentation	Other material (press releases, websites)	University of the Arts London (UAL), (2011), <u>Documents</u> [Online], Available from http://docslide.us/documents/ual-desis-labluta.html .
Informal conversations	Other members of the organisation	<ul style="list-style-type: none"> • Designer (1), face to face • Brand Ambassador, (1), telephone • Professor, Director at DAC (1), online (e-mail)
Interviews (this research, the number of interviews is in parenthesis)	Company	Designer, (1), telephone.
	Academic advisers	Deputy Centre Director at DAC, (1), face to face.

B.3.5 Case E

Type	Elements	Source
Archival records	Company's documentation (manuals and procedures and other)	<ul style="list-style-type: none"> • Perceptive Engineering Limited (PEL), (2014a), <u>ControlMV: The next generation of Model Predictive Control and Optimisation, helping process industries achieve their performance goals</u>, Product description, [document, also available online]. • Lovett, D., (2013), <u>Advanced Process Control for Industrial Manufacturing</u>, Perceptive Engineering LTD, [product description slides, available upon request] • PEL (2014b), <u>Products</u>, [online], Available from http://www.perceptiveapc.com/products/
	Company's website	http://www.perceptiveapc.com/
	Marketing material	PEL (2014c), <u>True Optimisation Starts Here</u> , [Marketing material, Online], Available from www.PerceptiveAPC.com/Audit .
Documentation	On-line material related to the partnership (news, bulletins)	<ul style="list-style-type: none"> • Bounds, A., (2010), <u>From the Lab to a Profit in Seven Years</u>, Financial Times (01 March 2010), [Online], Available from http://www.ft.com/cms/s/0/10b42902-24d3-11df-8be0-00144feab49a.html#axzz3lXbpZV3q.
	KTP website, KTP (2014d),	<ul style="list-style-type: none"> • http://info.ktonline.org.uk/action/details/partnership.aspx?id=1405 • http://info.ktonline.org.uk/action/details/partnership.aspx?id=6120

Case E (continued)

Type	Elements	Source
Documentation	Case studies on the same company, produced by third parties	<ul style="list-style-type: none"> • Greater Manchester Chamber of Commerce (2013), <u>Case Study – Perceptive Engineering Limited KTP with The University of Manchester</u>, [Magazine], 53° (degrees), 78, December 2013/ January 2014, ISSN 2051-3712 (ONLINE: 2051-3720), [print out, also online], Available from, www.gmchamber.co.uk. • KTP (2014e), <u>Perceptive Engineering LTD KTP Helps Engineering Company to Reach New Markets</u>, Case Study (1405), [Online], Available from http://ktp.innovateuk.org/case-study-search/971/KTP_PerceptiveEng_1405.pdf. • KE (2014), <u>Case Study: Perceptive Engineering, Innovative product development opens up new markets</u>, [document, also online] Available from http://documents.manchester.ac.uk/display.aspx?DocID=13034.
Documentation	Scientific publications (KTP Outputs)	O' Brien, et al., (2011). Full reference on the body of the thesis.
	Other material (press releases, documents, etc.)	<ul style="list-style-type: none"> • Sandos, D., (1984), <u>CAD for the Design and Evaluation of Industrial Control Systems</u>, IEE Proceedings Part D, 131 (4), pp. 125-139. [Basis of the product] • Sandos, D., et al., (2000), <u>Algorithms for industrial model predictive control</u>, Computing and Control Engineering Journal, 11(3), pp. 125-134. [Algorithms integrated into the product] • TSB (2013), <u>Materials and Manufacturing North West Launchpad Showcase</u>, [Document, available from innovateuk.org] • ECA Academy (2014), <u>ECA Certified Computer Validation Manager</u>, [Online], Available from http://www.gmp-compliance.org/computer-validation_course.html
Informal conversations	Other members of the organisation	Office Manager (Telephone)

Case E (continued)

Type	Elements	Source
Interviews (this research, the number of interviews is in parenthesis)	Company	<ul style="list-style-type: none"> Managing Director, (1), Telephone Office Manager, (2), Telephone, online (follow-up)
	Associate	<ul style="list-style-type: none"> Senior Lecturer, School of Electrical and Electronic Engineering, University of Manchester, (former KTP Associate), (1), face to face. Senior Engineer at PEL (former KTP Associate), (1), telephone.
	Academic advisers	Professor of Applied Control, School of Electrical and Electronic Engineering, University of Manchester, (1), face to face

B.3.6 Case F

Type	Elements	Source
Archival records	Company's documentation (manuals and procedures and other)	<ul style="list-style-type: none"> <u>Matthew Algie (2012a), a brief history, [online, available from company web site]</u> <u>Matthew Algie (2013), Sourcing Policy, [Online], Available from http://www.matthewalgie.com/about-us/sourcing-policy</u> <u>Matthew Algie (2014), company products (espresso warehouse), [Online], Available from http://issuu.com/matthewalgie/docs/espresso_warehouse_winter_2014_web_/82?e=13329794/9337970</u>
	Barista Resources	<ul style="list-style-type: none"> <u>Matthew Algie, (2012b), Single-serve Filter Coffee,</u> <u>Matthew Algie (2012c), From Seedling to Beam,</u> <p>[Both online] Available from http://www.matthewalgie.com/barista-resources/barista-downloads/</p>
	Company's website	http://www.matthewalgie.com/
Direct observations	Organisational practices (field notes)	Introduction to sensory analysis of espresso coffee with Barista. Observed process.

Case F (continued)

Type	Elements	Source
Documentation	On-line material related to the partnership (news, bulletins)	Mackie, G., (2013), <u>Matthew Algie is all perked up</u> , The Scotsman [online], Wednesday 02 October 2013, Available from http://www.scotsman.com/business/food-drink-agriculture/matthew-algie-is-all-perked-up-1-3121535 , [Accessed 2014]
	KTP website, KTP (2014d),	Partnership data 4857, __[online]__ Available from: http://info.ktponline.org.uk/action/details/partnership.aspx?id=4857 [Accessed 2014] Partnership data 5361, __[online]__ Available from: http://info.ktponline.org.uk/action/details/partnership.aspx?id=5361 [Accessed 2014]
	Case studies on the same company, produced by third parties	<ul style="list-style-type: none"> • Scottish Food and Drink Federation (SFDF), (2014a), <u>A Future in Food</u>, [Online Case Study, https://www.sfdf.org.uk/sfdf/schools_case_studies_algie.aspx • SFDF, (2014b), <u>Matthew Algie, Doing the Right thing</u>, [Online], Available from http://www.educationscotland.gov.uk/video/s/video_tcm4580627.asp
	Scientific publications (KTP Outputs)	<ul style="list-style-type: none"> • Cristovam et al., (2000) • Narain et al., (2003) • Narain et al., (2004) Full references on the body of the thesis.
	Other material (press releases)	Twin (2014), <u>Sustainable Coffee Partnership with Matthew Algie and Sainsburys Cafes</u> , [Online], 3 September 2014, Available from http://www.twin.org.uk/news/sustainable-coffee-partnership-with-matthew-algie-and-sainsburys-cafes/
Informal conversations	Other members of the organisation <ul style="list-style-type: none"> • School of Pharmacy administrator [Institute of Pharmacy & Biomedical Sciences, University of Strathclyde], (1), telephone • Barista, (2), face to face 	

Case F (continued)

Type	Elements	Source
Interviews (this research, the number of interviews is in parenthesis)	Company	<ul style="list-style-type: none"> • Technical Director, (2), telephone • Barista area trainer, (1), face to face
	KTP Associates	Sensory scientist, (1), telephone
Physical and other artefacts	Company products (derived from the KTP)	Espresso coffee (bag) brand 'Darwin' and 'Gama' Full product description from http://www.matthewalgie.com/coffee/espresso/darwin/ and http://www.matthewalgie.com/coffee/espresso/gama/
	How-to-guides	<u>Beginner's guide to espresso</u> , [online, same as barista resources above]

B.4 Three examples of interviews

This section contains three examples of interviews conducted in the case study. The examples presented in this section, are representative of the way the interviews were conducted with different types of beneficiaries, thus, including one interview with an Associate, one with an academic adviser and one with a CBP, each interviewee from different cases. These interviews were recorded on tape (when possible) and a research notebook. The interview notes are directly transcribed from the researcher's notebook, and during the interview, coding was used to keep with the pace of the interviews. Any inaccuracies in the information contained here are the sole responsibility of the researcher. For confidentiality reasons, some details have been omitted.

Box B.3	Example 1: Associate
Data	Description
Type of example (Role in KTP)	Mechanical project engineer (desing)
Case	Case A
CBP Information	See Box B.2 for additional details on the case.
Individual	Mr Chandra, currently mechanical project engineer at the CBP. The Associate, holds a PhD in Mechanical Engineering from the University of Nottingham, he saw the KTP's job advertisement on the company's website and, because his profile adjusted the job's requirements, he decided to apply for the position.
Date	Thursday, 31 st July 2014
Time	1:45 pm to 14:15 pm.
Place	CBP's premises, Club Mill Road, S62FH, Sheffield, UK
Interview	Face to face, conversational
Code	The interviewee is coded as CG, the interviewer as CR
Objectives	Testing the proposed set of questions related to the CCRC framework for Case A. Understand the creation of organisational routines from the perspective of the Associate.
Interview setting	<p>The interview took place on the interviewee's premises at the company's main headquarters, in an adjacent meeting room, booked by the interviewee specifically for the purpose of the meeting. The interview had a duration of 30 minutes, although it started earlier than scheduled. No eventualities were perceived. The interviewee was asked permission for recording the interview, but he declined. Thus, only written notes were taken⁹⁶. The interviewee accepted to be quoted (if necessary) and can be contacted again. The interview followed the proposed CCRC framework structure using the extant routine research protocol (see Chapter 6). Before the interview, the questions were reviewed, and a set of four topics (modules) was prepared:</p> <ol style="list-style-type: none"> 1. Can we discuss the sort of activity you conducted during your KTP? 2. What type of changes (organisational/project) did you experience? 3. Are these changes reflected in your capabilities? 4. Are these capabilities integrated into your performances? Artefacts? Rules?
<p>Interview Script</p> <p>[CR arrived at the premises, signed arrival form. CG was called upon reception, then conducted CR to the meeting room. As formal introductions were done in a previous event, no introduction of the project was required]</p> <ol style="list-style-type: none"> 1. CR – Good morning, and thank you for your time. I would appreciate if we could discuss the KTP project you are currently managing, and, if we could discuss, in specific, the type of activities you perform to achieve your objectives. [This introduction links with the first question]. 2. CG – “Initially I was 1 week in induction with the company, I had a side manager with me, I met people, we gathered, the university supervisor, the managers to discuss the problems and propose solutions. Then I went to the company's training and induction and then I started to work on the project”. 3. “For the project I have to do simulation, so I had to learn about their products, their planning, and buying procedures, as well as some computer skills, that took me one to two months”. “For the project my main responsibilities were to identify CAD/CAM solutions for tool manufacture and forging, to develop and apply methods of geometric design and segmental tool manufacture to minimize tooling costs, and to identify, procure and apply gross deformation FEA [Fine Element Analysis] software suitable for counter-blow forging analysis and optimisation for the process”. 4. I focused on finishing the objectives of my KTP very quickly so I could have enough time to dedicate myself to other things because I finished my KTP objectives very fast.” 5. “ [Once activities have been discussed, the novelty of these is discussed]. 6. CR – These manufacture processes you are mentioning, are they novel to the company? 7. CG – “No, only simulation. They did not use simulation before I entered the organisation.” <p>[The topic of capabilities is hinted]</p>	

⁹⁶ He explained that, because of confidentiality issues with the project he could not be recorded, but he could be cited and, if required, suggested to be contacted for a follow-up interview.

Box B.3 (continued)

8. CR – And related to the skills⁹⁷ you developed through your work, can you discuss a little about them?
9. CG – “There are many skills I have learned since I joined, I learned three engineering software and four core forging business... do you need the name of them?”
[Explains briefly].
10. CG – “I needed to learn them because the company use them to design their products and manufacture them. So the people involved in this process require lots of training, also you need to learn about maintenance, and managing people. [Also], you need to work with outside contractors. But basically everything I did was outside of the scope of the KTP, the KTP was only to do simulation, I did all this because I wanted to do it!”
11. “I also assisted to a lot of presentations, where the owner and the manager were present”.
[A question related to the size of the project was introduced]
12. CR - Where is the KTP project located in terms of the overall companies’ strategy?
13. CG – “It is a small part of a bigger project which seeks to introduce new products to the market. So we meet every three [...] four weeks, talking with top, middle and high management people.”
14. “So in this sense, I guess the KTP is important, because you actually get to talk to the owner, but it does not take too much effort (from my side), so I get to do other things”.
15. “I guess the company also benefits that it is a smaller project because they fund their innovation, and they get paid for their work and get help with an Associate and involved with the academics.”
16. “They also get to produce some academic papers, but I cannot disclose more because of confidentiality. Basically, what I can say is they get better standardized data and write about it”.
17. “Me? What am I getting? My diploma in management training, health and safety training, first aid, training that will help me with my management skills. I am also taking advantage of the language possibilities (I am learning German), and I am involved in managing people and contractors, facilitating skills, and working with the team”.
18. “Another benefit from the KTP is that it is a very easy route, it is an easy way and a fast track to managerial positions, probably in four years”.
- [As the discussion was drifting towards the individual, a question related to the organisation was posed].
19. CR – If we could go back to the sort of changes you have experienced from your involvement with the company, what can you tell me about the changes you have incorporated into the company?, let’s say, do you believe you have helped in changing the organisational culture?
20. CG – “In academia the changes are different, and that is my previous experience, there you work with a slow pace, in an industrial environment everything is tight, you are bound by time, so you need to adapt. In the university you work alone, here you need to be a team player, so you need to develop these capabilities, here you are interdependent, and the project is waiting for you, so you have to commit to what the company requires and learn industrial skills, how to speak to costumers.
21. CR – Can you give me some concrete examples?
22. CG – “Well, you have to tell your costumers what you what, at what cost, how to speak their language, and when you return to the company you have to report the outcomes to the managers, so you have several meetings, but in 3 or 4 meetings you develop those skills, and when you propose a solution you have to justify it, and if you say something is not going to work, then you explain why and what type of solutions you have to offer”.
23. CR - So how did you coped with this environment?
24. CG – “As a newcomer you have to get along with everybody, you need to. Because you meet new people and it takes a long time. But once you start learning to speak like they do in the company, then you become helpful, now, they tell me, show me how you did this (solved a particular problem), and I tell them, so I guess that helps in the long run the business.
25. “This is what we had to do for the KTP, we needed to transfer the knowledge and skills, because that is good to them, they did not know how doing simulation, but once I showed them that it helped them to save some costs, and it offers relatively fast solutions and we got the results they wanted (through simulation) I proved them I was good”. [unintelligible note] “So you show them what is going to happen, and you then tell them... this is going to change. At first you, as part of the new engineering team need to earn their confidence, so I show them, outside of the KTP project, different applications of simulation”.

⁹⁷ Here skills is intended to incorporate the topic of organisational capabilities

Box B.3 (continued)

26. “I had an initiative, and I showed them, so if I proved myself rubbish, it was ok, but I wanted to show them, that actually it could be done, that the products they were producing could be first modelled, and simulated and then manufactured, so the next time they would actually listen, and as a result of this, now they respect me”.
27. “So I earned their respect by actually showing them what I was capable of doing, if you are capable of showing them you do some work and see its worth, then you can change their behaviour because more respect is involved, in everything, so they invite me to more meetings and I have an active voice in the company”.
- [Some concrete examples of how different activities are now being demanded]
28. CR – Can you give me some specific examples of those activities you have just mentioned?
29. CG – “We modified a lot of the documentation, Standard Operating Procedures (SOPs), writing, documentation that we use in the manufacturing process”.
- [Here, an explanation of what in an SOP was demanded]
30. CR – Excuse me asking, but can you explain briefly what an SOP is?
31. CG – “For example, we work with the current manufacturing documentation, or the health and safety and risk and analysis manuals, these contain what the company needs to do in a specific situation, for example, you know how the machine runs the analysis, if you touch this [points to the table] you might lose a finger, so you document, you do not touch this at this moment. You can also write down that at this particular time you need to calculate the factor [...] or likelihood, you do a risk analysis, for people to know what to do”.
- [A question to link the perceived changes with the KTP’s influence is asked, intentionally using the word *contribution*].
32. CR –If you could summarise the contribution KTP has had in the company in one phrase, what would it be?
33. GC – “KTP has contributed to the future employee to get a managerial position, second, it has helped the company to develop fundamental analysis, simulation, third, before the KTP, they did not know how to solve problems with simulation, now they have this capability, fourth, they got expertise from the university side, and I guess a major advantage was that they get to finance their project”.
34. “I guess because the KTP is quite small, it helps with the bigger project (forging), KTP is also centralised, so it helps exclusively with the design stage before the actual manufacturing”.
35. “If there was no KTP, there would be no confidence in our company to fool with the forging process, and because it moves at a very fast pace it saves them money”.
36. “The KTP was extended [eight months] because of my activities, and we are now working to train people”.
- [A question related to negative effects is parsed]
37. CR – Do you observe any negative effects from the KTP?
38. CG – “No, but that is because I always focus on the positive, you get training, work experience, you help the company to do something, it also expands their business, so it is positive, at least for me”.
39. CR – If we could go back to the way the simulation process has helped the company to change, how would you describe this process?
40. CG – “Once we simulate (model) the component, we put it to test... in the computer and we develop a manufacturing design, with predicted delays (in production) too, but we have to wait for the actual machines come out of the production line, so we are interdependent on other activities as well”.
41. “Then you wait for the machine, and you work on another one, and once we test their durability or applicability to the actual intended process, we sell it to other companies”.
42. CR – Do you do it by yourself? Or do you manage a team?
43. CG – “The simulation I do it alone, but I do manage 12 contractors, and I communicate with a group of 35- 45 people, but obviously I am supervised by another manager.”
- [The interview time was finishing, a closing question was posed. It was related to the intention of the former associate to participate with the KTP].
1. CR – To finalise, why did you decide to apply for this particular (KTP) position?
2. CG – “I applied for the job because it matches my skills, I liked how the programme is structured, the salary was good, and I liked the company and as I said before, it is a fast track for you, in 2 years, if you use your time wisely, then you will be working as a manager, and although you came here just for the KTP, you do have the opportunity to use your time to more activities”. [End].

Box B.4	Example 2: Academic adviser
Data	Description
Type of example (Role in KTP)	Co-Designer
Case	Case D
CBP Information	See Box B.2 for additional details on the case.
Individual	Mr Thorpe is co-director of the Design Against Crime Research Centre (DAC) and founder of UAL's DESIS (Design for Social Innovation and Sustainability) Lab.
Date	Wednesday, 17 th September 2014
Time	11:00 am to 12:30 pm.
Place	KBP's premises (Central Saint Martins), Granary Building, 1 Granary Square, King's Cross, London, N1C 4AA
Interview	Face to face, conversational
Code	The interviewee appears as AT, the interviewer as CR
Objectives	Testing the proposed set of questions related to the CCRC framework for Case D. Understand the creation of organisational routines, from the perspective of the Academic adviser.
Interview setting	<p>The interview took place at the interviewee's premises in the DAC, in an adjacent meeting room, used for the purposes of the interview. Formal introductions were made and the project's nature was explained to the interviewee. No eventualities followed. The interview lasted for 1 hr 30 minutes, it adopted the form of a conversation. The interviewee was asked for permission to tape record the interview, but he declined⁹⁸. Thus, only written notes were taken and the general topics and some discussions held during the conversation appear here. Before the interview, a set of four topics were prepared:</p> <ol style="list-style-type: none"> 1. Nature of the project 2. Intention (problem) 3. Prior relationship between the partners 4. KTP project outcomes and perceived changes
Interview Script	<ol style="list-style-type: none"> 1. CR – Let's discuss the nature of the [KTP] project [AT introduces the story of LUTA] 2. AT – The company is a start up with 5 employees [...] started as a charity 10-12 years ago which supports Martial Artists. Includes 5 pillars. Effective in Rio de Janeiro and South East London. 3. AT – Provides gangs support [...] the founder had a background in social research [...] and was an amateur boxer. He lived in a <i>Favela</i> [...] [explains the way the charity works. Keywords include: gangs clear sides, a problematic engagement – family – skills, positive 500, 200-300 donations.] 4. AT – [Provides an example of how the gym works]. [AT Discusses how, the entrepreneur (founder of the company) approached CSM] 1. AT – First, he went to Holborn A-D fashion, as he had entrepreneurial connections. He also has some other good individual connections” 2. AT – “He came and asked, ‘I want to know, if you could help me with my clothing label, I want to develop it and use it as a brand name [...] do you think we can do a clothing label?’ 3. AT – The entrepreneur suggested if the work conducted by the university might be on a <i>pro bono</i> base. 4. AT – Often we don't work <i>pro bono</i>... [AT provides reasons why the university cannot work <i>pro bono</i>]. 5. CR – Why did you decide to participate in the project? 6. AT – “Because we are interested in 3rd sector and fashion design. Collaborative design”. 7. AT – Action research [...] helping companies using the design to develop their (design) skills and competencies... [AT provides an example of social oriented research and big brands]. 8. AT – [Explains the model used by DAC for socially responsible design, key word include: legislation, informed practice social context – engaged] 9. AT - [Explains his engagement with the partnership and how his lab would engage with the project].

⁹⁸ He explained that, because of confidentiality issues with the project he could not be recorded, but he could be cited and, if required, suggested to be contacted for a follow-up interview.

Box B.4 (continued)

10. [Several collaborative workshops had to be undertaken] *pro bono*. The process can be observed as a series of ‘sprints’].
- [History of the development of the product PRE- KTP: ‘*First Sprint*’]
11. AT – [He discusses the way the first collaborative project was set up, the discussion includes the orientation of the business, system processes, what- ifs [counterfactual scenarios contemplating potential problems], where to obtain financial advice, discussion with top-retailers (potential clients), meeting them, convincing gyms, developing the first collection, metric lab, seed angel, revenues. “This project lasted for 12 months”].
12. AT – “[AT’s lab did] everything, market research, collections sample, demonstrate the product’s value, product line, help finding venture capital”, “This is what we are talking about: materialise a dream and give value”].
13. AT – We provided expertise, *pro bono*, tangible, [Explains process including a description of selection for location and the way the process was conducted], “pop-up shop, ‘messy sprint’].
14. AT- That is when he asked me if I wanted to be involved in the next stage [...] [AT explains that, because of previous research commitments he had to decline]
15. CR - Can we return to the design model your lab provided to the company
16. AT – [Explains how the model works: ‘Actors – agents – assets’], [We] “suggested this model because it is what entrepreneurial person’s mental models, understand.”
17. AT - “Asset oriented approach”].
18. AT – “Language informs practice” [Key discussions: reflection, methodology, synergy, formalising his venture not make relationships, less discourse, we think procedure and behaviour], “The company’s [Case D] philosophy, or what [his founder] wanted to achieve adjusted to these elements” [reiterates charity model, key discussions include its rationale]: fight, join our family, violence-family, fashion and sportswear, the way with the methodology to do it].
- [Engagement with the KTP]
19. [Discusses uses of the first project’s outcomes for the potential KTP] AT – [Specification, scalable, transferable, workshops, learn from them, ‘first sprint’, iterative process].
20. AT – “I suggested we use the KTP for a second project”].
21. AT - “One way KTP, ‘mechanism enables you to be the [project’s] creative director’ [...] [explains why the KTP was a good choice for the project, discussions include the programme’s rationale and operation, its context, it provides a learning environment, KTP does support creative industries, graduate advisor to new recruits].
22. AT – “KTP principle, pitch- social impact design skills doesn’t have methodology as a way of work [does a square gesture with the hands]”].
23. [Explains the elements from the methodology that were incorporated into the partnership “Personal assets embed.”
- [Activities during the KTP]
24. AT – “KTP was about [...] explains the objective of the project [...] “we had a good experience, trying to embed a model that formalises the design process
25. AT - “Network, other guys teaching them, collaborative design what makes worth competing”].
26. AT – [Explains the philosophy adopted behind the KTP project from the perspective of the partners “Develop the manifesto: strength... emotional strength, real choices, MAC [training gear] by fighters for fighters”].
27. AT – [Explains in detail his activities and role and those of the Associate “Designer- associate functions, CBP meet in parallel, production – critical path, Decision making process, activities, do that, the typical production path. [Draws with hands a linear path]... which goes from technical requirements, and learning but in parallel.”
28. AT – “It required asking the question ‘how do we make those decisions?’ involve the community, involve the ... technical. Integrate in parallel the network, turning social capital of the brand into physical.”
29. AT – “Workshop, Yes, no decisions, then a template, then the tools and finally the capacity”].
30. AT – “It extended what we had already done before, during the ‘first sprint’.”
31. AT - “18 months, early success. The Associate brought, technical person, do it, free-lance basis, spent capital. [Draws a production line with curved lined on top].
32. AT – The Associate had to deliver the project by herself [Associate activities: determine a niche permutation, units, style, colours, Keep it tight. Competence: Design by champions, for champions].
33. AT – [Holistic approach].

Box B.4 (continued)

<p>34. AT – [ABCD model discipline case oriented enterprise, financial calculations value, access fighters. Gear and leverage.... Clothing wear].</p> <p>[KTP OUTCOMES]</p> <p>35. AT– “My papers, knowledge transfer teaching in CAD”.</p> <p>36. [Explains the influence of the KTP project to his own teaching]</p> <p>37. [For the KTP it was a way of obtaining resources].</p> <p>38. AT – “Mechanism, funding, identity, resources, learn and transfer knowledge. Multi-layered process”</p> <p>39. AT – [Discussion about the administrative process in a KTP, the Associate’s courses and the liaison personnel [KTP adviser] “different doors of perception”</p> <p>40. CR- What other outcomes were achieved by the company?</p> <p>41. AT – [Discusses other specific outcomes for the company] Including trading, marketing,</p> <p>42. CR - What would have happened had there not been KTP support?</p> <p>43. AT – “The KTP served as a reward mechanism. [Suitable for Start-ups] Risk divided anchor burn out, infrastructure”... For the associate the KTP training camp was different to her expectations.</p> <p>44. AT – [Provides specific examples] method SPL [draws graphics]</p> <p>45. AT – [Without the KTP] “the liaison system, further development of the production line and adaptation of the DAC’s methodology.</p> <p>46. AT – [Describes the benefits of the KTP for the associate in monetary terms.</p> <p>47. AT – [General reflection of the way KTP helps creative industries]</p> <p>48. AT – [Reasons why it is helpful for companies (in general) to participate in a KTP], [rhetorical question] “Do they need a KTP? Yes, companies need the money, should academic help? Yes, absolutely, innovation is risky. It is a good place for academics.</p> <p>49. AT – [Explains benefits to academics] The discussion includes topics such as personalities, trust, people and values.</p>
[End].

Box B.5	Example 3: Company Based Partner
Data	Description
Type of example (Role in KTP)	Technical director-project coordinator
Case	Case F
CBP Information	See Box B.2 for additional details on the case.
Individual	Mr Reid is the technical director of the CBP
Date	Wednesday 3 rd December 2014
Time	09:00 am to 09:40 am
Place	---
Interview	Telephone, set questionnaire and answers
Code	The interviewee appears as ER, the interviewer as CR
Objectives	Testing the proposed set of questions related to the CCRC framework for Case F. Understand the creation of organisational routines, from the perspective of the CBP. Review rationales for participating in the programme, project activities, outcomes and intentions of continuing in a different programme.
Interview setting	The interview was over the telephone. Formal introductions were made and the project’s nature was explained to the interviewee. No eventualities followed. The interview lasted for 40 minutes. Before the interview, a set of six topics were prepared: <ol style="list-style-type: none"> 1. The rationale for engaging with the project. 2. Type of changes from the project A to B. 3. Activities of the project. 4. KTP project outcomes and perceived changes. 5. Counterfactual. 6. Future plans.

Box B.5 (continued)

Interview Script

1. CR-Why did you decide to do a KTP?
2. ER- We had been working with Strathclyde. I studied in Strathclyde myself, and we had been working with them, really since about originally in 1994 we started doing undergraduates projects which then moved up to master's level projects, and we saw opportunity for a larger project under [...] some sort of research grant.
3. ER- [...] so, the reasons for choosing Strathclyde was one of geographical proximity, they are in the same city as we are based. At that time they had the expertise within the relevant science department [and] areas we were interested working in, and we had personal relationships with... going back from my own studies, with the academic staff there.
4. ER- The academics provided with what was then the TCS, because of our first project predated the name change KTP
5. ER- And we like the shape of the scheme and the financials worked well for us, in terms of grant support, the type of researcher that TCS or KTP Associate we could get onboard [and] works well. We also had a candidate lined up, [...] from the first programme, who was just finishing of her PhD at Strathclyde and had relevant industrial experience but also academic experience needed to work in the area of our interest. The timing for her was good for her to come on board and joining us as a KTP Associate, and also to finish her PhD with us.
6. ER -So that was really the rationale behind it.
7. ER – [And] the second one we went for, was that associate left and actually went on to academia, although she's since returned and is [actually] working for us again. But the second programme was essentially a continuation of the first one, so we worked in the [we] programmes [...] back-to-back, and we [...] in terms what we were looking out between the two was a natural continuation of research area between the two programmes.
8. CR - Did you notice about changes in the relationship with the academic, in the type of activities you were doing? [Changes from project one to two]
9. ER-Not so much for the academic, because we had a work plan that conceptually when we started the first project we knew it would be something that would take more than two projects, so it was not an individual issue, so we knew we had to work on two projects. We had some goals both commercial, research, that we went ahead knew.
10. ER- The major difference between the two programmes would have been the Associate, more than anything, and I am a good believer that a lot of the success is down to the quality of the associate that you took on board.
11. ER -The first associate that we took on the first programme was of great quality than the second programme and had more academic experience in the area of research, [and] but that meant [...].
12. ER -We didn't make the progress in the second programme as far we would have liked, but we still deliver quite a strong project we feel.
13. CR- Actual experience about the projects, tell me a little with about the projects, if it is possible?
14. ER- So the first project was essentially looking at developing [pause] a way of looking at coffee from a sensory analysis standpoint, that took learnings from the expertise world, that took learning from consumer research, and also took learnings from traditional search analysis.
15. ER -We sort of built statistical models to support that, and we carried out work in terms of [pause] focus groups with consumers, we carried out work in terms of building a sensory panels with [...] business, and we also carried out work in terms of building statistical models to help support product development and plan development, so the essence of the project was to build those products, but also to offer those products to consumers and at the same time advance the business in terms of its capabilities.
16. ER- [And] the second programme, was essentially a continuum of that, but it focused on espresso beans coffees and focused more on filter coffee. [Pause]
17. CR- [If there was no ... had there been no support from the KTP, what do you think would have happened with the projects?]
18. ER- Would have been difficult for us to build that level of expertise within the business.
19. ER- I think working with academics, it gave us a practical framework.
20. ER -The academics that we worked with at Strathclyde had a lot of experience working with industry, they did a lot of work in the Whisky industry, which is really relevant for Scotland. So they were doing a lot of interesting research there, but also happen to work with a lot of industrial partners at the same time.

Box B.5 (continued)

21. ER- So I think at that particular point in time the team working there was very capable of carrying high-quality research but was also working effectively with the industry.
22. CR- What about any... the outcomes of the projects?
23. ER- They were linked to the objectives.
24. ER- So we ended up the first Associate, as I mentioned, she [...] when the first programme ended she went to lecture, then [she] came back at the end of the second programme, and join us on our staff, and still works for us, and she has been in the business since 2002.
25. ER- What we did was essentially embed skills set and the academic understanding of sensory analysis within the business, which has helped us for product development, it has helped us from a technical field, point of view ever since.
26. ER -And we also identified models with [...] methodologies [...] [and] we also used it to deliver against a number of other research projects that we continued to work with Strathclyde on, and other academics institutions. Although, we had not delivered through the KTP programme, subsequently.
27. CR- [Pause] How would you describe does KTP aligned with KTP philosophy]
28. ER- Yes, so I think as a business, when [...] I joined the company in 1993, and I would have been the first scientist or technologist that [...] the company had employed.
29. ER. At that point we were still quite small, not regional, we had national reach, but the turnover was around £5m pounds, and the business has grown a lot on that time period and
30. ER. We were working with more complex and demanding costumers and the market has changed a lot over that period.
31. ER -So, I think as a company we have, over the last 20 years embraced research, embraced working in partnership with academia, quite strongly, and therefore KTP definitively sits into that approach.
32. CR- [Do you remember any 'harsh times' during the partnership? Any difficulties for the project, [technical or technological], or in the way the project work]
33. ER- I mean characterised across both of them, I think sometimes in research [...] sometimes a two-year time window is quite a short time, from a research standpoint. I think the KTP programme, the application process it quite focused, 'you got to deliver a product [...] you got to deliver something really commercial within two years'.
34. ER- Sometimes, what we were developing was a model, which would end up in due course to deliver products or deliver services or whatever afterwards [the knowledge] and sometimes
35. ER- [...] we would see that, whereas the KTP grant [...] was very focused on short-term delivering a product, for example on two years.
36. ER- [and] if I reflect back on what we did through the KTP, we definitively had value of money in terms of the project that we made... I had to send the TTI as well, albeit not necessarily within the two year time frame of the project.
37. ER- Actually, some [outcomes] occurred in five to seven, ten years went-on.
38. ER- And I think we understood that from day one when we were talking to the KTP about our application, we had a different approach. [...]
39. ER-I think we had a slight difference in terms of the quality between each programme.
40. ER- [...] for the second programme we had to restructure our expertise in terms of what could be delivered versus the first programme with the first associate against the second programme.
41. CR - Any plans for going into another KTP in the near future?
42. ER- We have looked into one last year, but we struggled really to make a good internal business case. I think we can see the scientific basis for looking for it, but we struggled with the business case.
43. ER- We [decided] not go forward with that.
44. ER-Unfortunately for us, the research team that we worked with in Strathclyde has now retired, and those academics have been replaced. There is actually not a similar quality research team in Scotland.
45. ER- I think one of the useful thinks for us was having someone on our doorstep to go and work with [...], and
46. ER- I would be nervous trying to run on of these programmes at a distance, in terms of academic support. So that is something that [...] it is a structural issue with Scottish academia there is no solid institute within any university in Scotland that will work the same topic with us, that is a limitation.
47. ER- We do have other projects running, but it is not through KTP.

[End].

Annex C. Tools and methods included for the analysis

C.1 Introduction

This annex includes the analytical procedures, tools and methods incorporated in the research. The annex is organised as follows, Section C.2 describes the procedures for selecting the programme and cases under analysis. Section C.3 describes the analytical procedures, and Section C.4 summarises, as tables the data contained in the case studies.

C.2 Selecting the programme and case studies for analysis

Procedures to select the innovation/ collaboration policy

Chapter 5.5.2 presented in Box 5.1 the optimal situations and suitability criteria for choosing a programme to test the methodology. The group of innovation policies from the UK assessed include: the Business Links, CR&D programme, Creative Credits, Growth Accelerator, Knowledge Transfer Networks, KTP Scheme, Innovation Vouchers (IV), SFLG, SMART, SBRI and the UK Innovation Investment Fund (UKIIF).

The assessment criteria, inclusive of six parameters, might adopt the following values:

- Context: Access to finance, collaboration, enhance demand (of innovation) and (increase the supply) of technical service and advice.
- Temporality: a numeric value, indicating the year of establishment is offered. In two cases (Business Links and KTP scheme), the year when the programme was renamed is provided.
- Actors: determines the primary beneficiaries. Possible choices included individuals or organisations. Organisations included academia, firms and the government. Firms were subdivided to provide further detail, for example, some programmes are aimed explicitly at SMEs or start-ups, thus, the criteria reflects this level of detail.
- Accessibility: Indicates the type of information that is publicly available from the programme. The (subjective) assessment included three levels: low, medium and high access.
- Policy goal: The categories in this criterion correspond to the typology and assessment offered on the ‘goal-oriented approach’ of Edler et al., (2013). Thus, the relevance of the policy to its corresponding goal are assessed with a three-level scale, ranging from low (+), moderate (++), and (+++) high relevance.

Due to the type of instruments under analysis, the possible goals included in the analysis were policies aimed at increasing: (1) R&D spent, (2) non-financial capabilities (access expertise), (3) systemic capabilities and complementarities, and (4) enhance demand for innovation. The policy goal criteria has important implications for the selection of a policy to focus the analysis on. In this sense, the policy assessment included an analysis of the policy rationale and its focus on the *behavioural additionality* dimension based on Edler et al., (2013).

- Evidence: This category had a binary choice, either yes or no.

The combination of the elements above enables the selection of a programme. Accordingly, the programme which is seen as matching a greater number of criteria is selected. Table C.1 below offers the elements that constituted the assessment.

Table C.1 Assessment of UK policy instruments available for analysis

Instrument	Categories for assessment
Business Links	<p>Focus: Promotion of collaboration in pre-commercial research between business and the research base (Cunningham and Gök, 2012).</p> <p>Temporality: Several phases, 1980s and currently reshaped in 2003 (Mole et al., 2006).</p> <p>Actors: Small firms.</p> <p>Accessibility: Medium.</p> <p>Policy goal: Strong relevance to increase non-financial capabilities (access expertise).</p> <p>Evidence: Yes. DITR (2003) and Mole et al., (2006), uses programme theory.</p>
Collaborative R&D programme	<p>Focus: Designed to assist the industrial and research communities to work together on R&D projects in strategically important areas of science, engineering and technology. (Cunningham and Gök, 2012).</p> <p>Temporality: 2004.</p> <p>Actors: Co-funds partnerships between business and businesses and academia.</p> <p>Accessibility: Medium. More information from https://interact.innovateuk.org/-/collaborative-r-d.</p> <p>Policy goal: Minor relevance to increase R&D spent, minor relevance to increase non-financial capabilities (access expertise), and strong relevance for systemic capabilities and complementarities.</p> <p>Evidence: Yes. (Gök, 2010), using case studies; PACEC (2009; 2011) Logic models.</p>
Creative Credits Initiative	<p>Focus: UK-based business-to-business innovation voucher programme designed to foster innovative partnerships between SMEs and creative service providers.</p> <p>Temporality: Several calls. Evaluated 2013.</p> <p>Actors: SMEs, creative service providers (individuals or organisations).</p> <p>Accessibility: Medium.</p> <p>Policy goal: Strong relevance to incentivise firms to increase R&D spent.</p> <p>Evidence: Yes. Bakhshi et al., (2013), using experiments and logic models.</p>

Table C.1 (continued)

Instrument	Categories for assessment
Growth Accelerator	<p>Focus: Part of the Business Growth Service, a government-backed service offering support to businesses with the potential to improve and grow. A ‘dedicated growth expert’ helps eligible business to identify growth barriers, design a growth strategy and select a ‘mentor’ to guide the process.</p> <p>Temporality: Initiated operations in 2012.</p> <p>Actors: UK registered business based in England with fewer than 250 employees, a turnover of less than £40m, and meet the EU definition of an SME are eligible.</p> <p>Accessibility: Medium.</p> <p>Policy goal: Strong relevance to increase non-financial capabilities (access expertise).</p> <p>Evidence: No.</p>
Knowledge Transfer Networks	<p>Focus: Aims to build better links between science, creativity and business.</p> <p>Temporality: 2004.</p> <p>Actors: Individuals and organisations (several).</p> <p>Accessibility: High. More information from: https://connect.innovateuk.org/knowledge-transfer-networks.</p> <p>Policy goal: Minor relevance to increase R&D spent, minor relevance to increase non-financial capabilities (access expertise), and strong relevance for systemic capabilities and complementarities.</p> <p>Evidence: No.</p>
KTP Scheme	<p>Focus: The programme satisfies companies’ needs. It can be used as a problem-solving mechanism, as a means to generate new products or services, or as a way of validating a form of (informal) cooperation agreement.</p> <p>Temporality: In operation since 1975. Its immediate antecedent is the Teaching Companies Scheme (TCS). The scheme was rebranded (as KTP) in 2003.</p> <p>Actors: Organisations (companies and Higher Education Institutions) and individuals.</p> <p>Accessibility: High, although KTP projects reports are not public.</p> <p>Policy goal: Minor relevance to increase R&D spent, minor relevance to increase non-financial capabilities (access expertise), and strong relevance for systemic capabilities and complementarities.</p> <p>Evidence: Yes. Ternouth et al., (2012) includes: programme theory, interviews and modelling; Regeneris Consulting Ltd (2010)</p>
Innovation Vouchers (IV)	<p>Focus: IVs helps businesses work with a supplier for the first time and is used to pay for knowledge or technology transfer from that supplier. Grant of up to £5K with an upper limit of €200K (approximately £165K) for all <i>de minimis</i> state aid provided to any one business over a three-year period (Innovate UK, 2015a).</p> <p>Temporality: Initiated operations in 2009.</p> <p>Actors: Start-ups and SMEs across the UK are eligible</p> <p>Accessibility: Medium.</p> <p>Policy goal: Strong relevance to incentivise firms to increase R&D spent.</p> <p>Evidence: No.</p>

Table C.1 (continued)

Instrument	Categories for assessment
SFLG Scheme	<p>Focus: Provides guarantee to encourage banks, etc. to lend money to support SMEs' R&D projects and start-ups.</p> <p>Temporality: Established 1981.</p> <p>Actors: Small firms.</p> <p>Accessibility: Medium. Reports cover mostly monetary data.</p> <p>Policy goal: Strong relevance to incentivise firms to increase R&D spent.</p> <p>Evidence: Yes. Cowling (2010); OMB Research (2010).</p>
SMART	<p>Focus: Provides a flexible range of grant-based R&D support to SMEs.</p> <p>Temporality: Full version launched in 1998.</p> <p>Actors: High growth potential SMEs.</p> <p>Accessability: Restricted. Information available from: https://interact.innovateuk.org/-/smart</p> <p>Policy Goal: Highly relevant to incentivise firms to increase R&D spent.</p> <p>Evidence: Yes. PACEC (2001; 2003; 2009)</p>
Small Business Research Initiative (SBRI)	<p>Focus: "Enables the public sector to tap into new ideas and technologies and speeds up their adoption. It helps government departments connect with innovative businesses to solve the tough challenges facing the public sector" (Innovate UK, 2015a).</p> <p>Temporality: First established in 2001.</p> <p>Actors: Government departments and other public sector bodies, any company, university or charity body (suited from pre-commercial support).</p> <p>Accessibility: High. Several evaluations available. Resources available from: https://sbri.innovateuk.org/</p> <p>Policy goal: Moderate relevance to increase R&D spent and strong relevance to enhance demand for innovation</p> <p>Evidence: No.</p>
UK Innovation Investment Fund (UKIIF)	<p>Focus: UKIIF is a venture capital fund of funds that aims to drive economic growth and create highly skilled jobs by investing in innovative businesses where there are significant growth opportunities. The UKIIF fund of funds invests in technology based businesses in strategically important sectors to the UK including digital technologies, life sciences, clean technology and advanced manufacturing. "UKIIF operates as two funds of funds investing UK government funds pari passu with other private investors into selected underlying specialist VC funds in the UK and Europe" (CEEDR, 2012).</p> <p>Temporality: Initiated in 2009.</p> <p>Actors: The fund targets high growth technology-based businesses.</p> <p>Accessibility: High.</p> <p>Policy goal: Strong relevance to incentivise firms to increase R&D spent.</p> <p>Evidence: No.</p>
<p>Source: Own elaboration based on information from CEDR (2012), Cunningham and Gök (2012); Cunningham et al., (2012) and Edler et al., (2013), Business Growth Service (2015), Innovate UK (2015a), and evidence from Chapter 3 (this research).</p>	

In terms of the elements guiding the selection, for the assessment of context, those policies assumed to be implicitly aimed at generating the *behavioural additionality* effect were preferred. Similarly, programmes with longer trajectories, such as Business Links, the KTP scheme, the SFLG and SMART were first choices. For actors, the unit of analysis of *behavioural additionality* determines that the programme needs to target organisations to be considered.

For the accessibility criterion, those programmes perceived as having ‘high’ levels of publicly available information were preferred, resulting in the Knowledge Transfer Networks, the KTP scheme, the SBRI, and the UKIIF, as candidates for selection.

For the policy goal element, those policies with a rationale going beyond the market failure approach (see Chapter 2) were preferred. Implying that the CR&D programme, the Growth Accelerator, the Knowledge Transfer Networks, and the KTP Scheme were first choices. Similarly, those policy measures that aim to increase R&D spending were left as a second choice, as these instruments “typically emphasise neo-classical market failure rationales for intervention” (Edler et al., 2013, p. 9).

Finally, the evidence provided by Chapter 3 served as an element to place the Growth Accelerator, the Knowledge Transfer Networks, the Innovation Vouchers, the SBRI and the UKIIF as second choices.

Based on the elements described above, four programmes were considered as final choices; Business Links, the CR&D programme, Knowledge Transfer Networks and the KTP scheme. Following the application of all the elements in the criteria the KTP scheme was selected, as it has a long track, high accessibility and a policy rationale that incorporates market and system failures, plus it has been covered in Chapter 3.

Procedures to select the cases

In Chapter 5.3 (see Box 5.3) the criteria for selecting the cases for analysis was presented. Box C.1 below presents details of the selection process. The selection process was applied to the KTP data base (KTP, 2014a) to determine a group of companies that met the selection criteria.

Box C.1 Selecting KTP cases				
Strategy	Factors affecting the decision	Rationale for the inclusion of the case	Relevance for the research	Outcome
Information-oriented selection	Critical case	Useful for testing theories	Strong Relevance	Included as first choice
	Longitudinal study	Cases at two points of time	Minor relevance	Excluded
	Unusual, or revelatory situations	Arises from opportunity	Relevant	Included, determined <i>a posteriori</i>
	Typical case	Common cases	Relevant	Included
Theoretical-analytical replication	Logic of replication	Increases the robustness of the case study design.	Strong Relevance	Included, thus leading to a Small-N research.
Adequate diversity of factors	Size of the organisation	Context settings	Strong Relevance	Included, thus, the analysis is restricted to SMEs.
	Industrial classification		Relevant	Included, supports the decision for including unusual cases
	KTP project (characteristics)	Aids with the identification of specific cases	Relevant	Determines the type of cases, and classifies them as critical, unusual or revelatory.
		Dates of the project		
Knowledge area				
Accessibility	Determines if the information can be collected from the case	Relevant	Included	

Following the exploration of the KTP website, a group of firms were contacted, the research explained and invited to participate. Initially by contacting the company help desks or representatives and sending an email which included the detailed description of the research. The firms contacted were classified in boxes (see Section B.3). The type of evidence collected for each case considered Yin’s (2014) strengths and weaknesses of the type of evidence (see Box C.2).

Box C.2 Yin’s (2014) six sources of evidence		
Source	Strengths	Weaknesses
Documentation	<ul style="list-style-type: none"> • Stable- can be reviewed repeatedly • Unobtrusive-not created as a result of the case study • Specific-can contain the exact names, referemces, and details of an event • Broad-can cover a long span of time, many events, and many settings 	<ul style="list-style-type: none"> • Retrievability-can be difficult to find • Biased slectivity, if collection is incomplete • Reporting bias-reflects (unknown) bias of any given document’s author • Access-may be deliberately withheld
Archival records	<ul style="list-style-type: none"> • [Same as those for documentation] • Precise and usually quantitative 	<ul style="list-style-type: none"> • [Same as those for documentation] • Accessibility due to privacy reasons
Interviews	<ul style="list-style-type: none"> • Targeted-focuses directly on case study topics • Insightful-provides explanations as well as personal views (e.g. perceptions, attitudes, and meanings 	<ul style="list-style-type: none"> • Bias due to poorly articulated questions • Response bias • Inaccuracies due to poor recall • Reflexivity-interviewee gives what interviewer wants to hear
Direct observations	<ul style="list-style-type: none"> • Inmediacy-covers actions in real time • Contextual-can cover the case’s contex 	<ul style="list-style-type: none"> • Time-consuming • Selectivity-broad coverage difficult without a team of observers • Reflexivity-actions may proceed differently because they are being observed • Cost-hours needed by human observers

Box C.2 (continued)

Box C.2 Yin's (2014) six sources of evidence		
Source	Strengths	Weaknesses
Participant-observation [not employed in this research]	<ul style="list-style-type: none"> • [Same as those for direct observations] • Insightful into interpersonal behaviour and motives 	<ul style="list-style-type: none"> • [Same as those for direct observations] • Bias due to participant-observer's manipulation of events
Physical artefacts	<ul style="list-style-type: none"> • Insightful into cultural features • Insightful into technical operations 	<ul style="list-style-type: none"> • Selectivity • Availability

Source: Yin (2014, p.106)

C.3 Analytical procedures

Developing the behavioural additionality questions

This research explored and analysed different sets of questions (see Chapter 3, Tables 3.4 and Table 4.2) employed in the practice of evaluating the *behavioural additionality* effect to develop its own initial questionnaire, which was later employed in the pilot case study. The analysis also included reviewing the set of questions developed by Georghiu and Clarysse for measuring the *behavioural additionality effect* and those developed by Gök (2010). These questions are presented in Table C.2 (below).

Table C.2 Behavioural additionality questions

(1) Questions classified according to type of additionality										
Additionality	Question									
Output	New products on the market, new patents, market share, profitability									
Behavioural	<table border="1"> <thead> <tr> <th>Dimension</th> <th>Project level</th> <th>Company level</th> </tr> </thead> <tbody> <tr> <td>Strategy</td> <td> <ul style="list-style-type: none"> Additional external finance (loans VC) Strategic partners Slack </td> <td> <ul style="list-style-type: none"> Improvement of production process Change patent strategy Competitiveness Image </td> </tr> <tr> <td>Operation</td> <td> <ul style="list-style-type: none"> Product quality Faster development time Collaboration Larger scale Higher risk/return projects </td> <td> <ul style="list-style-type: none"> Indirect benefit to other department and business units Positive service /supply of product Formalised innovation process Better innovation management capabilities Prolonged collaboration Upgrade of human resources/research equipment </td> </tr> </tbody> </table>	Dimension	Project level	Company level	Strategy	<ul style="list-style-type: none"> Additional external finance (loans VC) Strategic partners Slack 	<ul style="list-style-type: none"> Improvement of production process Change patent strategy Competitiveness Image 	Operation	<ul style="list-style-type: none"> Product quality Faster development time Collaboration Larger scale Higher risk/return projects 	<ul style="list-style-type: none"> Indirect benefit to other department and business units Positive service /supply of product Formalised innovation process Better innovation management capabilities Prolonged collaboration Upgrade of human resources/research equipment
	Dimension	Project level	Company level							
Strategy	<ul style="list-style-type: none"> Additional external finance (loans VC) Strategic partners Slack 	<ul style="list-style-type: none"> Improvement of production process Change patent strategy Competitiveness Image 								
Operation	<ul style="list-style-type: none"> Product quality Faster development time Collaboration Larger scale Higher risk/return projects 	<ul style="list-style-type: none"> Indirect benefit to other department and business units Positive service /supply of product Formalised innovation process Better innovation management capabilities Prolonged collaboration Upgrade of human resources/research equipment 								
Input	Increase in R&D Budget									
(2) Gök's (2010) behavioural additionality questions										
Umbrella question	"What kind of tasks do you do to accomplish these activities? What has changed in the way you do these activities?"									
Typical questions ¹	<p>(1) performance: Counterfactual question [Yes/No] measuring scale additionality. For example: "would yo conduct this project if you were not supported?", "If yes, would these benefits be as persistent as it is now?"</p> <p>(2) capabilities: "How have you achieved these performances? What kind of capabilities have you developed? What are the causes of this performance?" Includes counterfactual.</p> <p>(3) activities: "What kind of activities have you performed to be able to realise these performances? What do you do?"</p> <p>(4) routines: "What kind of tasks do you do to accomplish these activities?" "Do you think other people do this task as you do?" [Dispositions], "do you think these changes?" "Provided you more coordination" [Control/Truce], "save your time to devise a new way" [cognitive resources].</p>									
Notes: Only a selection of those questions identified by Gök (2010) as 'typical' for addressing additionality are reported in this table.										

Source: Own elaboration adapter from Georghiou and Clarysse (2006, p. 20) and Gök (2010, pp. 188, 284-288).

With the aid of the interview protocol discussed in Chapter 6.2, and following the review of the different questions exploring the *behavioural additionality* dimension the following initial questionnaire (Table C.3) was developed.

Table C.3 Initial set of questions employed for the pilot case

Topic	Respondent	Question	Example of answers*
Activities	All respondents	What sort of activities were developed during the partnership?	Reverse engineering, software development
Background and intentionality of the KTP project	CBP representative Academic Adviser	Did the partners involved in the KTP project had a prior relationship? What motivated the partners to opt for a KTP? Who suggested to integrate the KTP? Why?	Yes – the [CBP] was a supplier [of services] to the KBP KBP has a member of staff dedicated to KTPs and after discussions we [KBP] decided that this would be a good option in order for the joint work to proceed.
	CBP representative	What type of specific knowledge was demanded from the academic?	Knowledge of development and validation of software solutions in healthcare
Outcomes and Benefits from the Partnership	All respondents	What happened during the project? (brief description)? Were there any (tangible/Intangible) outcomes from the project?	The project proceeded on schedule but after 14 months [R&D funding was lacking]..
Organisational change	[Same as above]	What sort of changes were anticipated? Which of those changes did actually happen?	We anticipated building a long-term working relationship between the University and the industrial partner. We developed a complete software solution for remote monitoring of physiological parameters. However, we did not proceed to the clinical testing phase.
Dimensions of change	[Same as above]	Were any of the following dimensions impacted because of the KTP? a) Collaboration b) Company's skills/capabilities/academic's knowledge c) Innovation strategy	Collaboration was terminated KBP gained valuable insight into the development of web-based solutions – something that was new territory for the KBP. As a result of the KTP, KCL has been able to continue the work.

Notes: * Answers provided by academic adviser from KTP project: 8994, see Table B.1.

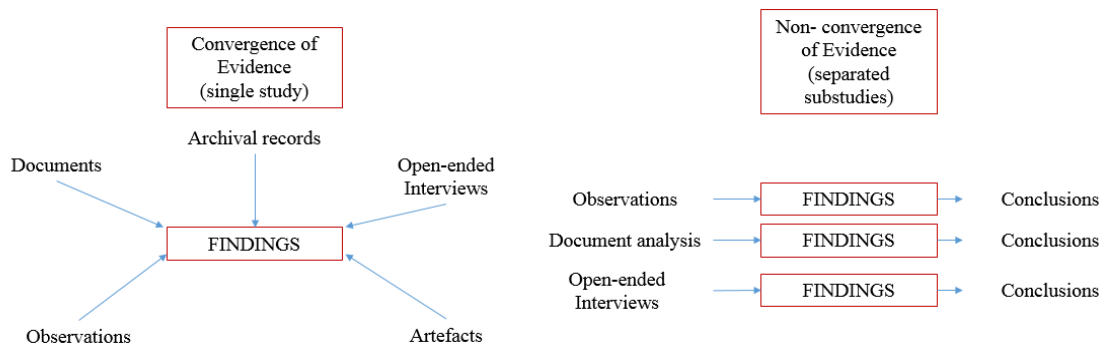
Procedures to analyse the behavioural additionality questions

After integrating the evidence from Case A into the portfolio of evidence, the next step corresponded to the analysis applied to determine if the case generated *behavioural additionality*. The inclusion of a set of reflective questions facilitated the analysis (see Box C.3, below).

Box C.3 Reflective questions guiding the analysis (questions Level II)
<ol style="list-style-type: none"> 1. What occurred during Case A? <ol style="list-style-type: none"> a. What were the consequences of engaging in the partnership? b. Was any organisational change perceived? c. How did the actors react to these changes? d. Were these modifications anticipated? 2. Where any patterns of interaction (organisational routines) formed? 3. What implications does the change have in terms of the anticipated changes? 4. Are there any similarities observed between Cases A and B?

The evidences (see Section B.3) from the cases were analysed according to the elements provided in Figure C.1.

Figure C.1 Convergence and non-convergence of multiple sources of evidence



Source: Adapted from Yin (2014, p.121)

Figure C.1 contains two conditions present when analysing evidence, a convergence of evidence and a non-convergence case. According to Yin (2014, p.121), convergence occurs when “the data has been triangulated and the case study’s findings will have been supported by more than a single source of evidence”. The opposite situation is the non-convergence, which uses multiple sources, but the analysis is done individually. The former strategy was preferred and adopted for this research.

The cases included an analysis of the organisation's motivations to engage in the collaborative project, followed by an identification of the mechanisms of change and those developed for managing change. The first analytical step incorporated five elements:

1. Organisational motivations to participate in the KTP.
2. Motivations to select a specific partner.
3. KTP's aims and activities.
4. Partnership outcomes, as anticipated by the partners.
5. Outcomes of participating in the project.

This process served to reconstruct the organisation's motives to engage in a KTP, select a specific partner and describe the activities-outcomes achieved after the project concluded.

Finally, a narrative analysis strategy was used to examine the evidence of the materialised (and non-materialised) strategies. It also included a discussion of the technological choices and organisational capabilities (inclusive of *attitudinal changes* and the organisational *dexterity*) in terms of the dimensions of change.

Procedures for reaching conclusions: Locating evidence of behavioural additionality from the cases

Preparing the collected evidence for its contribution analysis required first, to configure the organisational routines as located from the cases, and second, characterising organisational behaviours. The procedure considered the nature of the effects (*a posteriori* either as perverse/positive) and the possibility to anticipate some effects, as either generating perverse or adverse influences on their corresponding organisations. An iterative process was followed to determine these effects. Here, the outcomes anticipated by the partners and the actual consequences of engaging in collaboration and the (KTP) theory of change were linked.

The logic of replication has an important effect on the identification of unanticipated outcomes. Since the process is cumulative, it was observed that with the incorporation of additional cases in the analysis, the type of unanticipated effects became more refined and unique to the cases. By analogy, it is expected that the incorporation of different respondents (or policy makers) would introduce additional unanticipated effects with varying degrees of relevance to the analysis.

Different kinds of rival explanations were included during the analysis (Box C.4)

Box C.4 Brief descriptions of different kinds of rival explanations		
Type	Description	
Craft rivals	Null hypothesis	The observation is the result of chance circumstances only.
	Threats to validity	Several, e.g. history, maturation, instability, testing, selection.
	Investigator bias	Includes reactivity in field research.
Real-world rivals	Direct rival	An intervention ('suspect 2') other than the target (policy) intervention ('suspect 1') accounts for the results.
	Commingled rival	Other interventions and the target intervention both (practice or policy) contributed to the results.
	Implementation rival	The implementation process, not the substantive intervention, accounts for the results.
	Rival theory	A theory different from the original theory explains the results better.
	Super rival	A force larger than but including the intervention accounts for the results.
	Societal rival	Social trends, not any particular force or intervention, accounts for the results.

Source: Adapted from Yin (2014, p.141)

C.4 Summary of evidence obtained from the cases

The data obtained from the data collection phase were analysed to be presented in Chapter 8. In this section a summary of such data is presented in different tables. Table C.4 (below) includes the summary of evidence provided by the cases.

Table C.4 Summary of evidence to integrate the cases

Case	Element	Description
A	Prior relationship between partners	On-going the partners have collaborated before on the development of different technologies. For example, to develop a 'coating technology'.
	Nature of the project (intention)	Test the potential of CAD/CAM technologies in designing the technical drawings of the different components the company receives.
	KTP's environment (context)	<ul style="list-style-type: none"> The company has at least three decades in their market. They had collaborated on an on-going basis with different partners (including their current KTP partner). The company is aware of the importance of innovation and the strategic advantage that KBPs have over specific know-how. The 'talent' for the design department (as well as other departments) is 'pooled' from universities in the Yorkshire and the Humber area .
B	Prior relationship between partners	<ul style="list-style-type: none"> Informal. The partnership was originated as the result of the conversations between the organisation and the academic advisor. The partners meet through the KTP office who suggested the University of Hertfordshire as KBP.
	Nature of the project (intention)	Develop a system to monitor and reduce carbon emissions of the organisation and its clients.
	KTP's environment (context)	<p>The organisation was constituted in 2006. The KTP partners had prior interest and experience with carbon emissions.</p> <ul style="list-style-type: none"> The CBP was strategically interested in developing a carbon reduction strategy The academic adviser had relevant experience in carbon reduction systems (development and management) The Associate had applied expertise developing carbon reduction systems
C	Prior relationship between partners	<ul style="list-style-type: none"> New. The organisation has prior experience collaborating with different partners (since 1975) but this is their first collaboration with the University of the Arts, London. The academic adviser has participated in collaborative projects before, but this partnership does not correspond to their area of expertise. The Associate has a research background, although it is the first time she collaborates on a project like the KTP.
	Nature of the project (intention)	<ul style="list-style-type: none"> The intention of the project was to obtain information and feedback from the artist's related to the uses, needs and requirements in terms of work space. Document current artistic practices and the influence of these in their work/work place. Studios have good occupation rates (99 %). However, the allocation process is based on anecdotes.
	KTP's environment (context)	<ul style="list-style-type: none"> The organisation employs collaboration on a constant basis, to help artist and their commercial partners (other studio suppliers) to acquire knowledge related to Fine Artists The KTP, its environment, and the project's conditions are new for all partners. The decision-making system/studio provision is done in an informal unstructured way. This KTP is considered 'unique' (from the partner's perspective). Because "it is the first time the KTP has given support to a charity working for artists". Similarly, she observes that: "what also makes this KTP exceptional is that graduating students of the [KBP]... represent potential end users of the company's product i.e. the studio" [Associate].

Table C.4 (continued)

Case	Element	Description
D	Prior relationship between partners	<ul style="list-style-type: none"> Existing and formal. The entrepreneur approached the KB 18 months before the KTP began. The entrepreneur was referred to the design team where the future academic adviser works. The KTP was a suggestion of the academic partner, as a way of remaining involved in the development of the project, overseen the project as external consultants.
	Nature of the project (intention)	<ul style="list-style-type: none"> Formally (justification) to launch the clothing brand. The partners had the objective of capitalising on the expertise developed during previous projects to develop a particular clothing brand.
	KTP's environment (context)	<ul style="list-style-type: none"> The partnership was described as the second of a series of 'sprints'. Prior to formalising the partnership the relevant knowledge regarding sportswear manufacture and the specific characteristics of the product was provided by the academic adviser. The brand was co-designed by the academic adviser.
E	Prior relationship between partners	<ul style="list-style-type: none"> Existing and formal. The academic adviser and the firm's founding partners met during their university years. The firm is a university spin-off. The partners used to collaborate previously on a more regular basis. However, the frequency of their collaborations has diminished recently.
	Nature of the project (intention)	Product-improvement and acquiring specific know—how and capabilities.
	KTP's environment (context)	<ul style="list-style-type: none"> The CBP had developed collaborative projects under the TCS The company has a history of collaborating and establishing academic alliances with different universities.
F	Prior relationship between partners	<ul style="list-style-type: none"> Based on personal relationship with the academic advisers from the technical director's involvement with teaching in the KBP The current technical director graduated from the University of Strathclyde, The Associates working on the KTP projects hold doctoral degrees from the University of Strathclyde.
	Nature of the project (intention)	<ul style="list-style-type: none"> The first project attempt to generate a more comprehensive understanding of the company's customers. The second project, a continuum of the first partnership, involved product development and a modification of packing.
	KTP's environment (context)	<ul style="list-style-type: none"> Geographical proximity of the KBP was important for the CBP. The academic advisers had expertise in the Whisky industry (transferable skills to the KTP project). The company was established in the late seventeen century. It still operates as a family-based business The technological development and product diversification started from 1990's.

Source: Own elaboration with information from the portfolio of evidences (see Section B.3)