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Anthony Paul Buckley

Technological University Dublin, anthony.buckley@tudublin.ie

Stephen Davis

Technological University Dublin

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University-based Technology Start-up Incubators – Evaluating their contribution to the co-production of knowledge, innovation and growth. Experience from the Edge.

Dr Anthony Paul Buckley¹ & Stephen Davis MBA²

¹Dublin Institute of Technology, Dublin, Ireland

²Dublin Institute of Technology, Dublin, Ireland

Abstract

Policy makers in developed economies see merit in supporting the innovative abilities of technology entrepreneurs. It is hoped that from these highly-educated entrepreneur(s), new technology and service-based firms (NTBFs) can emerge. Indeed empirical evidence suggests that it is fast-growing young innovative firms which provide the bulk of new employment growth (Henrekson & Johansson, 2010; Storey & Greene, 2010).

Start-up incubators are one of a number of micro-policy interventions with which states attempt – primarily through publically funded higher education Institutions - to support technology entrepreneurs to develop and commercialise their innovations. Incubator numbers have grown globally from their first appearance in the US in the 1950's (for urban renewal purposes) to over 2,300 in the US and Europe currently. Since 2000, the number of incubators in US has almost trebled whilst the number in Europe has more than doubled (Bruneel et al, 2012). This latter growth has been driven primarily by *technology* start-up incubators, with these university – based incubators seen as important growth engines for developing knowledge economies and local and regional economic development (Etzkowitz et al. 2000, Link & Siegel, 2007).

Technology start –up incubators are typically located in or near universities as they generally fall under the universities knowledge transfer remit. They typically focus on the research strengths of the university and offer a range of services to academic entrepreneurs and other incubatees such as shared office accommodation, shared support services, business support (hard), business advice (soft) and network provision (Bergek & Norman, 2008). Incubation programmes attempt to contribute to enterprise sustainability and the professional and entrepreneurial development of participants through *buffering*, which protects participants from the external environment (for a defined period), enabling them to develop their own internal resources; and *bridging*, which facilitates firms in building sustainable competitive advantage through the acquisition of external resources and networks (Amezcuca *et al.* 2013).). This paper outlines the methodological and data-related challenges associated with attempting to evaluate the contribution of start-up incubator services and supports to value-adding outputs, outcomes and impact. It advocates theory-based evaluation (TBE) methodology as a possible solution for effective evaluation (and policy learning) in complex research settings such as this, where a study is unable for a variety of reasons, to meet the stringent requirements of an experimental design e.g. random assignment, establishment of counterfactuals, control groups etc. TBE will deliver findings on the contribution of the multiple factors influencing a result showing whether the incubation process in a study made a contribution to an observed result and in what way? Mixed methods research designs and data analysis approaches are particularly suitable for TBE studies. An exploratory case study is used to illustrate the proposed TBE approach.

Keywords

start-up incubator, entrepreneurship, enterprise supports, SMEs, public policy, business acceleration

Introduction

If a country is to grow and develop economically then its ability to nurture the growth and development of young high growth firms is perhaps the most important element in enterprise policy (Storey & Greene, 2010). However Storey (1998) notes that in general there is a dearth of evidence to support 'direct' state intervention in firms with high growth potential. Indeed in the case of state-funded business incubation centres there are: 'very real methodological problems in linking the provision of incubator support to subsequent economic outcomes' (Storey & Greene 2010:450). As a result, there is a gulf between our understanding of the need for such entrepreneurship policies and on how such policies might be conceived and designed - if needed (Karlsson & Andersson 2009: 127). Furthermore, should public money be spent on entrepreneurship and SME support then it is essential that rigorous evaluation of the contribution of these initiatives takes place to aid policy-learning. Regardless, the evaluation of

policy performance is important for public transparency and accountability, otherwise a government can simply 'set sketchy objectives' and 'claim that the target is anything it happens to hit' (Harrison & Leitch 1996).

Supporting Entrepreneurs and SMEs

Government policy aimed at supporting the development and growth of SMEs and entrepreneurs can be broadly categorised into macro and micro level policy measures. Micro policies focusing specifically on SMEs and entrepreneurs while macro policies 'do not have SMEs or entrepreneurs as their primary focus' (Storey and Greene 2010: p.407).

Macro-Economic Policy

Macro-policies sit within a country's institutional structure and generally include four key components: (i) macro-economic stability and regulation, business climate, trade policy and FDI policy; (ii) policies on competition and monopoly; (iii) government economic agency (taxation, public services and expenditures, employment, contracting and social policy); and (iv) government economic strategy, planning and promotion, contribution to the knowledge economy, technology and innovation (Bennett 2014: p.17).

Macroeconomic policies are therefore aimed at improving the broader economic conditions through a plethora of policy measures and in myriad ways. Many of these policies can have indirectly positive or negative influences on SME and entrepreneurial development.

Micro-Economic Policy

Micro policies targeted at start-ups and entrepreneurs 'are those which endeavour to support the start up and growth of businesses by providing direct assistance to the individuals or businesses concerned' (Bridge and O'Neill 2013: p.323). Such direct assistance or 'intervention' from the government is normally justified on the grounds of 'market failure' i.e. where there are barriers to entry and exit; information imperfections; the presence of externalities (knowledge, network or learning spill-overs); and where willingness to pay does not reflect demand (Storey & Greene, 2010). In other words, the government must have a case to intervene in the market mechanism in order to make it work better (p.381-385). One of the key issues around micro-policy intervention is whether a government can intervene cost effectively, with market failure alone not a necessary or sufficient justification for intervention (Storey, 2008). This is compounded by a lack of empirical support for micro policy intervention in the literature (Bannock 2005; Davidsson 2008; Bridge *et al.* 2009). Storey (2008) notes in conclusion that this is exacerbated by the paucity of rigorous evaluation of these enterprise policies. Indeed the OECD (2007) provides seven areas under which policy can be evaluated. These are: Rationale, Additionality, Appropriateness, Superiority, Systemic Efficiency, Own Efficiency and Adaptive Efficiency, although arguing that 'at the core of evaluation is the concept of additionality'. Additionality is thus an appropriate moniker for the attempts by researchers to try and quantify the impact or contribution of an intervention under study when compared to a possible 'counterfactual' situation (Oldsman & Halberg, 2002).

Micro policy instruments aimed at growing entrepreneurs and SMEs are broadly subsumed under the rubric of *Enterprise Policy*. Enterprise policy is often then justified on the basis that it helps stimulate and/or facilitate entrepreneurial activity which in turn can provide key benefits to national economies such as job generation, innovation, productivity and growth. On an individual level this support can also help entrepreneurs increase their 'utility' function by increasing, for example, their satisfaction or income (Van Praag & Versloot, 2007). Whilst there are rigorous and elaborate frameworks developed for evaluating enterprise policy (See: Storey, 1999; OECD, 2004), these have proven difficult to implement in practice and therefore there is a dearth of empirical evidence to support or justify micro policy intervention.

SME Policy & Entrepreneurship Policy

Bridge and O'Neill (2013, p.301) point out that 'there is often confusion about what is meant by [SME and Entrepreneurship] policies' as there is 'a lack of a clear definitions of both terms. Storey (1998) notes 'the important distinction between [these terms] in which [SME policy] applies to existing enterprises whereas [entrepreneurship policy] relates to policies seeking to enhance the creation of such enterprises' (p.6). SME policies are designed to stimulate the growth of already established small businesses 'and tend to focus on the businesses and what will help them grow, not the entrepreneurs behind them' (Bridge & O'Neill 2013, p.301). On the other hand, Entrepreneurship policies are aimed at 'encouraging and facilitating more people to create their own businesses' and 'are centred on what people and on what will persuade or help them to start businesses' (Bridge & O'Neill 2013, p.301).

In the context of publicly sponsored business start-up incubation, the distinction between enterprise and SME policy is made even more unclear considering this support is aimed at helping transform entrepreneurs into successful start-up companies. As a result, incubation programmes typically straddle both categories - providing a combination of supports and services that fall within both camps.

Policy Rationale for Business Start-Up Incubation

The rationale for business start-up incubators targeting new technology and service-based firms (NTBFs) is that ‘policy-makers view high-technology sectors as the main generators of potential [High growth Firms]’ or Gazelles (Mason & Brown, 2013: 214). Business Incubators aim to stimulate and support entrepreneurs and start-ups (Grimaldi & Grandi, 2005: 111) through the provision of supports that provide a ‘safe harbour’ for firms to develop their internal resources – so called *buffering*, while also connecting them with external resources and networks - referred to as *bridging* (Amezcuca *et al.* 2013: 1633).

Buffering allows fledgeling firms/entrepreneurs to isolate themselves from the environment (for a defined time-period). This allows them to engage in formational and developmental activities without having to confront directly these ‘general and specific environmental threats’. Bridging, on the other hand, allows them to actively engage rather than be isolated from their external environment to build assets that will hopefully allow for the development of sustainable competitive advantage (Amezcuca *et al.* 2013: 1629) and company value creation (Davidsson *et al.* 2008).

Measuring Incubator Performance

Ramsden and Bennett (2005: 229) differentiate between objective - ‘hard’ and subjective – ‘soft’ performance (impact) criteria. The former referring to outcomes such as reduction in business costs; increase in business turnover; increase in business profitability, and the latter referring to softer outcomes such as the ‘ability to cope with problems’ and ‘ability to manage.’

Voisey *et al.* (2006: 465) argue that business incubators must demonstrate their success in statistical terms of ‘hard measures’ as well as in ‘soft benefits’ such as increased business knowledge and skills, business awareness and client networking improvements. In parallel, the incubator must meet its own ‘hard’ targets as agreed with key stakeholders. Stephens and Onofrei (2012: 283) identified four additional hard measures of success (location/incubation space; success in entrepreneurial competitions; securing public funding; and customer retention) and three additional soft measures (increased productivity due to incubation structures; networking; and a positive image associated with being on a recognized programme). These authors advocate ‘a holistic approach to the measurement and evaluation of business incubation...utiliz[ing] hard and soft measures’ (Stephens and Onofrei 2012: 283).

Incubator performance measures are a widely discussed issue in this domain and it has generated some debate amongst researchers in the area. The literature has yet to come to even a broad consensus on what constitutes appropriate measures of performance (Barbero *et al.* 2012: p.891)

Table 1: Studies on Incubator performance measurement

Study/Researcher(s)	Review Period	Sample Size	Key Outcomes (Positive and Negative)
<i>Gti Pre-Incubator Longitudinal Study/ Voisey, Jones and Thomas (2013)</i>	2001-2011	26	“Positive economic and social contributions.” Cumulative turnover in excess of £25 million. More than 130 jobs created in the 26 enterprises. <i>Voisey et. al, 2013 (p.60)</i>
<i>Assessment of Business Incubators in France/ M’Chirgui (2012)</i>	2000-2007	200+	Lack of access to complementary financing structures. Training courses offered to applicants deficient. Deficiency in providing tenants with appropriate human capital resources to build their teams. The tenant selection process is insufficiently rigorous. The number of jobs created by incubatees is relatively low. <i>M’Chirgui (2012, p.68)</i>
<i>UK Business Incubation Study (Body Responsible for Business Incubation in the UK)</i>	N.P.	N.P	Over 90 per cent of companies that underwent the incubation process were still thriving after three years, compared to 41 per cent of UK start-ups in general, over the same period (Bream, 2009)

<i>Israeli Technology Incubator Program/ Yossi Smoller, Director of Israel's Technological Incubators Program</i>	2002-2011	1300	\$2.5 billion dollars private investment in 1300 companies post incubation. About 30 percent of the companies that graduate[d] the [Israeli] incubators [were] active at least ten years after graduation." <i>Wylie (2011, p.856)</i>
<i>EU 'Benchmarking of Business Incubators Project' / Centre for Strategy and Evaluation Services under guidance of the European Commission</i>	2002	71	85% average survival rate. 20% average growth in client turnover. 6.2 jobs per tenant company on average. 41 new graduate jobs per incubator on average. €4,400 gross cost per job.

Source: Adapted by the authors from M'Chirgu (2012); Bream (2009); Wylie (2011); CSES (2002)

Isolating the effects of business incubation

Incubator Value Creation

'Business incubators add value in a number of ways, but their main value proposition is in their core function, which is to help new and fledgling ventures survive in the early stages of operation' (Hamdani 2006, p.17). Voisey et al. (2006, p.459) citing Campbell et al. (1985) suggest that the business incubation process creates value through the diagnosis of business needs; the selection and monitored application of business services; the provision of financing; and providing access to the incubator network.

Bruneel et al. (2012, p.111) describe the 'value proposition' of incubators as having four key components:

- (1) The existence of scale economies which reduces tenants' overhead costs (e.g. water, electricity, cleaning).
- (2) The receipt of services the firms would not otherwise have access to during such early developmental stages (e.g. meetingrooms, reception services and private parking).
- (3) Reduced burden of planning as firms do not have to put effort and time in managing such complementary services.
- (4) The benefits that incubatees receive from the subsidy generating capacity of the business incubator.

Hughes et. al (2007, p.170) place the onus on the incubatee for deriving benefits from an incubation programme, taking the view that 'firms benefit from incubation to the extent that they behave in ways that enable them to seize network opportunities and make use of networked resources and knowledge', i.e. by developing 'social capital'.

For any given outcome, a 'policy impact can be considered as the difference between the observed outcome with the intervention, and what would have happened without the intervention (the counterfactual) i.e. the 'additionality' of the intervention (Storey, 2008: 16). In order to isolate the effects of public micro-policy instruments, such as business incubation, and determine incremental value creation (additionality), it is essential that such policies have measurable objectives and targets from the outset. Otherwise Storey and Greene (2010: p.384-385) highlight two unintended consequences of government micro policies such as incubation - 'deadweight', where a business would have set up even if the support was unavailable; and 'displacement', where a new business displaces incumbents in the industry with no net economic benefit to the state.

The COTE Framework

In June 2004, a background report prepared for the 2nd OECD Conference of Ministers for Small and Medium Sized Enterprises set out the COTE Framework, aimed at ensuring that whether an intervention is justified or not, 'all SME and Entrepreneurship policies and programmes... [should] have clear objectives and targets.' The components of the COTE Framework are outlined in table 2.

Table 2: The COTE Framework

Component	Description
Clarity & Coherence	The policy should be clear to those delivering and benefiting from it, and should be delivered in a 'unifying and mutually reinforcing' way by governments.
Objectives	Objectives of the policy, such as the creation of new firms or employment creation, should be clearly specified. According to Lenihan (2011) a logic model outlining a theory of change for the programme should be mapped out to 'ensure from the outset that objectives are well specified, and that issues of opportunity cost regarding public funds are addressed' (p.330).
Targets	Measurable 'targets' reflecting the policy objectives should be specified, e.g. to increase the number of new firms by X% by 2016.
Evaluation	'Policy can only be considered to be effective if it passes the challenges of high level evaluation, but Evaluation can only be undertaken when clear policy targets exist.' The OECD (2004, P.16) emphasises the importance of feedback in this process, stating that 'implementing evaluation as a process can be achieved, by feeding the results of evaluation back into the debate, once the evaluation is complete.' This helps increase policy learning.



Source: Adapted by the Authors from Storey (2008: 13-14)

Designing Evaluation and Performance Measurement for Incubators

Evaluation 'seeks to determine...the relevance, efficiency and effectiveness of an activity in terms of its objectives' (Papaconstantinou and Polt 1997:10). However, in reality, effective programme evaluation is very difficult to achieve and 'only rarely, do we see the application of evaluation methodologies which address the effects of selection bias and incorporate appropriate counterfactual scenarios' (Lenihan *et al.* 2007:313). Lenihan *et al.* (2007) complains that too often, evaluation studies [of public policy instruments] do not get beyond first base because they focus on resource inputs and monitoring impacts of particular programmes, schemes and initiatives with little reference either to context or longer-term outcomes (p.313).

However Stames (2009) asserts that 'black box' or experimental forms of evaluation (where possible) are equally deficient because of the 'successionist theory of causality' on which experiments are based. They do not tell us why something changes; only that something has changed thus making it difficult to say whether the change can be attributed to the programme (p.62).

Incubation programme evaluation is not suited to the exacting requirements of a true experimental 'black box' impact evaluation which requires the establishment of counterfactuals and valid control groups, given its complex research setting and multiple intervening variables before an outcome is achieved. For this reason and on the basis that 'strong theoretical underpinnings give rise to robust evaluation methodologies' (Lenihan 2011: p.330) - theory based evaluation is a more appropriate methodology for evaluating an incubation programme. Proponents of 'new' programme evaluation, such as Lenihan (2007), are calling for new methodologies to be adopted by public programme evaluators. Methodologies such as theory – based approaches map out a clear theory of change (ToC) and therefore allow for multiple or mixed research methodologies to be deployed within the broader framework. This methodological dexterity opens up the possibility for micro policy instruments to be evaluated in a broadly consistent manner as theory-based evaluation (TBE) involves examining the assumptions underlying a causal chain from inputs to outcomes and impact (White 2009: p.3) or contribution (Mayne, 2001, 2008, 2012).

Incubator Evaluation Metrics using TBE

Lenihan (2011) suggests that 'new' enterprise policy interventions such as incubation programmes should encompass a wide array of evaluation metrics. She provides a list of twelve (hard and soft) policy evaluation metrics but does not provide any guidance as to how policy interventions can be evaluated against these metrics nor does she provide empirical evidence of similar evaluations.

McLaughlin and Jordan (2004) propose that a logic model theory of change is useful for designing evaluation and performance measurement as it focusses on the important elements of a programme and helps to identify what evaluation questions should be asked and performance measures used (p.7). Lenihan (2011) notes that: 'well-constructed logic models can serve as ex-post measures to see whether objectives have been attained, enabling robust ex-post evaluations' (p.330) that ultimately feed back into future programme design.

Theory-based Impact Evaluation (TBIE) involves examining the assumptions underlying a causal chain from inputs to outcomes and impact (White 2009:3). The theory-driven method is based on the rationale that

‘evaluation should not be dictated or driven by one particular [research] method’ (Chen 2015:25) and that ‘the success of a program has to be judged not only by its results but also by its context’ (Chen 2015:26).

Inputs are ‘resources dedicated to or consumed by the program’ (Chen 2015, p. 60) and in the case of an incubator are aimed at ‘developing a supportive environment by providing access to opportunities, resources and support services.’ (Stephens and Onfrei 2012, p. 279) According to Hackett and Dilts (2004a) ‘a lack of inputs such as capable entrepreneurs....might go a long way toward explaining why many incubators perform so poorly’ (p.43). The entrepreneurs themselves are also a fundamental input while the opportunity cost of accepting one entrepreneur over another applicant can also be considered a negative input. The incubation inputs will directly influence the level of activities that can be undertaken within an incubation programme. In addition, the characteristics of the participating entrepreneurs represents a further input into the process at the pre-start-up phase.

Activities (processes) ‘are what the program does with the inputs to fulfil its mission’ (Chen 2015, p.60) and in an incubator, include the professional services, opportunities and informal networking environment designed to ‘facilitate knowledge and training’ (Stephens and Onfrei 2012, p. 279). The activities undertaken are designed to produce highly capable entrepreneurs and start-ups with high growth potential (gazelles). These activities will also influence the characteristics of the firm at start-up.

Outputs are ‘the direct products of program activities’ (Chen 2015, p.60) and primarily include the company as ultimately ‘the incubator is a manufacturer of new firms’ (Hackett and Dilts, 2004a) and also the graduating entrepreneur. The characteristics of the firm resulting from these activities will heavily influence its growth potential, which will be largely determined by the management strategies implemented post start-up.

Outcomes represent ‘the benefits for participants during and after program activities’ (Chen 2015, p.60) and will be heavily influenced by the success (or failure) of subsequent management strategies. The benefit to the individual participant will more likely be denoted

by learning or ‘soft’ outcomes while benefits for the firm will likely be indicated through ‘hard’, financial performance or employment growth. The management strategies adopted will also be heavily influenced by external environmental factors (Gibb and Davies, 1990).

The broken line represents a feedback loop and conveys how the logic model can serve as a highly effective ex post evaluation method by aiding policymakers in the ‘classification of options for setting priorities and supporting effective allocation of resources’ (Lenin 2011, p.382). In other words, by monitoring the outcomes of the program, it allows policy makers and programmer coordinators to manipulate the inputs and activities in an attempt to achieve the desired outcomes for future programmers.

Context

The Irish Government has identified six key areas it is seeking to develop via a combination of macro- and micro-economic policies in order to create a vibrant entrepreneurial ecosystem in Ireland: culture, human capital and education; business environment and supports; innovation; access to finance; entrepreneurial networks and mentoring; and access to markets (National Policy Statement on Entrepreneurship in Ireland. 2014, p.8)

In relation to micro policies, there are a large number of specific supports directly available to entrepreneurs in Ireland. The *Department of Jobs, Enterprise and Innovation (DJEI)* provides 82 specific individual enterprise policy instruments reflecting perhaps the absence of coherence and clarity in the overall enterprise strategy to date, not to mention the effect of rigorous evaluation (DJEI 2015). *Enterprise Ireland*, the government organisation responsible for the development and growth of Irish enterprises in world markets delivers a range of these supports, including start-up incubation programmes. The list of *Enterprise Ireland* supports, a description of each and the latest available exchequer funding for each is provided in Table 3.2.

Table 3: Enterprise Ireland Entrepreneurship Supports

Support	Description	Funding
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EnterpriseSTART Workshops	Provide entrepreneurs with comprehensive information to understand the business development process including the key success factors and potential pitfalls as well as an outline of financial supports available from Enterprise Ireland and Local Enterprise Office.	€90,000 (2013)
Mentor Programme	Mentors provide advice, guidance and support, to help clients grow and build capability.	€571,000 (2013)
Competitive Feasibility Funds	Aimed at assisting entrepreneurs to investigate the viability of a new growth orientated business that can succeed in global markets.	€1.0m (2013)
HPSU Feasibility Study	Funding to investigate the viability and potential of an innovative/high potential startup and the development of an Investor Ready Business Plan.	€2.6m (2013)
Competitive Start Fund	Aims to assist startups to bridge the equity gap and quickly validate their market.	€4.3m (2013)
Innovative HPSU Programme	Equity investment for HPSU clients, on a co-funded basis to support the implementation of company business plans	€21.7m (2013)
Commercialisation Fund	Drives the commercialisation of research from higher education research institutions by supporting the development of innovations at all stages of the commercial pipeline to the point where they can be commercialised as new products, services and companies.	€15.7m (2013)
Incubation Centres	Providing an essential transitional space between the research and business worlds.	€2.0m (2013)
Community Enterprise Centres	Provide entrepreneurs with business space in a supportive environment with the aim developing entrepreneurship in both urban and rural locations.	€64m (since 1989)
Seed & Venture Capital Scheme:	Aims to increase the availability of risk capital for SMEs to support economic growth through the continued development of the Seed and Venture Capital Sector in Ireland to achieve a more robust, commercially viable and sustainable sector	€59m invested in Irish companies
New Frontiers Programme	National incubation programme launched in 2012 that offers participants a package of supports to help accelerate their business development and to equip them with the skills to successfully start and grow a company.	€6.1m paid (June 2014)

Source: National Policy Statement on Entrepreneurship in Ireland (2014, p.62-64)

From the list of entrepreneur supports identified in table 3.2, 'Incubation Centres' and 'New Frontiers' constitute the extent of publicly sponsored start-up incubation in Ireland. Between 2013 and 2014, a total of €8.1 million of exchequer funding was appropriated to funding these incubation programmes. Based on Enterprise Ireland's budget of €219 million for enterprise development in 2014, incubation represents 3.7% of expenditure (Enterprise Ireland 2014, p. 11).

Publicly Sponsored Business Incubation in Ireland

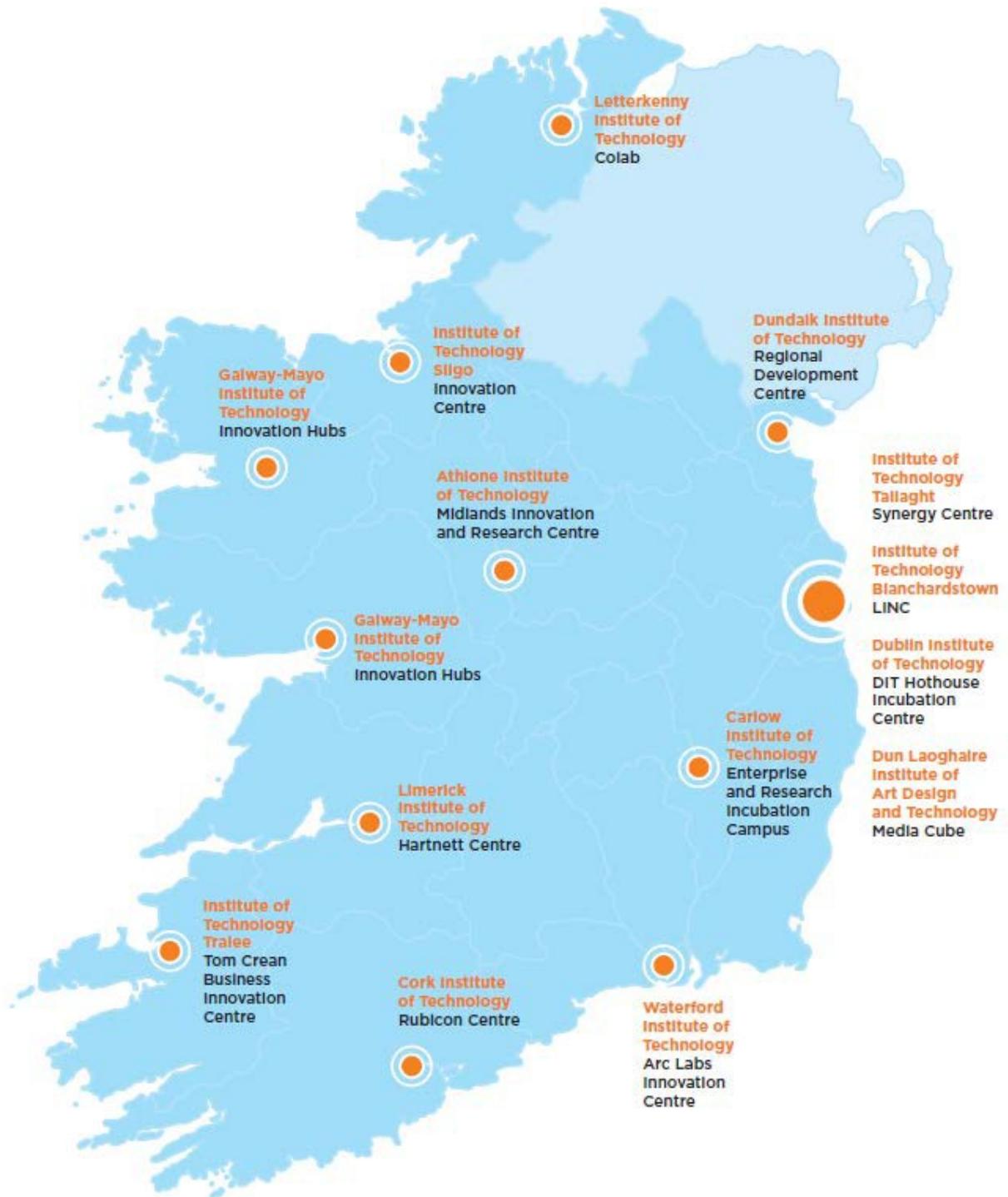
In Ireland, publicly sponsored incubation programmes are provided in through the *Enterprise Ireland Campus Incubation Programme*, provided by the incubation or industrial liaison offices of Irish Universities and the Institutes of Technology - such programmes offer structured training; mentoring; networking opportunities; financial assistance and shared incubation space (De Faoite et al. 2004, p.442) and 'provide entrepreneurs with a supportive environment that assists them in bringing their idea to market, aimed at helping to reduce the risk aversion to failure.' (Forfas 2012, p.119). There are currently 21 Enterprise Ireland funded business incubators in Ireland, dispersed throughout University and Institute of Technology (IoT) campuses (Enterprise Ireland, 2015). This research focuses on the experiences of past participants of IoT campus programmes, known collectively as New Frontiers.

The Enterprise Ireland New Frontiers Programme (2012 –2016)

Launched in February 2012, New Frontiers is a national entrepreneur development programme aimed at supporting the establishment and growth of technology or knowledge intensive ventures that have the potential to trade internationally and create employment in Ireland (DIT Hothouse 2015).

New Frontiers, funded and coordinated by Enterprise Ireland and delivered at a local level by 15 institutes of technology, provides aspiring entrepreneurs with a package of supports that includes funding of €15,000, office space, mentoring and workshops to help accelerate their business development (Enterprise Ireland, 2013, p.31). Figure 3.1 graphically represents the geographic location of each New Frontiers Campus Incubation Centre.

Figure 1: New Frontiers Campus Incubation Centres (2015)



Source: Enterprise Ireland (2015b)

The Phases of New Frontiers

The New Frontiers incubation programme consists of three phases:

Phase 1: Delivered Part Time (2 days per week) over 10 week period to help validate the potential of a business idea.

Phase 2: Participation is determined via a competitive selection process and requires successful applicants to be based in the campus incubation centre full-time for six months. The aim is to support in the development of an investor-ready business-plan.

Phase 3: This provides phase 2 graduates with the option to avail of incubation facilities for up to a further three months. The aim of is to assist entrepreneurs in developing their business and client bases.

Phase 2 represents the most intensive incubation phase of the programme and is therefore the focus of this research, with all entrepreneurs and firms comprising the research sample having participated on and graduated from this phase.

New Frontiers Phase 2 - Incubation

The mentoring and supports delivered throughout phase two are oriented towards helping companies, on graduation of the programme, to achieving public equity investment from the following sources:

Competitive Start Fund: A €50k equity investment designed to accelerate the development of high potential start-up companies by supporting them to achieve commercial and technical milestones such as evaluating international market opportunities or building a prototype (Enterprise Ireland 2015).

Innovative HPSU (High Potential Start Up) Fund: Equity investment, on a co-funded basis to support the implementation of a company's business plans. Investment is generally

provided by Enterprise Ireland on a 'match-funding' basis i.e. the same level as funding contributed by the business owners (Enterprise Ireland 2015).

Supports Provided through New Frontiers Phase 2

Table 3.3 provides a full list of supports provided to participants on New Frontiers Phase 2 throughout the six month programme duration.

Table 4: Incubation Supports provided through New Frontiers Phase 2

1. Training in all areas of business including financial management, market research and validation, business models, patenting, product development, business development and sales.
2. Personalised hands-on support, advice and mentoring from experienced business advisers and practitioners.
3. Peer group learning from participants in the region and across the country.
4. Office space and other business incubation facilities
5. Funding stipend of up to €15,000.
6. Networking opportunities with other entrepreneurs and business development agencies.
7. Introductions to seed and early-stage capital investment networks.
8. Access to entrepreneurship best practice – both national and international.
9. Expertise from higher education institutes and the supportive environment of their business incubation centres.
10. Access to the expertise in Enterprise Ireland through its Market Research Centre.

Source: Enterprise Ireland (2015b)

'Based on the success of [its] first year...a further €12.65m [was] invested [by Enterprise Ireland] for the next three years of New Frontiers' 2013-2016 (Enterprise Ireland 2013, p.31)

However, given the relatively short period that the New Frontiers programme has been in operation (less than three years at the time of writing), it is difficult to evaluate its performance in terms of economic outcomes.

It is therefore necessary to examine longitudinal empirical evidence relating to the experiences and outcomes of participants on previous publicly funded campus incubation programmes.

Experiences of Participants on Irish Campus Incubation Programmes

A study by Ryan and Wright (2009) investigating the experiences of incubated companies within Cork and Waterford Institutes of Technology (IoTs) found a number of prevalent themes which highlighted the experience of participants (p.76). These key themes are outlined in table 3.4.

Table 5: Experience of Participants within Campus Incubation Programmes

Theme	Explanation
Networking Opportunities	Informal, internal networking amongst participants through common facilities such as “the canteen” was emphasised as a clear value-creating activity, “particularly where there are opportunities to work together” (p.77)
Co-Location and Mutual Trust	There is a “huge advantage being able to work with other companies of the same stage of development” and “helping each other” which “provides the potential to generate new ideas” (p.77)
Relationship with the incubation manager	The companies relationship with the incubation centre manager is cited as being of “strategic importance”, particularly in linking client companies with the institutes (p.77)
Physical proximity to the Institute	Providing incubated companies with easy access to the “knowledge, facilities and [potential] labour force” within the IoTs and the relationships between the incubator and academic staff “played a key role in attracting several client companies to both incubators” (p.78)
Active Collaboration not supported by all academic staff	A “cultural disconnect” was highlighted between the incubated companies and academic staff, particularly “a different mindset towards meeting deliverables and deadlines” (p.79). This may be explained by the assertion that “academic staff are not appropriately rewarded for actively engaging with industry, and therefore not motivated,” (p.80)
Financial assistance, physical space and infrastructure	“Funding” and “increased sales revenues” highlighted as biggest challenges the incubated companies faced and the financial and infrastructural assistance of incubation enabled them to manage their cash flows and finances (p. 80)
Managerial Functions	The younger incubated companies (less than one year) typically rely on incubator staff to fulfil their managerial functions, such as identify funding, arrange business meetings and recruitment of staff/students for their business (p. 78)

Source: Ryan and Wright (2009)

Campus Incubator Performance: Irish Evidence

Empirical studies conducted by Forfas (2014) and Stephens and Onofrei (2012) have attempted to demonstrate the impact of the campus incubation programme. The key findings of each study are included in table 3.5.

Table 6: Empirical Findings on Irish Campus Incubation Outcomes

Study/Researcher(s)	Review Period	Sample Size	Greatest Benefit (% as expressed by sample)	
<i>Campus Incubation Programme Review/ Forfas (2014)</i>	1999 - 2007	149	Short Term: Increase in company value (30%). New domestic sales (27%). New export sales (17%). Increased export volumes (13%). (p.127)	Long Term: Improved Business capabilities (73%). Ability to attract highly skilled staff (40%). Better technological skills (38%). Greater higher-level skills (23%). (p.128)
<i>Business Incubation Centre (BIC) Study/ Stephens & Onofrei (2012)</i>	2012	43	Hard Benefits: Enterprise growth (79%). Reduced reliance on incubation support (51%). Improved sales or profitability (35%). (p.281)	Soft Benefits: Confidence, networking & business knowledge (79%). Cost savings due to incubation resources (70%). Increased positive publicity (42%). (p.282)

Source: Forfas (2014); Stephens and Onofrei (2012)

According to the Forfas (2014) report commissioned by Enterprise Ireland, the Enterprise Development Programme is succeeding in terms of employment creation, good incubation practice is in evidence, and the overall programme is delivering results albeit ‘at a relatively early stage of a long term, strategic programme’ (p.134).

Evident from the empirical studies outlined in sections 3.5 and 3.6 is a dearth of programme “evaluation”, rather the outcomes of these incubation programmes have simply been monitored, with no attempt to rigorously identify “additionality” delivered through the incubation process.

DIT Hothouse Venture Programme Performance (2001 – 2011)

Between 2001 and 2011, DIT Hothouse, the incubation centre at Dublin Institute of Technology operated 21 twelve-month long venture programmes that provided entrepreneurs with professional expertise, incubation facilities and mentoring with the aim of developing successful companies for the global market (DIT, 2011).

The key outcomes of the Hothouse Venture Programmes include:

- 91 of the 272 programme participants (33.45%) subsequently becoming Enterprise Ireland HPSU (High Performance Start Up) clients (DIT Hothouse 2012, p.19)
- 37 of the 272 participants (13.6%) becoming CEB (County Enterprise Board) Clients (DIT Hothouse 2012, p.19)

Table 7: Hothouse Venture Programme Outcomes (2001 – 2011)

Outcome:	Trading	Acquired	Investment Raised	Sustainable Businesses	Jobs Created
Total	171	8	€87 million	179	1055
Percentage/ per participant (pp)	62.9%	2.9%	€322,235 pp	65.8%	3.88 pp

Source: DIT Hothouse (2011)

Firm Survival Rate

The Hothouse Incubation Programme had a firm survival rate of 62.9% with 272 incubated firms still trading as at October 2012. Calvino et al. (2015) determined that the average survival rate for firms is 'just above 60% after 3 years, 50% after 5 years, and just over 40% after 7 years' (Calvino et. al, 2015, p.6). When considering that a further eight of the incubated firms were subsequently acquired, this brings the total sustainable businesses to 179, representing 65.8% survival.

However, the difficulty of long term survival is highlighted by a number of researchers. A study by Hull and Arnold (2008) on the growth of 442,000 small and large businesses in New Zealand found that only 30% of firms were able to achieved sustained growth over a five year period, with the remainder reducing in size in terms of turnover (Storey and Greene 2010, p.214-215). Phillips and Kirchoff (1989) found that in the UK only 26% of small businesses (1-4 employees) that failed to grow survived for more than six years (Storey and Greene 2010, p.214-215). These two stylised facts combined would suggest that sustained high growth is highly unusual. The OECD (2008) would appear to confirm this fact, indicating that gazelles account for less than 2% of sales and less than 1% of employment in all businesses (Storey and Greene, 2010, p.216).

Firm Job Creation

With 272 programme graduates creating a total of 1,055 jobs, this represents just fewer than 4 jobs created per incubated firm. This amounts to a cost of roughly €3,800 per job based on a total expenditure of approximately €5 million over the period. This appears to compare favourably to the average Enterprise Ireland cost per job of €6,721, measured over the seven year period from 2001 to 2007 (Enterprise Ireland 2014, p.59)

Private Investment Raise

Raising investment poses a significant challenge for start-up companies with the typical SME facing an 'equity gap' or 'shortage of risk capital investment' (Gualandri, 208, p.29) in the range of UK£250,000 and UK£1 million, according to Deakins and Freel (2012, p. 166 -167). The average figure of €322,235 investment per Hothouse Venture Programme is skewed on the basis that Enterprise Ireland HPSU and CSF investment is included and confined to the more successful participants, and also by this same logic, a smaller number of 'higher potential' companies would have undoubtedly received much larger sums of private investment while other graduates would have received much less or none at all. Deakins and Freel (2012) posit that 'the average early-stage investment was £789,000' in the UK in 2010 (p.176).

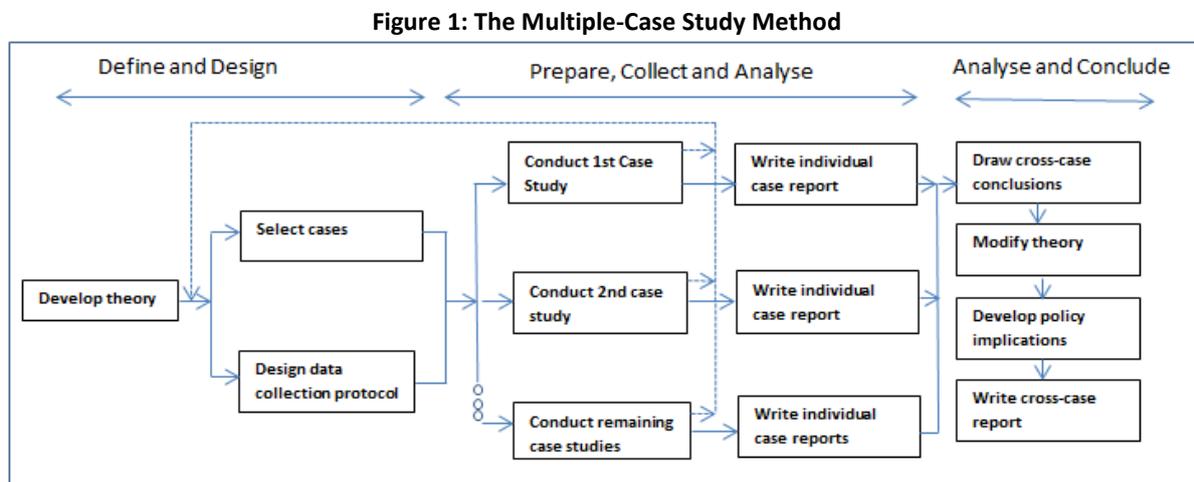
Conclusion

Overall, it would appear that the Irish government offers a very wide ranging network of supports to start-up companies and entrepreneurs. However, with such a vast range on offer, it could certainly be seen how evaluation and administration of these interventions could pose a challenge. In addition, such a vast range of options could be a source of confusion to potential entrepreneurs or start-ups seeking supports. It is also evident in the context of the research, that there is a clear lack of evaluation within the campus incubation programme, with previous studies appearing to comprise purely of monitoring as opposed to evaluation.

Methodology

This research employs a multiple-case study methodology. Yin (2009) posits that 'evidence from multiple cases is often considered more compelling [than single case designs], and the overall study is therefore considered more robust' (Yin 2009: 53 citing Herriott & Firestone, 1983). Comparing more than one case allows for 'the special features of cases to be identified much more readily' (Bryman 1989: 171).

Figure 1 outlines the process for conducting multiple-case study research, which is further described in the sections that follow.



Source: Adapted from Yin, 2009: p.57

To determine the most appropriate theoretical sample for the multiple-case analysis, secondary information on all 32 Hothouse New Frontiers 2012 programme graduates was acquired through a variety of sources. The 32 cases were analysed collectively in an attempt to identify a 'theoretical sample' (Eisenhardt, 1989) which also illuminated 'transparently observable' progress between participants (Pettigrew, 1990).

The final case study sample consisted of three graduates from each of the two 2012 cohorts (six in total), three of whom were currently still trading and classified as *Surviving Firms and Entrepreneurs* for the purposes of this study. The remaining three firms were not currently trading and were therefore classified as *Ceased Firms and Entrepreneurs* for the purpose of this research. The sample was deemed to be representative of the cohorts (Martinson & O'Brien 2010) in that it enabled direct comparison between surviving firms and ceased firms.

Interviews undertaken with all six programme participants followed a similar semi-structured format and questions were based largely on the key theoretical determinants of firm growth as suggested by Storey (1998) and Smallbone and Wyr (2012). Additional studies on the same topic, such as Dobbs and Hamilton (2007), Hansen and Hamilton (2011) and Barrow *et al.* (2011) also influenced the questions and framing of the interview guide. Finally, the findings of incubator performance studies, such as those by Voisey *et al.* (2006) and Onofrei and Stephens (2011), discussions with key informants such as the Hothouse incubation centre manager and review of previous incubator surveys informed the programme-related questions.

Following a detailed review of the six individual case reports, a 'data reduction' (Caudle, 2004: p.421) process was undertaken that involved categorising, tabulating, summarising, comparing and contrasting all information into 'data displays' to enable the identification of patterns and key themes (Caudle, 2004: p.421).

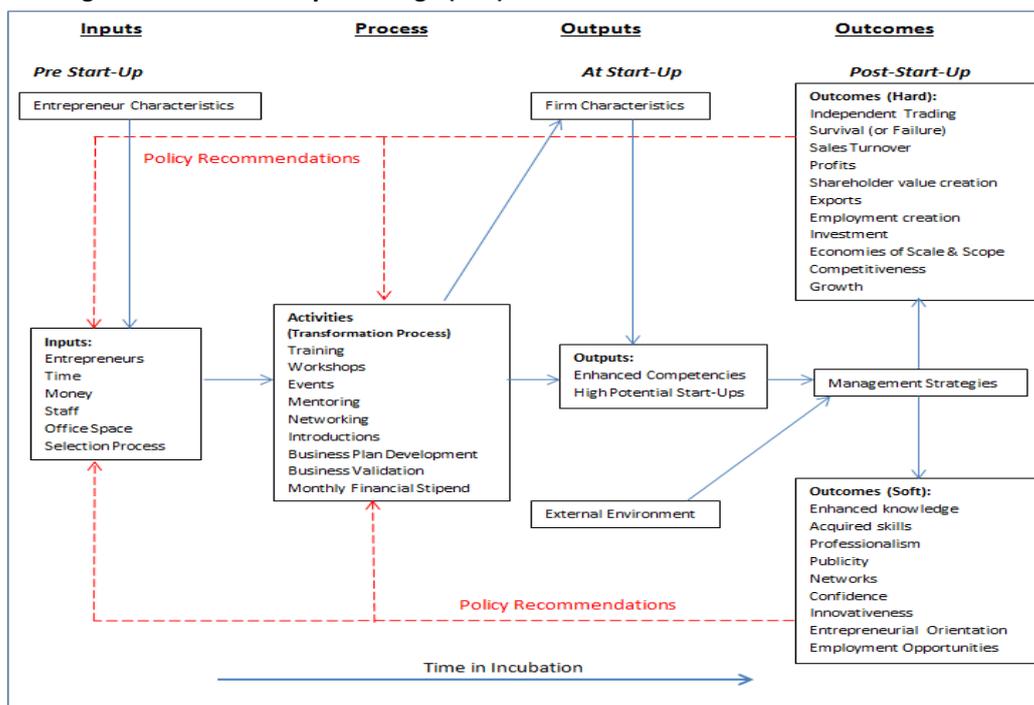
Business Incubation Logic Model and Theory of Change (ToC)

A logic model and theory of change draws attention to the potential importance of the incubation process in helping explain incubation outcomes (Hackett & Dilts, 2004a,b). A logic model was developed that represented the 'theory of change' hypothesised to occur through a business incubation programme logic model. By comparing and contrasting the actual outcomes of the theoretical sample with the hypothesised theory of change allowed for tentative conclusions to be drawn on the contribution of the incubation process to firm and entrepreneur survival. This Logic Model and Theory of Change (ToC) is depicted in Figure 2.

Findings and Discussion

Although each of the six cases analysed were largely idiosyncratic, a number of common themes emerged during the analysis stage. In particular, the three trading firms appeared to have had a more compelling technological offering than the three companies that had recently ceased trading. The surviving firms seem to have benefitted significantly more from the establishment of a 'balanced' management team from the outset of the venture. The increased absorptive capacity (Cohen & Levinthal, 1990) of the leadership team thereby increased the resilience of the ventures. They appeared collectively to have derived more benefit from the incubation programme than those participants that subsequently returned to paid employment.

Figure 2: A Logic Model and Theory of Change (ToC) for Business Incubation



Source: Buckley (2014: p.4); Hackett and Dilts (2004a: p.44); Voisey *et al.* (2006: p 465); Storey and Greene (2010) Lenihan (2011: p.329); Smallbone and Wyr (2012);

Through a combination of buffering and bridging processes - mentoring, training, and networking activities, incubation seems to have positively influenced the growth of participant (surviving) firms, specifically by improving the ability of their owner-managers to develop niche market strategies; delegate authority and responsibility, internationalise; create innovative technologies, and develop formal planning processes.

The programme-related factors which were perceived to be most beneficial for participants were one-to-one mentoring; strategy workshops and financial management training. However on the *least* beneficial aspects of incubation, opinions diverged between the surviving and ceased firms. The ceased firms considered the networking activities, such as events and introductions to be the least important in terms of the role they

played in influencing their entrepreneurial and professional development whereas the surviving firms placed high value on networking, events and introductions (Bridging processes).

Conclusion

This exploratory study suggests that publicly funded incubation programmes may make a contribution to firm growth and performance, as well as the entrepreneurial and professional development of individual participants. However, further research is required to identify those aspects of incubation which are the most beneficial to either the incubated firm or the individual programme participants. This research has also highlighted the idiosyncratic nature of firm development and the important role that fortune (and misfortune) can have in shaping the growth trajectories of young firms. Although there is no 'one-size-fits all' approach to an incubation programme - both buffering and bridging mechanisms would appear to play some part in influencing firm performance and individual success. An important tentative finding in this study is that the leaders of surviving firms placed a higher value on the networking, events and introductions aspect of the bridging process than the leaders of firms which subsequently ceased.

Recommendations for Future Research

There is a dearth of empirical research on the effectiveness of start-up incubation in influencing long term firm growth. In addition, there exists a significant level of uncertainty regarding the effectiveness of and justification for enterprise micro-policy interventions. Whilst the methodological and data related challenges in this area are significant nevertheless it would seem that longitudinal mixed research methods nested in theory-based evaluation approaches can make a significant contribution to future research in this domain.

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