Adaptability and Survival in Populations of Small and Medium Enterprises

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ABSTRACT

There is disagreement in the literature about the relative roles of selection (competition) and adaptation in explaining industrial change. For some, the possibilities for adaptation by individual firms are highly limited, and instead the key drivers of industry-level change are the extinction of some firms and the birth of others. Others stress that survival is all about the ways in which a firm can choose to adapt to changes in the external environment and to changes in competition.

This dissertation takes the view there is a false dichotomy between adaptation and selection, that they are not opposites and that adaptation is an essential an unavoidable part of any relevant evolutionary process. Even if selection generates larger industry-level outcomes, adaptability is still important. It is then an empirical matter of the relative strengths of adaptability and selection in particular circumstances.

The work makes a clear distinction between an adaptation, a change to an individual (firm) that enables the individual to be better fitted to its environment, and adaptability, the *potential* to adjust to changes in the selection environment. In looking for causal explanations, the approach adopted here acknowledges that causes relate to potentialities or dispositions and not to effects or events. Using this approach, the adopted methodology maintains that business routines, even when defined as capacities or dispositions rather than behaviours, can still be measured and used to generate an adaptability instrument. It is then possible to look at the relationship between the adaptability instrument and survival.

The research looks particularly at the adaptability and survival of small and medium size firms, as they constitute the majority of enterprises in the UK and are empirically under-represented in previous research. This thesis looks at the evolution of populations of such firms through the mix of firm-level adaptation and selection in the population.

The methodology concentrated on the four constituent areas of any firm: sales and marketing, production, administration and human resources, and corporate strategy. It examined not the quantities of operation in routines as in many previous studies but the levels of adaptability firms perceive they actually achieve or believe they would experience

in the face of both continuous and discontinuous internal and external change. The adaptability instrument is the composite measure of the potential to adapt routines across the four constituent areas, capturing a picture of the interactions between the strategies, structures and procedures within the firm.

The methodology also involved a relatively large sample of observations of a representative set of small and medium-sized enterprises, addressing the lack of previous empirical work on datasets of a whole population of firms taken from multiple industries and sectors. It was also possible to re-sample respondents in the depths of a recession 18 months later in order to look at the relationship between previously calculated adaptability and the subsequent degree of survival.

The results challenge the exclusive role of selection only in explaining industry attributes and suggest that adaptability is important for firm survival. Even if selection generates larger industry-level outcomes, adaptability is still important. The research demonstrates that both competitive selection and developmental adaptability combine to explain industrial change and that any differences in adaptability between firms are of significance.

In a sharp recession, however, only the firms with more potential to adapt their output in response to falling demand, and so better protect their cash flow against any contracting credit availability, have an advantage relative to their rivals that can confer relatively greater longevity and survivability. Other factors contribute to survival more strongly in recession than in more stable times and, while adaptability still matters, the slightly lower adaptability of older cohorts of firms masks the positive value of adaptability. At the individual firm level during sharp recession, indirect competition through customers choosing not to spend, or spend scarce resources elsewhere, rapidly de-selects those with weak cash flow management, poor cash reserves or poor credit worthiness. The criteria adopted for degrees of failure were heavily dependent on the context of use but reflected common parlance among the survey respondents.

The findings of this research point to the merits of a theoretical framework different from much textbook economics, strategy-choice theory and organisational ecology. The findings support an evolutionary approach that in turn corresponds with recent developments in the theoretical framework known as Generalised Darwinism.

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CHAPTER 1

INTRODUCTION

1.1 Background to the research

How far the landscape of firms can be explained by internal adaptation or environmental selection or combinations thereof is still a matter of debate. Neither the once-dominant view that it is natural selection among individuals that counts (Alchian, 1950; Enke, 1951; Friedman, 1953; Blume and Easley, 2007), nor the challenge that what matters are the interactions between individual firms and their environments, has yet accounted for the existence of both inertia and adaptability in organisations and how they combine to explain industry attributes.

Hannan and Freeman (1977, 1984, 1989), writing on the population ecology of organisations, challenge the assumption that organisations are plastic and changeable when failure is so common. They argue that the characteristic of most organisations is inertia, defined as a persistent organisational failure to change patterns of control in the face of changing circumstances. It is the processes of selection on a population of firms that produce the broad changes in the industrial landscape rather than individual adaptations within and among the firms themselves.

The organisational strategy and strategic choice literature, by contrast, stress that success derives largely from the decisions made by individual entrepreneurs and managers (Child, 1972; Chandler, 1977; Pfeffer and Salancik 1978; Porter, 1980). Firms survive or die in relation to their fit within the market place and the fitter firms must also be better able to learn, make better choices, adapt and survive (Cyert and March, 1963; Miles and Snow, 1978; Levinthal, 1991). Such strategic choices by the ‘dominant coalition’ of an enterprise are not merely constrained by the circumstantial environment but also reflect deliberate choices about whom to employ, what to produce in what market segments and when, and where and how to make the product or service. From a survival perspective, strategy theories reflect a view of natural selection as the survival of the fittest, where firms develop

sets of competencies, and competition selects for survival those bundles of competencies that best allow a firm to grow and prosper in the environment (Barney, 1991).

An appeal to standard economics textbooks and conventional economic theory for a view on the internal adaptation versus environmental selection issue is of little help, as notions such as adaptability, entrepreneurship, innovation and the impact of a firm's internal structures and size are largely incidental matters. Neoclassical theory assumes that firms act as if they are either rational or profit maximising and that competition weeds out the weak. From a selection perspective, the neoclassical view of firm survival and industrial change is the survival of the fittest leading to equilibrium market outcomes (Friedman, 1953). The focus is on market structure as a proxy for the degree of competition, with whatever is inside the 'black box' of the firm as a side issue.

An alternative view on adaptation and selection comes from the heterodox discipline of evolutionary economics, which draws on Darwinian notions of evolution and ideas of non-equilibrium. In this view, the whole concept of competitive individualism implied by the idea of the survival of the fittest is a matter of dispute (Hodgson, 1993). Evolutionary economics assumes that the adaptability of firms, their ability to improve the fit between the firm and the environment by changing their routines, can be a positive source of increased survivorship. At the same time, evolutionary economics also acknowledges stability and inertia as an integral part of the story (Simon, 1955; Nelson and Winter, 1982), where routines generate both adaptability and inertia and both contribute to the mechanisms of selection and retention (Hodgson, 2007).

For organisational ecologists, however, firms have very limited capacities to adapt and organisational ecology questions why failure is so commonplace if firms are malleable and flexible and can change their strategies and structures and generally adapt fast enough to keep up with changing market challenges.

Organisational ecologists also highlight the asymmetric distribution of firm sizes and observe that much of the theoretical and empirical work in strategy management and strategic choice tends to centre on larger firms or firms in specific sectors such as manufacturing, high-tech or high growth businesses. This ignores the long tail of small and medium-size enterprises that make up the majority of firms in most industrial landscapes. In

downplaying the important role of adaptation, organisational ecologists challenge empirical evidence to the contrary (Baum and Singh, 1994) and exacerbate the theoretical debate between so-called 'Lamarckian' (adaptive) and so-called 'Darwinian' (selectionist) perspectives (Hodgson and Knudsen, 2011). The problems raised by these misleading choices of label are examined in more detail in section 2.5.2 below.

The exchange between these four broad fields of study is both occasional and strained[1]. This is partly because of differences in theoretical and empirical approaches and partly because the differences in analytical granularity (single firm versus firm population) make it hard for the strategists to see the relevance of organisational ecology if there is little adaptive role for management. Empirical studies in organisational ecology usually have a large-scale, longitudinal focus, while strategy theory and research on routines tend to look at individual companies or smaller data sets by industry or geography over a relatively short period. And even then, populations of small and medium-size enterprises (SMEs) that make up the overwhelming majority of firms in the industrial landscape do not feature prominently in the empirical research.

In addition to casual descriptions of selection mechanisms as Darwinian and adaptability mechanisms as Lamarckian, ideas about adaptation and adaptability are ill-defined in the literature and the question whether adaptation is about change in the whole population and/or the adjustment of an individual firm in its given environment remains an issue.

1.2 Research problem and research questions

The research problem, then, is to look for causal explanations of the survival of individual firms, the adaptability of those firms and the evolution of populations of firms through a combination of population-level selection and firm-level adaptation. A supplementary problem, given that the research work began before the credit crunch crisis of 2008/9, is to investigate what happened to any relationship between adaptability and survival during the biggest UK economic downturn since the Second World War.

[1]See Child (2012) for a summary of significant articles on how organisations and their environments change over time, including the foundations of evolutionary thinking about organisational populations and industries and co-evolution of firms and their environments.

This thesis challenges the exclusive role of selection only in explaining survival in populations of firms and confirms there is scope for adaptation that can increase the chance of survival. It demonstrates that both competitive selection and developmental adaptability combine to explain industrial change and that any differences in adaptability between firms are of significance.

In a sharp recession, however, only the more adaptable specifically in production have an advantage relative to their rivals that can confer relatively greater longevity and survivability. Other factors related to age and circumstances contribute more strongly to survival than in non-recessionary times.

The approach adopted for this research looks at the contradictory views of the supposedly beneficial effects of organisational flexibility and inertia from the alternative perspective of evolutionary economics, where routines are commonly viewed as both a source of inertia and change (Nelson and Winter, 1982). Routines are defined following Hodgson (2004, 2007) as dispositions or capacities that shape the way various overlapping cohorts within the firm actually proceed in response to a series of signals to act, rather than actual processes.

Organisational adaptability is then specifically defined as the capacity of an organisation to change its strategies, structures, procedures or other core attributes, in anticipation of, or in response to, a change in its environment, including changes in relations with other organisations.

The challenge is to look at the relationship between firm adaptability and firm age as a proxy for survival as well as a number of other variables that might be associated with adaptability. The specific research questions, established in detail throughout chapter 2, are:

1. Does average firm adaptability correlate with average firm age and is adaptability associated with firm survival? At the population level, does inertia (the inability to move or, more weakly, an inability to shift from current momentum) increase with age and average adaptability decrease with age?[2]

[2] Organisational ecology suggests that organisational change that disrupts inertia is associated with diminished performance, including failure. This is said to be because altering an organisation's core features can be shown to be hazardous. Empirical research includes newspapers (Carroll 1984); administrative arrangements in

2. Do larger firms show more potential to adapt than smaller firms?
3. Is higher adaptability associated with higher levels of formal procedures or lower levels?
4. Is adaptability associated with innovative capacity (the more rapid adoption of technology, the willingness to try new ideas and the ability to implement new ideas/bring new products to market)?
5. Is adaptability associated with the use of external advisers or with new senior management?
6. Is adaptability correlated with the competitive environment (new competitor or price competition)?
7. Does posessing a greater ability to adapt help survival in a downturn?

1.3 Justification for the research

The research is important on a number of theoretical, experimental and practical grounds. These are touched on throughout the thesis and the implications of the findings for both policy and practice are examined in some detail in sections 5.5 and 5.6. In brief summary:

1.3.1 SMEs in the UK

The UK has a large business population by international standards although it has fewer small employers (as opposed to sole traders) than Italy or Germany. The UK Department for Business, Innovation and Skills recorded 4.3 million businesses in the UK at the start of this study (2006)[3], of which:

- 99.3 per cent were small (0–49 employees)
- only 26,000 (0.6 per cent) were classified as medium-sized (50–249 employees)
- only 6,000 (0.1 per cent) were classified as large (250+ employees).

hospitals (Zucker 1987); land ownership of wineries (Delacroix and Swaminathan 1991); geographic coverage of airlines (Amburgey 1993); frequency of newspaper publication (Amburgey, Kelley, and Barnett 1993); engine characteristics in automobile manufacture (Carroll and Teo 1996); formats of radio stations (Greve 1999); bicycle designs (Dowell and Swaminathan, 2000).

[3] The percentages had barely changed by 2011.

SMEs are crucial to the UK's economy. Businesses with fewer than 250 employees accounted for 56 per cent of UK non-government jobs and 52 per cent of turnover.[4] Many smaller businesses in the UK make a vital contribution to innovation as originators of new ideas and technologies and as links in supplying goods and services for larger businesses.

Yet the SME population is rarely studied in detail, unlike larger firms or 'innovative' firms or specific sectors, notably manufacturing where processes and routines are more easily identified. Such empirical evidence as exists tends to focus on specific niches such as high-tech/bio-tech, start-ups, clusters or other easily identifiable and quantifiable niches, or on much larger companies where, again, processes and procedures are more likely to be documented and visible.

Notably, only 15 per cent of all firms were classified as in 'manufacturing' in 2006 and by June 2010 British manufacturing accounted for just 8.2 per cent of the workforce and 12 per cent of the national output, reflecting the continuation of the steady decline in the importance of manufacturing to the British economy since the 1960s.

1.3.2 Government policy on SMEs

Government has been concerned for some years (BERR, 2008) to help build the capacity for small business growth to increase productivity and maximise opportunities for employment. Using the language of largely standard, neoclassical economics, evidence-based research (Warwick, 2005; BERR, 2008) has led to a number of initiatives for supporting and encouraging SMEs. The focus is on building management and leadership capabilities as a driver of growth and innovation, with particular emphasis on businesses with growth potential on the grounds they are more amenable to change. This is particularly so coming out of the current recession and is discussed more fully in chapter 5.

Critics such as the Confederation of British Industry (2006) and the Small Business Council (2006) have said such interventions to build small business growth capacity do not work well, despite the evidence base. They point to the gap between policy and how businesses

[4]This is a smaller share than any other European Union country, partly due to a greater proportion of employment in large corporations in the UK than elsewhere in the EU.

really behave, although they offer few alternatives other than suggesting the further reduction of red tape.

The author has eight years' experience as a Business Adviser for Business Link, the business support body set up by the Government, trying to implement government initiatives with the SME community. It became obvious early on that conventional economics was an inadequate explanation about how small businesses adapt, survive and thrive. Many would dearly love to improve productivity, grow revenues and profitability and introduce new technologies and product innovations – but many just cannot adapt or implement their strategic choices, and often not for lack of effort or capital or cash flow. Such an incomplete and incoherent understanding of SME behaviour leads to poor interventions by all agencies whose aim is to improve growth, employment and tax revenues.

1.3.3 Relative neglect of the specific research problem

The research problem, to look at the relative roles of selection (competition) and adaptation in explaining industrial change, is more or less written out of conventional economics and section 1.1 demonstrated how the differences in approach and granularity of view by organisational science and organisational ecology make dialogue difficult. Evolutionary economics, encompassing both adaptability and inertia, may shed further light on the issue, but it has proven hard to operationalise the concept of routines, especially if routines are defined as dispositions for action rather than specific processes. Even then, the evolving debate about the nature of and relevance of Darwinian evolutionary theory as a paradigm for evolutionary economics challenges whether the approach can generate theories that can serve as a useful guide for empirical enquiry.

1.3.4 Relative neglect of methodologies

Not only has it proven hard to operationalise the concept of routines, it has also proven difficult previously to get hold of sufficient data on a population of firms to address the

organisational ecologists on their own terms with regard to the lack of empirical work in other schools on such whole population datasets.

This research attempts to address these issues and make a practical contribution to the field of evolutionary economics, the debate on routines as genes and the empirical measurement of the routines concept as it operates within the realities of business life for small firms. It also makes a specific contribution to original knowledge by showing that, even if selection generates larger industry-level outcomes, adaptability is still important.

In addition, the research benefited from the fortuitous timing of the work over six (part-time) years that permitted a pre-recession sample to be re-surveyed during recession to assess the impact of recession on any relationship between adaptability and survival.

1.4 Methodology

The methodology is fully justified and described in detail in chapters 2 and 3 and is outlined here in general terms as a precursor to the rest of the dissertation.

The challenge was to look at the relationship between firm adaptability and firm age as a proxy for survival as well as a number of other variables that might be associated with adaptability.

As a business adviser for Business Link in the East of England, the author had the opportunity to obtain a relatively large database of firms to sample by an online survey that could be quantitatively analysed. Although this did not allow precise internal investigation of specific routines, the study captured, through a web-based questionnaire, specific types of routines as dispositions of the firm to respond to various signals to act, a novel aspect of the research design. The author is unaware of any other attempt to study routines through such a relatively large sample of observations, and to re-sample in the depths of a recession. The process also addressed the organisational ecologists on their own terms with regard to the lack of empirical work in other schools on datasets of a whole population of firms taken from multiple industries and sectors, though this is clearly not a longitudinal study.

1.5 Outline of the thesis

The thesis is divided into five chapters:

1. This first chapter introduces the core research problem, sets out the context for the research and describes the overall path taken to resolve the issues.
2. The second chapter sets out the research problem in some detail as well as the research questions that emerge from a review of the literature relevant to the four domains of knowledge that lay claim to an understanding of the research problem.
3. The third chapter presents the methods used to collect and analyse the data used to address the various research issues.
4. Chapter 4 presents the results and the analysis of those results for the research questions.
5. Chapter 5 concludes the thesis by summarising the findings and setting them within the context of the literature discussed in chapter 2. The dissertation is rounded off with a discussion of the implications of the findings for theory and practice.

1.6 Delimitations of scope and key assumptions

The major limitations of the research and the boundaries of the thesis are summarised at 5.7 and the key points are presented here to help manage expectations about the scope of the work and the limits on general inferences that can be made from the results.

The methodology chapter particularly notes the issues arising from self-reporting surveys and the possibly unrepresentative nature of the population surveyed and the sample obtained. It details the methods adopted to minimise these issues and the statistical techniques chosen to reduce the chances of error. Any study collecting data in the real world and not in a laboratory inevitably comes with such a health warning of its limitations.

The study consciously focuses on small and medium-sized enterprises and specifically excludes from the analysis large firms (250+ employees) on the basis they are able to influence their environments and fend off some of the pressures of selection. Much of the empirical work in organisational science, and some of the work on routines, is based on an

analysis of processes in larger firms, so it would be unwise to generalise any findings of this research to such larger organisations. Similarly, the study also excludes non-commercial organisations and professional bureaucracies, presupposing they are likely to be driven by a different set of priorities than strictly commercial enterprises. It also excludes start-up firms in their first year of trading on the basis that their routines are still in formation, suggesting a further research project on how habits and routines are initially acquired and change over the early months of trading. Again, it would be unwise to generalise any findings of this research to such organisations.

1.7 Conclusion

This chapter has laid out the research aims and purpose of the thesis, justifying the importance of accounting for the evolution of populations of small and medium-sized firms through the mix of firm-level adaptation and selection in the population, and the importance of the opportunity presented to look at the relationship between potential for adaptation and survival during recession.

The approach adopted for the research is set within the context of an abstract and generalised version of Darwinian evolutionary theory. In particular, it looks at the adaptation/inertia/selection nexus between organisational ecology and organisational strategy from the different theoretical perspective and framework of evolutionary economics, in which routines are commonly viewed as a source of both inertia and change. Routines are defined as dispositions to act or capacities that shape the way various overlapping cohorts within the firm actually proceed in response to a series of signals to act, rather than behavioural processes. Adaptability, the potential to adapt, is characterised as the capacities of a firm to change its core attributes, either in anticipation of, or in response to, a change in its environment. A methodology based on the opportunity of acquiring a relatively large sample of businesses for a number of observations for quantitative analysis was outlined, as was the overall structure of the thesis and the boundaries to the work.

Based on this overall infrastructure, the thesis continues with a detailed look at the theoretical and empirical literature surrounding the research question. This covers both evolutionary principles and evolutionary economics and the competing disciplines of

conventional economics, traditional strategy management and strategic choice theories, and organisational ecology, all of which have some claim on explaining firm and organisation adaptability and survival.

CHAPTER 2

RESEARCH ISSUES AND LITERATURE REVIEW

2.1 Introduction

The previous chapter introduced the debate about the adaptability and survival of individual firms and the evolution of populations of firms through the mix of firm-level adaptation and selection in a population. It showed how the concept of routines within the domain of evolutionary economics might be used as the basis of an empirical study of the relative importance of individual firm adaptation and firm selection for survival at the population level. It also raised the question of what might happen to any relationship between the potential to adapt and survival in a recession.

This chapter looks at the theoretical and empirical literature surrounding these issues in more detail. It discusses evolutionary principles, including the role of evolutionary development (evo-devo) and the loose deployment of the term Lamarckian in the Darwinian/Lamarckian debate about selection and adaptability. This is followed by an examination of the notion of, and measurement of, adaptability. Then the detailed explanation of the dynamic, evolutionary processes of inheritance, variation and selection within the specific context of evolutionary economics is contrasted with the approach of the three competing disciplines of conventional economics, strategy management and choice theory and organisational ecology that also have a claim on explaining firm-level adaptation and selection in a population. The overlapping relationships between these disciplines are laid out, as are their relative approaches to the key issues of adaptability and survival for organisations, with the aim of providing support for the methodology adopted for the empirical research.

Each approach is then considered in detail, starting with equilibrium-oriented theories which stress selection models leading to final states of rest, followed by the more evolutionary view that accommodates the idea of adaptability that can itself evolve and change the ability of the firm to adapt. These are in turn compared with the ecological view of selection that stresses inertia as a selection driver, and the

organisational strategy view that firms can adapt to changes in both the external environment and competition to achieve a better fit and long-term survival. Each section touches on the relationship of adaptability with a range of variables from the perspective of that theoretical view, backed by results from empirical work where appropriate.

The chapter shows how the research issues fit in with this overall body of knowledge, the limitations and drawbacks of some of the approaches and the questions that require further investigation. The work shows how routines, even when defined as behavioural tendencies, can be observed and measured and it provides support for evolutionary theory as a useful guide for empirical enquiry**.** In particular, it covers the relationship between adaptability and survivability and the relationship of adaptability with a range of variables from firm age, profits and revenues, through routine preferences, innovative drive and entrepreneurship, to the competitive environment.

What happens to any relationship between the potential to adapt and survival during recession is covered in a separate section at the end rather than discussed within each domain. This is because of the paucity of rigorous academic studies in any of the four disciplines under consideration that look at adaptation in recessions (Kitching et al., 2009).

The Chapter concludes with a discussion of recent developments in the theoretical framework known as Generalised Darwinism, a general theoretical framework for understanding evolution in complex populations. The emphasis here is particularly on a general ontological view of evolution in which variation and selection act on different entities, variation on the replicator (genotype) and selection on the interactor (phenotype). The Chapter closes with a summary of the research questions that emerged through the discussions.

2.2 Background

The research problem is to account for the roles of adaptability and selection in the survival of small and medium-sized firms, addressing the open question in the

literature about the relative roles of selection (competition) and adaptation in explaining industrial change. There is also a lack of focus in empirical studies on the SME sector as a whole, a sector in the UK that now accounts for 99.9 per cent of all enterprises, 59.1 per cent of private sector employment and 48.6 per cent of private sector turnover (Department for Business, Innovation and Skills, May 2011).

In seminal papers on organisational ecology, Hannan and Freeman (1977, 1984, 1989) argue that processes of selection in populations of firms are much more important in determining industry level changes through time than individual adaptations among firms themselves. Most firms are relatively structurally inert, runs their argument, in the sense of having an enduring inability to change patterns of behaviour and control in the face of changing circumstances, and this hinders adaptation when the environment changes. Competition causes firms that become unsuited to the environment to be replaced by firms more compatible with the changed circumstances.

Strategic choice theory, by contrast, says that success lies almost entirely in the decisions made by individual entrepreneurs and managers, though subject to environmental constraints, in sharp disagreement with the downplayed selection advantage of good management by organisational ecology. The traditional strategic management perspective (Cyert and March, 1963; Child, 1972; Miles and Snow, 1978; Porter, 1980) is all about the ways in which a firm can choose to adapt to changes in the external environment, and to changes in competition, to achieve a better fit between itself and the environment and/or a chosen niche.

Conventional economic theory assumes that firms are rational and profit maximising and that competition weeds out the weak. From a selection perspective, the standard economics textbook, neoclassical view of firm survival and industrial change is one of Darwinian natural selection through the survival of the fittest, in turn leading to equilibrium market outcomes. Within this model, the concept of adaptation effectively becomes a one-step process on the path to equilibrium.

Evolutionary economics takes a more dynamic view and assumes that economic behaviour is not guided by perfect rationality but by learned habits and behaviours. In

this context, routines are a basic conceptual building block of evolutionary economics, representing the repeated patterns of behaviour and activities that arise through internal and external interactions. Of particular interest for this study is the concept that routines in evolutionary economics are a source of both adaptability and inertia, providing a possible route for an empirical study of the research questions.

This dissertation adopts the line that there is a false dichotomy presented in the literature between adaptation and selection, that they are neither opposite processes that involve selection, nor are they mutually exclusive. Indeed, the argument here is that any evolutionary process that involves selection must also involve adaptation as well, and adaptation matters with regard to selection. The proposition, developed in detail at 2.5, is that selection works on phenotypes (interactors/firms) not on genotypes (replicators/routines), operating within an abstract and generalised version of Darwinian evolutionary theory that does not look to explain socio-economic circumstances in terms of biology. Selection operates on firms, which are themselves the result of the development of progressively expressed routine behaviours over the lifetime of the firm. Given that Darwinian evolution is all about populations of entities rather than the study of single developing entities, then the replicator and interactor concepts provide a good link for understanding the development of both individual entities and the evolution of whole populations (Hodgson and Knudsen, 2007, 2010). Routines play a key role in the development of firms and selection works on the firm, so the 'routines within a firm' framework (the replicator-interactor nexus) shows both competitive selection and developmental adaptability combining to explain industrial change. In other words, the evolution of populations must inevitably blend selectionist and developmental mechanisms.

As Sober (1984) makes clear, given this genotype/phenotype (replicator/interactor) distinction, selection applies to the selection *of* phenotypes (individual firms), with the associated selection *for* associated genotypes (routines in this case).

The emphasis of organisational ecology on selection alone, even if it is the prevailing force is an inadequate explanation of industrial change as it downplays the learning, strategic choice and development essential to a theoretically rigorous evolutionary view of economics. It is then an empirical matter of the relative strengths of

adaptability and selection in particular circumstances. The focus here is on the adaptability and survival of individual firms and the evolution of populations of firms through the mix of firm-level adaptation and selection within a population. This distinction between firm-level change through adaptation and industry-level change through selection is crucial to the argument.

To confuse matters, however, the concepts of adaptation and adaptability are often ill defined in the literature and bedevilled by a plethora of synonyms with similar meanings (Akoff and Emery, 1972; Levinthal, 1992; Brennan and Turnbull, 1999). There is also confusion generated by differences in meaning and levels of analysis for the term 'adaptation' in biology and ecology and 'adaptation' in organisational and business strategy. For the former, adaptation is about change in the whole population, while the latter sees adaptation as a process or as the outcomes of adjustment of an individual firm in a given environment. These issues are discussed more fully at 2.4, where definitions for and measurements of adaptability are laid out in greater detail.

The research problem, then, is to look for a causal account of adaptability and selection in the survival of small and medium-sized enterprises. A causal explanation according to Woodward (2003) is any explanation that advances by demonstrating how an outcome depends on other variables; explanations of outcomes are then about linked, causal sequential processes. As with the distinction above between adaptation and adaptability, between the actual and the potential, causal mechanisms similarly relate to potential rather than outcomes[5].

Using this approach, the adopted methodology maintains that business routines, even when defined as capacities or dispositions rather than behaviours, can still be measured. It is then possible to look at the relationship between a measurement of the adaptability of these routines and a measure of survival.

A further complication is that empirical organisational ecology studies usually have a large-scale, longitudinal focus with datasets covering decades or even centuries, while strategy theory and research on routines tend to look at individual companies or

[5] Note that causal mechanisms may not always be apparent or usable. See Ekstrom (1992) for a discussion on causal explanations of social action.

smaller data sets by industry or geography over a relatively short period. The SME population is rarely studied in detail, unlike larger or 'innovative' firms or specific sectors such as manufacturing, where processes are easier to identify. And the scarcity of empirical research within evolutionary economics is a notable lacuna, constituting just seven per cent of the relevant literature for the period 1969–2005 (Silva and Teixiera, 2006). A subsequent search of the empirical literature by this author for the period 2005–2011 carried out as part of this review shows little improvement on this situation.

2.2.1 Research questions

So how do large populations of small and medium sized firms persist without expanding or becoming increasingly efficient, when competition should have weeded them out? Are these firms really adaptable or innovative in some way, with particularly entrepreneurial management? From the organisational ecology standpoint, most firms have a negligible zone of strategic discretion and can do little more than hope they are not cut down by the scythe of selection. This raises four specific research issues:

- To what extent do developmental mechanisms and/or selection account for the characteristics of a population of firms, specifically SMEs?
- What circumstances lead individual firms to have greater potential to adapt and/or a greater tendency towards inertia? Are older or larger firms more or less adaptable than younger and smaller firms? At the population level, does inertia increase with age and average adaptability decrease with age?
- Is adaptability associated with firm size or innovative capacity, entrepreneurship, the competitive environment, or any other factors such as having routines for changing routines?
- Given the recent severe recession, does having a greater potential to be adaptable help survival in a downturn?

Despite the research issues being of interest to a number of different but overlapping disciplines as we have seen, the dialogue between them is relatively infrequent and is

often about defending territory and axiomatic approaches. The conversation between organisation science and organisational ecology is sparse, partly because of the differences in theoretical and empirical approaches and partly because the differences in granularity make it hard for strategists to see the relevance of organisational ecology to their work if there is no role for management choice. Neoclassical economics has surprisingly little to say about adaptability and pays no attention to evolutionary economics other than adopting a 'survival of the fittest' approach at the population level. Organisational ecology claims an evolutionary construct but downplays the learning and development essential to a theoretically rigorous evolutionary view of economics. And the so-called 'Darwinian' selection versus so-called 'Lamarckian' adaptability controversy lurks in the background, ready to perplex and confuse.

Of course, the landscape is much more nuanced than this and there are many examples in this chapter of the relative approaches of the various disciplines, the syntheses of ideas and exploration of boundary conditions between them. Nonetheless, the contrasts between them are more often than not presented in a reductionist way so as to set each discipline clearly apart. While this approach limits understanding of what are very complex systems, it does draw the battle lines very clearly.

As a precursor to the more narrowly focused discussion of the perspective of each domain on the research problem, the next section sets out:

- their key contrasting views of adaptability and selection
- the contrasting definitions of, and measures of, adaptability in firms.

While this latter point could have been left for the methodology chapter, clarification of this matter up front is designed to save possible confusion through the rest of this Chapter.

This is followed by:

- exploration of (an abstract and generalised version of) Darwinian evolutionary theory as a background to evolutionary economics and the evolutionary nature of organisational ecology
- discussion of the concepts of evolutionary developmental biology (evo-devo) as a way of looking at how the mechanisms of development are themselves influenced by evolutionary forces
- a consideration of the mislabelling in the literature of selection as Darwinian and adaptation as Lamarckian, the idea that acquired characters can be inherited.

These all help set the scene for the theoretical and practical approaches adopted in the subsequent methodology chapter.

2.3 Contrasting views of organisational adaptability and survival

Table 1, adapted from Dobrev et al. (2006), sets out the key contrasting perspectives across the four academic disciplines that claim explanatory power over adaptability and survival in populations of SMEs.

Table 1 shows how the four views differ in their basic assumptions about organisational drivers and the relevance of firm structure for a theory of the firm. It also shows how the perspective of analysis shifts from profit maximisation as a proxy for survivability to survival performance and the importance/relevance of entrepreneurship in making profits/survival happen. The differing approaches have distinct differences in their attitude to markets and competition, and distinctly differing perspectives in terms of timescale.

Table 1. Contrasting views of organisational adaptability and survival

Neoclassical economics	**Organisational strategy**	**Organisational ecology**	**Evolutionary economics**
Perfect rationality and adaptability	Bounded rationality, bounded adaptability	Inertia and selection focus	Adaptation and selection focus

Firm as 'Black Box'	Firm as 'White Box'	'Black Box'	'White Box'
Analysis at market level	Analysis at firm level	Analysis at population level	Analysis at routines level
Direct competition	Direct competition	Indirect competition	Both direct and indirect competition
Profit maximisation	Financial performance	Survival performance	Survival performance
Universal laws	Contingency conditions	Universal laws	Contingency conditions
Long run made up of envelope of short run	Shorter run	Longer run	Evolutionary cycle
Entrepreneurless	Managerial relevance	Managerial irrelevance	Managerial relevance

Source: Adapted from Dobrev et al. (2006)

Although there is overlap between some of the disciplines across most rows, Table 1 demonstrates clearly that the most distinct difference in approach between them is that of the unit of analysis; the market for textbook economics, the firm for the organisational strategists, the population for the organisational ecologists and firm routines for the evolutionary economists. The choice of the unit of analysis, of course, is much more a matter of emphasis and focus rather than one of precedence and importance and is generally directed by the interests and theoretical assumptions driving the research. What is notable in the conclusion of various empirical studies discussed further on is the issue of assuming a finding at a group level of analysis also applies to the individuals that make up that group (the ecological fallacy, Robinson, 1950), or inferring something is true of the whole from the fact that it is true of some part of the whole (the fallacy of composition). These intricacies pervade the literature, not always consistently**,** and are noted where relevant.

2.4 Defining and measuring adaptability in small firms

As indicated in the introductory chapter and at 2.2 above, the assumptions about adaptability and adaptation in the research material are often vague, with a multitude of terms with similar meanings. Starbuck (1965, p.468) noted that to talk about "all aspects of organization which are relevant to adaptation . . . means . . . that one could legitimately discuss everything that has been written about organizations" and Mintzberg et al (1998) say this is an understatement, because the last word in the quotation should read "collective systems of all kinds." And while the literature does not particularly distinguish between adaptation and adaptability, the material can be organised into three overlapping perspectives that shed light on the common phenomenon of change to fit changed circumstances (Strempek, 1997).

For the strategy choice theorists, adaptability is all about a series of adaptive choices by a dominant coalition influenced by both contextual variables such as technology and the prevailing environment and by internal considerations such as path-dependent (but current) structure and organisation (Child, 1972; Miles et al., 1978). The literature on organisational culture looks at adaptability as those shared organisational values that can influence, and can be influenced by, strategy (Allaire & Firsirotu, 1984; Kilmann, Saxton and Serpa, 1985; Schein, 1996). Finally, the literature on organizational learning considers the strategic expansion of firm capabilities through a process of acquiring, retaining and expanding collective knowledge (Levinthal, 1991; Dodgson, 1993).

Table 2 sets out a number of representative definitions for each of these three categories. Although they all include numerous factors, Sanchez et al. (2011) attempt to summarise strategic adaptability as a process composed of a set of external responses (new products, new ways of relationships with suppliers and customers, vertical integration or disintegration, expansion or contraction of domestic markets) and internal responses (redefining the company's architecture, organizational chart, incorporating new knowledge, process reengineering, new incentive systems, change in an organization's culture) that allow a firm to adapt itself efficiently and fast to changed circumstances.

Table 2. Definitions of strategic adaptability

Study	Type	Definition
Mott (1972)	Culture	Self-reported personal adaptability based on 11 items
Mintzberg (1977)	Strategic Choice	The notion that organisations through a stream of decisions develop a certain pattern to orient themselves towards the environment and so affect the overall scope and direction of a company, building on former perspectives on strategic adaptation.
Miles & Snow (1978)	Strategic Choice	Dynamic process of adjustment to change and environmental uncertainty, of maintaining an effective alignment with the environment while internal interdependencies are efficiently managed.
Kilmann, Saxton and Serpa (1985)	Culture	A culture that encompasses risk-taking and a trusting and proactive approach to organizational and individual life with a spirit of doing what it takes to achieve success and a receptivity to change and innovation.
Woo et al., 1990	Strategic Choice	The capacity to adapt business opportunistically
Chakravarthy, 1997	Strategic Choice	A firm's ability to identify and capitalize emerging market and technology opportunities.
Child, 1997	Strategy Choice	A strategic adaptation process as the sum of two dynamics: internal structuring (internal actions addressed to adapt organizational agents to new environment conditions) and external structuring (actions that modify the company's relationship with its environment, such as launching new products or changing suppliers).
Floyd & Lane 2000	Strategy Choice	Strategic adaptation as strategic renewal, taking in changes in core competences and/or the strategic positioning of the company. Key competences are socially complex combinations of assets, knowledge, and skills on which the company's ability to create differentiated products and services are based, and distinguish it from competitors.
Scheindehutte & Morris 2001	Strategic Adaptability	The actions of the entrepreneur and his/her team in processing information inputs from the environment and making rapid adjustments to this feedback. It involves changes in strategic behaviour, so as to improve competitive posture and achieve better fit between the organization and its environment or ecological niche
Eunni et al. (2005)	Culture and Choice	The company's ability on one hand to obtain the correct alignment of strategy, structure, and culture (internal alignment) in order to position it competitively in the market, and on the other hand, alignment with its environment in order to successfully face changes in its environment (external alignment).
Dervitsiotis, K. (2007)	Culture and choice	Becoming fit in emerging new business landscapes by changing structure and behaviour

Source: Literature review for this dissertation

Table 2 also shows the mixed of use of the terms adaptability and adaptation and a clearer distinction between the two is attempted here. For the purposes of this dissertation, an adaptation is defined, following Maynard-Smith (1976), as some structure or behaviour that makes it more likely a firm will survive in its environment, some physical or behavioural trait that contributes to a firm's ability to survive in competition with others in its environment. A firm that is adapted displays fit with the demands of its environment (Toulmin, 1981) and this situation will also reflect all previous adaptations to past circumstances. An adaptation in this sense is specifically an outcome that aids survival, rather than the common use in the literature of the looser meaning of adaptation as a process of differential growth (Burian, 1983).

Adaptability, by contrast, is about the *potential* to adjust to changing circumstances in a way that is relevant. Adaptability involves the capacity to respond to changes in the selection environment. And the term 'adaptability' is used consistently throughout this thesis to refer to the adaptability of individual firms.

This thesis takes the view that the capacity of any organisation – even a small business – to change depends on systematised internal and individual relations and does not depend on the intentions of the individuals alone (Teece, Pisano and Shuen, 1997; Cohen and Levinthal, 1990). Institutions in general and firms in particular, rather than just enabling individual actions, shape and constrain individual behavior more than just enabling it (Hodgson, 2003 and see also 2.5.3 for a discussion on intentionality). Organisational adaptability is then all about these systematised relations, internal structures and procedures and the combined capacity they engender to enable appropriate change (Teece, 2007). The internal culture of the firm is also closely aligned with those structures and procedures, as well as to the values and beliefs of individuals (Schein, 1996; Sorensen, 2002).

Reflecting the above, the working definition of organisational adaptability adopted for this dissertation is:

> the capacity of an organisation to change its strategies, structures, procedures or other core attributes, in anticipation of, or in response to, a change in its environment, including changes in relations with other organisations.

The resulting adaptations may well not improve performance but they are generally intended, by some benchmark, to do so. To repeat, 'adaptability' is used here to refer to the adaptability of individual firms.

2.4.1. Operationalised components of adaptability in the literature

It is clear from the above discussion that definitions of adaptability include many factors and the various attempts at measuring adaptability have been somewhat incomplete efforts based on limited definitions and conveniently available instruments designed for other purposes.

A review of a number of existing empirical studies of adaptability set out in Table 3, demonstrates these conflicting terms and definitions. The variables chosen for analysis differ widely, both because of differing definitions of adaptability and differing research aims. And while there is general consensus that the generic components of adaptability cover marketing, operations, organisational structure and strategy, the operationalisation of these is strikingly different in the various studies. Table 3 illustrates the range of component variables generated for a number of empirical analyses of adaptability in the literature.

Table 3. Operationalised components of adaptability in the literature

Study/measures	Marketing adaptability	Operational adaptability	Strategic adaptability	Organisational adaptability	Financial adaptability	Other
Oktemgil and Greenley (1997)	Marketing activities	Speed of response	Product/market opportunities			
Schinedehutte and Morris (2001)	Marketing adaptability	Tight/loose operational controls	Adaptive strategies	Organisational structure flexibility	Financial capacity	Change in HR priorities and level of entrepreneurship
Tuominen et al. (2004)	Broad/narrow market focus		Technology or market strategies	Organisational design		
Verdu-Jover et al. (2006)		Operative flexibility	Strategic flexibility		Financial flexibility	
Green et al. (2006)		Technocratic decision-making style	Strategy flexibility	Mechanistic-organic continuum		
Takii (2007)			Strategic adaptability			
Rudd et al. (2008)		Operational flexibility	Technical flexibility	Structural flexibility	Financial flexibility	

Source: Literature review for this dissertation

Table 3 shows studies covering marketing, operational, strategic, organisational, financial and other measures of adaptability, with only one study attempting to cover them all (Schinedehutte and Morris, 2001). Even within categories, the specific choice of target variable differs widely. In operational adaptability, for example, the chosen variable ranges from speed of response, tightness of control and operational flexibility to technocratic decision-making style. Strategic adaptability ranges from product, market and technology strategies to overall strategic flexibility.

As Tuominen et al. (2004, p.498) remark, there are 'no sophisticated and validated measurement proxies for adaptability and relatively little systematic effort has been given to methodological issues in developing adaptability scales.'

The literature is also wide-ranging and diverse with regard to the location, size, sector and other characteristics within which adaptability has been measured, again depending partly on the research goals. Small companies are variously defined and there is a preponderance of manufacturing industries in existing studies, although manufacturing makes up a relatively small proportion of employment and output in modern industrial economies. Given these factors, it is hard to generalise from the current research findings to the economy as a whole. The evidence so far points to the need for a wider-ranging, cross-industry study with a more encompassing definition of adaptability.

From the evolutionary perspective of trying to uncover causal explanations, what matters for evolutionary economics is the capacity of an organisation to change such that its performance is improved in some way that increases its chances of survival. As Hodgson (2007) remarks, if there is no capacity to change, then any discussion of specific changes is in vain.

Prefiguring Chapter 3 on measuring adaptability, the requirement for this dissertation is to attempt to measure the potential to adapt. The solution proposed here, one congruent with the requirement to seek for causal mechanisms, is to measure the potential to adapt routines from the perspective of routines as dispositions rather than rules. Chapter 3 discusses in more detail the issues involved in calibrating and measuring the potential to adapt routines

and suggests a method by which business routines, even when defined as capacities or dispositions rather than harder-wired process sets, can still be measured.

2.5 Evolutionary principles

The concept of socio-economic and cultural evolution in the sense of shifting by degrees to a different stage (especially a more advanced or mature stage) has a long history. Hobbes emphasised conflict and competition for resources as an inherent feature of social life and Kant and Hegel were concerned to demonstrate transitions to different states through the triadic process of thesis, antithesis and synthesis. Spencer, Comte and Lamarck offered various accounts of social evolution, emphasising the interconnectedness of social elements, but without any causal explanation of social progression and transformation. Darwin's genius was to provide a causal explanation of evolution in *organic* systems; that, over time, species evolve through an on-going process of natural selection whereby traits favouring survival are preserved and unfavourable ones are weeded out.

Darwin's original (1859) concept of natural selection was developed in the absence of a valid theory of heredity and the 'modern evolutionary synthesis', incorporating genetic inheritance, is now the commonly accepted basic paradigm. In this modern synthesis, natural selection is by far the main mechanism of change, such that even slight advantages are important when continued. The object of selection is the phenotype in its surrounding environment, where phenotype is any observable characteristic or trait of an organism, including physiological properties, behaviours and the products of behaviours. Phenotypes result from the expression of an organism's genes as well as the influence of environmental factors. If the phenotype is the outward, physical manifestation, the genotype by contrast is the internally coded, inheritable information used as a blueprint for building and maintenance and passed from one generation to the next. As Dennett (1995) says, a Darwinian explanation amounts to an algorithm – given a consistent selection process and mechanisms that bring up variations and retain the most fit, then adaptive evolution will take place.

Importantly, the evolutionary process does not necessarily result in optimal solutions or even in outcomes that are better than their predecessors. What results is a fit that is effective

and efficient relative to the prevailing environment. There is even the possibility that selection produces an error that is not just determined by chance but introduced through a systematic inaccuracy manifested within the system.

Darwin himself, along with Baldwin and James, considered applying the idea of selection to other, non-biological, domains such as language, psychology and culture, and Veblen (1898) applied it to economics in his pioneering paper, 'Why is economics not an evolutionary science?' But the evolutionary approach to socio-economic and cultural evolution was largely sidelined because of the connotations of biological reductionism for eugenics in the social sphere and the problems of stretching biological metaphors and analogies to fit the non-biological.

The concept was revived by Campbell (1969), who suggested that a focus on the underlying process of variation and selective retention could permit the application of evolutionary theory to socio-cultural systems or organisations but without any connotations of 'social Darwinism'. Dawkins (1983) subsequently coined the term 'Universal Darwinism' in an assertion that, in any system given variation, selection and inheritance by whatever means, evolution is likely to occur over time, as entities will accumulate complex traits that favour their reproduction.

In the formulation by Hull (2001), attempting a conceptual clarification of evolutionary theory beyond the sphere of biological selection (Dollimore, 2010), the process is one of repeated cycles of replication, variation and environmental interaction, such that what is replicated is progressively different. The process is summed up in the trilogy of:

- **Inheritance**: Some number of entities must be capable of producing copies of themselves and those copies must also be capable of reproduction. The new copies must inherit the traits of old ones.
- **Variation:** There must be a range of different traits in the population of entities, and there must be a mechanism for introducing new variations into the population.
- **Selection:** Inherited traits must somehow affect the ability of the entities to reproduce themselves, either by survival, or natural selection, or by ability to produce offspring by finding partners, or sexual selection.

Stricter formulations such as required for Generalised Darwinism (see 2.12), sometimes require that variation and selection act on different entities, variation on the replicator (genotype) and selection on the interactor (phenotype). If the entity or organism survives to reproduce, the process restarts.

2.5.1 Evo-devo

The thrust of this dissertation is that there is a false dichotomy between adaptability (development) and selection and that adaptation is an essential and unavoidable part of any relevant evolutionary process. The argument that both evolutionary (evo) and developmental (devo) process are likely to be equally fundamental to understanding change in a broad range of complex systems is termed 'evo-devo' and a small excursion into its biological origin is helpful for understanding the way that mechanisms of development can be influenced by evolutionary forces.

Building on the modern synthesis, evolutionary developmental biology looks at how the dynamics of development determine the phenotypic variation arising from genetic variation and how that in turn affects phenotypic evolution, as well as how development itself evolves. In other words, variation in genes may also arise by mutation-driven changes in gene regulation, so the diversity we see may not just be due to differences in genes but rather to alterations in the expression of genes through interaction with the environment (Goodman and Cochlin, 2000).[6]

Evolvability, the capacity to evolve, is a corollary of evolutionary development and represents the capacity to generate heritable phenotypic variation (Kirschner and Gerhart, 1998). It is a property of any characteristic that alters the ability of an organism to adapt, or the combined effect of all such characteristics on an organism's ability to adapt. Since the

[6]Among the more surprising and perhaps counterintuitive results of recent research in evolutionary developmental biology is that the diversity of phenotypes is not matched by the diversity of gene sequences. Gerhart and Kirschner (2007) observe the paradox here that, where variation is expected, there is in fact rather more gene conservation and absence of significant change. They suggest that the very different and seemingly new features of organisms are made and run by various 'core processes' but used in different combinations at different times and to different extents of their output, just as a box of Lego can create a variety of different results. And it is the regulation of these processes that determine the combinations and amounts of core processes to be used in all the special traits of the organism.

ability to adapt more rapidly or comprehensively would be of value to any organism under evolutionary pressure, characteristics that increased evolvability would tend to be selected and retained (Colegrave and Collins, 2008). Earl and Deem (2004) argue that, although the idea of evolvability being subject to natural selection seems to violate the principle that an event cannot precede its own cause, causal violations do not occur when mutations are based on genetic recombination, genetic transposition and horizontal gene transfer. With these mechanisms, relatively large chunks of genetic code are shuffled or substituted for one another along the DNA chain. In this way, an ability to reorder genes or to cause large-scale genetic change is a genetic trait that is subject to selection like any other. This would account for phenomena such as the evolution of drug resistance in bacteria or immune cells mutating more rapidly than other cells or the rapid mutability of 'flu viruses or other pathogens. Thus, many observations within evolutionary biology that might be classified as chance or accidental effects may be explained by selection for evolvability.

The question for socio-economic and cultural evolution in general, and evolutionary economics in particular, in the light of these findings is whether and how far the standard inheritance, variation, selection model might be modified to take account of the possibility that selection is not the predominant factor of evolution, but only one among many (Knottenbauer, 2009). Is the evo-devo concept suitable as the basis for a new, evo-devo variant of evolutionary economics? The debate is still on-going (see Chapter 5) but the concept strengthens the idea that selection operates on firms, which are themselves the result of the development of progressively expressed routine behaviours (through dispositions to act and/or actual behaviour) over the lifetime of the firm. This links with the replicator and interactor concepts mentioned above and so provides a basis for a system that is able to consider both the development of individual entities and the evolution of whole populations (Hodgson and Knudsen, 2007). It is worth repeating that routines play a key role in the development of firms and selection works on the firm. In this way, the 'routines within a firm' framework shows how both developmental adaptability and competitive selection can work together to explain industrial change and provide a sound basis for an empirical study.

As always, it is unwise to map directly any biological reasoning to social structures and economics (see Foster, 1997; Hodgson, 2002; Witt, 2008) but it is useful to explore how the evo-devo concept of evolvability might work within organisations. Different firms may be working with similar sets of routines material but have very different regulatory

mechanisms for these routines simply as the result of the effort of progressively expressing routine behaviours (through dispositions to act and/or actual behaviour) over the lifetime of the firm. So some of the differences between firms can result from these 'second-order' effects of routines that come about as a result of the interaction of routines with the environment the firm finds itself in over its lifetime rather than from the distinct functioning of individual routines, genomes-as-instructors rather than 'genes-as-replicators' as Pelikan (2011) puts it.

This may help explain why two firms with similar external features, delivering similar products or services in a similar competitive environment, might behave so differently when that environment changes, if their core processes have been arrived at through different interchanges between their capacities and dispositions and their lifetime interaction with their environment. The implications of this view are discussed in some detail in Chapter 5 in the section on implications for policy and practice.

2.5.2 Darwinism and Lamarckism

Before moving on, it is worth elucidating the idea of Lamarckian inheritance and adaptation that both pervades and complicates the literature. Lamarckism is simply the idea that an organism can pass on characteristics that it acquires during its lifetime to its offspring. The traditional example is the giraffe stretching its neck to reach leaves high in trees, so strengthening and gradually lengthening the neck. These giraffes have offspring with slightly longer necks. In similar fashion, the male children of blacksmiths would have strong arms. And while 'Darwinism' can be seen as a theory opposed to the 'Lamarckian' doctrine of the inheritance of acquired characters, Darwin himself often referred (1859) to the possibility of the inheritance of such acquired characters, although neither Darwin nor Lamarck knew anything of genetic science in order to pursue the argument.

Formulating the debate in modern terms, the discussions at 2.5 and 2.5.1 above show that Darwinism is a causal theory of evolution that requires the inheritance of genetic guidelines, variation of those genotypes (replicators/routines) and the subsequent selection of the resulting phenotype (interactor/firm). When expressed in similar terms, Lamarckism is the inheritance within the genome of characteristics acquired by the phenotype/firm interacting

with its environment. This formulation suggests that Darwinism and Lamarckism are not necessarily mutually exclusive (Hodgson and Knudsen, 2006), as the next paragraphs explain in more detail.

Lamarckism, then, proposes that physical changes lead to changes in the genetic coding and that these changes are inherited. While this has been traditionally discounted in the biological sphere as difficult (with the possible exception of rare epigenetic mutations),[7] in the social sphere it is generally accepted that humans and the organisational forms they create and operate are capable of searching for, and selecting in favour of, new forms of variation that are perceived at some point in time to advance their situation (Jones, 2005). Within organisational science, this is expressed in the ability of firms to change both their routines and structures so as to avoid being selected out, whereas the organisational ecologists insist that most firms have a negligible zone of strategic discretion and can do little more than hope they are not cut down by the grim reaper of selection. The debate is often cast as a competition between Lamarckian' adaptability and 'Darwinian' selection.

Usher and Evans (1996) particularly claim to show how Darwinian processes at the unit (outlet) level may lead to Lamarckian adaptations at the organisation (company) level through purposive replication of successful forms. Indeed, Nelson and Winter (1982, p.11) have contributed to the debate by stating that their own theory, in which routines stand for genes, is 'unabashedly Lamarckian: it contemplates both the inheritance of acquired characteristics and the timely appearance of variation under the stimulus of adversity'.[8]

Part of the problem lies in the extensive use of the Lamarckian label to discuss the adaptation of routines in a business when the concept does not include notions of inheritance. There is much discussion of learning and knowledge-transfer but the mechanism by which this is 'inherited' is expressed more as transmission by popular consent, much as mothers will take their children to a 'measles party' as a way of helping the child gain immunity from childhood ailments. Such a process has little or nothing to do

[7]Epigenesis occurs where the genotype or phenotype is modified by interaction with the environment such that there is an actual genetic change. By way of example, a Dutch famine birth Cohort study (Rosenboom, 2006) found that the children of women who were pregnant during the WW2 famine were smaller, as expected. However, surprisingly, when these children grew up and had children, those children were *also* smaller than average. This suggests that the famine experienced by the mothers caused some kind of epigenetic changes that were passed down to the next generation.

[8]Nelson and Winter (1982) complicate matters by regarding routines as both genotypes that carry information and as the phenotypic expression of the information (c.f. Hodgson and Knudsen, 2011).

with the inheritance of characteristics. Lamarckism still needs to demonstrate how an inheritance mechanism works beyond the mere passing on of characteristics. As Hodgson and Knudsen (2006, p.21) put it:

> Acquiring traits through learning and adaptation is a necessary condition of Lamarckism, but it is not sufficient. In order to qualify as Lamarckism, the acquired traits must also be encoded in a genotype that is passed on to the next generation.

Lamarckian inheritance, within a Darwinian framework, implies that some development in a phenotype impacts on its own genotype in some epigenetic fashion.

Knudsen (2001) and Hodgson (2001) suggest it is possible (Hodgson and Knudsen, 2006) to reconcile Lamarckian adaptation with Darwinian selection if Lamarckian evolution is nested[9] within a Darwinian framework that accommodates both adaptation and the process of natural selection. For Hodgson (2009), Lamarckism requires Darwinism to complete its explanations and is not an alternative to it.

2.5.3 Intentionality and adaptive fit

A long-standing issue in the application of Darwinian evolution beyond the biological sphere is the argument that, while variation in biology is 'blind' to selection, socio-economic modifications are influenced by both intentionality and design. The section above touched on the idea that humans and the organisational forms they create and operate are capable of searching for, and selecting in favour of, new forms of variation. In this way, variation can take place in response to specific environmental pressures (Penrose 1952). As any resulting traits can be passed on through learning, so socio-economic evolution can be seen as a Lamarckian process.

The concept of strategic choice, that firms may have the ability to reshape their environment and not just bow to environmental selection pressures (Child, 1972, 1997) is the basis of the

[9]One useful distinction is between nested hierarchies that involve levels that consist of, and contain, lower levels and non-nested hierarchies, in which the requirement of containment of lower levels is relaxed. So a university consists of a collection of lecturers and administrators and is made up of them, making the university a nested hierarchy. On the other hand, the Vice-Chancellor does not consist of his or her academics or administrators and so the business command is a non-nested hierarchy with regard to the academics or administrators in the university.

argument that managerial intentionality plays an important role in how firms achieve adaptive fit. This holds for all the variants of organisational strategy, discussed in detail at 2.7 below, taking in satisficing on conflicting political pressures and path-dependent constraints. The process includes the balance between the capacity of individuals to act independently and make their own free choices (agency) and those recurrent patterned arrangements that influence or limit the choices and opportunities available (structure), both of which are encompassed within the notion of strategic choice (Child, 1997).

Subsequent work by Hodgson (2004), Vanberg (2004) and Stoelhorst (2008) amongst others suggests that the explanatory logic of the inheritance, variation and selection algorithm would apply equally well to evolutionary processes driven by the actions of intentional agents as it does to natural selection driven by random genetic variation. In exploring causal explanations, there is no reason why adaptation resulting from human intentionality should not also be subject to causal explanations[10]. The strategic choices made by the dominant decision-making group are necessarily governed by their previous, path-dependent experience and prior stock of perceptual schemata, with intentionality essential to any explanation of institutional change.

This reinforces the requirement to include in any measurement of adaptability, when defined in terms of capacities to change strategies, structures, procedures or other core attributes, the notion of routines to change routines and the assignment of a central role to strategic choices.

With this general background of evolutionary principles in mind, the next sections discuss in detail the views of the relative roles of adaptability and selection from the perspective of the four main disciplines of standard, textbook economics, evolutionary economics, the strategy based view of adaptability and the perspective of organisational ecology.

2.6 Traditional views on adaptability and the power of natural selection

The idea of natural selection, the process that results in the evolution of entities best suited to the environment, is a pervasive topic in the orthodox literature and associated standard

[10] For a discussion on the intentionality of human action, see Wilson and Wilson (2007).

economics textbooks. Competition weeding out irrational or inefficient firms is integral to the mind set of many economists (Frank, 2011), alongside the neoclassical assumptions that all agents are rational and seek to allocate scarce resources amongst competing uses so as to maximise their utility or profits. Such assumptions are the bedrock of rational choice theory and the basis of the neoclassical emphasis on equilibria, where such equilibria are the solutions of agent maximisation problems (see Lucas and Sargent, 1981 for a summary).

From a selection perspective, the standard economics textbook, neoclassical view of individual firm adaptation and selection for survival is a matter of the survival of the fittest leading to equilibrium market outcomes (Hodgson, 1993, 1994). Firms develop routines (competencies, behaviours) and competition selects for survival that bundle of routines that best allows the firm to grow and prosper in the environment. Indeed, the strength and longevity of the neoclassical model derives from these simple 'as if' assumptions of rational choice, profit maximisation and market equilibrium producing sufficiently accurate predictions about how firms behave.

Economists have tried (Alchian, 1950) to integrate a more temporal dimension into general equilibrium theory by accepting that profit maximisation might not be achievable and relying on natural selection only rather than rational behaviour as the driver of success or failure. Alchian (1950, ibid.) suggests that profit maximisation is still valid even if individual actors are not rational or do not consciously strive for profit maximisation. This is because, at the macro level, firms with more rational behaviours will naturally be selected for success, where success is measured in positive profitability. Even if all the entrepreneurs and managers make a range of decisions, none of which are a priori rationally profit maximising, the market still selects for those that actually generate positive and higher profits (Blume and Easley, 2007). Note here that Alchian refers to realised profits rather than maximum profits as the sign of success and, no matter what strategy or driver brings about such success, the fact that it occurs is sufficient for the market to select as survivors those generating positive profits, while those who incur losses will disappear.

While Alchian settles for survivability rather than profit maximisation as a result of selection, Enke (1951) concludes that, given enough time and competition, the process of selection, even for the relatively fit, would eventually select for perfectly rational behaviour and, presumably, profit maximisation. Ideas of natural selection underpinning the

neoclassical model can also be found in the work of Hirshleifer (1977) and Miller (1977), although there is still an open question in the neoclassical world as to whether survivability or profit maximisation results from, or drives, selection.

For practical and empirical purposes though, the conventional wisdom is one of natural selection favouring rationality and profit maximisation and a Darwinian view of natural selection, expressed thus by Friedman (1953, p.21):

> The process of natural selection thus helps to validate the hypothesis (of profit maximisation) or, rather, given natural selection, acceptance of the hypothesis can be based largely on the judgment that it summarises appropriately the conditions for survival.

Friedman's view is that, no matter what the decision or strategy-making process a firm goes through, the market will select those that consistently make the better decisions, a process that in due course eliminates irrational behaviour. Though Friedman's simple notion of the selection process working only through differences in firm profitability ignores many factors, Blume and Easley (2007) note that it is probably at the back of the minds of many economists who believe that markets consist largely of firms acting as if they were rational profit maximisers. Indeed, Krugman (2007, online) writes:

> Nobody, not even Nobel-winning economists, really makes decisions that way. But most economists – myself included – nonetheless find Economic Man useful, with the understanding that he's an idealized representation of what we really think is going on. People do have preferences, even if those preferences can't really be expressed by a precise utility function; they usually make sensible decisions, even if they don't literally maximize utility. You might ask, why not represent people the way they really are? The answer is that abstraction, strategic simplification, is the only way we can impose some intellectual order on the complexity of economic life. And the assumption of rational behaviour has been a particularly fruitful simplification.

Friedman further buttresses his view with a claim that theories should not be tested by the realism of their assumptions, as good hypotheses are parsimonious and only need those essential elements required to yield relatively precise, valid predictions. Indeed, the idea that economic models should be judged on the accuracy of their predictions and not on the

validity of their assumptions (Friedman, ibid.) has overshadowed attempts to look at these underlying assumptions and the gap between assumptions and realities. Friedman's argument is that, even if other heterodox accounts of economics are theoretically possible (even within the maximising paradigm), they are not necessarily useful if mainstream accounts of behaviour reach similar predictions with less explanation and greater ease of understanding. So Occam's razor might cut the argument in favour of the neoclassical, rational, natural selection approach unless evolutionary or other accounts can better accommodate the realities of behaviour and determine the implications (Winter, 2005).

This emphasis by mainstream business economics on profit-seeking and elimination by competition also leaves little room for the concept of and role of adaptability in survival, or the idea that the internal structure of a firm plays any significant role in the process. Apart from Williamson (1975, 1987) and followers of transaction cost theories, most of the contention about the theory of the firm has been about whether firms maximise profits or are 'satisficing', a strategy that attempts to meet criteria for adequacy, rather than seeking to identify an optimal solution (Simon, 1955). And many modern mainstream developments (e.g. Hart and Moore, 1990) continue to treat the firm as if it were a single entrepreneur rather than an organisational structure with its own internal tensions and dynamics, so pushing the influences of adaptability and inertia to the margins.

The evolutionary processes through which natural selection operates, however, are often unexamined by orthodox economists. This is partly because, as van den Bergh and Gowdy (1998, p.4) note, 'notions of evolution are so ingrained in the world view of economists that they often go unrecognised'. van den Bergh and Gowdy (2000) also observe that this general approach tends to the methodologically individualist[11] view that explanations of macro-economic phenomena must be derived from micro-economic foundations and that economic change comes about progressively through marginal improvements.

Neither Friedman nor Alchian fully spell out the processes of evolution and the manner in which selection actually works. Rational behaviour by firms cannot just be assumed as uncertainty leads firms to try to reduce the environmental conditions that cause it (Penrose, 1959). If firms try to change their environment, then the environment is not independent of

[11]For a discussion of methodological individualism, see Hodgson (2007a).

firm behaviours. Penrose also argues that there must be some sort of genetic mechanism that ensures the behavioural continuity of firms as selection takes time, and so the poorly adapted cannot get eliminated without some heritable traits remaining in the survivors.[12]

Williamson's take on the neoclassical model (1975, 1985) is that individuals wish to minimise costs rather than maximise profits in a situation in which the near-perfect information assumed by neoclassical theory no longer exists. So from all possible organisational forms given the nature of the competition, 'contractual man' chooses the one with the lowest transaction costs. Such an adaptive trait should ensure survival of the phenotype as those with wrong or unfortunate choices with higher transaction costs will die out (North, 1992). In fact Williamson (1987) says that, although transaction cost economics 'invokes' natural selection, it results in a weak rather than strong form, in which the fitter survive in a relative sense but not necessarily the absolutely fittest. Over time, however, Williamson does argue that even such short-term imperfect selection would eventually result in the survival of the most efficient.

A further problem for the market selection hypothesis is that selection can only operate on the types of behaviours that exist so that, if no one maximises profits, how would a profit maximising firm get selected? This is why Alchian (1950) emphasises the selection of positive profits through relative efficiency rather than maximised profits. As he says (1950, p.213), 'As in a race, the award goes to the relatively fastest, even if all the competitors loaf.'

In addition, a range of critics in both biology (Levins and Lewontin, 1985; Eldredge, 1996) and economics (North, 1990; Hodgson, 1994) demonstrate that either local optima[13] or path-dependency can defeat the attainment of evolutionary optimisation, at least in the sense of survival of the fittest trait (c.f. Williamson's weak form of selection). Vromen (1995) and others also remind us that natural selection as an optimising process will not always create 100 per cent efficient mutants. As Khalil (2000) puts it, in an echo of Alchian, natural selection and market selection only guarantee the survival of the 'least foolish of fools' and then only if the productivity of such a fool is high enough to compensate for its foolishness.

[12]At the time, Penrose was concerned there were no hereditable traits in economics to pass on to as in the biological case.

[13]A local optimum of a combinatorial optimisation problem is a solution optimal within a neighbouring set of solutions. This is in contrast to a global optimum, which is the optimal solution among all possible solutions.

Such high-level macro level arguments of rationality and selection models also hide a multitude of issues at the micro level. Assuming a perfect set of contingent markets, as well as certain other restrictive assumptions, neoclassical theory shows how the market produces efficient outcomes in which the firm need only be treated as if it is a profit maximising 'black box', where internal structure, contractual relationships, entrepreneurship and innovation are simply not relevant (Debreu, 1959). Inputs go in and outputs come out without any explanation of how one gets turned into the other. Small firms are merely small versions of large firms and adaptability is effectively treated as if firms possess an almost instantaneous ability to adjust capabilities and routines to fit internal and external changes. As entrepreneurship, innovation and firm size are key issues for the other schools of thought on adaptability and survival, the next section notes the neoclassical perspective on these for comparison with the views of the other competing disciplines.

2.6.1 Entrepreneurship, innovation, firm size and age

'The theoretical firm is entrepreneurless – the Prince of Denmark has been expunged from the discussion of *Hamlet*' is the famous view of Baumol (1968, p.68). Although subsequent research (see Acs and Audretsch, 2003 for a summary) suggests entrepreneurship may be relevant to firm growth and survival (Audretsch and Thurik, 2000; Carree et al., 2002), this is not supported by any theoretical underpinning neoclassical microeconomics. Many modern mainstream developments continue to treat the firm as if it were a single entrepreneur rather than an organisational structure with its own internal tensions and dynamics (Hart and Moore 1990). Indeed, Johansson (2004) demonstrates that the words 'the entrepreneur' and 'entrepreneurship' hardly appear in any of the major post-graduate textbooks covering microeconomics, macroeconomics and courses in industrial organisation.[14] Bianchi and Henrekson (2005, p.22) conclude that an individual real-world entrepreneur, even if highly stylised, 'cannot at present be modelled in mainstream economics, since he or she *does* elude analytical tractability'. This is in marked contrast with the organisational strategy and strategic choice school where the entrepreneur is key, and with the organisational ecology school, where the entrepreneur is important for

[14]Johansson has similar observations for the terms bounded rationality and innovation.

organisational founding, not as an individual-level phenomenon but from a population-level perspective (Carroll and Khessina, 2005).

Entrepreneurship for neoclassical selection models is also cast as a behavioural characteristic of the individual who takes the risk of organising and operating a new business venture rather than one who acquires or continues to assume the financial risk of operating and managing a given business or undertaking (Wennekers and Thurik, 1999). It does not allow for the role of the entrepreneurial manager or management team within the institution of the firm.

Similarly, innovation is treated in neoclassical economics in much the same way as entrepreneurship. Writing in a blog (2008), Atkinson and Audretsch are still able to observe that '[i]nnovation is largely ignored in Washington because most economic policy makers are informed by the neoclassical economic doctrine that does not appreciates the importance of innovation and sees almost no role for government in it.' So a strictly neoclassical view has little to say on the role of innovation in adaptation or selection or the interaction between entrepreneurial management and the choice and implementation of innovation.[15]

As for firm size, small firms are largely treated by textbook economics effectively as small versions of large firms and adaptability is effectively treated as if all firms possess an almost instantaneous ability to adjust capabilities and routines to fit internal and external changes whatever their size. Larger firms, however, are acknowledged to be more able to influence their environments and so avert some selection pressure and they probably have some greater capacity to survive external shocks. Consequently, in the mix of adaptation and selection processes that influence organisational evolution, the relative role of selection is probably less profound for large organisations (Singh and Lumsden, 1990).

Textbook economics is similarly silent on whether older firms are more adaptable or less adaptable than younger firms. For Jovanovic (1982), technical efficiency increases with firm size and age and efficient firms grow over time and inefficient ones remain small or exit. There is also substantial evidence (discussed later on) that the growth and hazard rates of

[15]There is no room here for discussion of the relatively new doctrine of 'innovation economics', the idea that knowledge and innovation should be at the centre of a growth model rather than seen as independent forces largely unaffected by policy. The neoclassical response is that innovative ideas may flourish, but if they cannot be sold in some form, they are not innovations.

firms eventually decrease with age and size, though the detailed mechanisms through which this works remains largely unexplained by textbook economics.

2.6.2 Summary of traditional views on the power of adaptability in natural selection

So the orthodox, textbook, business economics approach sees natural selection as the survival of the fittest leading to equilibrium market outcomes, with competition selecting for survival whatever best allows the firm to grow and prosper in the environment. The focus is on market structure as a proxy for the degree of competition and there is a neglect of the internal structure and workings of the firm itself. Adaptability, entrepreneurship, innovation and a firm's internal structures and size are largely incidental. The overall approach, therefore, offers no real help in assessing the role of developmental adaptability in the survival of small and medium-sized firms, with much of the literature on the 'theory of the firm' about market structure and market behaviour rather than a theory of the firm as an organisational entity. On the other hand, Friedman's view that theories should be judged on the accuracy of their predictions and not on the validity of their assumptions remains a challenge to other views.

With this in mind, the next section looks at non-equilibrium, evolutionary views of selection and at the associated role of adaptability and inertia in the process of selection for survival. It builds on Winter's comments (1964) on Alchian (1950) and Friedman (1953) that both use what amounts to a crude selection analogy from biology that contains no inheritance mechanism. If profit seeking (maximisation) is not a deliberate conscious process, how does it get passed on to others (Hodgson, 1998)? In other words, winning in one period is unrelated to winning in another period if profit seeking cannot be learned by others and winning is just a random process.

In contrast with the neoclassical approach, the evolutionary view shifts to non-equilibrium, circular and cumulative causation processes that come from the interactions of a range of agents with imperfect knowledge, who learn from experience and whose differences contribute to change. In contrast with organisational ecology, evolutionary economics assumes that the adaptability of firms, their ability to improve the fit between the firm and the environment by changing their routines, might equally be a source of increased

survivorship as one of inertia. As Nelson and Winter (1982, p.410) say, 'The more we can learn about the way firms actually behave, the more we will be able to understand the laws of evolutionary development governing larger systems that involve many interacting firms in particular selection environments.'

2.7 An evolutionary view of adaptation and selection

Evolutionary economics and the associated idea of 'routines as genes' offer a promising way of looking at the impact of the adaptation/inertia/selection nexus on the survival of small and medium-sized firms as all three concepts are important in the literature. Evolutionary economics takes its cues from the Darwinian evolutionary algorithm discussed in 2.5 and emphasises specific notions of inheritance, variation and selection mechanisms within the socio-economic domain, though without any attempt to explain socio-economic phenomena in purely biological terms. In contrast with neoclassical theories, the focus is on non-equilibrium and cumulative processes that derive from the interactions of a range of agents with imperfect knowledge that do learn from their experience of trading in the marketplace. In contrast with organisational ecology, evolutionary economics assumes that the adaptability of firms, their ability to improve their position by changing their routines with regard to the circumstances, can be a positive source of increased survivorship. At the same time, and in contrast with much of strategy theory, evolutionary economics also acknowledges stability and inertia as an integral part of the story of industrial change.

Evolutionary economics assumes, then, that economic behaviour is guided not by perfect rationality but by learned habits and behaviours that are constrained by social mores, custom, practice and belief systems. In this context, routines are a basic conceptual building block representing the repeated patterns that arise from these constraints. Following Simon (1955), Nelson and Winter's seminal work (1982) shifts away from the neoclassical maximisation and equilibrium model altogether, substituting instead three basic concepts of an evolutionary theory of economic change: organisational routines (routines as genes), 'search', related to the evaluation of routines and stochastically generating mutations, and a selection environment generated by the market and competition. Routines then become the unit of analysis of an evolutionary view of firms, markets and economies, although their existence is rather taken as both a theoretical and empirical given.

In the related sense of organisational capacities, routines are also a key thematic in organisational science and strategy management (Barney, 1991; Teece et al., 1997; Zollo and Winter, 2002), but evolutionary economics casts routines in a role more analogous to genes in biology rather than the harder-wired process sets of organisational science, though again without any attempt to explain socio-economic phenomena in purely biological terms.

In this evolutionary view, competition is now not so much a matter of pushing prices to marginal costs in a neoclassical formulation but rather the replacement of products and services, and the processes which make them, by those that are better in some way, more efficient or satisfy customer preferences more closely (Nooteboom, 2001). At a population level, there is variational change in the composition of the population and transformational change in the nature of the individual elements within the population (Lewontin, 1974).

This section explores these ideas in some detail. It discusses the evolutionary approach to adaptability and selection and how both competitive selection and developmental adaptability combine to explain industrial change. In particular, it looks at the roles that the institution of the firm and its age and size may play in driving adaptability and survival. It covers the nature and role of routines in some depth and looks at the associated issues of learning, innovation and entrepreneurship. Of particular interest, as stressed, is the concept that routines in evolutionary economics are a source of both adaptability and inertia, although what determines the balance between them is still an open question.

If routines are the basic units of analysis that generate the adaptability/inertia that contributes to mechanisms of selection and retention for evolutionary economics, what do they consist of, were they come from, what they do, how does variation come about and how are they selected and retained over time? Unpacking these issues one by one gives a clearer account of the issues involved in using routines as the basis of an empirical analysis of adaptability in the survival of small and medium-sized firms.

The discussion looks first at the concept of routines, particularly how they can be sources of adaptability and inertia at the same time, followed by an examination of their inheritance mechanisms, sources of variation and how routines affect firm survival.

2.7.1 Routines – definitions

The literature uses the word 'routine' in at least two different senses. As a noun, routine is used to objectify a collective capacity to perform recognisable patterns of action (Nelson and Winter, 1982). As an adjective, the word indicates a judgment about a variable property of a pattern of action, something that happens in the normal course of events, so there can be confusion about the underlying construct. Routines are also hard to study from an evolutionary perspective because they are essentially complex patterns of social action and not just a sequence of instructions. Moreover, while the tools for characterising the variable properties of static objects are well developed, tools for characterising the sequential structure of patterns of action are not (Pentland and Reuter, 1994). Empirical study is progressively constrained as the view moves from the individual to the collective because it is a move from the easily observed to the hard to discern (Felin and Foss, 2004). Becker, in his comprehensive summary of the field (2001), particularly observes not only a relative lack of empirical studies on routines but also notes that few citations of the empirical work are to be to be found in the theoretical literature. Even ten years on, Winter (2011, p.265) says, 'Providing a fully compelling theoretical account of the origins of routines and capabilities is indeed a challenging goal, and in my view it is correct to say that no such account exists at present.'

For Nelson and Winter, organisational routines cover all repetitive patterns of activity, from individual skills to regular organisational and individual performance in a way that embodies organisational behaviours. They also distinguish a hierarchy of routines: lower order ones for production and operational processes and higher order routines for modifying lower order ones, for example choosing which production or operational techniques to use or which strategies to change. Firms may also have routines for changing routines at various levels, categorised by Nelson and Winter's 'search'. Searching in this sense for Nelson and Winter (op. cit. 1982, p.18) 'is the counterpart of mutation in biological evolutionary theory'.

Such a generalisation of routines can be expanded to encompass all the rules, procedures, strategies and technologies through which the organisation operates (Levitt and March, 1988), summarised by Miner (1991, p.773) as a 'coordinated, repetitive set of organisational

activities' and by Cohen et al. (1996, p.683) as 'an executable capability for repeated performance in some context that has been learned by the organisation in response to selective pressures'.

Organisation science also sees routines as organisational capabilities, from organisational characteristics that let the organisation select and implement strategy (Barney, 1991), through to the notion that dynamic capabilities build, integrate and reconfigure internal and external competences to allow a firm to address a fast changing marketplace (Teece et al., 1997). Organisational capacities may also be the learned and stable patterns of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness (Zollo and Winter, 2002). This aspect is discussed in more detail in the section on strategy-based theories of adaptability at 2.8.

So the idea that routines embody persistent, repetitive patterns emerges strongly from the literature (Teece and Pisano, 1994; Cohen et al., 1996; Becker, 2004). But a contentious issue is the balance between actual behaviours of individual actors within the routine concept and the collective idea of routines that comes somewhat at the expense of critical individual level considerations (Abell et al., 2008; Felin and Foss, 2004, 2011, 2012). This was touched on in section 2.5.3 above in the discussion on intentionality and adaptive fit. The argument is cast between the methodologically individualist view that emphasises the role of individuals and their deliberate actions and a more multilevel (methodologically collectivist) view that takes in group dynamics and processes. On the one hand, individualism seems important for investigating management decision and strategic choices and for making sure the firm is not treated as the black box of economics textbook theory. On the other is a view that the analysis of firms (and social phenomena generally) needs to take into account both individuals and the structured relations between individuals (Hodgson and Knudsen, 2011).

At the practical level, there is an on-going debate whether the individualist view expressed by Felin and Foss (2009, 2012) can generate practical, useful empirical research given such a philosophically abstract starting point (Pentland, 2011). Felin and Foss argue that experience and repetition alone as antecedents of routines and capabilities are inadequate

and that the 'poverty of stimulus'[16] argument and a more individualist and rationalist, choice-based approach provide a fruitful basis for research on organisational routines and capabilities. Pentland (2011) on the other hand counters that real, ethnographic observation of repetition and experience in real routines provides a better foundation for exploring issues in routines.

A further, more encompassing view is that routines can also be seen as patterns of interaction expressed as dispositions or capacities that shape the way various overlapping cohorts within the firm actually proceed in response to a series of signals to act (Hodgson, 2004). They show in the routine behaviours to be seen across all functions of the firm, from production and administration to sales and marketing and strategy, as well as in routines to change routines in a regular and orderly fashion. This is a strong argument that routines are not behaviour as such and are deeply context-dependent, specific to an organisation and its structures (Teece and Pisano, 1994; Cohen et al., 1996). While this concept is attractive in that it takes in a multilevel view and incorporates individual and collective notions, such a high-level view makes routines even harder to operationalise.

2.7.2 Routines as a source of stability, inertia and change

Nelson and Winter (1982) identify three main roles for routines: as organisational memory, as a way of managing intra-organisational conflict (truce) and as a norm or target that keeps the routine on track so that sound replication can take place. Routinisation of activity is the locus of operational knowledge in an organisation, making routines a major source of reliability, speeding organisational performance and adaptability and avoiding the need to re-invent the wheel each time (Cohen and Bacdayan, 1994).

As a store of operational knowledge (Miner, 1990; Hodgson, 1998; Zollo and Winter, 2002), routines are also the link between the structure of the firm and the processes of the firm (Pentland and Reuter, 1994). An empirical study by Knott and McKelvey (1999) of franchises and company-owned stores found that the value of professional managers

[16]Felin and Foss's argument is extrapolated from a linguistics view that claims natural language grammar is unlearnable given the relatively limited data available to children learning a language, and so this knowledge must be supplemented with some sort of innate linguistic capacity.

implementing tried and tested routines was more important for efficiency and profitability than the profit maximising behaviour of entrepreneurial franchisees. This work demonstrates not only that routines contribute to efficiency but also that tacit knowledge is hard enough to pass on within an organisation, let alone trying to franchise out such knowledge (Becker, 2001).

So routines as organisational memory embody tacit knowledge – the knowledge that people carry in their minds and that, by its very nature, is difficult to access. People are not aware of the knowledge they have garnered, how valuable it can be to others and the extent of personal contact and trust the effective transfer of such knowledge generally requires (Winter, 1994; Hodgson, 1998; Lazaric, 2000). Cohen and Bacdayan's (1994) empirical psychological study suggests that procedural memory, a memory for how things are done that is relatively automatic and inarticulate, may help explain how routines arise, stabilise and change and so act as a source of both adaptability and stability.

Building on the ideas of Coase (1937), Simon and March (1958) and Williamson (1975), Nelson and Winter (1982) devote a whole section of their book to the idea that routines must be taking account somehow of motivational considerations and intra-organisational conflict. Routines become patterned in ways that reflect implicitly a truce in the internal politics of a firm or organisation, thus contributing to its stability. Stability here is the state or quality of being stable, with the strength to stand without being moved or overthrown. Inertia, by contrast, is the inability to move or, more weakly, an inability to shift from current momentum. Routines as a source of such stability are a feature of the literature (Hodgson, 1993; Nelson, 1994), although the organisational ecologists insist that most organisations are so structurally inert that adaptation is hindered when the environment changes (Hannan and Freeman, 1989). Again, there is little empirical evidence or theoretical reasoning to explain what generates more or less inertia or more or less change.

Routines can also be a source of change, especially through interactions with learning (Aldrich, 1999) and through the interaction of both the ostensive aspect that enables people to guide, account for, and refer to specific performances of a routine and the performative aspect that creates, maintains, and modifies the ostensive aspect of the routine (Feldman and Pentland, 2003). The dynamic relationship between the two aspects potentially permits a wide range of outcomes, from great stability to considerable change. But again, there is

scant empirical evidence or theoretical reasoning to explain the conditions that generate more or less inertia or more or less change and the boundary conditions between change due to adaptation and change due to selection.[17]

Routines certainly generate flexibility by making decision-taking easier through economising on cognitive resources and reducing complexity and uncertainty (Egidi and Narduzzo, 1997), as learned habits lead to more automatic responses and guide decision-making (Becker and Knudsen, 2001; Betsch, Hohle and Habestroh, 2002). As Nelson and Winter (1982) note, keeping existing routines running is hard enough and managers strive just to keep routines under control or to replicate them properly in new situations. The importance of this co-coordinating and controlling aspect of routines (Dosi and Malerba, 1996; Cyert and March, 1963) is seen when routines are interrupted (Weick, 1990) and Knott and McKelvey's (1999) empirical study on franchises demonstrates the advantages for firms of such well-controlled systems.

To sum up, the empirical evidence on what routines do is still thin and analysis is difficult if routines are hard to measure dispositions rather than actual behaviours. And there is the consideration that routines in a firm should be examined at their different functional levels. This would need to include routines for production and marketing, routines for daily and strategic management and routines for changing routines, taking in the likely conflicting and paradoxical mix of routines that arises from such a multi-level of analysis (Nelson and Winter, 1982; Sorensen and Stuart, 2000). In one empirical study, Sorensen and Stuart (2000) find that firms with lower-level routines that fit the environment well can perform poorly if the higher-level routines do not fit (are too inwardly selected), and vice versa. This is an interesting echo of the evo-devo debate at 2.5.1 and is followed up in Chapter 5.

There is also scope for empirical work that blends the 'top-down' approach of imposing an abstract framework on evolutionary economics with a 'bottom-up' approach that looks at the detailed processes underlying the acquisition and transfer of knowledge within and across real-world organisations (Buenstorf, 2006).

[17]In game theory terms, routines might even be seen as specific outcomes of beliefs about how other players, both internal and external, play the game (Holzl, 2005).

2.7.3 Inheritance, variation and selection of routines

Having discussed the nature of routines, the following sections explore how routines fit within a framework in which both competitive selection and developmental adaptability can combine to explain industrial survival and change from the perspective of evolutionary economics. Once again, the replicator and interactor concepts provide a useful basis for looking at the development of both individual entities and the evolution of whole populations (Hodgson and Knudsen, 2007). To repeat, routines in this context play a key role in the development of firms; and selection works on the firm. Thus the 'routines within a firm' framework (the replicator-interactor nexus), in which both competitive selection and developmental adaptability are allowed to combine to explain industrial change, is an interesting viewpoint from which to look at inheritance, variation and selection of routines.

2.7.4 Inheritance and replication

If routines are part of the mechanism of adaptation and can potentially confer a selection advantage, it is useful to understand how the whole reproduction cycle works, where routines must be capable of producing copies of themselves and those copies must also be capable of reproduction.

Hodgson (2004) states that the replication of routines must involve the replication of generative structures and capacities above and beyond individual habits as well as some of the information embodied in the routine, including an element of any tacit knowledge. Such replication means the routine to be replicated may be only partially understood at source so that replication is costly and difficult and is an interactive process rather than a single directional transfer (Winter and Szulanski, 2001). Adding a performative view, it may be that the routinisation process is only truly successful when the change issues are out of the way and the routine is bedded in such that it becomes the perceived norm (Lazaric and Denis, 2001).

But, as Buenstorf (2006) asks, as part of the methodologically individualist versus collectivist debate, what is being copied, the disposition for conditional behaviour or only the behaviour it gives rise to and how do you tell the difference? Buenstorf also considers

that, given the inter-individual character of routines, the knowledge underlying them will be distributed among the involved organisation members, limiting their individual ability to successfully copy the routine.

There is a number of replication processes identified in the literature including replication through employees migrating from one firm to another, the activities of external experts (consultants) helping transfer routines from one organisation to another, and a process of imitation of what looks like good practice elsewhere (Hodgson and Knudsen, 2004). Nelson and Winter (1982) look at replication in terms of replica new plant from an existing one, especially in an expansion phase. Winter and Szulanski (2001) look at routine replication in firms that sequentially establish large numbers of similar outlets, the 'copy exactly' McDonalds or Intel approach. However, not all firm growth involves duplication processes that are so nicely divisible (Buenstorf, 2006) and growth may be just the up scaling of existing routines or their replacement by routines more suitable for larger organisations, rather than just the replication of existing routines.

Routines may also get also get progressively adapted through the process of converting tacit knowledge to explicit knowledge. In their model, Nonaka and Takeuchi (1995) show knowledge following a cycle in which implicit knowledge is somehow transmuted into explicit knowledge and this knowledge in turns takes on the aspects of implicit knowledge with use and familiarity. They illustrate the first part of the cycle with the example of Matsushita trying to develop a fully automated home bread-baking machine. When the designers couldn't perfect the dough kneading mechanism, a software programmer apprenticed herself with a master baker, gained a tacit understanding of kneading, and then conveyed this information to the engineers.

A similar model of knowledge asset development is proposed by Boisot (1998), in which knowledge assets can be located within the three dimensions of abstraction, codification and diffusion, labelled the 'I-Space'. Boisot then suggests there is a Social Learning Cycle (SLC) that uses the I-Space to model the dynamic flow of knowledge through a series of six phases: scanning, codification, abstraction, diffusion, absorption, and impacting. Data is increasingly filtered to produce meaningful and explicit information and this information is then abstracted and codified to produce useful knowledge. As the knowledge is applied in

diverse situations it produces new experiences in an un-codified form that in turn produces the data for a new cycle of knowledge creation.

Applying the idea of such a social learning cycle to the variation and selection of routines and the adaptability of those routines, routines become increasingly explicit and flexible through the frequency of their implementation and as their merits are debated and tested, reaching a peak of explicitness as the cycle reaches the selection stage. Through the replication and retention phases, routines become increasingly embedded in behaviour, improve in effectiveness, and become generalisable to a wider range of situations. At the same time, paradoxically, they become in turn more un-codified or tacit as knowledge is absorbed and produces learnt behaviours (c.f. Zollo and Winter, 2002), reflecting the adaptability/inertia nexus discussed at 2.7.

As Knudsen (2001) points out, however, the polarisation of knowledge into explicit versus tacit may be better expressed as a continuum between the two. What matters are the costs of making knowledge explicit and he suggests that more insights can be gained from the view that the two ends of the spectrum are 'knowledge-that-is-extremely-costly-to-articulate and knowledge-that-isn't-at-all'. What is important is the cost of articulating, transferring, absorbing and integrating knowledge. Although many authors cite Polanyi (1966) as the originator of the distinction between tacit and explicit knowledge, Polanyi himself suggests that tacit knowledge cannot in fact be expressed because, in his famous phrase, 'we know more than we can tell'. In other words, it may be hard for an agent to articulate in words knowledge of what he or she is doing because we are not fully conscious of all the knowledge we possess.

Hodgson (2004, p.4) emphasises that, however routines are replicated, by the transfer of codified and tacit information, by laws or rules or as a strategic initiative, routines replicate 'on a substrate of organized and habituated behaviour' and that inherent structural inertia is likely to make internal routine change hard. Hodgson also suggests that successful external duplication of routines depends on the capacity of the receiving organisation to interpret and implement them in the context of its own capabilities (creating a further source of variation).

What emerges from the literature is a lack of understanding precisely how the replication mechanism of routines works, how many types of inheritance mechanisms are viable, how

they differ and whether the differences matter (Becker, 2004). It is unclear if the mechanisms are different for small and large firms and what makes for successful rather than unsuccessful replication.

2.7.5 Variation

Variation generated by the search process may itself be the object of internal selection (Cyert and March, 1963), so that fitter variants - from a purely internal perspective - accumulate in collective stored memory (Levitt and March, 1988). This could be as a result of deliberate adaptive learning by management (Zollo and Winter, 2002) or from deliberate managerial choices about alternatives for the future.

Variation may also come about from uncertainty arising from differences of opinion and judgment (Alchian, 1950), from the trial and error of the innovation process recombining routines in novel ways, and from the process of searching for new and better ways of doing things (Nelson and Winter, 1982). Variation may also come about as the result of the almost inevitable incomplete copying or mimicking of routines by others, perhaps at start up or spin off (Hodgson and Knudsen, 2004), or just through the accretion of small slippages in cycles of repetition of a routine. Importantly, all these mechanisms permit the introduction of new variations that result in a range of different traits in the population of firms. Feldman and Pentland (2003), as mentioned, argue that the relationship between the ostensive and performative aspects of routines creates an on-going opportunity for variation, selection and retention of new practices and patterns of action within routines. This allows routines to generate a wide range of outcomes, from apparent stability to considerable change. The key point here is that all these mechanisms permit the introduction of new variations that can result in a range of different traits in the population of firms, echoing the 'evo-devo' debate.

2.7.6 Selection

In his comprehensive summary of routines, Becker (2002, p.29) notes: 'While many studies allude to routines and variation, the area of the selection of routines is virtually untouched.' At one level, interaction with the environment (the market) selects firms by the goods and services they produce, the methods of production employed and the associated bundle of

routines involved in animating and effecting the whole process (Metcalf, 1998). Routines thus selected ought to confer some advantage, making the firm more profitable, or giving it a relatively larger market share, or improving survivability than firms with routines that do not confer the same advantages for the given environment. Over time, repeated cycles of replication, variation and environmental interaction result in differential selection of firms (phenotypes) through their interaction with the environment (c.f. Hull et al., 2001) and the survival or not of their associated routines (genotypes). However, if the market is the only selector of routines, competition should lead to some convergence of routines across firms so the differences in firm practices suggest that some selection must also occur at the level of the firm itself (Plunkett, 2005).

Routines themselves may not be optimal as the learning process involves 'imperfect adaptation and mistake-ridden discoveries' (Dosi and Nelson, 1994, p.159). In addition, as Metcalfe (2000) notes, from an evolutionary standpoint the outcomes of competition are always contingent on the nature of the selection environment and the characteristics of the whole population of firms that are being selected. On this basis, competition may not select in general the most efficient firm, as touched on in 2.6 above. Market competition can only select for behaviours made available for selection so that winning, at least in evolutionary terms, only requires the firm to be 'the least foolish of the fools' (Khalil, 2000).

Of course, the process is unlikely to be as mechanical as described, and Meyer (1994) suggests that organisations adapt rather more to internal managerial requirements than to responding to signals from the external environment, so that the selection process is also driven by internal competition for resources and power (Miner, 1994). Indeed, success can often breed less success rather than more because internal selection can come to dominate external selection forces (Miller, 1994). Routines may also not be without information costs and might be selected according to the 'information environment' and the costs of gathering information (Lorenzen, 1998). This might also explain the result that firms with lower-level routines that fit the environment well can perform poorly if the higher-level routines do not and vice versa (Sorenson and Stuart, 2000). Again, there is a low level of empirical evidence on how inherited traits affect the ability of routines or firms to reproduce themselves, either by survival or natural selection and selection may be better viewed in the whole context of the replication and inheritance cycle.

So the exact mechanisms for introducing new variations into the population are not yet well specified, nor is the extent to which they occur as the result of random or deliberate change. Becker (2002, p.29) comments yet again that, twenty years after Nelson and Winter's work, it is 'astonishing how little progress has been made on the exact nature of the involvement of routines in the process of variation, selection and retention'.

2.7.7 Innovation as an aspect of the adaptability of routines

Routines, then, are capable of generating both inertia and adaptability depending on the context and timescale, and the concept of having 'routines to change routines' refers to a spectrum from an unchanging or inert set of routines to change routines to a genuinely adaptable disposition to generate and integrate genuinely new routines. This concept is illustrated to advantage in the context of innovation activities, where innovation can be seen as another expression of adaptability.

While the importance of innovation to individual firm growth and survival is acknowledged (Audretsch, 1995), and Schumpeter (1934) identifies innovation as the critical dimension of economic change, the term 'innovation' is still without a consistent and agreed definition. The European Commission's Oslo Manual (2004, p.10) offers the following:

> A technological product innovation is the implementation/ commercialisation of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer. A technological process innovation is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these.

But the manual itself recognises that the definition only deals with changes that take place at the individual firm level and does not cover categories of innovation discussed by Schumpeter, such as the opening of a new market, the conquest of a new source of supply of raw materials or semi-manufactured goods, or the reorganisation of an industry.

And even innovation as the introduction of something new (Child and Heavens, 2001) or the carrying out of new combinations (Schumpeter, 1934) does not quite catch the idea of the amount of change involved even in incremental improvements. Consider the amount of real change involved in IT software in maintenance improvements, incremental enhancements

(bug fixes?) and incremental software upgrades/releases that usually have some significant new features but are a long way from being a completely new service or product such as an e-reader or i-Phone. So innovative activities encompass incremental and radical technology and system innovations (Freeman and Perez, 1988) as well as continuous and radical product and process improvements. Christensen (2000) even separates new technologies into sustaining and disruptive. Sustaining technology relies on incremental improvements to an already established technology, whereas disruptive innovations are those big technological or organisational breakthroughs that revolutionise the business in a big market or the whole industry. This leads to Christensen's famous 'innovators dilemma'; successful companies often fail because of the very management practices that have allowed them to become industry leaders. Those practices make it extremely difficult for them to develop or adopt the disruptive technologies that ultimately steal away their markets. It is a dilemma because companies fail for the same reason they succeeded.[18]

Christensen's perspective reflects the organisational ecology view that, although older firms may have increased innovation rates, the difficulties of keeping pace with incessant external developments make even their innovative outputs increasingly unsuited to the most current environmental demands (Sorensen and Stuart, 2000). Moreover, change that disrupts both internal routines and external linkages is likely to be hazardous, if not fatal (Hannan and Freeman, 1984).

The innovation literature also suggests that the successful implementation of innovations of any sort requires the incorporation and routine use of a new technology on an on-going basis within the firm (Yin, 1977; Szulanski, 2000). The literature also suggests that some organisational adaptation is required for new technologies to be effectively exploited (Barley, 1986; Leonard-Barton, 1988; Attewell, 1992; Orlikowski, 1993, 2000). The innovation process is unlikely to be a continuous one but is more likely to occur in stages as

[18] Christensen's insight is from the Hard Disk Drive Industry. The old 8 inch drives used in mini-computers were superior to the new 5.25 inch drives used in desk-top machines but they were too expensive for desktops. The simple 5.25 inch drive, assembled from technologically simple and off-the-shelf components, was an "innovation" only in the sense that it was new. However, as this market grew and the drives improved, the companies that manufactured them eventually triumphed while many of the existing manufacturers of 8 inch drives fell behind.

technology adaptations and adoptions themselves occur in stages and present different hurdles to adoption over time (Szulanski, 2000). According to Jones and Craven (2001), successful innovation depends on both technical resources and the organisational capabilities to manage them, although successful innovation management routines are not easy to acquire because they represent what a firm has learnt over time through a process of trial-and-error. The need to juggle multiple competencies and reconcile contradictions to get innovation successfully implemented echoes the debate on ambidextrous organizations (Tushman and Anderson, 1997), discussed further at section 2.10.

Edmondson et al. (2001) take a learning perspective on innovation; when a new technology disrupts existing work routines, the adopting organisation must go through a learning process and make those organisational adjustments that allow new routines to become on-going practice. Child and Heavens (2001) also see that the successful introduction of something new implies that a learning process has been accomplished in such a way that continuity is reconciled with change and Ellstrom (2001) emphasises the distinction between learning processes that occur within a given set of existing routines and learning processes that represent a break with current routines and go beyond the given.

From a routines perspective, then, innovation can be described as a real change that involves real change in routines (Becker et.al., 2005) and routines are essential to change because routines such as new product development routines are designed to implement innovations while others are designed to seek out external sources of change (Nelson and Winter, 1982). The innovation process seems to involve a complex and ambidextrous trade-off between routinisation and change, between reliability and accountability and timely adaptation, with innovation routines playing a part in the success of innovation processes (Tidd, et al., 2001) and with recurrent patterns of interactions themselves systematically stimulating innovation within the firm (Pavitt, 2002; Becker and Zirpoli, 2008.)

On the other hand, routines can also prove a source of resistance to innovations, with routines around the use of existing technologies producing a feedback loop of stability (Orlikowski, 2000) and existing routines persisting in the face of external events that demand change (Gersick and Hackman, 1990; McGrath, Kelly, and Machatka, 1984). Edmondson et al. (2001) point out that failure to adopt innovations, even those demonstrably beneficial, is widespread (see also Tushman and Anderson, 1986; Henderson

and Clark, 1990), with firms trapped by their current competencies (Levitt and March, 1988), hampered by a lack of relevant expertise (Cohen and Levinthal, 1990) or business models (Christensen, 2000), or trapped by core rigidities (Leonard-Barton, 1992). The constant challenge for firms is how to align routinisation with innovation-induced organisational change and consistent performance (Meeus and Oerlemans, 2000).

Having a propensity for exploiting existing practices and current knowledge into action for sustained cost or demand-side innovative gains can thus be seen as part of a firm's overall adaptive capacity for change. Similarly, a firm may also have a disposition for (and sets of routines for) exploring new knowledge in terms of genuinely new products and processes as part of its capacity to change, described by Nelson and Winter (1982, p. 132) as 'heuristic search'.

Given the adaptability/inertia nexus, however, some firms are likely to have routines for search but not for implementation and vice versa. Others may have dispositions for new product development but not for marketing new products. It is also hard to distinguish where successful innovation has been brought about through the exploitation of existing routines where a firm has routines for new product or process development, and where the innovation required a level of adaptation that involved genuinely new and possibly disruptive routines.

As with much of the empirical work on organisations, a lot of the evidence on innovation studies is taken from manufacturing companies, where innovation is easy to observe, or from highly innovative 'hi-tech' companies. Many of the qualitative case studies choose to measure innovation or innovation propensity as the sum of the dispositions of, or opinions of, individuals within the organisation for such change (Edmondson et al., 2001; Damanpour and Schneider, 2006). A literature search for this dissertation revealed studies of a population of telephone companies (Tushman and Nelson, 1990), a study of the microprocessor industry (Drazin and Schoonhoven, 1996) and a study of clusters (Pouder and St John, 1996) but no studies of innovation in a whole population of firms taken from multiple industries and sectors as the research questions demand. There are also few empirical studies of the relationship between adaptability expressed in terms of routines and the uptake of radical, new, technologies or the introduction of genuinely new products and services. There are also few empirical studies of the effectiveness of routine responses in

implementing all those more incremental process and product improvements.

Those studies that do exist also focus on new manufacturing technologies or specific aspects of adaptability (Leonard-Barton, 1988; Bierly and Chakrabarti, 1996; Katayma and Bennett, 1999; Tyre and Hauptman, 1992). But they all demonstrate that successful implementation of new technologies requires considerable attention to the change process and conscious management adaptation, as well as showing that the higher the level of technical novelty involved, the less useful was any overlap of routines between engineering, manufacturing and other internal functions. McCarthy et al. (2006) use comparative case studies to present the new product development process as a complex adaptive system that naturally results in adaptability because of the ability of individual NPD processes to switch between different behaviours.

Takeuchi and Nonaka (1986) look at the development processes of 6 large multinationals, concluding that the older, sequential approach to developing new products does not work as well as a more holistic approach that involves built-in instability, self-organizing project teams, overlapping development phases and organisational transfer of learning that all acts as a change agent. Damanpour and Gopalakrishnan (2001) look at the innovations introduced over time by a large sample of US commercial banks. They find that, not only are product innovations adopted at a greater rate and speed than process innovations, high-performance and more adaptable banks adopt product and process innovations more evenly than low-performance banks.

A study by Griffin (2002) suggests that firms having a specific new product development department and all the routines associated with that process are better able to bring to bear the resources needed to hasten new product improvements to market. For incremental improvements, however, they suggest that having a separate NPD process can increase time to market as many NPD processes are built to manage the complexities of more innovative projects. Bhuiyan et al. (2006) point to the merits in an aerospace company of a continuous improvement methodology (Achieving Competitive Excellence) that requires small scale but continual adaptation to achieve world-class quality in products and processes. Similarly, a study of a company that excelled in continuous existing and new product development shows that adaptable capacity is made up of continuous knowledge creation, absorption,

integration and reconfiguration and is dependent on a coherent mix of organisational resources (Verona and Ravasi, 2003).

So innovation can clearly be seen as both an aspect of adaptability and the outcome of adaptability and there is empirical evidence of the positive relationship between adaptability and innovative capacity across new technologies. There are, however, no empirical studies of innovation across a population of firms looking at innovative capacity as an aspect of adaptability and how it might relate to survival and there is little material on the relationship between the sheer willingness to try new ideas and technologies and the capacity actually to implement them successfully.

2.7.8 An evolutionary view of entrepreneurship, firm size and age

One of the research issues concerns the relationship between adaptability and factors such as firm size, age, entrepreneurship, innovative capacity, the competitive environment and other success factors or outcomes. The next section looks at these issues from an evolutionary economics perspective.

Schumpeter (1934) identifies innovation as the critical dimension of economic change, arguing that economic change turns on innovation, entrepreneurial activities and market power. Schumpeter sought to prove that innovation-originated market power could provide better results than the invisible hand and price competition (Pol and Carroll, 2006). He particularly identifies the importance of entrepreneurs – creative destructors – as the animating force of change, as well as innovation driven by entrepreneurial managers working through large companies with the resources and capital to invest in research and development.

The entrepreneur, however, is an elusive character in economic theory, as discussed at 2.6.1. There is no agreed definition of entrepreneurship and most theoretical approaches yield operational difficulties (Karlsson et al., 2004). For practical purposes, the definition by Wennekers and Thurik (1999, pp. 46–47) suffices:

> Entrepreneurship is the manifest ability and willingness of individuals, on their own, in

teams, within and outside existing organisations, to:

- perceive and create new economic opportunities (new products, new production methods, new organisational schemes and new product-market combinations)
- introduce their ideas in the market, in the face of uncertainty and other obstacles, by making decisions on location, form and the use of resources and institutions.[19]

The events initiated by innovative entrepreneurs create new routines and competences that are intended to generate products, processes and services favoured by selection criteria (Anderson and Tushman, 1990; Hunt and Aldrich, 1998). Such new knowledge can diffuse through a population or possibly create a new one, even if the initial innovating firm does not survive.

While there are a number of empirical studies on entrepreneurship (Drucker, 1985; Covin and Slevin, 1991; Acs, 2010), none thoroughly explore the relationship between entrepreneurship (however defined) and adaptability. This is partly because adaptability is generally assumed and subsumed in entrepreneurship and radical innovative activities, and failures are expressed in terms of market acceptance rather than the inability to get the innovation out of the door on time and to price. From the routines perspective, there is a need for routines that translate entrepreneurship into implementable actions rather than just relying on the power of leadership to bring about change. There is little empirical work so far on the handedness or propensity for adaptability as a limiting or enabling factor in new product, service or process implementation.[20]

As discussed in Chapters 1 and 2, the age dependency of firm survival is a discernable empirical regularity in the industrial organisation literature, seen in both large multi-industry (though manufacturing-based) studies (Dunne et al., 1988, 1989; Disney et al., 2000; Persson, 2002) and in number of specialist studies (Audretsch, 1991; Baldwin and Gorecki, 1991; Mata and Portugal, 1994). Age and size are positively correlated among surviving firms, as are size and survival, where age is seen as a proxy for some other determining variable or variables. As Coad (2010) points out, it is hard to find empirical or theoretical

[19]In a previous study (Wennekers et al., 1997, p.5) a third aspect was included as well:
'[…] compete with others for a share of that market.'
[20]In their book 'Darwin's Conjecture' (2010), Hodgson and Knudsen particularly argue against the frequent over-stress on leadership, entrepreneurship and change, emphasising rather the importance of preserving, replicating and cautiously developing embodied knowledge in firms.

predictions on the relationship between firm age and performance because most models see firm size and age as representing the same fundamental concept.

Inasmuch as there is an evolutionary economics perspective on the relationship between firm size, age and survival, it would tend to reflect the above. There could, however, be a more prosaic explanation for the age dependency of survival, one accounted for by the heterogeneity of the population. As a cohort of firms ages, the risk set becomes increasingly composed of firms with the lowest propensity to exit (Thompson, 2005). The mean death rate for the cohort can decline with cohort age, even if the hazard rate does not decline with age for any individual firm. In a study of shipbuilding, Thompson (2005, ibid.) shows both that the usual age-dependency of exit is present in the data and that it disappears with the addition of the quality proxies to the hazard regression, implying the initial age dependency can be explained by selection bias.

2.7.9 Summary

In contrast with organisational ecology, which also claims evolutionary underpinnings, evolutionary economics assumes that the adaptability of firms, their ability to improve the fit between the firm and the environment by changing their routines, can potentially be a positive source of increased survivorship. Unlike strategy theories, evolutionary economics acknowledges stability and inertia as an integral part of the story. The approach takes in the contradictory views of the effects of organisational flexibility and inertia with the idea of routines as both a source of inertia and change. Defining routines as dispositions or capacities that shape the way various overlapping cohorts within the firm proceed in response to signals to act might prove a fruitful research tool if the concept can be operationalised.

If routines play a key role in the development of firms and selection works on the firm, then the routines-within-a-firm concept offers a framework that shows how competitive selection and developmental adaptability can work together to combine to explain industrial change. To quote Lewontin (1974) again, there is transformational change in the nature of the individual elements within the population and, at the population level, there is variational change in the composition of the population.

2.8 Strategy-based theories of adaptability

2.8.1 Introduction

Under the umbrella of organisation science, strategy theory consists of a wide range of academic disciplines and schools, many of which disagree on basic assumptions, definitions and even about what strategy theory should try and explain (Haugstad, 1999). There is a proliferation of strategy planning typologies in both the academic and popular literature, and business managers have come to expect a new classification and/or new theory every few years as one fad supersedes another. Some are replaced or revised to reflect a changed business environment but elements of the more successful models linger as they contain a certain ring of truth, and offer useful descriptions for thinking about strategy and strategic behaviour.

All strategy theories owe intellectual allegiance in some way or other to the work of the refiners of strict neoclassical theory, ranging from imperfect competition (Robinson, 1933; Chamberlain, 1933) to the transaction cost theory of the firm (Coase, 1937; Williamson, 1975). They also take in Simon's (1955) idea of bounded rationality, that decision making takes place within an environment of incomplete information and uncertainty and bounded by human limitations. The behavioural and strategic models that flow from this approach typically integrate insights from psychology with neoclassical economic theory, notably the work of Cyert and March (1963), discussed in some detail below.[21]

Nonetheless, the one common element of strategy theories is the idea that firms can adapt to changes in the external environment and/or changes in competition to achieve a better fit between the firm and its environment or its chosen niche. Strategic choice theory assumes that success lies in the decisions made by individual entrepreneurs and managers (Child and

[21]Other managerial theories of the firm (Baumol, 1959, 1962; Marris, 1964) focus on managers maximising their own utility and returns rather than maximising the profits of the legal entity for which they work. As a result, firm size and growth result from the managerial utility function. The empirical evidence for this view is equivocal (Radice, 1971; Holl, 1975). There is some evidence that SME management controlled firms may have stronger preferences for growth than owner-controlled firms (Hay and Kamshad, 1994).

Kieser, 1981, Child, 1997), in stark contrast to the downplayed selection advantage of good management in organisational ecology. Firms survive or die in relation to their fit within the marketplace and the more fit firms must also be better able to read and interpret what is going on and then adapt over time (Schindehutte and Morris, 2001). Part of this ability to adapt is related to the ability of the individual entrepreneur and/or management teams to learn (Levinthal, 1991; Durand and Coeurderoy, 2001). Haugstad (1999) particularly observes that all strategy theories are neoclassical at heart, effectively assuming that strategy is driven by the owner/manager, that it is an on-going process involving continuous and discontinuous change and that everything can be adapted more or less efficiently and swiftly to the requirements of the strategy.

For strategy theories, therefore, greater adaptability should contribute to larger size and greater revenues and profits, even allowing for trade-offs between these variables and balancing the costs and benefits of adaptability (Chandler, 1977; Pfeffer and Salancik, 1978; Porter, 1980). From a survival perspective, strategy theories also see Darwinian natural selection as the survival of the fittest, where firms develop competencies, behaviours, strategies, innovations and flexibilities, and competition selects for survival that bundle of those routines that best allows a firm to grow and prosper in the environment.

Rumelt (1980, 1993, p.2), commenting that the term ‘strategy’ had been used in such a disparate way in the literature that ‘it has lost any clearly defined meaning’, offers a definition of strategy that is appropriate for this study:

> For our purposes a strategy is a set of objectives, policies and plans that, taken together, define the scope of the enterprise and its approach to survival and success. Alternatively, we could say that the particular policies, plans and objectives of a business express its strategy for coping with a complex competitive environment.

Typologies abound in strategy theories. Typologies are useful constructs for thinking about behaviours, even if they may not explain well what is actually going on or prove the existence of the chosen categories. One reason for their popularity in organisational science, according to Doty and Glick (1994, p.230), is that ‘they appear to provide a parsimonious framework for describing complex organisational forms and for explaining outcomes such as organisational effectiveness or groupthink’. Doty and Glick note that such parsimony

glosses over the complex processes that determine organisational outcomes and that 'most typological theories are inadequately developed because the causal processes operating within each type of organisation are not fully specified,' (ibid. p.2). Indeed, the strong criticism of typologies is that they are classification systems rather than theories as such (McKelvey, 1982; Rich, 1992).

The standard unit of analysis in strategy theory, as discussed at 2.3, is the overall strategy of the firm, where strategy is all about the most propitious adjustment and arrangement of internal capabilities in the light not only of external opportunities but also of actual and perceived threats. Having said that, there is still confusion generated in the literature by the choice of typologies. Miles and Snow (1978), for example, show a typology of **firms** (as reactors, analysers, defenders and prospectors), whereas Porter (1980) offers a typology of **strategies** such as differentiation, focus and cost leadership, so comparing empirical results is not always straightforward.

2.8.2 Making sense of the strategy world

There are numerous perspectives on business strategies and an array of disparate and conflicting classification systems. Mintzberg (1990, 1998) identifies ten schools of strategy theory, and Pecotich et al. (2003) assign strategy studies to three major, but overlapping and increasingly coalescing, disciplines of:

- marketing strategies (doing things right)
- corporate strategies (doing the right things)
- industrial economic strategies (structure, conduct and performance).

For the purposes of this dissertation, Ahonen (2004) proposes a more useful classification of the literature:

- **strategic planning school** – strategy as the planned allocation of scarce resources to achieve the long-term goals of the organisation. This grouping of systematic planning typologies includes both neoclassically based theories and bounded rationality variants (Chandler, 1962; Ansoff, 1965, 1979, Cyert and March, 1963)

- **competitive strategy view** – combining desired outcomes and the means to achieve them within the competitive environment (Porter, 1980)
- **strategy process school** – strategy arising out of continuous learning, change and development – a more dynamic but still equilibrium-based view (Miles and Snow, 1978; Mintzberg, 1987, 1988, 1994; Peters and Waterman, 1982)
- **resource-based view** – strategic positioning is based on combinations of resources and capabilities unique to an individual firm and including learning processes and outcomes (Prahalad and Hamel, 1990; Barney, 1991, 1997).

Again, the key common element of all these strategy perspectives is that organisational flexibility leads to better performance than organisational inertia, or at least produces economic returns greater than the total costs of that flexibility. Once more, overlying Ahonen's classification, strategic choice theory assumes that success lies in the decisions made by individual entrepreneurs and managers, including their ability to bring about the changes demanded by their strategic choices (Child, 1972). Much of the literature and most of the management handbooks are devoted to prescriptive guidelines for success.

Most strategic choice theory makes little distinction between short- and long-term strategies, whereas a successful strategic approach that manages both the long and short term requires firms to exploit existing markets while simultaneously exploring new market opportunities. Strategic ambidexterity is the ability to follow both exploitation and exploration strategies simultaneously to deliver greater organisational effectiveness over time (Lawrence and Lorsch, 1967). The skills to make both happen simultaneously, however, are often at odds with each other (Judge and Blocker, 2008). This may be because exploitation and exploration strategies are typically associated with dramatically different organisational structures, cultures and systems (Kyriakopoulos and Moorman, 2004). Alternatively, firms that pursue both exploitation and exploration can be perceived as necessarily lacking either a good external organisation/environment match or a good internal/organisational fit (Lawrence and Lorsch, ibid.). To date, empirical studies on ambidexterity are methodologically diverse, comprising case studies, simulations, laboratory studies and field studies (O'Reilly and Tushman, 2008). Some look at the relationship between dynamic capabilities and organisational adaptation (Venkatraman et al., 2006) and others look at the results of ambidexterity such as performance or new product development (Lubatkin et al.,

2006; Markides and Charitou, 2004). None of these studies looks at the potential sources of strategic ambidexterity or the influence of any contextual factors so there is no guidance about how it might be created and how best exploited.

From an organisational science perspective, 'routines as organisational capabilities' is also a recurring theme, from the view that capabilities are organisational characteristics that let the organisation select and implement strategy (Barney, 1991), through to the notion that dynamic capabilities build, integrate and reconfigure internal and external competences to allow a firm to address a fast-changing marketplace (Teece et al., 1997). Organisational capacities may also be the learned and stable patterns of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness (Zollo and Winter, 2002). Again, the difference in approach from evolutionary economics is that routines for organisation science are largely the actual, customary or regular courses of procedure. They are things done regularly or at specified intervals; prescribed, detailed course of action to be followed repeatedly, or standard sets of customary and often mechanically performed procedures or activities. Given such a definition, it is easy to see why so many empirical studies in the field are of firms engaged in manufacturing, where process is relatively clear, or they are of larger and older firms where routines are more likely to be identifiable and documented in some way.

2.8.3 Entrepreneurship, innovation, firm size and age

Nonetheless, as Witt (2004) stresses, all these various theories still focus on what amount to equilibrium states of institutions, and so the search for optimality makes it hard to get to grips, conceptually and practically, with the systematic changes going on inside firms over time. For many strategy theories, there is no theoretical difference between a newly-founded small entrepreneurial business and a large, multi-division corporation.

But the size of firm can have a major impact on a range of outcomes. Organisations such as banks can become 'too large to fail' and larger firms operating above the minimum efficient

scale[22] may have lower average cost advantages over smaller ones. While relative size may offer a competitive advantage through increasing returns to scale, smaller firms can compete through 'niche' strategies by exploiting market segments that are too small to be exploited profitably by very large organisations (Porter, 1980), or by specialising in goods and services whose appeal comes from their status or brand name (Carroll and Swaminathan, 2000), or focusing on a particular customer segment and offering tailored or customised products (Boone, Broecheler and Carroll, 2000). These strategies all offer some potential selection advantage from an organisational science perspective.

Organisational ecologists, as discussed, are particularly critical that theoretical and empirical work in strategy management and evolutionary economics focuses on larger firms or sub-populations such as engineering or high-growth firms that are relatively easier to identify and study. One empirical study on a wider selection of smaller firms by Gray (2002) shows strong positive links between growth orientation, the setting of financial objectives (as opposed to lifestyle goals), propensity to introduce changes and actual growth. This author's ethnographic experience is that many small firms simply do not have time to reflect on, or learn effectively from their experiences and they are reluctant to introduce changes until they are forced to do so by circumstances. Skills development is also a much more a functional rather than a formal matter for SMEs, as would be expected. Nooteboom (1994) takes the view that small firms have more flexibility and greater ability to introduce innovation and also have more customer focus than large ones but simply do not have their economies of scale. Nooteboom calls this customisation and innovation effect 'dynamic complementarity' and it is this that lets small firms operate effectively in markets where they are not confronted with direct competition from larger firms. An empirical study by Audretch, Prince and Thurik (1999) shows that large and small firms do operate in distinct segments of the market rather than competing directly. Indeed, rather than higher-cost small firms imposing a loss in allocative efficiency, Audretch, Prince and Thurik (ibid.) argue that the process of creating and occupying a strategic niche lets smaller firms act as change agents through their innovative actions.

[22] The minimum efficient scale (MES) is the output for a business in the long run where the internal economies of scale have been fully exploited. It corresponds to the lowest point on the long run average total cost curve and is also known as the output of long run productive efficiency.

2.8.4 Summary – strategy-based theories of adaptability

Organisational strategy and strategic choice theories assume that success lies in the decisions made by individual entrepreneurs and managers. Firms survive or die in relation to their fit within the marketplace and the more fit/adaptable firms must be better at scanning the market for signals and then interpreting what is going on and adapting over time to change. Strategy theories assume that everything can be adapted more or less efficiently and swiftly to the requirements of the strategy. Greater adaptability should contribute to larger size, greater revenues and profits and so greater survivability, even allowing for the trade-offs between the costs and benefits of adaptability. From a survival perspective, strategy theories are about the survival of the fittest, where firms develop a set of approaches and competencies to the market and competition selects for survival those sets of routines that best allows a firm to grow and prosper in the environment in which it finds itself.

In terms of addressing research questions about the roles of adaptability/inertia in the survival of populations of small and medium-sized firms and the relative roles of selection (competition) and adaptation in explaining industrial change, strategy theories are light on inertia and heavy on adaptability and bottom-up analysis, within a framework that implicitly favours equilibrium.

2.9 Organisational ecology

2.9.1 Introduction

Organisational ecology makes use of ideas from biology, economics and sociology and deploys statistical analysis to try and understand the conditions under which organisations emerge, grow, and die. The key proposition of organisational ecology is that processes of selection in populations of firms are overwhelmingly more important in determining industry level changes through time than individual adaptations among firms themselves. Organisational ecology questions why failure is so commonplace if firms are malleable and flexible and can change strategies fast enough to keep up with changing market challenges.

It suggests that selection favours organisational forms characterised by relatively inert procedures, structures and strategies. Organisational ecologists also highlight the asymmetric distribution of firm sizes, stressing that most of the theoretical and empirical work in organisational strategy and management tends to centre on larger firms or sector-specific firms rather than on whole populations of firms that include the mass of small firms that make up the bulk of the industrial population.

Hannan and Freeman (1977, 1989) argue it is selection rather than adaptation that accounts for long-term population-level changes in the diversity of firms and the makeup of an industry. Most firms are relatively structurally inert, in the sense of having an enduring inability to change patterns of behaviour and control in the face of changing circumstances, and this hinders adaptation particularly when the environment changes. Competition causes firms that become unsuited to the environment to be replaced by firms more compatible with the changed circumstances. The success of new firms breeds a legitimacy that encourages similar firms (Carroll and Hannan, 1990) and this increased organisational 'density' in turn increases competition, in turn raising firm mortality and so reducing the number of companies (Delacroix and Carroll, 1983).

Borrowing from population ecology, organisational ecologists use the term 'carrying capacity' to define the maximum stable population size that a particular environment can support over a relatively long period of time. So there will be a maximum number of firms an industry or economy can support without the environment being consequently degraded to the point where it can no longer support that number of firms (Smith and Smith, 2001).

George (2002) provides a neat summary of organisational ecology, noting that the environment of a firm is made up largely of other firms and so there is a need to look at how organisations affect each other. Hannan and Freeman's prime model for this is 'density dependence,' which says that organisations' vital rates (founding rates, growth, and mortality) depend on the total number of organisations within the relevant population. Population density then makes itself felt through the two separate effects of:

- Legitimation – the process by which a certain way of doing things comes to be seen as natural or taken for granted. Legitimation increases founding rates and reduces mortality rates.

- Competition – arising when organisations rely on the same pool of resources such as capital and customers. Competition has the opposite effect of legitimation and reduces founding rates and raises mortality rates.

Combining both effects, the theory predicts that founding rates will show an inverted U-shape relationship with density, first rising as legitimation increases, then falling as competition kicks in. For the same reason, mortality rates should show a U-shape pattern, falling at first and then rising.

Hannan and Freeman's challenges to the 'old assumptions' of organisational strategy are summarised by George (2002) in Table 4 as follows:

Table 4. Hannan and Freeman's assumptions challenge

Old assumptions	**Challenge**
Organisations change easily and often	The research shows inertia reigns
The relevant players in an industry are companies that have opened for business	Industries are also shaped by ideas from companies that are aborted or stillborn
Companies without competitors have the best chance of survival	Companies with enduring competition are better survivors
New organisations are the most likely to fail	It is not their youth but their small size that is the biggest risk factor
Personnel changes at the top of a company are disruptive	It is more disruptive for existing executives to change the company blueprint

Source: adapted from George (2002)

Apart from the emphasis on inertia rather than adaptability, Hannan and Freeman also claim that firms experiencing on-going competition have better survival rates, that small size rather than young age is a big risk factor and that changing the strategy is more risky than changing the management. They also embrace the Darwinian view that evolution is all about populations and not individuals (Hannan and Freeman, 1989), with a strong focus on the

dynamic, industry-shaping, selection process and a rejection of traditional organisation science and its 'Lamarckian' focus on organisational adaptation.

A literature review by Sammut-Bonnici and Wensley (2002) sets out the research that subsequently broadened the application of population ecology models to the evolution of firms (Beard and Dess, 1988; Betton and Dess, 1985; McKelvey and Aldrich, 1983; Wholey and Brittain, 1986, 1989; Zammuto, 1988). The literature also covers the evolutionary aspects of growth and development in the product evolutionary cycle (Crawford and Tellis, 1981) as well as the development of organisational strategies (Freeman and Boeker, 1984; Hannan and Freeman, 1977; Zammuto, 1988) from an ecological viewpoint.

Dobrev et al., (2006, p.2) encapsulate the argument that organisational ecology emphasises 'evolutionary dynamics that favor *structurally inert* (emphasis original) organizations. Inertia is not only a survival-enhancing feature, but also a by-product of prior success and a consequence of selection.' Organisational change that disrupts inertia is associated with diminished performance, including failure. For organisational ecologists, structural inertia is actually a *survival-enhancing* feature leading to superior performance, as well as a reflection of past history and a result of selection, because changing an organisation's core features is demonstrably hazardous. It is the constraint of external resources that results in the differential net mortality of firms. It is these pressures on survival that result in the observed populations of firms (McKelvey, 1982), downplaying the effects of both organisational learning and innovative and entrepreneurial re-combinations of existing firms (Girard and Stark, 2001).

So, for organisational ecologists, inertia is the result of previous successes and a consequence of selection, as well as an attribute that enhances survival, as inertia-disrupting organisational change leads to reduced performance and death. Even if inertia is relative and organisations do change all the time in some way, inertia for the ecologists still slows change such that firms find it hard, if not impossible, to keep pace with environmental 'drift'.

As Singh and Lumsden (1990) point out, organisational ecology has attracted a fair share of critical attention largely focused on:

- the deterministic nature of ecology (that the next state of the system depends only on prior states of the system or the environment)
- the insufficient role of firm-level adaptation and change
- the nature of the organisational populations used in empirical studies (Astley 1985; Perrow, 1984).

Strategy theorists are particularly exercised by the idea that the deterministic approach leaves no room for entrepreneurs, owners and managers (Bourgeois, 1984), echoing the strict formulations of neoclassical theory, though Hannan and Freeman argue (1977) that they do take in the effects of other firms in as much as the environment consists of other firms and their actions. Evolutionary economists are still debating just how far organisational ecology really applies Darwinian principles of natural selection to understand the evolution of new forms of organisations over time (Reydon and Sholz, 2009; Lemos, 2009), particularly as it takes a typological view of organisational populations as 'sets' or 'classes,' which, by definition, cannot change. More crucially, Organisation Ecology does not articulate the inheritance mechanism required for a fully-functional Darwinian approach.

Ecologists counter the view they pay insufficient attention to adaptation by arguing that adaptation and selection are complementary processes but it is selection rather than adaptation that can far better, if not wholly, account for changes in firm populations. Hannan and Freeman (1984) do accept that firms can make substantial change but continue to insist that inert firms are more likely to be chosen through the selection process, though McKelvey and Aldrich (1983, p.101) worry that many ecology studies 'generalize about organizations as if they were all alike, or refrain from generalizing at all, as if they were all unique.'

A further issue is that the large populations studied by organisational ecologists typically include a large majority of smaller firms and so may not allow for larger firms that are able to influence their environments and are thus less subject to the selection processes experienced by smaller firms (Scott, 1987). In the mix of adaptation and selection processes that influence organisational evolution, the relative role of selection is probably less profound for large organisations (Singh and Lumsden, 1990), as discussed in 2.2. Indeed, Aldrich (1979) describes organisational ecology as the science of small business because

most studies include large numbers of small firms.[23] In fact, there is little in the organisational ecology literature that accounts for the persistence and endurance of small firms as opposed to their rates of birth, growth, and mortality. As Baum (1999) candidly points out, the wealth of empirical evidence from a range of organisation studies highlights a major weakness in that the data by themselves say little about the underlying theoretical explanations that might account for the landscape and make it hard to account for contradictory findings on any theoretical basis. Organisational ecology has theories of the liability of newness (Stinchcombe, 1965; Freeman et al., 1983) and of adolescence (Brüderl and Schüssler, 1990; Fichman and Levinthal, 1991), but no theory to explain the survival of large numbers of small firms that persist without expanding or becoming increasingly efficient, when competition should have eliminated them. Indeed, as organisational ecology is a theory of populations of firms, it is not clear how to extend such thinking to the study of an individual firm.

A further issue concerns the density dependence of founding and mortality rates (Hannan, 1986; Hannan and Freeman, 1987; 1988; Carroll and Hannan, 1990). One problem is the assumption of equal levels of competiveness in the density measure, when larger firms may have a greater competitive edge (Barnett and Amburgey, 1990). Zucker (1989) suggests there is a problem if the concepts of legitimation and competition are derived from models of density dependence when the link between legitimacy and density has not been demonstrated. The empirical evidence is mixed, with some density-dependence studies showing the predicted results for organisational births but errors in results for mortality (Carroll et al., 1989; Tucker et al., 1988; Delacroix et al., 1989; Barnett, 1990), though it is hard to gather fully complete sets of such data for analysis.

2.9.2 Organisational ecology, adaptability, entrepreneurship, innovation, firm size and age

Given a focus on the population level and the downplaying of the role of management, it is hardly surprising that the two literatures of organisational ecology and entrepreneurship are

[23] Although ecological studies largely focus on small organisations, both large and small firms are included in the populations studied. Large firms may be equally liable to selection pressures, but the time spans needed to analyse selection effects for these firms is likely to be longer than for smaller firms.

largely unconnected (Carroll and Kessina, 2005). For organisational ecology, entrepreneurship matters mostly in the founding of new firms and for their initial survival. The literature is concerned with background conditions that induce or limit the propensity with which individuals and others start new organisations. The founding rates for new firms depend on the number of failures and prior start-ups in a population as well as rising density - the increase in the number of firms within a population (Wang, 2007).

For strategy theorists, organisational age is not a major issue other than a mechanism that allows for the proper development of capabilities (Dobrev et al., 2006). For organisational ecology, however, it is a key factor and the literature identifies four 'liabilities of ageing' as indicated in 2.9.1. The liability of newness (Stinchcombe, 1965; Freeman, Carroll and Hannan, 1983) means that early stage firms are still developing the routines and experience they need to support their capabilities. The liability of senescence (Ranger-Moore, 1997), by contrast, suggests that older firms can experience a degree of inertia because their routine set becomes very fixed. The liability of obsolescence (Carroll, 1983; Baum, 1989) is an argument that a firm's core competence is increasingly liable to become obsolete over time, and the liability of adolescence means that a firm's survival is related to the starting stock of goodwill and resources and goodwill (Bruderl and Schussler, 1990). Once these initial endowments are used up, the risk of failure of a firm increases.

Organisational ecologists emphasise size in two ways, absolute effects and effects relative to other relevant organisations (Hannan et al., 1998). So does a firm gain advantage by virtue of its absolute size or by its position in the size distribution? Very small firms that exist close to an extinction boundary are 'very likely to be destroyed by a single random shock' (Hannan et al., 1998, p.285) whereas firms of large absolute size have leverage over trading partners, regulators, and the like, even if the population contains other large organisations.

So is a firm, as Dobrev et al. (2006) ask, more likely to perform better when it is young, old or adolescent? Organisational ecologists tend to treat the four liabilities of ageing as complementary rather than as competing organisational processes (Baum, 1989) and the empirical evidence is equivocal, other than where age is associated with size. Routines might become more reliable and less ambiguous over time so that the net disruption of change decreases with age (Amburgey et al., 1993), complementing the Jovanovic (1982) 'effect', where maturity allows information to be communicated faster, there is less trial and error

and more workers are skilled in the industry. We saw in 2.3 that the probability of failure conditional on age (the hazard rate) declines with age. Not only are age and size positively correlated among surviving firms, size and survival are also positively correlated, where age is seen as a proxy for some other determining variable or variables, though this could be accounted for by the heterogeneity of the population as previously noted.

The relationship between organisational age and innovation is much debated in the ecology literature, as firm age is associated with increases in innovation rates but also with increasing difficulties in matching innovative change to the changing demands of the environment (Sorensen and Stuart, 2000). A study by Cefis and Marsili (2006) found that innovation increases the survival probability of firms such that the 'innovation premium' balances out the potential liability of newness of a firm but it is still unclear if innovation aids or hinders survival for innovative older firms.

2.9.3 Summary – organisational ecology

Organisational ecology says that inertia rather than adaptability is the typical state for firms, such that they have little room for strategic manoeuvre and can do little to prevent themselves being selected out in due course. Most firms are relatively structurally inert and this hinders adaptation when the environment changes. Competition causes firms that become unsuited to the environment to be replaced by firms more compatible with the changed circumstances. In this way, it is selection rather than adaptation that explains longer-term industrial change. Inertia here is the result of previous successes and a consequence of selection, as well as an attribute that enhances survival, as inertia-disrupting organisational change leads to reduced performance and death. Even if inertia is relative and organisations do change all the time in some way, organisational ecology still says that inertia slows change such that firms find it practically impossible to keep pace with environmental flows and selection overwhelmingly accounts for industrial change.

While organisational ecology claims to apply principles of natural selection to understand the evolution of new forms of organisations over time,[24] the de-emphasis of developmental adaptability versus competitive selection and the absence of an articulated inheritance mechanism challenge the overall approach. Indeed, as the research problem is to look for causal explanations of the survival of individual firms, the adaptability of those firms and the evolution of populations of firms through a combination of population-level selection and firm-level adaptation, organisational ecology sets up a paradigm against which to test empirical results.

2.10 Adaptability and survival during recession

That market economies experience fluctuations from boom to bust over time has long been acknowledged. Within these cycles, recessions are defined by the US National Bureau of Economic Research (NBER) as 'a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production and wholesale-retail sales' (NBER, 2010).

Whatever the causes, recessions drive selection both through business exit and entry and through adaptation by existing firms trying to stay alive. So there is a concentrated and accelerated change in both the firm population and individual firm behaviour during recessions. Each recession has its own drivers such that comparison are hard to make and lessons hard to draw, but the 2008/9/10 recession seems most similar to the 1929 crisis, in which a rapid growth in credit combined with an asset price bubble to produce a significant bank crisis (von Mehren, 2009).

Neoclassical theory says that demand and supply, competitive market processes and general equilibrium theory explain the determination of economic outcomes, even in recession. Left alone, recessions in this view are generally self-correcting; prices will eventually adjust and the economy will go back to producing at potential. In the process, the most adaptable and

[24]See Reydon and Scholz (2009) for a contrary view and Lemos (2009) and Dollimore (2012) for a counter argument that explains how the replicator/interactor distinction, when properly applied, provides the way forward for organisational ecology.

fittest survive and the weakest die, whether the swing in the economy is in growth or recession mode while tending back to a stable position.[25]

The organisational strategy perspective on recession is that firms that choose and implement the right strategy within the recessionary environment can boost their chances of survival. This can be achieved by making the right call on how far to cut costs to conserve resources and/or by investing in new products and processes to take advantage of weak competition. Indeed, the 'pit-stop' theory of business behaviour in recession treats firms as more willing to innovate because the opportunity costs of failing to do so are lower than at more normal times (Mensch, 1979). Most likely, firms feel the need to adopt some ambidextrous strategy during recession and adapt through a combination of considered retrenchment and some process improvements and new product or service development (Kazozcu, 2011), although doing so under pressure must be even more risky than attempting it during more normal times.

Organisational ecology, on the other hand, implies that the process of environmental selection at the industry or population level (rather than resulting from the action of individual firms) is speeded up during recessionary periods. Competition causes firms that become unsuited to the environment to be replaced by firms that are even more compatible with the rapidly changing circumstances. In a recession, organisational inertia seriously prevents firms from adapting appropriately to sudden and extreme environmental shocks.

In the evolutionary economics view, recession is an example of particularly intensified creative destruction, in which some firms and industries decline, often terminally, while new ideas, technologies, products and industries emerge and become the driving forces of subsequent economic activity and growth. Recession conditions contribute to this economic restructuring through stimulating business churn (the entry and exit of firms) and by motivating incumbent firms to adapt products and business processes. In this process, even if the scope for adaptation is generally small, it is likely that the more adaptive firms may

[25]Although the neoclassical view was challenged after the Great Depression by Keynes (1936), suggesting that free-market economies needed some positive and active governance to work effectively, a New York Times article by Krugman (September, 2009) points out: 'The story of economics over the past half century is, to a large degree, the story of a retreat from Keynesianism and a return to neoclassicism, notably the Friedman view of the world.' While the fault-lines running through the economics profession are not of concern here, the debate about the extent to which the neoclassical world may need to take on board issues of irrationality and unpredictable behaviour and the idiosyncratic imperfections of markets is certainly apposite.

possess an advantage relative to their rivals. If the more adaptable have some advantage relative to their rivals that confers greater longevity, then a reasonable conjecture is that this advantage should confer even greater benefit during recession as flexibility lets a firm adjust relatively fast to rapidly changing external factors.

Commenting on their survey of business responses in the UK to the recession in 2008/9, a survey by Kitching et al. (2009) found the literature on how businesses respond during recessions was 'limited and partial', with few academic studies looking at the causes, processes and consequences of adaptation during recession. The authors point out that recessions do not have a regular impact on industries, countries, regions and firms and that there is no one 'recession effect' for businesses, nor any particular best practice to adopt in recession conditions applicable to all businesses. Recessions generate contradictory tendencies; for instance, declining aggregate expenditure and falling input prices. A study of the impact of the latest recession on different sized firms in the UK (Buccellato and Scheffel, 2011) found that, for the services sector, small firms were hardest hit by the downturn, followed by medium-sized firms, which in turn have done worse than large firms. For the manufacturing sector, however, the opposite results were reported.

What actually happens to any relationships between adaptability, firm size, age and survival in a recession are still wide-open questions. If adaptability contributes to survival in normal circumstances, does it matter even more in a recession for survival, as the attribute should allow firms to respond more rapidly to rapidly changing circumstances? Or is the transforming force of competitive selection on the population amplified in the suddenly shortened business cycle? These are legitimate topics for empirical enquiry.

2. 11 Adaptability and inertia – a perspective issue?

As touched on in section 2.2 above, there is the need to keep a proper perspective on the degree of granularity brought to bear on analysis by the various disciplines. At the macro level of analysis, events over time seem to constitute a flow of repetitive action, with routine and inertia dotted with occasional episodes of revolutionary change. But a closer view at the micro level of analysis suggests on-going – even continuous – adaptation and adjustment (Weick and Quinn, 1999). There is work on what might constitute the boundary conditions

between the two views (Hannan and Freeman, 1984; Kelly and Amburgey, 1991; Amburgey et al., 1993) but there still remains the problem of reconciling large-scale change in goals with changes of routines, or reconciling changes that lead to some minor loss of competency with those that lead to a catastrophic event such as merger or failure.

Helfat and Winter (2011) suggest that firms change all the time so any claim of inertia would require a perspective and time frame that render change practically invisible. So what level of change, from small adaptations to strategically important change, is under consideration, and to what extent is any observed lack of change just a matter of the fineness/coarseness of the view? If routines are an important part of the story, say Helfat and Winter, then the distinction between adaptation and routine responses to change presents significant conceptual difficulties and poses a huge challenge to operational measurement. If inertia is defined as no change of routines, or routines to change routines, then firms with unchanging routines are still capable of changing significantly. This may be through an existing reactive response to environmental change but it can certainly cover a significant range of real change. The question is how well existing routines (including routines for changing routines) manage significant change, as such a routine response would effectively amount to an adaptation?

Helfat and Winter conclude (p.1248) that, because things are always changing to at least some extent, 'identifying a precise threshold level of change that separates an operational capability from a dynamic one is likely to be fruitless, or to produce answers that vary erratically across cases.' Instead, they say, it may be more useful to assess the nature and speed of change that a capability enables and to be as open as possible about the level of granularity, the time frame of observation and what this may imply for any conclusions.

Before a summary of the contrasting views of the relative roles of adaptability/inertia and selection in accounting for the survival of SMEs, it is worth discussing, as background to the thrust of the dissertation, the more conceptual, general models that sit above evolutionary economics.

2.12 Generalised Darwinism

There is still an on-going ontological debate in the literature about the universality of Universal Darwinism against a more generalised concept of Darwinism that furnishes an all-encompassing theoretical framework within which discipline-specific accounts can be determined. Dawkins' (1976) Universal Darwinism comes along with a biological reductionist view of the 'selfish gene', whereas a more generalised Darwinism is logically independent of whether or not a gene-centred view is appropriate in biology (Aldrich et al., 2008). For Hodgson (2002), Universal Darwinism is only a general explanatory framework and, for any particular branch of study the particular explanations of the dynamic processes of inheritance, variation and selection have to be spelled out. Concepts of fitness, adaptation and units of selection can be encompassed within a 'Generalised Darwinism', and independent of any biological frame of reference (Metcalfe, 1998).[26] Hodgson and Knudsen define Generalised Darwinism (2010, p. 238) as follows (emphasis original):

> Darwinism is a general theoretical framework for understanding evolution in *complex population systems*, involving the inheritance of *replicator* instructions by individual units, a variation of replicators and *interactors*, and a process of selection of the consequent interactors in a population.

It is within this overarching framework that Hodgson and Knudsen (2004) suggest that, in the economic domain, habits and routines are the replicators and firms are the interactors.

The value, purpose and usefulness of this Generalised Darwinism approach has been a matter of dispute in the literature, most sharply challenged by the Continuity Hypothesis promulgated by Witt (2003, 2004) and Cordes (2006, 2007). This view says that evolutionary processes at the socio-economic level are not contained by the three principles of Generalised Darwinism. This is because biological evolution has created human propensities that, in turn, generate evolution at the cultural level (Loasby, 2009). The Continuity Hypothesis thus sees Darwinism as explaining the basis of human cognitive abilities but insists that Darwinism has nothing to do with the subsequent cultural evolution (Pelikan, 2010). In other words, cultural evolution is such a significantly different matter from biological evolution that, as a consequence of human intervention, the rules of man-

[26] As Aldrich et al. (2008) point out the idea of generalizing Darwinism has little to do with biological metaphors or analogies but relies rather on common abstract features in both the social and the biological world. Aldrich et al. cast this as an *ontological communality*, where the communality is captured by precisely defined concepts such as replication and selection, but in a highly general and abstract sense.

made evolution are likely to differ from those of biological evolution. According to the Continuity Hypothesis, these differences are sufficiently large that the Darwinian trilogy, particularly replication, does not provide a good explanation of cultural evolution (Vromen, 2008). There is a clamour for a 'bottom-up' approach that reflects evolutionary processes in the economy (Levit, et al., 2011).[27] Buenstorf (2006) also suggests that, when defined as behavioural tendencies, routines become non-observable and so un-falsifiable, as covered in some detail in the sections on routines at 2.7.1/2/3.

One practical issue that arises from the debate is, as Vromen (2008, p.21) points out, that the research programs 'provide different heuristics'. Generalised Darwinism investigates processes of interaction (firms as interactors) and of replication (routines and habits) to demonstrate processes of economic evolution, while the Continuity Hypothesis prompts research into on-going processes of economic evolution and their constraints, and how antecedent processes of biological evolution affect them. Vromen also says that the competing views may not be mutually exclusive as they look at different issues, Generalised Darwinism looking at the general features of evolutionary processes across domains and the Continuity Hypothesis looking at causal relations between preceding biological evolution and on-going economic evolution.

Generalised Darwinists would concede that the principles of selection, inheritance and variation are inadequate to explain social evolution – and even to explain detailed outcomes in the biological sphere because, in both cases, context-specific explanations are required, Generalised Darwinism only claiming to provide an over-arching analytical framework (Aldrich et al., 2008). Factors in addition to natural selection are always needed for a complete account of the outcomes of evolution. Indeed, Hodgson (2010, p.13) suggests that Witt's explanation of evolution does not exclude Generalised Darwinism and that 'the challenge for both Generalised Darwinism and Witt's "generic concept of evolution" is to show that they can have an important impact on the development of middle-range theory and serve as a useful guide for empirical enquiry.'

[27]Buenstorf (2006) also says that there is no reason to expect a bottom-up discourse would lead to the principles suggested by Generalised Darwinism rather than a progressive evolution or some other evolutionary mechanism.

The implications of the results of this research for theory and how it links up with Generalised Darwinism are discussed further in Chapter 5.

2.13 Chapter summary

The principal research questions concern the role of individual adaptations versus competitive selection in the transformation of a population of SMEs and the circumstances under which, and the degree to which, firm adaptability contributes to survival. Does size lead to greater potential for adaptation or inertia? Do survivors have exceptional and entrepreneurial leaders and/or management teams and are they really adaptable or innovative in some way? Organisational ecology says that inertia is a typical state for firms such that they have little room for strategic manoeuvre and can do little to prevent their being selected out in due course. Inertia in this view is the result of previous successes and a consequence of selection, as well as an attribute that enhances survival, as inertia-disrupting organisational change leads to reduced performance and death. Even if inertia is relative and organisations do change all the time in some way, inertia for the ecologists still slows change such that firms find it almost impossible to keep pace with environmental 'drift'.

Can having a greater potential to be adaptable reduce the chances of being selected out? To what extent does adaptability and/or selection account for the characteristics of a population of firms specifically consisting of SMEs? What circumstances drive individual firms to become more adaptable or more inert? Are older or larger firms more or less adaptable than younger and smaller firms? At the population level, does structural inertia increase with age and average adaptability decrease with age or vice versa? Related questions concern the relationship, if any, between adaptability and innovative capacity, entrepreneurship, the competitive environment and other factors such as having (dispositions for) routines to change routines. A particular research question arising, given the timing of the research, is what happens to any relationship between firm adaptability and survival in a recession?

This Chapter also looked beyond the immediate boundaries of the disciplines that claim some insight into these issues and explored the more theoretical areas of Darwinian evolution and how that concept is expressed in the specific domain of evolutionary economics, as well as exploring the evo-devo concept, which has potential implications for

evolutionary economics. It looked at what textbook economics, evolutionary economics, strategy-based theories and organisational ecology have to say about adaptability and its relationship to a range of variables from the perspectives of those theoretical views, backed by empirical data where appropriate.

A key specific issue that emerged across all the disciplines was the relationship between firm age, adaptability and survival. Organisational ecologists maintain that older firms are more inert/less adaptable (Carroll, 1984; Hannan and Freeman, 1989; Harreld, O'Reilley and Tushman, 2007), while, for organisational strategists, older, surviving firms have learned to be, and remain, more adaptable (Levinthal, 1991; Durand and Coeurderoy, 2001). If the probability of failure conditional on age (the hazard rate) declines with age for any reason, (Phillips and Kirchhoff, 1989; Audretsch and Mahmood, 1995), does adaptability increase or decrease with age? For organisational strategists, individual adaptability must increase with age as entrepreneurs and their teams learn to adapt (Levinthal, 1991) and the more flexible companies must also be better able to interpret the signals coming from the market and then progressively adapt to them (Schindehutte and Morris, 2001), generating rising average adaptability. For the organisational ecologists, by contrast, at the population level structural inertia increases with age, whatever adaptability is occurring at the individual level. The corollary of this is that average adaptability must be decreasing with age where selection processes significantly favour those with high levels of inertia (Hannan and Freeman, 1984). For evolutionary economists, both adaptability and selection should matter in some combination yet to be determined.

Beyond age, the various theories suggest that average firm adaptability should also be associated with firm size, either by employees or turnover or profit levels. For the organisational strategists (Chandler, 1977; Pfeffer and Salancik, 1978; Porter, 1980), even allowing for trade-offs and balancing the costs and benefits of adaptability, adaptability should be positively associated with size, revenues and profits, all of which should be the products of survival.

Both the strategy and evolutionary approaches to adaptability and survival suggest that the ability to adapt to environmental change depends on the ability to maintain consistency in internal processes. The better all the routines work together, the better the firm should be able to manage change, and even execute an ambidextrous strategy. It is an open question,

however, whether having higher levels of formal procedures to govern the operation of routines are necessary for the smooth introduction of change? Do they permit the rapid transformation of any changes into standard procedures and/or do they just produce inertia? If they do both, what might be the boundary conditions between them?

Similarly, there is an open question at the population level, whether innovation is a risky and disruptive exercise that makes firms more prone to failure through the disruption and loss of competence from changes in routine and patterns of internal relationships? Or is it an adaptive process that contributes to survival? There is also a question for survivability about the relationship between the more rapid adoption of technology and the willingness to try new ideas and the 'handedness' of the firm to implement new ideas successfully.

There is also scant empirical evidence on the contribution of entrepreneurship to adaptability and survival, and whether a willingness to make use of external advice and guidance or bringing in managers from other firms with different experience can contribute to firm adaptability.

At the population level, organisational ecology sees selection operating within the population through some kind of competitive advantage (or disadvantage) of some traits relative to others. For the organisational strategists and neoclassical economists, competition would also be expected to prompt firms to adapt to remain competitive and survive, whether prompted by new competitors and/or price competition. Evolutionary economics, by contrast, suggests that firms are driven not merely by profit maximisation but also by the desire to survive in the environment in which they operate, so that adaptability is directed more towards this overall goal rather than tackling various forms of competition head on.

Finally, if those with a greater potential to adapt have some advantage relative to their rivals that confers greater longevity, it is a reasonable conjecture (but an outstanding empirical issue) that this advantage confers even greater benefit during recession because such potential should let a firm adjust relatively fast to rapidly changing external factors.

The next Chapter looks at a methodology for collecting and analysing data to look at these outstanding questions. It details the data collection method and discusses the development of an adaptability instrument that measures not so much the quantities of operation as in

many previous studies but more the levels of adaptability the firm expresses in the context of continual internal and external change, including other contributing factors to adaptability such as staff involvement and flexibility. It describes a methodology and process for gathering data at the routines level from a whole population of firms, encompassing multiple industries and sectors, bringing a novel perspective to the study.

2.13.1 Summary list of research questions

1. Does average firm adaptability correlate with average firm age and is adaptability associated with firm survival? Does structural inertia increases with age and average adaptability decrease with age?
2. Are larger firms more adaptable than smaller firms?
3. Is higher adaptability associated with higher levels of formal procedures or lower levels?
4. Is adaptability associated with innovative capacity (the more rapid adoption of technology, the willingness to try new ideas and the ability to implement new ideas/bring new products to market)?
5. Is adaptability associated with the use of external advisers or with new senior management?
6. Is adaptability correlated with the competitive environment (new competitor or price competition)?
7. Does adaptability help survival in a downturn?

CHAPTER 3

METHODOLOGY

The previous chapter looked at the theoretical and empirical literature on adaptability and survival in populations of SMEs. It looked at the competing claims of conventional economics, evolutionary economics, traditional strategic management theory and organisational ecology in explaining the evolution of populations of firms through the mix of firm-level adaptation and selection in the population. The chapter concluded that examining the research problem through the lens of evolutionary economics, where adaptability and inertia are integral parts of the story, is a fruitful approach. This is especially so if the idea of routines as behavioural tendencies can be operationalised.

This chapter discusses a methodology for operationalising an adaptability instrument, the data collected to populate it and the associated data gathered in order to look at issues of adaptability, inertia and survival. It justifies the data collected and the associated data analysis strategy. It includes details of the data collection method and pilot studies, response rates and bias in three surveys used to collect the data and it comments on the limitations of survey methodology in general.

A background section on the relationship between the methodology and the research issues is followed by a discussion of the adaptability instrument and then the pre-recession survey of a sample of SMEs to populate it and generate other relevant data. A next section covers the follow-up survey carried out during the depths of a recession to look at the relationship between adaptability and survival in such circumstances. A final part discusses the role and nature of a subsequent survey of those respondents who went out of business between the two surveys to find out more about what was driving these business deaths.

3.1 Background

This dissertation takes a line through disparate arguments about the adaptability/selection nexus by looking at it through the perspective of evolutionary economics, where routines –

those recurring organisational interaction patterns – are a source of both adaptability and inertia. A further objective was to address the lack of empirical work around the subject on datasets of a whole population of firms taken from multiple industries and sectors, though this work is clearly not intended to be a longitudinal study and the emphasis here is firmly on the SME sector.

The working definition of organisational adaptability adopted in chapter 2 and repeated here is the capacity of an organisation to change its strategies, structures, procedures or other core attributes, in anticipation of, or in response to, a change in its environment, including changes in relations with other organisations. The resulting adaptations may well not improve performance but they are generally intended, by some benchmark, to do so.

Again, the term ‘adaptability’ is used consistently to refer to the potential to adapt of individual firms and ‘adaptation’ refers to outcomes. Change at the population level is always referred to as the ‘average (or mean) adaptability’ of the population of individual firms.

3.2 The adaptability instrument

The previous chapter discussed the idea that organisations are more than the sum of their individual members. This dissertation takes the line that firms have properties of their own that are not possessed by those individuals and that organisational dispositions cannot be summed out of those of its individual members. Measuring and summing the adaptability and dispositions of individuals within the firm cannot, in this view, get at organisational adaptability. This is better achieved by focusing on the strategies, structures and procedures within the firm that are contained within firm routines and measuring in some way how adaptable they are.

Routines in this view are organisational dispositions that shape the way various overlapping teams within the firm respond to information signals, resulting in patterned behaviours observed across all functions of the firm (Hodgson, 2008). The challenge is to measure the

adaptability of these routines as expressed by the firm in the context of continual internal and external change.

But organisational dispositions, along with many other variables, cannot be observed directly and have to be inferred from behavioural indicators. As discussed in some detail in section 2.7.1 on routines, while the conceptual tools for characterising the variable properties of static objects are well developed, tools for characterising the sequential structure behind patterns of action are not (Pentland and Reuter, 1994). There is also the view (Nelson and Winter, 1982; Sorensen and Stuart, 2000) that routines in a firm should be analysed by different operational functions such as production and marketing, as well as by different hierarchies, such as routine management and strategic management, all taking in the likely conflicting and paradoxical mix of routines that arises from this multi-level of analysis.

A good deal of abstraction and simplification is required for any theoretical or empirical analysis in this area, so the methodology here concentrates on the four constituent areas of any firm, as highlighted in a wide range of literature:

- sales and marketing
- production
- administration and human resources
- corporate strategy.

The strategy adopted is to focus on bundles of interconnected routines within and across these four areas, taking in not only routines that regulate existing functions but also routines that monitor and change routines. The aim here is not to measure individual routines but the adaptability of these component bundles of routines in the four constituent areas, as well as the interrelationships between them and with the firm's environment.

The process is operationalised by examining not so much the quantities of operation, as in many previous studies, but the levels of adaptability firms perceive they actually achieve or believe they would experience in the face of continual internal and external change, taking in constraints such as human resources, formal procedures and frequency of review of routines across the four constituent areas.

By asking a series of carefully crafted questions about how hard or easy it is or was (or might be) to make changes in response to specific internal and external changes to the environment (see Appendix 1) and by gathering appropriate demographic data, it is possible to build an adaptability instrument. This consists of a composite measure of adaptability summed across the four constituent areas subscale scores, capturing a picture of the interactions between the strategies, structures and procedures within the firm. It is then possible to examine how this instrument, comprising the average of the scores received for each one of the 20 relevant items on the survey instrument, is associated with a range of other variables.

It is important to stress once more that the survey methodology, despite the self-report process, was not designed as a psychological survey of individual or company-wide attitudes to adaptability or beliefs about how others behave, or as a cultural index of adaptability. Nor was it designed to pick up individual personality traits about personal adaptability or flexibility or uncover personality types or create an overall adaptability instrument or typology from such data. The question sets were all designed to assess organisational dispositions to act in response to information signals producing measurable behaviours across the four constituent areas of the firm. Measuring and summing the adaptability and dispositions of individuals was not the aim of the research.

3.3 Populating the adaptability instrument and other data acquisition

The research question requires investigation of the adaptive capability of a large and heterogeneous population of small and medium-sized firms. If such a population database were available, this would dictate large-scale sampling rather than undertaking a large number of detailed case studies. A substantial qualitative survey might well have provided a rich and full picture through an exploration of the research issues in as real a manner as possible (Robson, 2002). It would also more readily admit a more inductive approach to the issues. The author was employed as a Business Adviser with Business Link, the free business advice and support service delivered under the aegis of the East of England Development Agency (EEDA), and had substantial ethnographic experience of, and access to, small and medium-sized enterprises to bring to a qualitative study.

The availability, however, of access to a large database of SMEs from EEDA through Business Link presented a rare opportunity to sample a large and clearly identifiable population of the type required for the research goals: a sample reasonably representative of the population, already partly classified by employment band and with reasonably up to date contact details. In these circumstances, an e-mailed, self-response, on-line survey was the only viable way to manage efficiently and effectively the large numbers of invitees and expected responses and the administration of the data collected. The author is unaware of any other study of (expressed preferences of) routines through such a relatively large sample of observations, a novel aspect of the research design.

Additional qualitative richness was nevertheless captured through quasi-structured interviews with respondents prior to the survey design. Post-analysis interviews with other respondents and non-respondents provided a 'sanity check' on the results and added triangulation to the data. Copies of all the e-mailed invitations and online surveys are at Appendices 1, 2 and 3.

3.4 Survey design – first survey, pre-recession

A particularly difficult aspect of surveys is the need to design a questionnaire so that relevant and accurate data are captured in such a way that the respondent decodes the question in the way intended (Saunders, Lewis and Thornhill, 2003). The statistical analysis package SPSS and the survey software SurveyShack offered guidance documents on questionnaire design and Dillman's (2000) tailored design method proved helpful. The author also benefited from input from a market research company specialising in surveys of customer perceptions of satisfaction.

The starting point was to build an initial data requirements table culled from a review of the relevant literature. This listed the appropriate investigative questions, the variables likely to be required to address the questions and the detail in which data might be measured. The table was then exhaustively checked to weed out questions not wholly essential to answering the research questions and hypotheses arising, leading to an initial introductory text and a first pass of the questionnaire on paper. At this early stage, the paper version of

the questionnaire was given to ten fellow Business Advisers at Business Link with an explanation of the purpose of the survey and seeking their views on the questions, particularly with regard to the readability and comprehension of the questions from the perspective of likely recipients. Their comments and observations were then coded into a first-pass online version of the questionnaire – where it was immediately apparent that what worked on paper did not work as an online format. A second-pass online version, complete with a proposed e-mail introduction, was then sent to the ten Business Advisers asking them to try completing the on-line survey in the persona of a particular business well known to them.

Their subsequent comments and observations were built into a third version of the survey that was the basis of quasi-structured interviews with eight firms on the Business Link database that had previously expressed interest to the author in assisting with the survey. The purpose of these interviews was to identify any questions that were difficult or confusing to respondents, to identify any terminology that was unclear to respondents and to assess whether respondents could interpret the questions as intended.

Details of the pilot and final questionnaires and their differences are discussed at 3.8, with each survey consisting of three sections covering demographics, adaptability and competition as dictated by the research questions. As discussed above, the adaptability section looked for data about routines (as defined) and the adaptability of these routines in the four constituent business processes of strategy, production, administration, finance and human resources and marketing and sales. The question format allowed some questions to cover all four areas at once, potentially generating sharper comparisons than answers to a series of single questions about each process in sequence.

3.5 Survey software and data collection

There are many survey software packages on the market but a prime selection criterion was for a web-based service so that the responses were clearly held independently from both Business Link and the University of Hertfordshire to support the statement in the invitation to participate that ‘all information provided will be treated in the strictest confidence and in accordance with the Data Protection Act 1998’.

Business Link's partner company, Exemplas Ltd, had experience of the internet questionnaire and survey management tool SurveyShack and had satisfactorily demonstrated its ease of use in managing all stages of the process, from creating and distributing effective surveys to using the data export tools successfully. SurveyShack kindly agreed to extend permission to the author to use their software for this research.

3.6 Likert item issues

Likert items, which ask the respondent to evaluate a statement according to subjective or objective criteria, are common in surveys but not without some operational issues. The survey used five ordered response levels because finer-grained choices from seven, nine and ten level items trialled on the pilot interviewees led to indecision and frustration. A 'forced choice' four-item scale with no middle option was rejected as the literature and the hypotheses suggest that a middle response would be a useful indicator, despite the potential 'central tendency' bias (see below). Likert himself (1932) and Cicchetti, Showalter and Tyrer (1985) have shown that increasing the number of scale response categories makes little difference to reliability, and a recent empirical study by Dawes (2008) also demonstrates that data from a range of item levels produces roughly similar responses.

On the other hand, a five-item choice is likely to mean that some respondents will tend to avoid using the top and bottom of any such scale - the central tendency bias. There is also the problem of respondents going along with the statements they are given - the acquisition bias. Furthermore, some respondents will also, consciously or unconsciously, try to answer the questions so as to portray their company in the best possible way - the 'social desirability' bias. The impact of such Likert scale bias was minimised through detailed discussion of the wording of the survey questions during the semi-structured interviews. A serious attempt was made to arrive at clearly phrased questions with clear and reasonably unambiguous wording, at least to the average small businessman seeing the questions once only and responding immediately.

The distinction between categorical and ordinal data is important here as there is an on-going debate as to whether or not Likert items can be considered only as ordinal data. A

categorical (nominal) variable is one with two or more categories but with no built-in ordering to the categories. Hair colour is a good example of a categorical variable with a number of categories (blonde, brown, brunette, black) but with no order in terms of highest to lowest. If there is a clear ordering to a variable then it is an ordinal variable, such as the classification of educational experience into GCSEs, A-Level, first degree and higher degree, which can be ordered from lowest to highest. Where categories are equally spaced, the variable is an 'interval variable' but the values may well not be equal across the levels of all the variables.

These distinctions matter because the various options for statistical analysis assume specific levels of measurement. An average of a categorical variable such as hair colour is problematic as there is no intrinsic ordering of the levels of the categories. In the same way, a concept such as 'average educational experience' means little, as the spacing between the educational levels is inconsistent. Some variables fall between ordinal and interval, typically five-point Likert scales values such as 'strongly agree', 'agree', 'neutral', 'disagree' and 'strongly disagree' as employed here.

As there is no reason to assume that all respondents see all adjacent interval levels as equidistant, there is an argument that Likert items can be considered as categorical data. On the other hand, the very wording of most Likert items, certainly in the surveys deployed here, suggests there is a degree of symmetry of response around a middle item, especially if the questions are answered via a visual tick box (see Survey at Appendix 2), where the equal spacing of the boxes suggests some equality to the response levels. For practical purposes, the Likert item responses are treated here as ordinal data and analysed as such.

3.7 Firm size selection

Small and medium enterprises are defined by UK National Statistics as firms with 1-249 employees, but not all these are relevant for this research. One potential problem for the analysis is the 'lifestyle' small business owner: one who established or purchased a business for the prime purpose of furthering personal goals or as a way of buying employment. The business is their main source of income and is intricately bound up with their own or family needs and desires, and the routines of the firm and those of the individual may be the same

for all practical purposes. These are usually micro businesses (as defined by the European Commission in 1996) with fewer than ten employees and probably fewer than five employees. The data analysis in the next chapter shows the majority of respondents (61 per cent) had four employees or fewer and a ready distinction is not possible between a small business venture and a lifestyle owner.

On the other hand, it is important not to overlook the enormous amount of adaptation that does occur. After all, the move from a single person firm to an enterprise of three or four members involves a considerable amount of organisational adaptation, especially in complex and changing environments. Furthermore, given rapidly changing circumstances such as new entrants, new technologies, new products and new government policies, most firms are required to adapt to some degree on an almost continuous basis or face extinction.

Nonetheless, the survey did exclude where possible the sole trader and also the 'professional bureaucracies' such as accountants and solicitors (Mintzberg and Quinn, 1988) because of their reliance on standardised skills of trained and indoctrinated specialists, who usually work relatively independently of their colleagues but closely with their clients. The selection also excluded firms in their first year of trading where it was possible to identify them as such from the EEDA database, where routines are likely to be still in the formative stage.

At the other end of the spectrum, the survey excluded firms with 250+ employees to keep the study aligned with the research aims and because larger and more powerful firms may not be subject to selection pressures in the same way as small firms (Scott, 1987), as discussed in chapter 2.

3.8 Pilot studies on the pre-recession survey

At the pilot study stage, there were still six separate county Business Links in the East of England region rather than the single, combined regional Business Link East that came into operation in April 2007. Although access was available to the Business Link Hertfordshire database at the pilot stage, there was also access to an alternative database of similar SMEs across the East of England and London provided by Business Link Hertfordshire's partner Exemplas Ltd. The Hertfordshire-only database was of modest size, and the alternative

database was used for the pilot to avoid reducing the potential sample size of a final study based only on the Hertfordshire data.

3.8.1 The first pilot study

A first selection for the first pilot study was those firms on the database that had given express permission to be contacted by e-mail about business matters relating to SMEs. The database had limited data on firm size by employees, although some had provided the information as part of their engagement with Business Link. The database had a reasonable count of firms likely to be in their first year of trading and, where known, these were excluded from the frame. In addition, a visual inspection weeded out those organisations clearly not commercial entities or professional bureaucracies, leaving an unknown number of not strictly commercial firms and professional bureaucracies in the frame. The demographic questions were designed to pick up on all these issues so non-target enterprises could be further eliminated from the analyses.

Dillman (2000) suggests that, for very large surveys, seeking 100–200 pilot responses would be usual. Based on 10 years experience of an average 10 per cent response rate for all unsolicited Business Link Hertfordshire and Exemplas letters and e-mails, an initial survey sample of some 2,000 companies was required. From the alternative database population of just over 80,000 companies, a simple systematic sample[28] selected every 40th company on the list to produce a pilot study sample of 2007 companies. As the initial pilot was more about seeing what questions got answered (or not) and how, whether the questions could be properly interpreted by the respondents and whether the answers made any sense in the light of the research question, any inherent bias in the sample was deemed to be acceptable.

For this pilot study, the introductory e-mail volunteered to ‘feed back the collective results, from which you should be able to get a good handle on how adaptable you are as a firm’ as a small incentive to improve the response rate. It was also made clear that the survey was a pilot and it asked for comments on the form or contents. This first pilot was bulk-mailed, without a personal salutation, without prior warning and with no follow-up prompt, to a

[28] A simple systematic sample was chosen over a simple random sample for ease of use at this pilot stage.

recipient population with only a tenuous connection with Business Link. The merits or otherwise of such an approach are discussed in more detail in the section on the final survey. At this stage, it was not mandatory for all questions to be answered and the survey program permitted respondents to continue without a prompt if they failed to answer or missed an answer.

After an e-mail failure rate of 8 per cent, there were exactly 100 responses, 5 per cent of the total, although only 61 were fully complete – a response rate of just 3 per cent. Despite the low response, the results prompted a number of useful questions and ideas for refinement. The most frequent cause of non-completion and likely cause of non-response was the very first question, 'What business are you in?' having far too many options (99) on a drop-down tab based on the higher-level Standard Industrial Classification (SIC). Respondents had to tab down a long list to find a suitable category and then they were not always sure what category their business was in. The results and various respondent comments also showed the need to sort out some poorly worded questions, make the profitability measure more granular and to ask more and different questions about competition. A further review of the literature following the pilot also suggested additional questions to gain a clearer distinction between static competition (based on price) and dynamic competition (based on new entrants with similar offerings), and to get some measure of relational contracting (non-contractual agreements governing on-going relations) as a useful research concept.

This feedback was used to create a second pilot study that incorporated the lessons from both the first pilot study and the literature review it prompted. The second pilot used as the drop-down list of business categories just the 50 business sectors listed by the UK Government Insolvency Service. This provided a much more commercially understandable listing of business types than the categorisation of the higher level SIC codes.

3.8.2 The second pilot study

An initial version of the second pilot was trialled with the same Business Link advisers and was also trialled though five semi-structured interviews with companies who had helped with the first draft. A revised second pilot survey was then mailed to 3,168 further firms chosen from the original database using a systematic sample of every 25th company on the

list to increase the response rate, using the same introductory e-mail as for the first pilot. Despite getting over 1,000 non-valid e-mail addresses at this mailing, 139 responses were received, 83 of which were fully completed, despite not making all questions mandatory. Simple summary statistics demonstrated satisfactory similarities with the first pilot and a range of interesting results that suggested a full study would yield positive relationships that would contribute to answering the research questions.

The single most important lesson from the second pilot was the need to make all questions mandatory, with an upfront explanation that the research really needed all questions answered to be valid. This may have deterred a few respondents from fully completing the subsequent final survey but the trade-off to maximise full completions was deemed worthwhile.

3.9 The final survey and Business Link East database

By the time of the final survey in April 2008, the six county Business Links had merged into Business Link East (BLE) and permission was sought and secured to mail the survey to the whole database rather than just the Hertfordshire database. The BLE database contained some 240,000 entries from the combined six county databases, themselves made up from a variety of sources. The BLE database included commercial and non-commercial enterprises, private and public sector enterprises and a large number of sole traders and start-up companies. The database is not derived from any official statistics (see section 3.12 below for these) but is meant to reflect the Inter-Departmental Business Register (IDBR) used by EEDA and central Government to determine target performance levels for company interactions by Business Link. The database was professionally cleansed at the beginning of 2008 when the six different lists were merged to ensure as up to date and accurate a list as possible and individual opt-in permission to e-mail was expressly sought at the time. No response was taken as permission not given to mail and many either did not respond or expressly said do not mail. This had the effect of reducing the potential database number down to some 30,000.

There is no statutory requirement for businesses to reveal numbers of employees and such numbers as existed on the BLE database were derived from interaction with the enterprise

and/or where they had volunteered the data in a survey. In some cases, the enterprise was classified by SIC code but the poor accuracy of such classification is an on-going debate in government. A reluctance or inability to self-classify was, once more, the major source of non-completion in the final survey, with many attempting the first question and then giving up.

As in the pilot studies, the first selection criterion was those firms on the BLE database that had given permission to be contacted by e-mail about business matters relating to SMEs, followed by elimination of those claiming to be less than one year old or having only one employee or no employees. This further reduced the total database to 24,009 and the list was refined further by removing:

- any duplicate addresses
- all e-mail addresses containing the suffixes .gov; .sch; .org and .nhs
- by visual inspection, organisations such as rugby clubs with a .co.uk/.com suffix
- by visual inspection, as many professional bureaucracies as could be identified.

This resulted in a final mailing list of 22,045.

The SurveyShack software sent an e-mail as if from the author's Business Link e-mail address, with a link to the web-based survey. A copy of the invitation mail is at Appendix 1. The e-mail was sent over a Tuesday night in the third week of April 2008 so that early week e-mail traffic and first and second week of the month distracting business issues might have been dealt with by recipients. The e-mail was sent without prior notification. In a review of e-mail survey response rates, Sheehan (2001) found conflicting evidence about the influence of pre-notification on survey response rates. On the other hand, as Sheehan points out, a pre-notification message may also be considered unsolicited e-mail. For this study, all the recipients had previously selected to receive e-mails of various types from Business Link so a pre-notification was deemed likely to be unhelpful and not in keeping with usual communications from this trusted source.

Despite the data cleansing exercise, there were thousands of e-mail failure notices where the mail was no longer valid, together with the expected 'out of office' replies, as well as some 200 from Spam Arrest or other spam catching software that required human intervention to

avoid spam. For this final survey, the SurveyShack software was also primed to continue for the next 72 hours to deliver whatever mails it could not deliver first time round. The eventual e-mail failure rate was estimated in excess of 5,500, based on the initial round of no-longer existing mails and the second round of failures on retries.

The survey software also has a facility to prompt non-respondents and part-completers and this prompt (not used in the pilot studies) was sent one week after the first mail. As a result, the final response total was 1545, a response rate of 9.3 per cent on a live database of some 16,545 (much in line with the 10% average response rate for all unsolicited Business Link Hertfordshire and Exemplas letters and e-mails noted previously), with 909 (59 per cent) responses fully completed.

3.10 Sample size

How large a sample is needed to infer the findings of the research back to the population as a whole? This is important because of the danger that any differences shown up in the analyses do not really exist (type 1 error) or, indeed, the statistics show no significant differences when they do in fact exist (type 2 error). The issue of these error types in statistical hypothesis testing is discussed in more detail at 3.15.

An ideal sample size is usually estimated through three criteria: the sampling error (level of precision required), the confidence (risk) level and the degree of variability likely in the attributes being measured (the distribution of attributes in the population).

For authorities such as Krejcie and Morgan (1970) and Cochran (1977), an acceptable margin of error in the social sciences for categorical data is 5 per cent and for continuous data 3 per cent. For confidence levels in the social sciences, an ‘alpha’ level of .05 is generally considered acceptable to justify a claim of a statistically significant effect. Of course, current computing power makes it easier to investigate the effects of other alphas but the 0.05 level is employed here partly as there is still a common mind-set and general agreement among researchers to use the level and it ‘lets signals pass while keeping the noise down’ (Dallal, 2008, p.7).

As to the degree of variability, the more heterogeneous a population, the larger the sample size needed to get a given level of precision and the less variable, the smaller the sample size. A proportion of 0.5, the maximum variability in a population, is often used conservatively where there are no grounds for any other estimate. Running all these parameters through the online sample size calculator, Raosoft, generated an ideal minimum number of 377 obtained responses, so 909 was deemed a more than satisfactory result.

3.11 Sources of sample bias and response/non-response rates

As the database and permission to email belonged to Business Link East, the survey required Business Link to be clearly identified as the source of the survey. The author was also clearly identified in both the e-mail and survey as a Business Adviser for Business Link and a researcher seeking help with a study on adaptability in SMEs. It was made very clear (see the e-mail text at Appendix 1) that the study was purely for research purposes and not sponsored by any company or commercial interest. No feedback was offered as this had proven problematic following the pilot studies and because any final analysis and publishable conclusion would not have been available in a reasonable time frame.

The final survey was mailed to the prime contact on the database for each company. In most cases, this was the managing director or chairman, but could also be the person in the organisation who happened to make contact with Business Link, typically the human resources or finance director or sales and/or marketing manager. In some cases, the prime contact might have felt insufficiently qualified or knowledgeable to complete the survey, so biasing the survey in favour of firms where the prime contact was the most senior person. On the other hand, the most senior person is most likely to have the breadth of view that was required to answer the survey accurately.

Companies that interact strongly and positively with an external support service such as Business Link are likely to be predisposed to take a more outward and open view of their business, even if they came to Business Link as a last resort. Similarly, those that positively give express permission to be contacted either by mail or e-mail or both are likely to be more open and outward looking that those refusing contact of this sort. There may be some

bias generated here as the question set looks for openness to new ideas, to taking external advice and taking on new management.

3.11.1 The respondent effect and response set bias

The 'respondent effect' bias is a combination of the tendency for respondents to give the answer they feel the researcher wants to hear and self-reporting in a way that makes them and their company look as good as possible. Of course, for many studies, self-reporting may be the only way of getting the data and self-reporting in psychological surveys is often mediated through a 'lie scale' or a social desirability index to control for impression management. Such a scale was not available for this study, though the development of such a tool would be extremely useful. Instead, all that could be done was to ensure as far as possible that the questions were designed to minimise potential bias by excluding simple *agree/disagree* questions, by ensuring that all categories were mutually exclusive and that all the items were exhaustive, with a reasonable response category available to all respondents.

There is also a potential 'response set' bias, where the respondent tends to answer a series of questions in one direction regardless of their content. The usual technique to minimise this is to reverse the wording in some of the survey items. This was not employed, as the pilot interviewees considered it far easier to have a consistent scale of 1= 'high' or 'very often' and 5 = 'low' or 'rarely' in order to answer the questions set.

3.11.2 Non-response bias

Non-response refers to the failure to obtain observations on some of the respondents selected for the sample (Kish, 1965). Common sources of non-response are out of office, refusal, unable to answer and the not found contact or e-mail address.

The out of office and spam catcher responses only amounted to some 200 of the total, so there was unlikely to be any significant bias here. On the other hand, there was a significant

number of refusals, probably a combination of apathy, fear of invasion of privacy or, most probably, concern about data confidentiality. Some refusals were partial, where the respondent either fell at the first 'What business are you in?' question or stopped at the early questions about revenues and profitability. Some responded on prompting through the follow up e-mail, which suggested that it was perfectly reasonable to use the 'Business and Computing' sector for a number of named business types. Some of those unable to answer may also have been an insufficiently knowledgeable respondent. Of rather more concern were the large numbers of e-mail addresses not found, though there is no reason to believe that this section of the sample frame was unrepresentative of the database as a whole.[29]

The conventional wisdom following Fowler (1984) is that the lower the response rate, the greater the sample bias, because those interested in the topic are more likely to respond. Fowler also warns that mail surveys in which 20 per cent or less of the sample respond are unlikely to provide any credible statistics about the characteristics of the population as a whole. However, a study of surveys by Groves (2006), where the design allowed an estimation of non-response bias, shows empirically there is no simple relationship between non-response rates and non-response biases. It also finds scant empirical evidence for the idea that low response rate surveys actually generate estimates with a high non-response bias.

3.12 Comparison databases

One problem with using the EEDA database is that there is no easy way of estimating the goodness of fit of companies on the database to those in the actual business population in the region. A further issue is that the Enterprise Directorate of the Department for Business, Enterprise and Regulatory Reform (BERR, 2007) says that no single source is able to estimate the total number of enterprises in the UK. There are, however, two official estimates of such data for the UK as a whole and by region. The official register of enterprises, the Inter Departmental Business Register (IDBR), holds records of over two million enterprises but its coverage is known to be incomplete among the very smallest enterprises. So the directorate also estimates small and medium-sized enterprise statistics,

[29]Ten non-respondents were interviewed by telephone and the responses for this straw poll were all of the nature 'I meant to get round to it' or 'Not another survey!'

including an estimate of the number of unregistered enterprises, their employment and turnover. This database covers some 4.2 million enterprises and these databases are the best available external gauges of the proportions of businesses in the sample to those in the imputed population.

3.12.1 The Inter-Departmental Business Register (IDBR)

The Inter-Departmental Business Register (IDBR) is the comprehensive list of UK businesses used by the UK Government for statistical purposes. It provides a sampling frame for surveys of businesses carried out by the Office for National Statistics (ONS) and by other government departments. It is also a key data source for analyses of business activity. The main administrative sources for the IDBR are VAT trader and PAYE employer information passed to the ONS by HM Revenue & Customs, together with details of incorporated businesses passed to ONS by Companies House. This is supplemented by ONS survey data and survey information from other government departments. The IDBR contains over two million enterprises and BERR (2007) claim that the 'comprehensive administrative sources combined with the survey data contribute to the coverage on the IDBR, which is one of its main strengths, represent nearly 99 per cent of UK economic activity'. The IDBR does not, however, include businesses that are not registered for either VAT or PAYE, thus excluding many small businesses and the self-employed, so the Small Business Service and the UK Statistics Authority collect additional data on these enterprises to add to the IDBR.

3.12.2 Small and medium-sized enterprise (SME) statistics according to arrangements approved by the UK Statistics Authority

Officially collected SME statistics add to the IDBR an estimate of the number of unregistered enterprises such as sole proprietorships, partnerships and companies (including public corporations and nationalised bodies) in which the working directors are counted as employees. Confusingly, single employee companies are excluded from the one to four employees category of the IDBR but included in the zero employees category in SME statistics. An estimate of self-employment is taken from the Labour Force Survey (LFS) and

HMRC's Survey of Personal Incomes (SPI) and a number of assumptions are made to avoid over-counting. The estimates exclude inactive companies.

The SME statistics for 2007 showed an estimated 4.71 million private sector enterprises in the UK at the start of 2007, employing an estimated 22.7 million people with an estimated combined annual turnover of £2,800 billion. Of these, small and medium-sized enterprises (SMEs) together accounted for 99.9 per cent of all enterprises, 59.2 per cent of private sector employment and 51.5 per cent of private sector turnover. Notably, almost a quarter (24 per cent) of all UK private sector enterprise is deemed to operate in the Business Services sector (SIC2003 Section K).

Table 5 compares the two databases by employment bands for the Eastern Region. Note that the SME statistics provide a finer-grained analysis of companies with 100 employees or more.

Table 5. Comparison of employment bands in two UK National Statistics measures for the East of England Region

2007		SME statistics		IDBR
All enterprises		512,455		168,900
With no employees		389,715		
0–4				129,420
1–4		83,205		
5–9		20,475		20,765
10–19		10,670		10,130
20–49		5,360		5,335
50–99		1,615		1,630
100–199		735		{925
200–249		140		{.....
250–499		255		{695
500 or more		285		{…..

Source: UK Office for National Statistics (2008)

So the question is just how representative of the actual population is the proportion of businesses in the survey sample? Table 6 below shows the percentage by employee band for the EEDA region SME statistics and the percentage by employment band generated in the survey sample.

Table 6. Employment bands by per cent

Number of employees (per cent)	SME Statistics EEDA region	Survey sample
4–9	52.5*	42.2
10–24	)	)
25–49	) 41	) 45.5
50–99	2	6.8
100–249	0.5	5.4

Source: UK Office for National Statistics (2008) and analysis of the 2008 Research Survey
*based on 5–9

Given that the SME statistics count those with five to nine employees, and the survey counts four to nine, the bottom end percentage match is a little low for the sample. The SME statistics also count 10–19 and 20–49 so consolidating these within the two columns gives a reasonable match in these employment bands. For firms above 50 employees, the survey sample appears significantly over-weighted, though the small numbers are subject to large statistical variation. One explanation is that the nature of the survey appeals to larger firms that can more readily identify with the issues tackled within the survey questions. Given all the caveats about the reliability of the data in the official statistics and in the EEDA database, the over-representation of relatively larger SMEs needs to be borne in mind when looking at the analysis.

3.13 Follow-up survey during recession

The first survey was carried out in April 2008 and a follow-up survey was carried out 18 months later (when the recession was biting hard) of those who responded the first time to examine possible relationships between adaptability and survival. The follow-up survey consisted of four questions: one asking how well and in what form the firm had survived,[30] two asking for a management estimate of revenue changes and estimate of profit changes over the period, and an additional question asking for actual age rather than age by band to try and get finer granularity in the analysis. The criteria adopted for degrees of failure are of course heavily dependent on the context of use, but reflected common parlance among the survey respondents according to Business Link Business Advisers consulted and ten firms from the first survey on whom the recession survey was pre-tested in semi-structured interviews.

The follow up survey was mailed in October 2009, 18 months after the first survey. In December 2009, the Office of National Statistics noted that the UK economy was 5.1 per cent smaller at the end of the third quarter of 2009 than it had been a year earlier. Since the start of the downturn in early 2008, GDP had dropped by 6.03 per cent, marginally worse than the 6 per cent fall during the manufacturing slump of 1979–81.

3.13.1 Respondents

Of the 909 fully usable respondents to the 2008 survey, 503 returned fully useable responses to the second survey. Chi-square tests to examine the attrition rate (those who responded to the first survey and those who responded to both the first and second survey) showed no significant relationship between attrition and variables such as profits, revenues, size or adaptability or length of trading, so the characteristics of the 2009 subset do not appear to deviate significantly from the whole 2008 set. A Kolmogorov-Smirnov test showed that the adaptability variable of those in the second survey was also normally distributed.

[30] The gradations of survival were: 1. Survived more or less intact; 2. Survived - but only just in the current line of business; 3. Survived - but through an asset sale or merger in the same or similar line of business; 4. Survived by moving largely into a new line of business; 5. Gone out of business all together.

There was an inevitable bias in the results in that those that had gone out of business were not likely to have received the e-mailed survey as their e-mail addresses and/or the recipient were likely to have become redundant. There was also a possible respondent bias in firms not being willing to admit to having gone out of business, though the ten pilot respondents did comment they would want to answer the questions truthfully, either to boast they had survived or to tell someone 'just how hard it is out there'.

As the categories of 'survived – but through an asset sale or merger' and 'gone out of business' were sparsely populated, some of the analysis in Chapter 4 was conducted at the binary level of 'survived v. not survived'. In an effort to boost responses, the 406 who did not respond to the recession survey first time round were contacted again in June 2010, with the potential aim of pooling the results.

It subsequently became clear there is a major objection to pooling the results from the October 2009 survey and those of the prompted survey in June 2010 to non-respondents. Previous respondents may well have changed their survival categorisation, with businesses reporting as survived in October 2009 going under by July 2010. In addition, the few respondents that said they were no longer operating in the July 2010 survey might have been in a survived category had they responded to the October 2009 survey. The October 2009 recession survey suffers from much the same issues as it is a snapshot in time, and firms reporting survival might not survive in the medium/long term. In fact, the pooled data gave results that were insignificantly different from the analysis of the October 2009 sample on its own and so were not used. There were also insufficient respondents to the request for actual age rather than band of age, and any additional data reported were also not used.

3.14 Survey of respondents to the October 2009 recession survey who stated they had gone out of business

To get a richer and more qualitative picture of factors affecting those who had gone out of business between the two surveys, the 14 respondents to the recession survey who said they had gone out of business were contacted by e-mail (copy mail at Appendix 1) to ask if they would be willing to talk about their experience in more detail.

The survey questions were based on the 2009 survey[31] of recession effects on a sample of 343 London SMEs by the Small Business Research Centre at Kingston University. Their sample was reasonably representative of the first and second survey respondents by employment size, sector and turnover. Acknowledging the difficulty of surveying those who had gone out of business, the sample only looked at businesses that survived and had no comparative data from non-survivors. The survey questions made a specific distinction between 'finance related' and 'other' effects:

Finance effects:

- Late payment by customers
- Bad debt or uncertainty over customer payments
- Cash at bank
- Credit periods and/or credit terms from suppliers
- Availability of bank loans/overdrafts

Other effects:

- Cost of supplies
- Falling value of sterling
- Transport costs
- Energy costs
- Staff motivation/effort

The Kingston study used a two-stage research design, an online/mail survey to generate quantitative data and a series of interviews to produce detailed qualitative data on responses and reasons for these in the recession to date (August 2009).

3.14.1 The survey

Using an initial question set based on the Kingston 'finance' and 'other' effects,[32] an e-mail script was created asking for a telephone interview to discuss why they had gone out of

[31]Smallbone, Kitching and Xheneti (2009). *Are small businesses resilient to recession?* Small Business Research Centre, Kingston University

[32]One possible factor that might have changed between surveys was cash flow, suggested by the business press at the time, and by the finding of no significant relationship between the percentage change of profits between

business or asking for participation in a follow up questionnaire for those who preferred an e-mail rather than phone interaction on what is a potentially a delicate issue. The draft e-mail and the questionnaire were tested on three businesses known to the author that had not participated in any of the previous surveys but that had gone out of business. Comments from representatives of these organisations were built into a final mailing to the 14 in the recession survey who said they had gone out of business.

There were no e-mail failures and eight responses, five of which were from people willing to be interviewed and three of which asked for and then completed the survey e-mail. Table 7 below describes the respondent profile.

Table 7. Profile of respondents who had gone out business

	PR firm	Flower shop	Educational materials	Ladies golf shop	Management consultant	Online lighting retailer	Automotive parts	Promotional goods
Turnover £M	0.030	0.055	0.075	0.10	0.16	1.2	7	13
Employees	2	2.5	1	2.5	2	4	100	25

Source: Online, mail and telephone survey, October 2010

The sample is not randomly drawn but does cover businesses that ranged from 1 to 100 employees and with turnover from £30,000 to £7m across a diverse spread of industries. The results are analysed in Section 4.6.

3.15 Statistical analyses

Statistical analysis techniques permit data to be analysed in a number of ways, each of which could yield legitimate answers depending whether the data is treated as interval,

the sample periods and survival outcomes (see Chapter 4). While profit is a vital indicator of the performance of a business, the generation of a profit does not necessarily guarantee its survival. Sales and costs and, therefore, profits do not necessarily coincide with their associated cash inflows and outflows so that profits may be reported while a firm experiences a short-term cash shortfall that kills it.

ordinal or categorical variables, the normality of data distribution and the number of dependent and independent variables being analysed. The choice of statistical technique was also potentially constrained by the boundaries of the statistical software package, SPSS, deployed by the University of Hertfordshire and used here.

All data were scrutinised for normality of distribution by visual inspection of the frequency histogram. Where the data was severely non-normal, it was analysed through non-parametric tests such as Kruskal-Wallis instead of one-way ANOVA, Wilcoxon signed-rank test instead of a paired t-test and Spearman rank correlation instead of linear regression.[33]

Statistical analysis of tests such as t-tests and Analysis of Variance (ANOVA) assume the distribution of individual observations from the sample is normal. Even if the distribution of individual observations is not normal, the distribution of the sample mean is usually normally distributed if the sample size is about 30 or larger (Statsoft Electronic Statistics Textbook, 2011). This is due to the 'central limit theorem' that shows that even when a population is non-normally distributed, the distribution of the sample means will be normally distributed when the sample size is 30 or more.

Welch's ANOVA (one-way analysis) and Games-Howell ANOVA (two-way ANOVA) were employed extensively as analytical tools where the variances between the groups were not equal to one another as implied by the data analysis. Specifically, Levene's test was used to assess the homogeneity of variance, a precondition for parametric tests such as the pooled variances version of the t-test and ANOVA. Levene's test works by testing the null hypothesis that the variances of the group are the same.

Both are designed to determine whether there are statistically significant relationships between a dependent variable that is continuous (adaptability) and an independent variable that is categorical (e.g. firm age), while assuming that the variances of the independent variables are not equal.

[33]ANOVA, unlike t-tests and regression, is not very sensitive to moderate deviations from normality. Simulation studies, using a variety of non-normal distributions, have shown that the false positive rate is not affected very much by this violation of the assumption. This is because, when a large number of random samples is taken from a population, the means of those samples are approximately normally distributed even when the population is not normal.

For regression analyses, the assumption is that residuals are normally distributed (Statsoft, ibid.), likely if the dependent variable is normally distributed and predictors are all normally distributed. However, it is not necessary for the residuals to be normally distributed. Extensive use was also made of logistic regression, appropriate when trying to model a categorical dependent variable as a function of one or more independent variables.[34]

Significance of test results is reported as per Coolican (1990) based on probability levels of 'p':

- Significant $0.05 \geq p \leq 0.01$
- Highly significant $0.01 \geq p \leq 0.001$
- Very highly significant $0.001 \geq p$

As touched on in the discussion of sample size, two types of errors in statistical hypothesis testing can lead to wrong conclusions. A Type I error (false positive) is rejecting a null hypothesis (the assertion that the items being tested are not related and the results are the product of random chance events) when it is actually true. In other words, a Type I error means that a positive inference is actually false. A Type II error (false negative) is that of failing to reject a null hypothesis when it should be rejected. In other words, a Type II error is that of failing to observe a difference when there is one. Decision rules on the significance of test results as described help minimise errors as does increasing sample size but, even if tests show little/no correlation between adaptability, size or profits, this may be consistent with there being no relationship but it may also be consistent with there being a relationship which is additionally being affected by another characteristic.

3.16 Ethical issues

There is a consensus (McNamara, 1994; Newman, 1994; Babbie, 2007) that all social research should be conducted with a number of ethical issues in mind, especially where individuals are asked to participate as subjects.

[34] In logistic regression, the goal is the same as in ordinary least squares (OLS) regression, to model a dependent variable in terms of one or more independent variables. However, OLS regression is for continuous (or nearly continuous) dependent variables, while logistic regression is for dependent variables that are categorical.

A key principle is that of voluntary participation, so no one is forced or even feels obligated to participate in the research. As the survey responses showed, voluntary participation can sometimes conflict with the desire for a high response rate, although the survey method did follow Dillman (2000) by trying multiple contact attempts with potential respondents, from the initial e-mail to a repeat cover note on the web-based survey and an e-mail prompt to take the survey if not done so. As indicated in the section on response bias, a small number of participants who may have benefitted from the services of the author in his capacity as business adviser may have felt rather more obligation to respond than the average participant.

Another requirement is to avoid possible harm to respondents, including embarrassment or being made to feel uncomfortable about the questions. The second and third surveys were all about survival or failure and the questions might have raised unwelcome sentiments for some recipients, who may or may not have subsequently responded. The wording of both the e-mails and the second survey questions were designed to approach the subject in such a way as to minimise concern. The e-mail talked about wanting to take advantage of a once in a lifetime opportunity in the current recession to see how well (if at all) the more adaptable fared compared with the less adaptable. Because the research was concerned with degrees of survival, the web-based survey offered a range of survival categories, although including 'gone out of business altogether' as an option.

The invitation e-mail for the third survey of business failures stated very clearly, 'I appreciate your openness in being willing to tell me you went out of business during the recession and I would like to follow up with a very brief telephone call to see if there are any common reasons why businesses failed.' It asked for a telephone number and time to call and offered a number for the participant to call as well as the offer to continue the discussion by e-mail.

A further ethical consideration is to guarantee both anonymity and confidentiality. A survey is anonymous when a respondent cannot be identified from their response and is confidential when a response can be identified but the researcher promises not to disclose the individual's identity (McNamara, 1994). The cover e-mails clearly identified the surveys as being confidential in regard to responses and the reporting of results, that they were

purely for research and not sponsored by any company or commercial interest and that all information provided would be treated in accordance with the Data Protection Act 1998. Participant identification was restricted to e-mail addresses and these were only used to work out who had not responded for follow-up purposes.

3.17 Chapter summary

This chapter has looked at:

- the relationship between the research questions and the methodology deployed for collecting data to answer those questions
- the development of the adaptability instrument as a composite of survey scores for reported adaptability across the four constituent areas of the firm
- the three surveys conducted to generate data and populate the adaptability instrument and the limitations of such survey methods
- issues of bias in the data collection
- the sets of statistical analyses employed to look at the data and the necessity to ensure correct choice of analytical technique depending on the nature and form of the data
- how key ethical considerations were handled.

The next chapter sets out the data analysis in detail and weighs the results for their relevance to the research questions, subject to the usual health warnings about statistical analysis. It also deals with the difficulties of evaluating the cross-sectional data of this study with regard to the time series or longitudinal data that characterise organisational ecology. Chapter 4 is largely restricted to presentation and analysis of the collected data with regard to the hypotheses developed and discussion of the findings within the context of the literature review is more or less reserved for the final chapter.

CHAPTER 4

ANALYSIS OF DATA

4.1 Introduction

Previous chapters laid out the overall purpose of the research, described the relationship of the work to the general body of research in the field and elaborated on the questions arising. Chapter 3 set out details of the data collected to help answer the questions, along with a description of the adaptability instrument designed to examine dispositions for actions, and also looked at the choice of analytical techniques as well as some of the limitations of the overall methodology. This chapter presents the data collected and the detailed analysis of that data to address the various research issues discussed in chapter 2.

To recapitulate, the principal research question concerns the role of individual adaptations versus competitive selection in the transformation of a population of SMEs. A particular research question arising, given the timing of the research, is what happens to any relationship between firm adaptability and survival in a recession? One might conjecture that adaptability should matter even more in a recession for survival, as the attribute should allow firms to respond more rapidly to rapidly changing circumstances.

The specific purpose of this chapter is to discuss the results of the three surveys of small and medium-sized businesses designed to generate data to address the research issues. The first, the pre-recession survey, was designed to populate the adaptability instrument and gather data on a range of likely dependent variables in order to address the research questions. The second survey looked at what happened to the relationship between survival and adaptability during recession. The third, short and qualitative, survey was designed to get a better understanding of what other factors may have changed between surveys and contributed to demise more strongly than in more stable times.

A summary of the descriptive data is followed by the detailed descriptive analysis of the adaptability instrument and its subcomponents. A sub-section then details the statistical findings and analyses for the prime and secondary research hypotheses. This format is

repeated for the follow-up recession survey and for the subsequent survey of those that had gone out of business between the two surveys.

Once more, for clarity and to maintain the all-important distinction between individuals and populations, the term ‘adaptability’ is used here consistently to refer to the capacity of individual firms to respond to changes in the selection environment, and ‘adaptation’ to an outcome that is intended to provide some improved function. The analysis then looks at changes in the mean adaptability in a population of individual firms, examining the relationship with survivability.

This chapter is largely restricted to presentation and analysis of the collected data with regard to the hypotheses developed and detailed discussion of the findings within the context of the literature review follows in Chapter 5, ‘Conclusions and Implications’.

4.2 Descriptive statistics for the pre-recession survey

Of the 909 firms represented in the database, 42 per cent were in the combined category of Business Services and Computing, 13 per cent in Manufacturing and nine per cent in Wholesale/Retail, broadly representative of the SME population in the east of England as described in the previous chapter. More than half (54 per cent) had been trading for ten years or more, 18 per cent for six to nine years and 22 per cent for three to five years. Only 10 (one per cent) were in their first year of trading and only 49 (five per cent) had been trading for one to two years. The majority (61 per cent) were limited companies; six per cent were sole traders and ten per cent partnerships. The frequency distributions for all the pre-recession respondent demographics can be found in Table 8.

By revenue bands, over three quarters (79 per cent) had revenues less than £1m, ten per cent had revenues between £1m and £2.49m and five per cent between £2.5m and £4.9m. Only 10 (1 per cent) had revenues over £50m. Looking at firm size by employees, most (61 per cent) had four employees or fewer, 16 per cent had five to nine employees and 13 per cent had 10–24 employees. Only 24 firms (three per cent) had between 50 and 99 employees and only 19 (two per cent) had between 100 and 250 employees.

Table 8. Frequency distribution for respondent demographics (N = 909)

1	**Business sector**	**Responses**	**Percent**
	Agriculture, Hunting & Forestry	29	3
	Fishing	2	0
	Mining & Quarrying	1	0
	Manufacturing	117	13
	Electricity, Gas & Water Supply	8	1
	Construction	56	6
	Wholesale, Retail	79	9
	Hotels & Restaurants	16	2
	Transport, Storage & Communication	37	4
	Financial Intermediation	29	3
	Real Estate, Renting	17	2
	Business Services and computing	384	42
	Public Administration & Defence	3	0
	Education	48	5
	Health & Social Work	26	3
	Other Social & Personal Services	46	5
	Private Households with Employees	5	1
	Extra-Territorial Organisations	6	1
	TOTALS:	909	100
2	**Firm age**		
	10 years or more	495	54
	6–9 years	160	18
	3–5 years	195	22
	1–2 years	49	5
	First year	10	1
	TOTALS:	909	100
3	**Legal status**		
	A limited company	561	61
	A partnership	88	10
	A sole trader	235	26

	A social enterprise or not-for-profit company	25	3
	TOTALS:	909	100
4	**Trading status**		
	Independent	849	94
	A subsidiary	41	4
	A franchise	19	2
	TOTALS:	909	100
	Of which family firms	213	23
5	**Revenue bands**		
	More than £50m	10	1
	£25m–£49.9m	8	1
	£10m–£24.9m	19	2
	£5m–£9.9m	19	2
	£2.5m–£4.9m	45	5
	£1m–£2.49m	93	10
	Less than £1m	715	79
	TOTALS:	909	100
6	**Per cent turnover from top 20% of customers**		
	80+	225	25
	50–79%	240	26
	26–50%	205	23
	25% or less	239	26
	TOTALS:	909	100
7	**Distance for the majority of revenues**		
	25 miles	252	28
	50 miles	163	18
	100 miles	119	13
	200 miles	44	5
	Whole of UK	193	21
	International	138	15
	TOTALS:	909	100

8	**Profit bands**		
	Loss	63	7
	Breakeven	92	10
	£0-£49,999	415	46
	£50-£99,999	148	16
	£100-£249,999	110	12
	£250-£499,999	45	5
	More than £500,000	36	4
	TOTALS:	909	100
9	**Employees**		
	4 or fewer	553	61
	5–9	149	16
	10–24	116	13
	25–49	45	5
	50–99	24	3
	100–250	19	2
	TOTALS:	909	100
10	**New senior staff in last five years**		
	None	689	76
	1%–25%	107	12
	26%–50%	41	4
	51%–75%	10	1
	75%–100%	62	7
	TOTALS:	909	100
11	**Respondent status**		
	The owner/manager	593	65
	The MD/CEO	168	19
	Other senior manager or director	108	12
	Other (please specify):	40	4
	TOTALS:	909	100

Source: Analysis of research survey, April 2008

As described in chapter 3, the sample is slightly over-weighted in firms with more than 50 employees compared with the statistic for the region as a whole. As for profits, 63 firms (seven per cent) reported losses and 92 firms (ten per cent) reported break-even only. Beyond that, almost half the respondents (46 per cent) said they had profits up to £50,000, 16 per cent profits between £50,000 and £100,000 and 12 per cent profits between £100,000 and £250,000. Only 45 (five per cent) had profits between £250,000 and £500,000 and only 36 (four per cent) had profits greater than £500,000.

The survey asked details on concentration of revenues by customers and by geography. The percentage of turnover from the top 20 per cent of customers was evenly spread among the quartiles, whereas the distance accounting for the majority of revenues showed a reasonable concentration within 25 miles (28 per cent), 50 miles (18 per cent) and 100 miles (13 per cent). Only five per cent said the majority of their revenues came from 200 miles away and 15 per cent said the majority of their revenues arose from exports, although 21 per cent did say their revenues were generated all over the UK.

The survey also asked about numbers of new senior staff in the last five years to see if this might have an impact on adaptability. Three quarters of respondents said they had taken on no new senior staff in the last five years, 12 per cent had taken on up to a quarter of new senior management and seven per cent reported taking on between 75 to 100 per cent new senior management. As for respondent status, 84 per cent were either the owner/manager/CEO or MD and 12 per cent were a senior manager or director, so the vast majority of responses were from someone with the desired and informed overview needed to complete the survey satisfactorily. In addition, the overwhelming majority were independent firms (94 per cent), with just four per cent subsidiary companies and just two per cent franchise companies. Nearly a quarter (23 per cent) also reported they were family-owned firms.

The contingency Table 9 sets out some of the relationships between key variables. There was a significant relationship between age of firm and band of total revenue, $\chi^2(df = 2, N = 909) = 58.56$, $p < .01$. This means that older firms tend to have larger revenues. There was also a significant relationship between the age of the firm and number of employees, $\chi^2(df = 4, N = 909) = 90.26$, $p < .01$. This means that older firms tend to have more employees.

Table 9. Contingency tables for age of organisation with band of total revenue and number of employees

		Age				
		10 years +	6–9 years	3–5 years	1–2 years	First year
Band of total revenue	£2.5-4.9m	82	8	8	2	0
	£1-2.49m	69	16	8	0	0
	Less than £1m	341	136	182	47	10
Number of employees	Fewer than 4	238	110	156	44	10
	4–9	91	29	25	3	0
	10–24	89	15	11	1	0
	25–49	38	4	2	0	0
	50–99	36	2	4	1	0

Source: Analysis of research survey, April 2008

The survey also captured a range of data about customers, competitors and innovation. Most respondents thought they had some sort of competitive advantage, be it a product advantage, a service advantage or both. The majority also considered that competition had increased over the three years to 2008, though price competition alone as the main customer driver was not a common feature. The sample believed they experienced a substantial degree of customer loyalty and a substantial majority would also go a long way to resolve problems with customers, even at a small loss to themselves, rather than lose a customer.

Just over half said they never used external consultants and ten per cent admitted they were not particularly entrepreneurial, although nearly two thirds said they were quite or very entrepreneurial. Half of respondents claimed to have introduced genuinely new products in the last year, while 10 per cent had not introduced new products for at least three years, with the rest claiming to have new products in planning. Only 10 per cent of firms claimed to be one of the first to try new technologies, although getting on for half said they were early

adopters and just over a quarter said they were neither first nor last. A good 20 per cent said they preferred to wait or were last to adopt new technologies.

4.3 The adaptability instrument

The adaptability instrument is defined here as the sum of survey scores for reported (dispositions for) adaptability across the sales and marketing, production, administration and human resources, and corporate strategy functions. As a number of specific adaptability factors were also recorded (such as adaptability of employees, ease of structural change, frequency of management reviews), two versions of the adaptability instrument were tested, one based on the shorter set of questions that only covered strategy, production, admin/HR and sales and marketing and one that included the larger set of more widely ranging adaptability questions. Examination of statistical relationships with other data using the two versions of adaptability produced surprisingly identical results. Factor analysis[35] of the larger set also revealed one prime factor that consisted entirely of the components of the shorter set, so the shorter was used as a matter of parsimony and for clarity of explanation.

A reliability analysis was conducted to make sure that the items that comprise the adaptability score and each sub-score were in fact reliable. The reliability of the scores was assessed using Cronbach's alpha statistic.[36] A score of .70 or greater would indicate that the items that comprise the composite scores are an adequate measurement for these scores. The results of the reliability analysis are presented in Table 10.

The reported Cronbach's alpha of .887 indicates a high level of internal consistency for the scale with 5 sets of responses in the four areas of sales and marketing, production, administration and human resources, and corporate strategies.

[35]The larger data set of adaptability was analysed by means of both principal axis factoring with oblimin rotation and principal components analysis with varimax rotation (Kline, 1994). The various indicators of factorability were good enough (KMO .672 v. KMO .698 in the PCA model) and the residuals indicated that the solution was good. Seven components with an Eigenvalue of greater than 1.0 were found and examination of the scree plot on the principal components analysis indicated three components. For ease of analysis, factor loadings lower than 0.50 were excluded and one prime factor that consisted of the components of the shorter set emerged.

[36]When items are used to form a scale they need to have internal consistency. The items should all measure the same thing, so they should be correlated with one another. Cronbach's alpha is a standard coefficient for assessing internal consistency.

Table 10. Reliability analysis for the adaptability instrument

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.887	.892	20

Source: Analysis of research survey, April 2008

A further measure of reliability was obtained by measuring the relationship of each individual item to the overall adaptability scale. This was generated from item-total statistics that show if any of the items in the scale are inconsistent with the average behaviour of the others by measuring whether the value of Cronbach's alpha would be improved if that particular item were deleted from the scale.

Table 11 shows the item-total statistics with 'Cronbach's alpha if item deleted' in the last column. The table demonstrates that all the items correlate at .881 or better so the items are measuring the same underlying characteristic and reliability would not be improved by removing any individual item.

Although the overall adaptability score for the study population was a well-fitting measure, an examination of the four individual subscale scores of the adaptability component shows reliability measures ranging from $\alpha = .648$ for the administration variable to $\alpha = .673$ for the production variable. These are set out in Table 12, as is a composite formal procedures measure computed as the average value for each of the formal procedures items on the survey instrument in order to look at whether higher levels are associated with adaptability or inertia.

The item-total statistics for each sub-scale were also examined to see if the value of Cronbach's alpha would be improved if any particular item were deleted from the scale. The only positive case was that of the frequency of involvement of staff in sales and marketing, where the removing this item would have improved the overall alpha from .658 to .666, and this small difference is not worthy of note.

Table 11. Item-Total statistics for the Adaptability Scale

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
LESS IMPT - PRODUCTION	46.234	143.462	.489	.688	.883
LESS IMPT - SALES	46.238	142.384	.520	.739	.882
LESS IMPT - ADMI	46.146	141.707	.525	.739	.882
LESS IMPT - STRAT	46.212	141.630	.568	.735	.881
REVIEW - PRODUCTION	45.597	139.054	.464	.713	.884
REVIEW - SALES	45.789	138.795	.515	.772	.882
REVIEW - ADMI	45.495	138.834	.496	.731	.883
REVIEW - STRAT	45.755	138.745	.516	.783	.882
EMPLOYEES ADAPT - STRAT	46.222	141.801	.556	.760	.881
EMPLOYEES ADAPT - ADMI	46.185	141.992	.535	.710	.881
EMPLOYEES ADAPT - SALES	46.271	141.962	.528	.677	.882
EMPLOYEES ADAPT - PRODUCTION	46.240	141.879	.515	.645	.882
IMPT CHANGE - PRODUCTION	45.837	143.870	.446	.617	.884
IMPT CHANGE - ADMI	45.723	142.366	.447	.652	.884
IMPT CHANGE - SALES	45.791	142.624	.449	.670	.884
IMPT CHANGE - STRAT	45.780	141.674	.495	.651	.882
INVOLVE STAFF - PRODUCTION	46.092	138.245	.475	.625	.884
INVOLVE STAFF - SALES	46.066	137.220	.539	.722	.881
INVOLVE STAFF - ADMI	45.828	137.211	.520	.720	.882
INVOVLE STAFF - STRAT	45.814	137.011	.521	.692	.882

Source: Analysis of research survey, April 2008

Table 12. Reliability analysis for adaptability sub scores

Variable	Alpha	Number of Items
Adaptability (composite)	.887	20
Production	.673	5
Sales	.658	5
Administration	.648	5
Strategy	.652	5
Formal Procedures	.861	4

Source: Analysis of research survey, April 2008

The summary statistics for each of the composite scores and the overall Adaptability score are presented in Table 13.

Table 13. Summary statistics for survey instrument composite scores (N = 909)

	Min	Max	M	SD
Adaptability	1.00	3.80	2.4450	.53119
Production	1.00	5.00	2.3635	.65643
Sales	1.00	4.40	2.3419	.65660
Administration	1.00	4.40	2.5510	.62892
Strategy	1.00	4.20	2.5236	.63811
Formal procedures	1.00	5.00	3.0114	.93362

Source: Analysis of Research Survey April 2008

Table 13 shows that the average values for each of the composite scores of adaptability is approximately equal to 2.5, with the administration variable having the highest average value of 2.55 (SD = .63) and the sales variable having the lowest average value of 2.34 (SD = .66). The fact that these are all similar is reflected in the positive relationship between adaptability and the congruence of routines discussed at 4.4.3. The overall score of

adaptability was found to have an average value of 2.45 (SD = .53). The average score for the formal procedures was observed to be equal to 3.01 (SD = .93).

Using the calculated adaptability scale as the Adaptability Instrument and the computed sub-scales where relevant, the next section presents the results and findings in regards to the study hypotheses.

4.4 Data analysis and presentation of results from the pre-recession survey

This part of the chapter presents the data for the research questions/hypotheses in the same order as presented in chapter 2 and includes post-hoc tests where relevant and a brief justification of the statistical measures used where not fully covered in the methodology section.

4.4.1 Adaptability and firm age

A key question concerned the relationship between firm age as an indicator of survival and adaptability. Organisational ecologists maintain that older firms are more inert/less adaptable (Carroll, 1984; Hannan and Freeman, 1989; Harreld, O'Reilly, and Tushman, 2007), while, for organisational strategists, older surviving firms have learned to be more adaptable (Levinthal, 1991; Durand and Coeurderoy, 2001). For the organisational ecologists, inertia is the result of previous successes and a consequence of selection, as well as an attribute that enhances survival, as inertia-disrupting organisational change leads to reduced performance and death. Even if inertia is relative and organisations do change all the time in some way, inertia for the ecologists is still a drag on change such that firms find it hard, if not impossible, to keep up with the ever-changing environment.

Chapter 2 noted that the probability of failure conditional on age (the hazard rate) is shown empirically to decline with age (Phillips and Kirchhoff, 1989; Audretsch and Mahmood, 1995). If the probability of survival of a firm increases with age, does its adaptability increase or decrease with age? For organisational strategists, individual adaptability must increase with age as entrepreneurs and their teams learn to adapt (Levinthal, 1991) and the

more fit firms must somehow be better at reading and interpreting what is going on and then adapting to market and technology changes (Schindehutte and Morris, 2001), generating rising average adaptability. For the organisational ecologists, whatever adaptability is occurring at the individual level, at the population level structural inertia increases with age. The corollary is that the average adaptability of firms in the population must be decreasing with age where selection processes significantly favour those with high levels of inertia (Hannan and Freeman, 1984).

In order to address this issue, a Welch's ANOVA was conducted as the purpose of Welch's ANOVA is to determine whether there are statistically significant relationships between a dependent variable that is continuous (adaptability) and an independent variable that is categorical (firm age), while assuming that the variances of the independent variables are not equal.

There was a significant difference in the adaptability of the firm by the age of the firm, $F(4, 58.82) = 4.14$, $p < .01$. In fact, firms ten years old or older had significantly higher adaptability scores than organisations three to five years old. None of the other comparisons were significantly different from one another and the average value for each age group is presented in Table 14. The analysis also shows that firms ten years old or older had significantly higher adaptability scores than firms less than ten years old, $F(1, 850.79) = 14.64$, $p < .01$, and the average values for this are shown in Table 15.

Table 14. Mean adaptability scores by age of firm

	N	M=Mean	SD
10 years +	492	2.4920	.59066
6–9 years	160	2.3447	.59915
3–5 years	198	2.3227	.69921
1–2 years	49	2.2878	.52356
First year	10	2.5900	.90025

Source: Analysis of research survey, April 2008

Table 15. Mean adaptability scores over and under ten years trading

	N	M	SD
10 years +	492	2.4920	.59066
Fewer than 10 years	417	2.3335	.64794

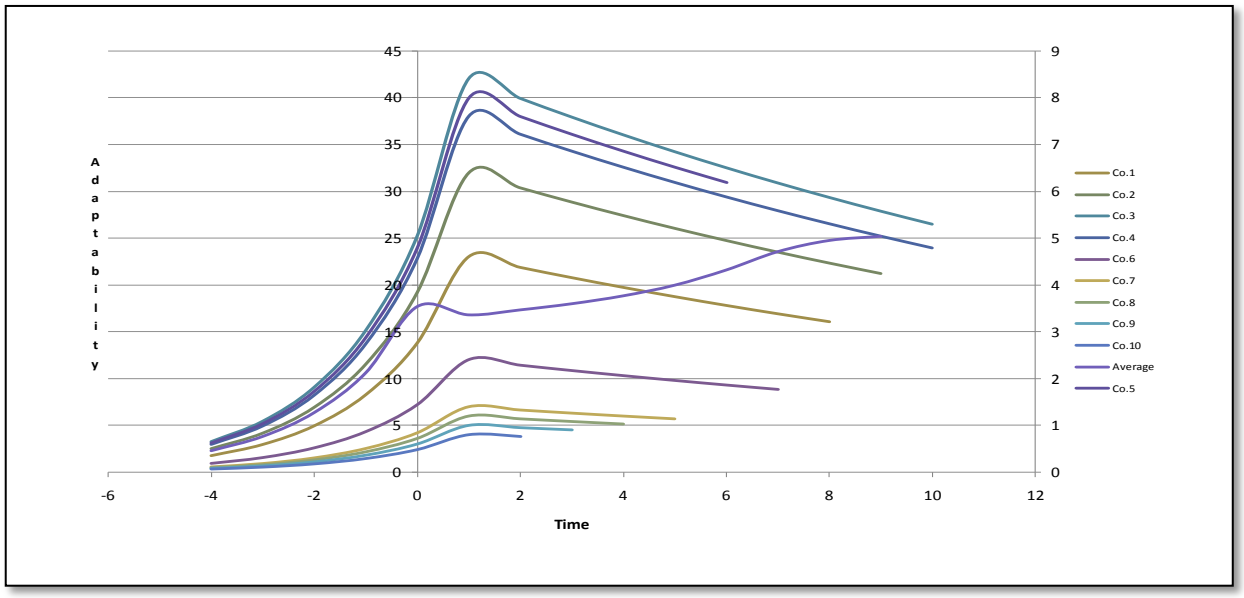
Source: Analysis of research survey, April 2008

The result implies that, even if the scope for a firm to change adaptability is small, the more adaptable have some advantage relative to their rivals that confers greater longevity, which is in turn associated with greater survivability, as the hazard rate has been shown to decline with age.

As noted in chapter 2, however, there may be a commonplace explanation for the age-dependency of survival, accounted for by the heterogeneity of the population. As a cohort of firms ages, the risk set becomes increasingly composed of firms with the lowest propensity to exit (Thompson, 2005); those that have not yet exited are those less likely to exit. The mean death rate for the cohort can decline with cohort age, even if the hazard rate does not decline with age for any individual firm. In his shipbuilding study, Thompson (2005, ibid.) shows both that the usual age-dependency of exit is present in the data, and that it disappears with the addition of the quality proxies to the hazard regression, implying the initial age-dependency can be explained by selection bias.

At the macro level, the result presented here may also be accounted for by the heterogeneity of the population, with younger cohorts of firms having a spread of adaptability levels and the less adaptive being weeded out through time. This would conceptually be consistent even with a decline in adaptability for every single firm as it ages. Depending on firm birth and death rates, the average adaptability of the remaining contingents can rise even if adaptability falls for every single firm, as shown illustratively in the diagram at Figure 1.

Figure 1. Individual firm adaptation versus change in population characteristics



The diagram shows the heuristic example of ten companies over 14 time periods, each assigned a life of between six and 14 years and each with constantly declining adaptability after year five. The result demonstrates explicitly the distinction between the adaptability of the individual firm and the average adaptability of the population, between the capacity of an individual firm to survive by adapting to the changing environment and the average level of adaptability in a population of SMEs. Average adaptability can increase even when adaptability is falling for all firms in the population.

A more refined result was demonstrated in a multi-objective optimisation simulation using the Optimisation Toolbox in Matlab, a software package for mathematical computing and visualisation. The assumptions were:

- a population of 100 firms;
- normally distributed initial adaptation levels, with mean 1.0 and standard deviation r
- survival rates for new entrants decline reasonably constantly (ONS) at the rate of 93 per cent, 78 per cent, 63 per cent, 53 per cent, 45 per cent between years one and five;
- a death rate fixed at 10 per cent and birth rate at 12 per cent per annum;
- in each year the adaptability value of each firm alters by a fractional amount, a, so each firm exhibits an exponential increase or decrease in its adaptability; and

- mean adaptability scores by age of firm as per Table 14.

The simulation was targeted to replicate the following:

- the adaptability/age correlation coefficient for the sample (taken as 0.01);
- the percentage of firms of age ten years or more (about 50);
- the mean population adaptability score for those >= ten years / mean population adaptability score for those < ten years
- the adaptability standard deviation for those < ten years / mean population adaptability score for those < ten years
- the adaptability standard deviation for those >=ten years / mean population adaptability score for those < ten years.

The model looks like a stable (rather than stationary) population model and is sensitive to the initial starting conditions. At each time step the same number of new firms, according to the death rate, replaces the least adaptable firms. At the end of 100 runs, the correlation of adaptability with age in the population was calculated.

Broadly, the program shows the correlation of adaptability with age increases with the death rate. Even if the increment in adaptability is slightly negative, the correlation of adaptability with age can be positive with a sufficiently high death rate. The simulation also shows average individual firm adaptability declining slowly over time and the variation in adaptability, initially high, declines only slightly through time by 1.1 per cent per year. All local optima seemed to be in the declining adaptability zone in the simulation and examination of the optimisation surface in the simulations showed the height of the various peaks to be much the same, suggesting no single optimum solution.

It is also significant that the variation in adaptability is high (initially r=0.413) and declines only slightly. This means that adaptability matters a great deal and, insofar as it is possible for firms to improve their adaptability, they can reduce their chances of extinction, again contrary to the strict Hannan and Freeman view.

According to the Office of National Statistics (ONS, 2009), the business birth rate in the United Kingdom in 2008, the year of the survey, was 12.3 per cent and the death rate 9.4 per

cent and this gap is common for most years recorded. Given that business births normally exceed deaths, and the actual survey data show a positive correlation of adaptability with age in the population, then rising average adaptability with age in the sample population is highly likely, even if adaptability for each individual firm were to decline over time.

The implications of these results are discussed more fully at 5.2.1.

4.4.2 Adaptability and performance (employee numbers, revenues and profits)

For organisational strategists, (Cyert and March, 1963; Chandler, 1977; Pfeffer and Salancik, 1978; Miles and Snow, 1978; Porter, 1980), even allowing for trade-offs and balancing the costs and benefits of adaptability, average adaptability should be positively associated with larger size, revenues and/or profits, all positive outcomes conferred by being adaptable and flexible.

Welch's ANOVA was used once more to look at the relationship between the adaptability instrument and employee numbers, band of revenues and band of profits. There was no significant difference in the average adaptability of firms by number of employees, $F(4, 157.64) = .65$, $p = .63$ (Table 16). There was no significant difference in average adaptability by band of revenues, $F(2, 172.97) = 2.08$, $p = .13$ (Table 17) or by band of profits, $F(6,194.63) = .41$, $p = .88$ (Table 18).

Table 16. Mean adaptability scores by number of employees

	N	M	SD
Fewer than 4	558	2.4030	.67326
4–9	148	2.4152	.55957
10–24	116	2.4629	.54844
25–49	44	2.5045	.44823
50–99	43	2.4384	.46737

Source: Analysis of research survey, April 2008

Table 17. Mean adaptability scores by band of revenue

	N	M	SD
£2.5–4.9m	100	2.3515	.47394
£1–2.49m	93	2.5075	.57837
Less than £1m	716	2.4172	.64496

Source: Analysis of research survey, April 2008

Table 18. Mean adaptability scores by band of profits

	N	M	SD
Loss	63	2.4643	.69203
Breakeven	92	2.4495	.56590
£0–49,999	417	2.4032	.64750
£50–99,999	147	2.4282	.63653
£100–249,999	110	2.4373	.55158
£250–£499,999	45	2.4611	.52374
£500,000+	35	2.3014	.61959
Total	909	2.4193	.62229

Source: Analysis of research survey, April 2008

Looking at the relationship between average adaptability and a variable of age by number of employees also shows no significant difference in the adaptability of the firm by the age of the firm, $F(1, 899) = 3.52$, $p = .06$. There was also no significant difference in firm adaptability by number of employees, $F(4, 899) = .13$, $p = .97$, or between years trading and number of employees, $F(4, 899) = .23$, $p = .92$. The average values for each group are presented in Table 19.

Table 19. Mean adaptability scores by number of employees and years trading

Years trading	Number of employees	M	SD	N
10 years+	Less than 4	2.4889	.65954	238
	4–9	2.5071	.54623	91
	10–24	2.4820	.54331	89
	25–49	2.5263	.45407	38
	50–99	2.4625	.46727	36
	Total	2.4920	.59066	492
< 10 years	Less than 4	2.3392	.67729	320
	4–9	2.2684	.55385	57
	10–24	2.4000	.57093	27
	25–49	2.3667	.41913	6
	50–99	2.3143	.48366	7
	Total	2.3335	.64794	417

Source: Analysis of research survey, April 2008

As there is a positive relationship between average adaptability and age, the data was examined again allowing for years trading. There was no significant difference in the adaptability of the organisation by bands of revenue whether the firm had been trading for more or less than ten years, $F(2, 903) = 1.68$, $p = .19$ (Table 20).

In sum, although there was a significant difference in the average adaptability of firms by age, there was no difference by numbers of employees or band of revenues or profits. There was no significant interaction between firm age and employee numbers and no significant interaction between firm age and band of revenues. The results are discussed in detail at 5.2.2.

Table 20. Mean adaptability scores by band of revenue and years trading

Years trading	Band of revenue	M	SD	N
10 years +	£2.5–4.9m	2.3817	.48365	82
	£1–2.49m	2.5210	.54486	69
	Less than £1m	2.5126	.62064	341
	Total	2.4920	.59066	492
< 10 years	£2.5–4.9m	2.2139	.41117	18
	£1–2.49m	2.4688	.67692	24
	Less than £1m	2.3305	.65516	375
	Total	2.3335	.64794	417

Source: Analysis of research survey, April 2008

4.4.3 Congruence of the adaptability instrument components

It is an open question in the literature whether routines meshing well together are a force for inertia because their linkages provide a drag on change or whether such complementarity allows more flexibility when change is required. Here, does congruence of the various adaptability routines in the four component areas of sales and marketing, strategy, administration and human resources and production contribute more to adaptability (Covin 1991; Hoffman et al., 1992) or to inertia (Hannan and Freeman, 1984; Singh and Lumsden, 1990)?

An analysis of the congruence across the four subscales of adaptability, namely strategy, production, administration and marketing, was carried out to address this question. Spearman's rho correlation analysis was conducted because the purpose of Spearman's rho is to determine whether there is a significant relationship between two ranked variables while not making any assumptions about the distribution of the data. The correlation coefficient indicates the level of congruence between the sales, production, administration and strategy components of adaptability computed above and the results are present in Table 21.

The table shows a significant positive correlation between each of the subscales computed, ranging from a low of r =.466, p < .01 for the administration and production variables to a high of r =.713, p < .01 for the strategy and sales variables. This says there is congruence between the strategy, production, administration and sales/marketing variables for the firms in the sample and that such congruence is likely to be associated with higher adaptability as the adaptability instrument is based on a combination of those variables

Table 21. Correlation showing levels of congruence between the four subscale scores of adaptability

	Production	Sales	Administration	Strategy
Production	–			
Sales	.541**	–		
Administration	.466**	.600**	–	
Strategy	.510**	.713**	.675**	–

Note: ** p < .01

Source: Analysis of research survey, April 2008

For a population of individual firms, if average adaptability rises with age, the average level of congruence of routines will also rise, even if that of individual firms fell, as the less adaptive get weeded out over time. Higher levels of congruence of adaptability in the population, then, would be associated with higher levels of adaptability, rather than contributing to inertial effects through the reliability and accountability of congruent routines in an ecology view.

4.4.4 Adaptability and levels of formal procedures

A similar aspect in the routines debate related to organisational ecology concerns the accountability and reliability of routines and whether well-established formal procedures, rather than congruence of routines, inhibit adaptability or allow routines to change.

An analysis of the reported levels of formal procedures in the survey sample was conducted to see whether firms with greater levels of formal procedures were more adaptable than firms with lower levels. A Pearson product-moment correlation coefficient was computed to assess the relationship between the continuous variables of the formal procedures instrument and the adaptability instrument. Based on a two-sided test, there was no positive correlation between the two variables (r = .012, n = 909, p = .729). A computation using Spearman's rho showed a similar lack of relationship (r = - .011, n = 909, p = .740). Further analysis of the individual components of the formal procedures instrument and the adaptability instrument also showed no positive or negative relationships (Table 22).

Table 22. Adaptability and individual components of formal procedures

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Formal processes of production	Between groups	90.446	61	1.483	1.047	.382
	Within groups	1199.515	847	1.416		
	Total	1289.960	908			
Formal processes of administration	Between groups	101.490	61	1.664	1.124	.246
	Within groups	1253.713	847	1.480		
	Total	1355.204	908			
Formal processes of sales and marketing	Between groups	66.247	61	1.086	.901	.689
	Within groups	1020.981	847	1.205		
	Total	1087.228	908			
Formal strategy processes	Between groups	101.114	61	1.658	1.288	.073
	Within groups	1089.658	847	1.286		
	Total	1190.772	908			

Source: Analysis of research survey, April 2008

The result says that higher levels of formal procedures do not contribute to inertia, contrary to the organisational ecology view – but neither do they contribute to adaptability. The implications of this are discussed at 5.2.4.

4.4.5 Adaptability and innovation

The literature review (2.6, 2.7, 2.8) noted that evolutionary economics stresses the importance of innovation for firm growth if a firm is driven not only by the goal of profit maximisation but also by survival in the environment in which it operates. This contrasted with the organisational ecology paradigm that suggests innovation is a risky and disruptive exercise, and the strategic choice view that innovation is a management problem of selection and implementation. The literature review also noted few empirical studies of the relationship between adaptability and the take up and effective implementation of new technologies, products and services, and between adaptability and take up and implementation of a range of incremental improvements.

To examine the association between adaptability and innovation, a Welch's ANOVA was deployed to look at the relationships between the adaptability instrument, the frequency of copying good ideas, success in copying good ideas, the rate of adoption of new technologies and the time since (genuinely) new products were released. There was a significant difference in the average adaptability of firms by frequency of copying good ideas, $F(4, 256.7) = 8.58$, $p < .001$ (Table 23), a significant difference in the average adaptability of firms by success in copying good ideas, $F(4, 128.40) = 13.12$, $p < .001$ (Table 24), a significant difference in the average adaptability of firms by their rate of adoption of new technologies, $F(4, 123.40) = 8.58$, $p < .001$ (Table 25) and a significant association between average adaptability and the time since firms introduced genuinely new products (not just incremental improvements to existing products) , $F(4, 110.93) = 8.071$, $p < .001$ (Table 26).

The results show that higher average adaptability is positively associated not only with the more rapid adoption of technology and the willingness to try new ideas but, importantly, the ability to implement new ideas successfully. Higher adaptability is also associated with the more recent introduction of genuinely new goods or services

Table 23. Frequency of copying good ideas

	N	Mean	Std. Deviation
Very often	107	2.1322	.62394
Often	244	2.3768	.55515
Sometimes	367	2.4605	.58900
Occasionally	127	2.5110	.65774
Never	64	2.6422	.79533
Total	909	2.4193	.62229

Source: Analysis of research survey, April 2008

Table 24. Success level at copying good ideas

	N	Mean	Std. Deviation
Very successful	52	2.0048	.62804
Successful	492	2.3503	.59085
Neither successful or a disaster	268	2.5371	.58559
Not very successful	34	2.6618	.54343
Not tried to copy ideas	63	2.6675	.78201
Total	909	2.4193	.62229

Source: Analysis of research survey, April 2008

Table 25. Speed of adoption of new technologies

	N	Mean	Std. Deviation
Usually one of the first	94	2.1835	.59647
Not first but still relatively early adopter	395	2.3527	.59519
Neither first nor last	237	2.5034	.61214
Prefer to wait	162	2.5546	.63661
Usually one of the last	21	2.7333	.76098
Total	909	2.4193	.62229

Source: Analysis of research survey, April 2008

Table 26. Time since last introduced a genuinely new product

	N	Mean	Std. Deviation
Five years	20	2.6100	.69917
Three years	72	2.5069	.58816
Last year	499	2.3218	.58456
In planning	158	2.4475	.62937
No new product/service	160	2.6319	.67308
Total	909	2.4193	.62229

Source: Analysis of research survey, April 2008

Taken together with the fact that higher adaptability is also associated with higher levels of informal relational contracting,[37] $F(4,901) = 14.99$, $p < .001$, the results support the idea of 'dynamic complementarity', the view that more successful small firms have the flexibility and ability to introduce innovation and also have more customer focus than large ones (Nooteboom, 1994). At an individual level, the results support the contingency theory of

[37]'How far will you go to resolve problems with customers even at a small loss to yourself rather than lose a customer?'

innovation as a problem-driven, rational response to environmental change or uncertainty, prompting the implementation of innovations.

4.4.6 Adaptability, management and external consultants

The importance of management for organisational survival is another long-running debate (Astley and Van de Ven, 1983; Hrebiniak and Joyce, 1985). For the strategy school, organisational inertia is a management problem that, though not easy to solve, does get resolved by better managers, while incompetent management gets selected out (Christensen, 2000). In the organisational ecology paradigm, firms fail not because of bad management but because trying to overcome inertia involves trade-offs to the key survivability markers of accountability and reliability such that better management cannot actually deal with the structural problem (Dew et al., 2006).

For the organisational ecology school, taking on external consultancy will also not help solve the structural problem, in contrast to the strategy school (Greiner and Bhambri, 1989), who argue that strategy consultants can increase organisational flexibility and adaptability, with such interventions likely to be more effective for long-run survival than for generating short-term profitability (Ginsberg, 1989).

To test the relationship between adaptability and the flexibility of the incumbent management, the impact of new management within the senior management team and the use of external consultants, a Welch's ANOVA was conducted once more. There was a significant difference in average adaptability by the propensity of senior management teams to do things differently, $F(61, 847) = 4.342$, $p < .001$ and a significant difference in the average adaptability of firms who made use of external consultants, $F(61, 847), = 1.36$, $p = .039$. There was, however, no difference in average adaptability by the number of senior managers brought from other firms in the last five years, $F(61, 847) = .981$, $p = .519$. This result shows how beneficial behaviour from elsewhere can be copied and become rooted in the dispositions of the recipient company, probably imperfectly, leading to a source of variation through an indirect route.

4.4.7 Adaptability and competitive advantage

Having a competitive advantage should allow firms to offer greater value for customers and generate greater profits (Henderson and Cockburn, 1994; Powell, Koput and Smith-Doerr, 1996). Organisational ecologists, however, do not consider competitive advantage as important for survival but a situation largely generated by the events surrounding the birth of a firm (Klepper and Simons, 1997; Eisenhardt, 1988; Eisenhardt and Schoonhoven, 1990). So do firms with a competitive advantage have lower average adaptability because it engenders a level of complacency and inertia or does the absence of a competitive advantage encourage adaptability and the search for one (Porter, 1980)?

The survey asked respondents to say whether they considered they had a product or service advantage, a relationship advantage or neither (Table 27)**.**

Table 27. Competitive advantage

	N	Mean	Std. Deviation
A product or service advantage	237	2.4061	.66458
A relationship advantage	262	2.4714	.60567
Neither	410	2.3935	.60684
Total	909	2.4193	.62229

Source: Analysis of research survey, April 2008

Analysis of the relationship between competitive advantage and adaptability showed there was no relationship between average adaptability and having a competitive advantage of any sort and no relationship between average adaptability and possession of no competitive advantage, $F(2,524) = 1.382$, $p = .252$. The result is discussed further at 5.2.7.

4.4.8 Adaptability and competition

Although the results so far have shown no relationship between bands of profitability and average adaptability, for the organisation strategy school, there should be some relationship

between competition and adaptability as competition weeds out the less adaptable. In organisation ecology, by contrast, competition is about firms struggling for those external resources that are critical for their long-term survival (Astley, 1985). The outcome of competition for individual organisations is measured by survival, rather than profitability, although survival can be considered as reflecting long-term profitability.

There is also the issue of static and dynamic competition to contend with, the difference between competition based on price and competition based on more temporal issues (Ellig, 2001), so the survey chose to look at both straightforward price competition and one aspect of dynamic competition, that of the likely loss of revenues for firms if a competitor of similar size and capabilities entered the market.

In order to assess the relationship between adaptability and competition, an ANOVA was conducted to determine whether there was a statistically significant relationship between the dependent continuous variable of adaptability and the independent categorical variable of 'per cent revenues lost with the entry of a competitor of similar size'. There was no relationship (Welch) between the variables, $F(6, 144.91) = 1.379$, $p = .227$. Similarly, there was no relationship between average adaptability and the potential loss of revenues likely at various price increases, $F(5, 324) = 1.53$, $p = .180$.

Individual adaptability does not seem to be associated with dynamic (new competitor) or static (price) competition. Organisational strategy would expect competition to prompt firms to adapt to remain competitive and survive. This result suggests that adaptability is a more internally generated attribute rather than one dependent on external factors and that competition works more at the macro level through competition with new organisations better suited to external demands replacing those that become incompatible with the environment.

4.4.9 Adaptability by business segment

One question prompted by the research output is whether adaptability varied by business segment. There is no literature to suggest a result either way, other than older industries or those with segments with an older cohort possibly being more adaptable.

To examine this, a one-way ANOVA was deployed to look at differences in adaptability by business segment as recorded. Those categories with a sample size of 1 were dropped from the analysis as their inclusion makes post-hoc analysis impossible. The analysis shows there were significant differences in adaptability between business segments, $F(16,944) = 4.18$, $p < .01$ (Table 28).

Table 28. Adaptability by business segment

	N	Mean	Std. Deviation
Agriculture, hunting and forestry	29	2.4468	.58565
Fishing	2	2.1000	.98995
Manufacturing	117	2.6191	.50133
Electricity, gas, water	8	2.2875	.36912
Construction	56	2.6603	.45919
Wholesale, retail	79	2.5063	.39860
Hotels and restaurants	16	2.7656	.63317
Transport, storage and communications	37	2.4782	.42578
Financial intermediation	29	2.5484	.36549
Real estate, renting	17	2.5750	.44234
Business services and computing	384	2.3509	.46482
Public admin and defence	3	2.9000	.66144
Education	48	2.3820	.54377
Health and social work	26	2.6089	.53870
Other social and personal services	46	2.5602	.50642
Private households with employees	5	2.2917	.49337
Extra-territorial organisations	6	2.2750	.81348
Total	908	2.4633	.49124

Source: Analysis of research survey, April 2008

As there was no specific hypothesis about the relationship between adaptability and business segment, post-hoc tests were carried out to compare all the segments with each other to see which business sectors are more adaptable than others. The tests used the Games-Howell method as the most likely accurate test when sample sizes are unequal as here and the extensive multiple comparisons are given at the end of Appendix 4. The results showed that the business services and computing sector (M=2.35, 95% CI [2.31, 2.40]) was more adaptable than both the manufacturing sector (M=2.62, 95% CI [2.53, 2.71]), $p = .000$, and

the construction sector (M = 2.66 95% CI [2.54, 2.78]), p = .001. Comparisons between all other business sectors were not statistically significant at p < .05. The implications of these results are discussed further at 5.2.9.

4.4.10 Multiple regression analysis

Having tested the relationship between the adaptability instrument and a number of variables suggested by the literature on a one by one basis, this section reports on a multiple regression analysis that fits the adaptability instrument against the whole set of variables. This acts as a check on the robustness of the findings and can help determine the relative contribution of the various independent variables to the dependent adaptability instrument.

One problem in regression analysis is that of variable selection; should all the available variables be included or would a smaller number give a 'best' model? One standard method for dealing with this issue is to undertake a backwards, stepwise regression. The dependent variable is initially regressed on all the designated independent variables. Each variable is tested to see if its removal would lead to a significant worsening of the model. If there are any variables for which this is not the case then they are candidates to be removed from the model. If there is more than one candidate variable then the one that causes the least worsening of the model is removed.

This regression analysis utilized the backward stepwise linear regression in order to determine which predictors were significant predictors of adaptability, and a significant model emerged:

$$F(4,500) = 14.74, p < .005.$$

The final regression model achieved an R^2 of .105, indicating that 10.5% of the variation in the dependent variable is explained by all predictors included in the model. Additionally, the analysis of variance associated with this final model was found to achieve statistical significance. This indicates that the predictor variables included in this model are collectively significant predictors of the dependent variable. Table 29 presents the details for the predictive variables included in the model.

Table 29. Results of a backwards, stepwise multiple regression

Model	B	SEB	β	Sig.	t
Constant	2.339	.179		.000	13.067
Firm age	-.075	.023	.138	.000	-3.256
Success copying ideas	.144	.028	.220	.000	5.159
Speed of take up new technologies	.085	.026	.141	.001	3.296
Dynamic competition indicator	-.029	.012	-.101	.018	-2.377

Source: Analysis of Research Survey 2008

This final regression model ended up with just the four independent variables of firm age, success in copying good ideas, speed of uptake of new technologies and the dynamic competition marker of percentage of revenues with entry of a competitor as predictors of the dependent variable, adaptability. All of these predictors were found to achieve statistical significance at the .05 alpha level. Interpreting the signs with their correct direction of travel given the questionnaire format, the regression coefficients indicated that all the independent variables remaining were associated with higher predicted values of adaptability. Focusing on the standardised coefficients, the highest standardised coefficient, indicating the strongest predictor, was found to be that associated with success in copying new ideas. This was followed by the coefficient associated with the speed of take up of new technologies, then firm age, followed by the dynamic competition indicator variable.

In addition, a series of diagnostics were conducted in order to determine whether any of the assumptions of linear regression analysis had been violated in this analysis. First, the Durbin-Watson coefficient was found to be 1.940. As this value is between 1.5 and 2.5, this indicates no significant autocorrelation in this analysis. Next, all tolerances and variance inflation factors associated with the final model were found to approximate one, indicating no problematic issues with regard to multicollinearity in this model. Regarding regression

residuals, a histogram of the regression standardised residuals as well as a normal probability-probability plot of the regression-standardised residuals indicated no substantial non-normality. Next, a scatter plot of the regression standardised predicted values plotted against the regression-standardised residuals showed a random dispersion of data, suggesting no problems relating to heteroscedasticity. A series of partial regression plots found no problematic issues relating to linearity or outliers and a one-sample Kolmogorov-Smirnov test - as well as measures of skewness and kurtosis and a histogram - found no substantial or significant non-normality relating to the dependent variable of adaptability. Overall, the set of diagnostics indicate that none of the assumptions of linear regression analysis had been violated here. The implications of these findings are discussed in more detail in section 5.2.10.

4.5 Recession survey

This part of the chapter presents the data for the research questions/hypotheses that arose in chapter 2 with regard to the relationship between adaptability and survival in recession. A specific question, given the timing of the research, was what happened to any relationship between firm adaptability and survival in a recession? If adaptability contributes to the survival of populations of SMEs in normal circumstances, does it matter even more in a recession for survival as the attribute should allow firms to respond more rapidly to rapidly changing circumstances? Or is the transforming force of competitive selection on populations of SMEs amplified in the suddenly shortened business cycle?

To investigate this further, a follow-up survey was conducted in October 2009 during the biggest UK economic downturn since the Second World War and after a significant shakeout of firms had occurred. The aim of the second survey was to use the opportunity of the recession to obtain data to refine the analysis of the relationship between survival, adaptability and other possible factors, where survival this time was a measurable variable. Survival was examined both as a binary issue (survived versus did not survive) and for a spectrum of outcomes as described in the next section.

4.5.1 Descriptive statistics for the recession survey

The descriptive statistics for survival as declared in the recession survey are shown in Table 30. There were 503 participants who responded to both the original and the recession surveys, 67 per cent of whom survived more or less intact, 24.7 per cent survived but only just in the current line of business, 1.6 per cent survived through an asset sale or merger in a similar line of business, 4.6 per cent survived by moving largely into a new line of business and 2.2 per cent who reported they had gone out of business.

Chi-square tests between the attrition rate (i.e. those who responded to the first survey only and those who responded to both the first and second survey) showed no significant relationship between attrition and variables such as profits, revenues, size or adaptability, although there was a significant relationship between attrition and the length of trading. This says the two survey samples were roughly comparable, though older firms tended to respond to both surveys more than younger ones, partly because younger firms were more likely to have gone out of business and because the first survey was slightly over-weighted with older firms. A Kolmogorov-Smirnov test showed that the adaptability variable of those in the second survey was also normal.

Table 30. Frequency distribution of degrees of survival

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Survived more or less intact	337	20.6	67.0	67.0
Survived – but only just in the current line of business	124	7.6	24.7	91.7
Survived – but through an asset sale or merger in the same or similar line of business	8	.5	1.6	93.2
Survived by moving largely into a new line of business	23	1.4	4.6	97.8
Gone out of business all together	11	.7	2.2	100.0
Total	503	30.8	100.0	

Source: Analysis of recession survey, October 2009

Of the respondents, 45 per cent (231) said revenues increased over the previous 12 months and 57 per cent (272) said revenues had decreased. The same percentages said profits has increased (46 per cent) or decreased (57 per cent) over the same period.

4.5.2 Data analysis of the recession survey

In a recession, organisation science and strategic choice theory suggests that the more adaptable should survive better than the less adaptable, while organisational ecology argues that structural inertia is a survival-enhancing feature that should come to the fore when the sword of competition gets sharpened. To address these hypotheses, logistic regression is a suitable analytical technique for modelling a categorical dependent variable as a function of one or more independent variables.[38]

Ordinal regression analyses were conducted to assess the cumulative relationships between the categorical dependent variable of survival and the numerical independent variables of the adaptability construct, increase/decrease of turnover over the last year and, if survived, how much net profit increased or decreased over the last year.

Three ordinal logistic regression models were developed. The first model (Table 31) considered adaptability only as the independent variable, the second model (Table 32) considered adaptability and percentage change in revenues as the independent variables while the third model (Table 33) considered adaptability, percentage change in revenues and percentage change in profit as the independent variables.

For the first model, Table 31 shows that adaptability does not have a significant relationship with survivability, with p-levels greater than 0.05.

[38]In logistic regression, the goal is the same as in ordinary least squares (OLS) regression, to model a dependent variable in terms of one or more independent variables. However, OLS regression is for continuous (or nearly continuous) dependent variables, while logistic regression is for dependent variables that are categorical.

Table 31. Ordinal logistic regression: independent variable – adaptability

Parameter estimates								
							95% confidence interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower bound	Upper bound
Threshold	Survived more or less intact	.870	.490	3.157	1	.076	-.090	1.830
	Survived – but only just in the current line of business	2.484	.510	23.684	1	.000	1.483	3.484
	Survived – but through an asset sale or merger in the same or similar line of business	2.682	.516	27.047	1	.000	1.672	3.693
	Survived by moving largely into a new line of business	3.942	.586	45.180	1	.000	2.792	5.091
Location	Adaptability	.078	.197	.155	1	.694	-.309	.464

Source: Analysis of recession survey, October 2009

The results of the second model are shown in Table 32. Here the percentage change in revenues was significantly related with survivability since the p-value is less than .05, with the sign indicating, not unreasonably, that the greater the fall in revenues the lower the degree of survival.

Table 32. Ordinal logistic regression: independent variable – adaptability and turnover

Parameter estimates								
							95% confidence interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower bound	Upper bound
Threshold	Survived more or less intact	1.118	.517	4.681	1	.031	.105	2.132
	Survived – but only just in the current line of business	2.865	.541	28.088	1	.000	1.806	3.925
	Survived – but through an asset sale or merger in the same or similar line of business	3.066	.546	31.497	1	.000	1.995	4.136
	Survived by moving largely into a new line of business	4.326	.616	49.244	1	.000	3.118	5.534
Location	Adaptability	.064	.206	.098	1	.755	-.339	.467
	Turnover	-.024	.004	28.510	1	.000	-.032	-.015

Source: Analysis of recession survey, October 2009

The results of the third model are shown in Table 33. While turnover was still significantly related with survivability, neither adaptability nor percentage change in profits had a significant relationship with the degree of survivability.

Table 33. Ordinal logistic regression: independent variable – adaptability, turnover and profit

Parameter estimates								
							95 per cent confidence interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower bound	Upper bound
Threshold	Survived more or less intact	1.160	.519	4.986	1	.026	.142	2.178
	Survived – but only just in the current line of business	2.916	.543	28.803	1	.000	1.851	3.982
	Survived – but through an asset sale or merger in the same or similar line of business	3.119	.549	32.268	1	.000	2.043	4.195
	Survived by moving largely into a new line of business	4.387	.620	50.116	1	.000	3.173	5.602
Location	Adaptability	.083	.206	.161	1	.688	-.322	.487
	Turnover	-.026	.005	29.108	1	.000	-.036	-.017
	Profit	.002	.002	2.007	1	.157	.000	.006

Source: Analysis of recession survey, October 2009

These results show no relationship between average adaptability and degree of survival during the recession.

4.5.3 Adaptability by business segment and survival

A further question that arises from the data is whether firms in certain segments survived better than others. As set out in 2.10, recessions do not have a regular impact on industries and there is little empirical data on the relationship between adaptability and survival let alone by business segment so this is an interesting matter for empirical analysis.

In order to examine this, a Kruskal-Wallis ANOVA was undertaken to see whether survival rates significantly differed by business segment. A Kruskal-Wallis ANOVA was deployed here instead of the standard one-way ANOVA as the measure of survival was ordinal (categorical and ordered) as opposed to continuous. One-way ANOVA assumes that the outcome measure is continuous and normally distributed, which is not the case here. There were no statistically significant differences in survivability by business segment during sharp recession, $H(16) = 18.397$, $p = .301$. The result is discussed further at 5.2.9.

4.5.4 Overall survival and the individual components of the adaptability instrument

While there was no overall significant relationship between the adaptability instrument and survivability, it was worth exploring if this held for each of the four individual components of adaptability. An ANOVA was carried out to compare the means between the four elements that made up the adaptability indicator according to survivability categories.

Table 34 shows no significant differences between the production and sales adaptability of the five survivability categories while there is a significant difference in the administration and strategy adaptability of the five survivability categories (p-values < .05). The Tukey Post Hoc test run showed that the category ‘survived by moving largely into a new line of business’ had a significantly lower score in administration and strategy adaptability than the category ‘survived but only just in the current line of business’.

Table 34. ANOVA for comparison of means between adaptability categories according to survivability categories

		Sum of squares	df	Mean square	F	Sig.
Adaptability in production	Between groups	9.592	4	2.398	2.164	.072
	Within groups	427.804	386	1.108		
	Total	437.396	390			
Adaptability in sales and marketing	Between groups	6.209	4	1.552	1.628	.166
	Within groups	368.931	387	.953		
	Total	375.140	391			
Adaptability in administration	Between groups	9.799	4	2.450	2.514	.041
	Within groups	377.056	387	.974		
	Total	386.855	391			
Adaptability in strategy matters	Between groups	9.043	4	2.261	2.492	.043
	Within groups	351.080	387	.907		
	Total	360.122	391			

Source: Analysis of recession survey, October 2009

4.5.5 Survival/non-survival by groups and the individual components of the adaptability instrument

Although the degrees of survival are listed categorically, there is an argument that a binary measure of either ‘survived’ or ‘did not survive’ would give a clearer picture. To examine this, t-tests for comparison of means were conducted to determine whether there was a significant difference between the adaptability scores in the four categories according to whether the participants are classified as survived or not survived. Five tests were carried out on combinations of the various survival categories into just the two classes of survived and not survived:

4.5.5.1 Test 1: The best versus the worst survivors

The survived group here is the strongest, consisting of: 'Survived more or less intact' and 'Survived – but only just in the current line of business' categories. Non-survived = all the other groups of weaker categories of survival: 'Survived – but through an asset sale or merger in the same or similar line of business', 'Survived by moving largely into a new line of business' and 'Gone out of business all together' categories.

The t-tests shown in Table 35 demonstrate that a significant difference was observed only for adaptability in production, with the survived group as defined scoring significantly higher in this adaptability category than the not survived group.

Table 35. T-test for comparison of means between adaptability categories according to survivability

	T-test for equality of means						
	t	Df	Sig. (2-tailed)	Mean difference	Std. error difference	95 per cent Lower CI	95 per cent Upper CI
Adaptability in production	2.369	52.489	.022	.316	.134	.048	.584
Adaptability in sales and marketing	1.337	390	.182	.229	.171	-.108	.565
Adaptability in administration	1.115	390	.266	.194	.174	-.148	.536
Adaptability in strategy matters	1.719	390	.086	.288	.167	-.041	.617

Source: Analysis of recession survey, October 2009

4.5.5.2 Test 2: those that went out of business VERSUS all the others

T-tests for comparison of means were again conducted to determine whether there is a significant difference between the adaptability scores in the four categories according to whether the participants are classified as survived or not survived. Test 2 was all those that went out of business VERSUS all the others. The t-tests (Table 36) showed there was no significant difference between the adaptability of all survived categories as compared to those who went out of business altogether.

Table 36. T-Test for comparison of means between adaptability categories according to survivability

	t-test for equality of means						
	t	Df	Sig. (2-tailed)	Mean difference	Std. error difference	95 per cent lower CI	95 per cent upper CI
Adaptability in production	.425	389	.671	.152	.358	-.551	.855
Adaptability in sales and marketing	.902	390	.368	.298	.330	-.352	.948
Adaptability in administration	.876	390	.382	.294	.336	-.366	.954
Adaptability in strategy matters	.738	390	.461	.239	.324	-.398	.876

Source: Analysis of recession survey, October 2009

This result may reflect the random nature and small sample size of those who reported having gone out of business altogether.

4.5.5.3 Test 3: those that went out of business + those that survived only just VERSUS all the others

T-tests for comparison of means were conducted to determine whether there was a significant difference between the adaptability scores in the four categories according to whether the participants are classified as survived or not survived. Here the NOT SURVIVED group is composed of those under 'Survived – but only just in the current line of business' and 'Gone out of business altogether' categories versus all the other categories.

The t-tests (Table 37) showed that a significant difference was observed for adaptability in production and administration. This implies that the worst surviving group scored significantly lower in these adaptability categories than the better surviving group.

Table 37. T-Test for comparison of means between adaptability categories according to survivability

	t-test for equality of means						
	t	Df	Sig. (2-tailed)	Mean difference	Std. error difference	95 per cent lower CI	95 per cent upper CI
Adaptability in production	-2.099	168.506	.037	-.266	.127	-.516	-.016
Adaptability in sales and marketing	-1.138	390	.256	-.127	.112	-.347	.092
Adaptability in administration	-2.023	168.165	.045	-.241	.119	-.476	-.006
Adaptability in strategy matters	-1.719	169.471	.087	-.197	.115	-.423	.029

Source: Analysis of recession survey, October 2009

4.5.5.4 Test 4: those that went out of business VERSUS all the others excepting 'those that survived – but through an asset sale or merger in the same or similar line of business'

The t-tests (Table 38) here showed that there was no significant difference between the adaptability in all survived categories except 'Survived – but through an asset sale or merger in the same or similar line of business' category as compared to those who went out of business altogether.

Table 38. T-Test for comparison of means between adaptability categories according to survivability

	t-test for equality of means						
	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95 per cent lower CI	95 per cent upper CI
Adaptability in production	.422	383	.673	.152	.359	-.555	.858
Adaptability in sales and marketing	.885	384	.377	.291	.329	-.356	.938
Adaptability in administration	.858	384	.391	.286	.333	-.369	.942
Adaptability in strategy matters	.721	384	.472	.233	.324	-.403	.869

Source: Analysis of recession survey, October 2009

4.5.5.5 Test 5: those that went out of business + those that survived only just VERSUS all the others excepting 'those that survived – but through an asset sale or merger in the same or similar line of business' (Table 39).

Table 39. Test for comparison of means between adaptability categories according to survivability

	t-test for equality of means						
	t	Df	Sig. (2-tailed)	Mean difference	Std. error difference	95 per cent lower CI	95 per cent upper CI
Adaptability in production	-2.106	170.584	.037	-.268	.127	-.519	-.017
Adaptability in sales and marketing	-1.228	384	.220	-.137	.112	-.356	.082
Adaptability in administration	-2.123	167.968	.035	-.253	.119	-.488	-.018
Adaptability in strategy matters	-1.796	170.371	.074	-.206	.115	-.433	.020

Source: Analysis of recession survey, October 2009

The t-tests (Table 39) showed again that a significant difference is observed for adaptability in production and administration. This implies again that the 'not survived' group scored significantly lower in these adaptability categories than the survived group.

4.5.6 Summary of recession survey

The recession survey shows that, for the sample that responded to both surveys, more years' trading leads to better survival outcomes during recession, where age is again a proxy for some underlying differences between firms that are relevant to survival in the depths of a recession.

The composite adaptability score, however, is not significantly related to the degree of survivability. This is consistent with the less adaptable in the pre-recession survey being weeded out faster in the recession, leaving a recession sample with a much lower spread of

average adaptability levels. Chi-square tests on the attrition rate (those who failed to respond to the second survey as a fraction of those who responded to both the first and second survey) showed no significant relationship between attrition and variables such as profits, revenues, size or adaptability, but a significant relationship between attrition and the length of trading. In other words, older cohorts of firms, with narrower spreads of average adaptability levels were over-represented in the second survey. This reflects the relationship between age and survival in a sample in which a significant shake out of firms was likely to have taken place given the non-response rate.

Yet the recession survey also showed a strong relationship between degree of survival and potential adaptability in the production and marginally the administration aspects of the adaptability score. A disposition towards, or preference for, adaptability in production contributes to better survival outcomes during a recession.

Looking at some of the underlying operational differences among firms during the recession, the survey also shows a strong relationship between the amount of change of revenues between surveys and survival outcomes. Not unreasonably, those experiencing the greater percentage decrease in revenues had less favourable survival outcomes, reflecting how hard it is hard to adjust cost of sales to match falling revenues, especially in a business with relatively large fixed costs compared with variable costs. For older firms, however, this effect is likely to be tempered by a degree of learned adaptability in production.

The survey, however, showed no relationship between the percentage change of profits between the sample periods and survival outcomes. This may be because respondents have a better grasp of their revenue streams as a continuum, while the profit figure reported is overestimated as a snapshot. The result also suggests that factors other than the short-term reduction in profits (or increase in losses) are important in determining survival outcomes in deep recession in addition to a measure of adaptability in production. The next section looks at this in more detail to round out the picture on this result.

4.6 Data analysis and presentation of results from the survey of failed firms

What, then, may have changed significantly between the two surveys to overwhelm the adaptability response and account for the results? As the factors were most likely to be seen in extremis in those who did not survive, the third survey was of the 14 respondents to the recession survey who said they had gone out of business between the first and second survey, to see what had changed for them. A starting hypothesis, based on the 2009 Kingston study discussed in the methodology section at chapter 3, was the credit crunch nature of the recession possibly leading to cash flow problems that produced circumstances where demise was inevitable for some firms. Table 40 below shows once more the profile of the eight firms that responded. The sample is not randomly drawn but does cover businesses that ranged from 1 to 100 employees and with turnover from £30,000 to £7m across a diverse spread of industries.

Table 40. Profile of respondents who had gone out business

	PR firm	**Flower shop**	**Educational materials**	**Ladies' golf shop**	**Management consultant**	**Online lighting retailer**	**Automotive parts**	**Promotional goods**
Turnover £M	0.030	0.055	0.075	0.10	0.16	1.2	7	13
Employees	2	2.5	1	2.5	2	4	100	25

Source: Online, mail and telephone survey, October 2010

4.6.1 The results

The results, summarised in Table 41, show the single common factor operating across all respondents was a rapid and significant loss in revenues because of over-dependence on one supplier that went out of business or customers that just stopped spending. Respondents were unable to adjust their cost of sales to match and seemed to have relatively high fixed costs to variable costs. Short-term cash flow then swiftly became a problem, reflecting the

Table 41. Reasons for failure

	Flower shop	Online retailer of lighting	Promotional items for consumer goods	Ladies golf shop	Educational materials	Management consultancy	Automotive parts	PR firm
Lack of availability of bank loans or overdraft facilities			Fast reduction of factoring facility during Christmas peak					
Late payments by customers								
Bad debts								
Reduced credit terms from suppliers								
One problem leading to another								
Comments on any of the financial issues that contributed to your situation	Could not afford redundancy payment or to pay VAT/NI			Bank willing to convert overdraft to secured loan at high interest rates and large arrangement fee	Clients stopped spending money	Loss of equity in Florida property pension fund investment	HMRC pressed for payments	Only the loss of revenues
Cost of materials or supplies								

Falling value of the pound			Did not buy $ forward				Yes but not a major factor	
Rising transport /energy costs								
Loss of key staff								
Any other factors like these you would like to talk about that contributed to your troubles?	Loss of revenues as the starting point	Revenues dropped faster than could adjust costs, esp. advertising as online model relies on this	Revenues dropped in light of potential increase in price due to low £	Revenues more lumpy than normal hence the need for cash flow management	Clients just stopped spending	Severe reduction in revenues from prime market in the public sector	Sales volumes dropped dramatically, over-dependent on Jaguar/Land Rover	
Overall, what would you say was the single most important factor that contributed to the loss of your business?	A bank loan or increase in the overdraft of £2000 would have kept us going	Inability to match costs to revenues fast enough	Reduction of funding via factoring at a crucial time	Could not match revenues and costs, even if bank had helped	Clients just stopped spending	Cutbacks in public sector on consultants and over dependent on this sector	Massive reduction in sales volume leading bank to reduce credit facilities	Very short term inability to pay bills due to loss of revenues forced us out of business
Turnover	£55K	£1.2m	£13m	£100K	£75K	£160K	£7m	£30K
Employees	2.5	4	25	2.5	1	2	100	2

Source: Online, mail and telephone survey, October 2010

conclusions of the Kingston study (2009) and emphasising the reduction of cash at bank through straight revenue loss.

For the three largest respondents and one smaller respondent, suppliers reducing their credit terms squeezed their cash even harder, compounded the effect. Five of the respondents mentioned that a lack of additional availability of bank loans or overdraft facilities, or an actual reduction of these, compounded the cash flow problem even further. These results are examined further at 5.3.4.

4.7 Conclusions

There is a positive correlation in the sample population of SMEs between average adaptability and firm age but no correlation between average adaptability and profitability or revenues or firm size by employees. The results indicate that, even if the scope for adaptation is small, the more adaptive firms possess an advantage relative to their rivals. Adaptability contributes to longevity and is a better predictor of survival than profitability. The results also suggest that younger cohorts of firms have a spread of adaptability levels and that selection pressure weeds out the less adaptive firms such that the average adaptability of the remaining contingents rises even if adaptability falls for every single firm.

The findings challenge the view that industry characteristics are explained through selection only and demonstrate that adaptability also matters for firm survival. In sharp recession, the less adaptable get weeded out even faster, yet the more adaptable specifically in their output have some advantage relative to their rivals that confers relatively greater longevity and survivability, even if the scope for adaptation is generally small.

CHAPTER 5

CONCLUSIONS AND IMPLICATIONS

5.1 Introduction

Previous chapters have set out:

- the overall purpose of the research: to look at the disagreement in the literature about the relative roles of selection (competition) and adaptation in explaining industrial change
- a methodology for investigating the issues using an adaptability instrument based on analysis of expressed preferences for routine actions across a sizeable sample of small and medium-sized firms in a range of industries
- an analysis of the resulting survey data, including follow-up surveys that looked at the possible change of relationship between adaptability and survival during the depths of the recession.

Chapter 4 presented the detailed findings of the research. This chapter sets those findings further within the overall context of the research programme and the literature review and goes on to form conclusions about the overall research problem. The Chapter then discusses the implications of the findings for the various theories explored and suggests where the research contributes to the knowledge base. The chapter concludes with a discussion of the implications of the findings for both private enterprise strategy and for government policy - particularly towards SME businesses - and proposes possible lines of future research.

5.1.1 Synopsis of the research problem, research questions and methodology

The literature disagrees about the relative roles of selection (competition) and adaptation in explaining industrial change and it falls into four separate but overlapping schools:

- Textbook economics and conventional economic theory (firms are rational and profit maximising and competition weeds out the weak). Adaptability, entrepreneurship, innovation and a firm's internal structures and size are largely incidental matters
- Organisational strategy and strategic choice theory (success lies mostly in the decisions made by individual entrepreneurs and managers and firms survive or die in relation to their fit within the marketplace). Adaptability here relates to the innate and learned abilities of the individual entrepreneur or chief executive and/or management teams and their ability to reshape their environment and not merely submit to environmental selection pressures
- Organisational ecology (inertia is the natural state for firms so that they have little room for strategic manoeuvre and can do little to prevent themselves being selected out in due course). Selection rather than adaptation accounts for long-term changes in the diversity of firms. Even if organisations do change all the time in some way, inertia for the ecologists still slows change such that firms find it just about impossible to keep pace with gradual but inevitable changes in the environment
- Evolutionary economics (acknowledges both stability and inertia as an integral part of the story). At a population level, there is variational change in the composition of the population and transformational change in the nature of the individual elements within the population.

The literature review also noted the lack of focus in empirical studies, other than in organisational ecology, on the small and medium-sized enterprise (SME) sector as a whole, a sector in the UK that accounts for 99.9 per cent of all enterprises, 59.1 per cent of private sector employment and 48.6 per cent of private sector turnover (Department for Business, Innovation and Skills, May 2011).

The specific research questions that arose were about how large populations of small firms persist without expanding or becoming increasingly efficient, when competition should have weeded them out. From the organisational ecology perspective, most firms have little strategic discretion and can only hope they are not chopped down by the axe of selection. Alternatively, are these firms really adaptable or innovative in some way, with particularly

entrepreneurial management, so that adaptability reduces the chances of being selected out? To what extent does adaptability and/or selection account for the characteristics of a population of firms?

Specifically:

- Are older or larger firms more or less adaptable than younger and smaller firms and what is the contribution of adaptability to survivability? At the population level, does structural inertia increase with age and average adaptability decrease with age?
- Is adaptability associated with firm size or innovative capacity, entrepreneurship, the competitive environment or any other factors such as having routines for changing routines?
- Given the recent severe recession, does adaptability help survival in a downturn?

The approach adopted looked at these contradictory views of the effects of organisational flexibility and inertia from the perspective of evolutionary economics, where routines are commonly viewed as both a source of inertia and change (Nelson and Winter, 1982). Routines were defined following Hodgson (2004, 2007) as dispositions or capacities that shape the way various overlapping cohorts within the firm actually proceed in response to a series of signals to act.

Organisational adaptability was then specifically defined as the capacity of an organisation to change its strategies, structures, procedures or other core attributes, in anticipation of, or in response to, a change in its environment, including changes in relations with other organisations.

The challenge was to look at the relationship between firm adaptability and firm age as a proxy for survival as well as a number of other variables that might be associated with adaptability in a relatively large-scale quantitative analysis. Although this did not allow precise internal investigation of specific routines, through a web-based questionnaire the study captured specific types of routines as dispositions of the firm to respond to various signals to act, a novel aspect of the research design. The author is unaware of any other

attempt to study routines through such a relatively large sample of observations and to re-sample in the depths of a recession. The process also addressed the organisational ecologists on their own terms with regard to the lack of empirical work in other schools on datasets of whole populations of firms taken from multiple industries and sectors, though this is clearly not a longitudinal study.

5.2 Research questions – conclusions

This section summarises the findings for each research hypothesis analysed in chapter 4 and sets these findings further within the overall context of the research and the literature.

5.2.1 Adaptability and age

Section 4.4.1 looked at the relationship between firm adaptability and firm age as a proxy for survival. As discussed in both 2.6, 2.7 and 2.8, the age dependency of firm survival is a conspicuous empirical regularity in the literature (Dunne et al., 1988, 1989; Audretsch, 1991; Baldwin and Gorecki, 1991; Mata and Portugal, 1994, Persson, 2002; Disney et al. 2003). Not only are age and size positively correlated among surviving firms, where age is seen as a proxy for some other determining factors, but size and survival are also positively correlated.

For organisational strategists, individual adaptability must increase with age as entrepreneurs and their teams learn to adapt and the fitter firms must also be better able to read and interpret what is going on and then adapt over time, generating rising average adaptability (Levinthal, 1991; Schindehutte and Morris, 2001). For the organisational ecologists, no matter how adaptable are individual firms, at the population level structural inertia increases with age so average adaptability must be decreasing with age where selection processes significantly favour those with high levels of inertia (Hannan and Freeman, 1984).

The results reported at 4.4.1 demonstrated a significant difference in the average adaptability of firms by age, with firms 10 years old or older having significantly higher

average adaptability than firms less than 10 years old, particularly in comparison with firms between three and five years old. Even if the scope for a firm to change adaptability is small, the more adaptable and flexible firms must have some relative advantage against their competitors that confers greater longevity, in turn associated with greater survivability.

As also noted at 4.4.1, the result can be accounted for by the heterogeneity of the population, with younger cohorts of firms having a spread of adaptability levels and the less adaptive being weeded out through time. Depending on firm birth and death rates, the average adaptability of the remaining contingents can rise even if adaptability falls for every single firm.

This result challenges both exclusively selectionist and relative and dynamic accounts of determinants of industry characteristics. It says that average adaptability in a population of firms is likely to increase over time, contrary to the Hannan and Freeman (1977, 1984, 1989) organisational ecology view that the selection effects of inertia should show as a decrease in the average adaptability in a population over time. Both adaptability and selection matter and adaptability matters a lot, the simulation suggesting that the variation in adaptability is high initially and declines only slightly. To the extent it is possible for firms to improve their adaptability, they can reduce their chances of being selected out, in contrast to the ecology view (Hannan and Freeman, 1989; Amburgey and Kelly, 1985; Carroll and Hannan, 1990) that firms with inert features are more likely to survive.

Of course, if the birth rate of firms is less than the death rate, then a positive correlation of adaptability with age is less likely to be sustainable with declining adaptability. In 2009, in the depths of the recession and for the first time since the series began (Office of National Statistics [ONS], 2010), the rate of business deaths (11.3 per cent) outnumbered business births (10.1 per cent). The potential impact of this is discussed further at 5.3 in the section following up on the results of the second survey.

5.2.2 Adaptability and firm size by employees, turnover and profits

The literature review (2.6, 2.7, 2.8) also reports that age and size are positively correlated among surviving firms and that size is also positively correlated with survival. The question

is whether average adaptability is also associated with firm size by employee numbers, turnover or profit levels. For organisational strategists, (Chandler, 1977; Pfeffer and Salancik, 1978; Porter, 1980) even allowing for trade-offs and balancing the costs and benefits of adaptability, adaptability should be positively associated with size, revenues and profits. For the organisational ecologists, the various liabilities of newness (Stinchcombe, 1965; Freeman, Carroll and Hannan, 1983), senescence (Ranger-Moore, 1997), obsolescence (Carroll, 1984; Baum, 1989), and adolescence (Bruderl and Schussler, 1990) are equivocal, but mortality tends to decline with increased size so large organisations are expected to have lower adaptability but also be less vulnerable to the risk of failure (Baum and Oliver, 1991).

The results presented at 4.4.2 showed no significant difference in the average adaptability of firms by numbers of employees or band of revenues or profits. There was also no significant relationship between firm age and employee numbers and no significant relationship between firm age and band of revenues in the sample. The results here contradict the strategy choice view that adaptability should be positively associated with size, revenues and profits. The results also contradict the organisational ecology view that average adaptability should be decreasing in populations of larger firms and suggest that adaptability may be a better predictor of survival than profitability. From a population perspective, the absence of correlation between average adaptability and profit levels or revenues supports the idea that selection processes do not necessarily produce optimal outcomes, as selection is prone to errors (Levinthal and Posen, 2007). It also suggests, significantly, that adaptability may be a better predictor of survival than profit levels.

5.2.3 Adaptability and congruence of routines

The literature review (2.6) shows routines as the fundamental mechanism through which firms accomplish much of what they do (March and Simon, 1958; Cyert and March, 1963; Nelson and Winter, 1982). They are a source of inertia (Hannan and Freeman, 1983), inflexibility (Weiss and Ilgen, 1985; Gersick and Hackman, 1990), and even thoughtlessness, (Ashforth and Fried, 1988) as well as a source of adaptation (Cyert and March, 1963) or mutation (Nelson and Winter, 1982). Routines also change all the time, even in old and established firms (Feldman, 2000) and change is particularly to the fore at

times of crisis (Gersick and Hackman, 1990), where there is ambiguity (Miner, 1990), and in the start-up and early years phase (Narduzzo, Rocco and Warglien, 2000). This raised the issue of whether the congruence of routines contributed more to adaptability (Covin 1991; Hoffman et al., 1992) or inertia (Hannan and Freeman, 1984; Singh and Lumsden, 1990).

Change here is not just a matter of having routines for changing routines, meta-routines, (Hackman and Wageman, 1995; Teece and Pisano, 1994; Tranfield and Smith, 1998), but the inherent capability of all firms to change throughout their on-going existence. To say again, it is pivotal to this dissertation not to overlook the enormous amount of adaptation that does occur within all firms most of the time and that such a granular perspective is required in order to examine adaptability in an appropriate way.

The research results at 4.2.3 looked at the congruence between the strategy, production, administration and sales/marketing components of the adaptability instrument and showed that higher congruence is associated with higher adaptability rather than higher inertia. At the population level, the result can be accounted for once more by the heterogeneity of the population. If average adaptability rises with age, the average level of congruence of routines also rises, even if that of individual firms were falling as the less adaptive get weeded out over time. Rising congruence of routines in a population of firms over time supports the idea that it contributes more to adaptability in the population than contributing to inertial effects from the reliability and accountability of congruent routines in an organisational ecology view.

5.2.4 Adaptability and formal procedures

Feldman and Pentland (2003) distinguish between the ostensive aspect of routines that guides and accounts for specific routine performance and the performative aspect of routines that creates, maintains, and modifies the ostensive aspect of the routine. They argue that the relationship between ostensive and performative aspects of routines creates an on-going opportunity for variation, selection and retention of new practices and patterns of action within routines and allows routines to generate a wide range of outcomes, from apparent stability to considerable change. There is an on-going debate whether a high level

of formal procedures is needed to facilitate change or whether a high level of formal procedures inhibits change.

The analysis of formal procedures at 4.4.4 concluded that higher levels of formal procedures contribute neither to inertia nor adaptability. The result supports the idea that formal procedures can be sources of both organisational stability (Pentland and Rueter, 1994) and organisational change (Miner, 1990; Feldman, 2000). It may be that the performative effects of routines are more inertial while the ostensive contribute more to adaptability, a matter for further research.

5.2.5 Adaptability and innovation

At a population level view, the organisational ecology paradigm casts innovation as a risky and disruptive exercise, making firms more prone to failure through the disruption and loss of competence from the changes in routine and patterns of internal relationships that follow innovative activities. This is because routines become more practised, definite and set with age (Nelson and Winter, 1982; Hannan and Freeman, 1984) and relationships within the firm and with customers and suppliers get cemented in (Stinchcombe, 1965).

While the ecological view does not deny the role of the choices and actions of individual firms, it stresses there are limits on the influence of firm choice and actions. Older firms may be better at producing 'incremental innovations along existing technological trajectories' (Sørensen and Stuart, 2000, p.83), rather than exploring along new paths. In this case, one would expect to find a negative relationship between the average adaptability of firms in the population and a range of innovation markers, especially those associated with radical change.

For the organisational strategy school, innovations (both inventions and adoptions) are the lifeblood of firms, creating competitive advantages that let firms generate superior value for customers and superior profit for themselves (Utterback and Abernathy, 1975; Ettlie et al., 1984; Hamel, 1998). For Teece (2000), technological innovation needs to go hand in hand with a rethink of the overall business model for a firm to capture maximum value. Survival may depend more on identifying new opportunities and organising to make them a reality

than strategic moves to disrupt and keep out competitors (Teece, Pisano and Shuen, 1997). The presence of such dynamic capabilities should, therefore, show a positive relationship between average adaptability and innovation activity.

The results at 4.4.5 showed that higher adaptability is associated not only with the more rapid adoption of technology and the willingness to try new ideas but, importantly, the ability to implement new ideas successfully. Higher adaptability is also associated with the more recent introduction of genuinely new goods or services. The results show that innovation is adaptive and contributes to longevity in firms with sets of routines to search for and select appropriate innovations (be they product or process) and with routines to implement new routines. They also challenge the organisational ecology paradigm that innovations cause disruption and loss of competence from changes in routine and patterns of internal relationships. Average adaptability in a population of firms is positively associated with innovative activities and, to the extent that it is possible for firms to improve innovation, then they can reduce their chances of being selected out, in contrast to the ecology view (Hannan and Freeman, 1989; Amburgey and Kelly, 1985; Carroll and Hannan, 1990) that innovation is a risky and disruptive exercise.

5.2.6 Adaptability and entrepreneurship

The literature review (2.6, 2.7) also discussed the evolutionary concept that, from a population perspective, innovative entrepreneurs and 'intrapreneurs' create new routines and competences intended to generate products, processes and services favoured by selection criteria (Anderson and Tushman, 1990; Hunt and Aldrich, 1998). The organisational strategy school, to repeat, insists that survival is predominantly a complex management problem that does get resolved by better entrepreneurs and managers while the incompetent get weeded out (Christensen, 2000). By contrast, organisational ecology says that firms fail over the longer run because it is hard, if not impossible, to manage the trade-offs to the key survivability markers of accountability and reliability that change requires and that better management cannot actually deal with the structural problem (Dew et al., 2006). So taking on external consultancy will also fail to solve the structural problem. The organisational strategists argue that external strategic consultants can give management

more options and positively increase organisational adaptability and so long-run survival, even if at the cost of short-term profits (Ginsberg, 1989).

The research attempted to look specifically at the relationship between adaptability and the entrepreneurship of the senior management team rather than that of the individual entrepreneur. Indeed, the research sample excluded start-up firms and consisted of firms trading long enough for the incumbent management team to be influential, either positively or negatively. It also looked at the relationship between adaptability and the number of senior managers brought from other firms in the last five years, to see if this is an important vector for change as suggested at 2.6 in the literature review. Finally, the research also looked specifically at the relationship between adaptability and the willingness to make use of external consultants, to test the notion that this vehicle is an agent of change.

The results at 4.4.6 demonstrated that higher adaptability is positively associated with the greater propensity of senior management teams to do things differently and also the willingness of firms to make use of external consultants. This supports the idea that external input as well as an entrepreneurial attitude by a senior management team can be factors of variation, especially if senior management has a propensity for change. And such an attitude is more likely to be associated with the willingness to consider a range of options 'not invented here'. There was, however, no difference in average adaptability by the number of senior managers brought from other firms in the last five years, whatever the propensity to do things differently. This result emphasises the importance and roles of routines within firms and just how hard it is for new management to come in and drive significant and worthwhile change (Hodgson, 2010).

5.2.7 Adaptability and competitive advantage

For the strategy school, a competitive advantage should enable a firm to create superior value for customers and superior profit for itself (Henderson and Cockburn, 1994; Powell, Koput and Smith-Doerr, 1996), while the organisational ecology school sees competitive advantage as something heavily influenced by conditions at a firm's founding and not material to survival (Klepper and Simons, 1997; Eisenhardt, 1988; Eisenhardt and Schoonhoven, 1990). So do firms with a competitive advantage have lower average

adaptability because it engenders a level of complacency and inertia and 'rent displacement' (Geroski, 2001), where firms already in a profitable position are less likely to try new products that may risk current earnings than a player that has nothing to lose? Or does the absence of a competitive advantage encourage adaptability and the search for one (Porter, 1980)?

Analysis of the relationship between competitive advantage and adaptability at 4.4.7 showed no relationship between average adaptability and having a competitive advantage of any sort, and no relationship between average adaptability and possession of no competitive advantage. At the population level, organisational ecology sees selection operating within the population through some kind of competitive advantage (or disadvantage) of some traits relative to others. While the results show adaptability offers some form of advantage that confers greater longevity, the presence of a specific product/service or relationship advantage does not contribute to that adaptability.

5.2.8 Adaptability and dynamic (new competitor) and static (price) competition

From the neoclassical economics and strategy schools, competition is about the search for supra-normal profits (rents) by firms in the same product markets. Competition drives rents to zero or stability and a competitive equilibrium is reached (Milgrom and Roberts, 1992). In the competitive process, some new firms or divisions of diversified firms are attracted by the potential rents and decide to enter the markets, while others are forced to leave if they fail to make satisfactory profits. Although the results so far have shown no relationship between bands of profitability and average adaptability, for the organisation strategy school, there should be some relationship between competition and adaptability as competition weeds out the less adaptable.

In organisation ecology, by contrast, competition is about firms struggling for those external resources that are critical for their long-term survival (Astley, 1985). The outcome of competition for individual organisations is measured by survival, rather than profitability, although survival can be considered as a consequence of long-term profitability (Han, 2007).

The results at 4.4.8 showed no relationship between adaptability and a measure of dynamic competition expressed here specifically as the percentage of revenues likely to be lost with the entry of a competitor of similar size. The analysis may not be picking up a possible lagged effect of increased dynamic competition driving change and adaptability, but the result more likely reflects the reality that change is hard to achieve and that increased adaptability is not generated merely by the threat of potential entrants. This result, however, should be seen in the light of the findings at 5.2.10, where dynamic competition does show up as a positive variable with adaptability in a multivariate analysis.

Similarly, the results showed no relationship between adaptability and straightforward price competition. This contradicts the organisational strategy and textbook economics view that competition should prompt firms to adapt to remain competitive and survive. Overall, the results suggest that adaptability amongst SMEs is more strongly influenced by factors such as the propensity to introduce and implement innovations and the degree of customer focus (Nooteboom, 1994). The result also supports the view (Gray, 2002) that many small firms do not have time to reflect or learn effectively from their experiences and that they are reluctant to introduce changes until forced to do so by circumstances.

Indeed, the results tend to support the organisational ecology position that the effects of competition show themselves more at the macro level through competition with new organisations better suited to external demands replacing those that become incompatible with the environment.

5.2.9 Adaptability by business segment

The result that the business services and computing sector was more adaptable than manufacturing and construction may reflect the typically lower infrastructures required for service industries and the inherent flexibility this may offer. In addition, service-sector firms are more likely to utilise the capabilities of individual employees, while manufacturing and construction companies tend to require more complex sets of tacit organisational capabilities that interweave the activities of individuals (Henderson and Mitchell, 1997). The result may also highlight the fact that the business services and computing sector contains a larger number of newer sub-industries and firms (from computer/video games to mobile ‘app’ developments and cloud computing facilities and offerings), likely to have a greater spread

of associated adaptability than among firms in established and declining industry sectors.

For some businesses now ('bricks and clicks' businesses with both stores and online sales, for example), it is getting harder for senior management to clearly identify in what industry and with which companies they are competing and the results need to be seen in this light. UK manufacturing companies increasingly design and distribute products in the UK and elsewhere, with manufacturing sub-contracted to China, India or Brazil, potentially improving their capacity and flexibility to respond to change. Business segments are still officially classified by, and so commonly thought of through, Standard Industrial Classification (SIC) codes. These were originally designed as descriptions of the processes used rather than aggregating things that are competitive products, or competition for similar resources. Chapter 3 detailed the fact that not knowing what business segment you were in was the largest source of non-response to the survey and the results here need to be interpreted in that light.

5.2.10 Adaptability and the total variable set

The results of the final regression model (4.4.10) showed that just four independent variables together (firm age, success in copying good ideas, speed of uptake of new technologies and a marker of dynamic competition) were reasonable predictors of the adaptability instrument. Moreover, the strongest predictor was success in copying ideas, followed by speed of new technology take up, then firm age and the marker for dynamic competition. This result generally supports the overall findings and particularly emphasises the importance of, and the role of, both copying new ideas and the speed of take up of new technologies as having a specific association with adaptability. The result reflects the argument in 2.7.7.1 that innovation, even if expressed here as the copying of rather than the generation of new ideas, can be seen as an aspect of the adaptability of routines. Indeed, the relationship derived may demonstrate bi-directional causality, where the dependent variable of adaptability affects one or more of the independent variables and it may not be possible to identify which variable of adaptability and which aspect of innovation "causes" the other.

The sole difference from the rest of the analysis arising from the regression model was the dynamic competition indicator (per cent revenues lost with the entry of a competitor of

similar size) showing up positively related to adaptability when combined with the remaining variables in the model, but with no association when measured on its own. This may appear as a positive independent variable in the regression analysis because the fear of competitive entry for many firms may only have a significant impact after the actual event in stimulating businesses at least to try and catch up in the easiest and quickest way by copying good ideas and embracing new technologies.

5.2.11 Summary

In summary, the pre-recession survey of firm adaptability found that, for the sample as a whole, adaptability is positively associated with firm age but not with firm size by either turnover or profit levels. Congruence of routines is associated with higher adaptability rather than higher inertia, although higher levels of formal procedures are not. Innovation is adaptive and contributes to longevity.

This research has demonstrated that both competitive selection and developmental adaptability combine to explain industrial change and those differences in adaptability between firms are of significance. The work shows how routines, when defined as behavioural tendencies, can be observed and measured and provides support for evolutionary economics as a useful tool for empirical enquiry**.**

5.3 Research conclusions - adaptability and survival during recession

If adaptability contributes to the survival of populations of SMEs in normal circumstances, the question was whether it mattered even more in a recession for survival, as the attribute should allow firms to respond more rapidly to rapidly changing circumstances. Or is the transforming force of competitive selection on populations of SMEs amplified in the suddenly shortened business cycle? Does age continue to correlate with adaptability and survival?

The explicit and implicit views of the literature on the effects of adaptability for survival during a recession were:

- **Textbook economics** says that the fittest survive and the weakest die, whether the swing in the economy is in the growth or recession phase while tending back to a stable position, and that adaptability is again largely incidental
- **Organisational strategy** takes the view that choosing and implementing the right strategy (often an ambidextrous one) within the recessionary environment can boost the chances of survival
- **Organisational ecology** implies that the process of adaptation that goes on through environmental selection at the industry or population level is speeded up during recessionary periods. In a recession, organisational inertia seriously prevents firms from adapting appropriately to sudden and extreme environmental shocks
- **Evolutionary economics** suggests that, even if the scope for adaptation is generally small, it is likely that the more adaptive firms possess some advantage relative to their rivals and this should remain an advantage during recession.

Organisational survival was defined both as a binary issue (survived/died) as well as a more nuanced set of outcomes and the challenge was to assess the relationship between adaptability and survival or demise. Once more, there was the opportunity to acquire a relatively large number of observations for quantitative analysis by re-surveying the original respondents for their survivability between the surveys and match this to their previously calculated adaptability 'index'.[39]

As noted in 2.9 of the literature review, Kitching et al. (2009) found few academic studies that address the causes, processes and consequences of adaptation during recession. Kitching also noted that the recession period under study had an irregular impact on industries, countries, regions and firms and that there was no single recession effect for businesses, nor any particular best practice to adopt in recession conditions applicable to all businesses. Recessions generate contradictory tendencies; for instance, declining aggregate expenditure and falling input prices. The research results reflected this with contradictory tendencies for the contributions of adaptability to the survival of populations of SMEs in recession.

[39] With all the bias that entailed, see 3.11 for details.

5.3.1 Survivability and age

The recession survey results reported at 4.9 showed that more years' trading led to better survival outcomes during recession, where age is again a proxy for some underlying differences between firms that are relevant to survival in the depths of a recession.

As before, there could be a more prosaic explanation for the age-dependency of survival in recession, accounted for by the heterogeneity of the population (Thompson, 2005). As a cohort of firms ages, so the risk set becomes increasingly composed of firms with the lowest propensity to exit, so the mean death rate for the cohort can decline with cohort age, even if the hazard rate does not decline with age for any individual firm.

5.3.2. Survivability and adaptability

The research findings at 4.9.3 were that the composite adaptability score did not have a significant relationship with survivability (either binary or by degree of survival). This runs counter to the conjecture made in Chapter 2 that the advantage of adaptability should confer even greater benefit during recession. Once more, this could be accounted for by the individual firm hazard rate declining with age and, at the population level, the less adaptable getting weeded out even faster in recession to leave a recession sample with an even lower spread of adaptability levels. Indeed, older cohorts of firms, with narrower spreads of average adaptability levels were over-represented in the second survey, reflecting the relationship between age and survival in a sample in which a significant shake-out of firms had probably taken place, given the non-response rate.

A look at the components of the adaptability instrument, however, revealed a stronger relationship between the degree of survival and the production aspect of the adaptability instrument. This suggests that a disposition towards, or preference for, adaptability in production contributes to better survival outcomes during a recession.

Firms that have the knowledge and experience of adjusting variable costs relatively fast and/or who are in a business with variable costs relatively large compared with fixed costs, survive better in recession and may better protect their cash flows against any declining

credit availability. This would include, of course, firms with potentially inferior long-run performance that do not get selected out but happen to have a short-term ability to flex variable cost and/or switch rapidly to more products or services better suited to changed circumstances.

5.3.3 Survivability and changes in revenues and profits and by business sector

As reported at 4.5.4, and consistent with all the theories discussed, survivability was significantly related to the percentage change in revenues between survey periods. Those experiencing the greater percentage decrease in revenues had less favourable survival outcomes. For older firms, however, this effect may be tempered somewhat by the degree of adaptability in production.

More surprisingly, the degree of survivability is not related to the percentage change in profits between the survey periods, contrary to the strict textbook approach in which profits are the key indicator of business health. The result may be because respondents had a better understanding of their monthly revenues and gross profits on an on-going basis, whereas pre-tax profits are likely to be significantly lagged and overestimated, especially for small firms where financial reporting systems are often inadequate.[40] Moreover, while profit is a key indicator of business performance, the generation of a profit does not necessarily guarantee survival. Profits do not necessarily coincide with the cash inflows and outflows of a business so that profits may be being generated while a firm suffers a short-term cash shortfall that kills it. The result may also reflect the fact that factors other than the reduction in profits (increase in losses) are important in determining survival outcomes in addition to the degree of adaptability in production.

Analysis of the data also showed no statistically significant differences in survivability by business segment during sharp recession. As described in 2.10, each recession has its own drivers and the 2008-10 recession generated contradictory tendencies both by industry and by firm size, so perhaps it is not surprising that survival rates did not significantly differ by business segment.

[40] This observation is based on the author's ethnographic experience of some 500 such firms as a Business Link business adviser.

5.3.4 Other factors in recession contributing to survival and was the credit crunch directly to blame for demise?

A follow-up qualitative survey of those who had gone out of business between the two surveys demonstrated the fatal hazard of a rapid and significant loss in revenues for whatever reason in firms that were unable to adjust their cost of sales and/or had relatively high fixed costs to variable costs. This complements the findings in 5.3.3 that flexibility in managing output is important and more important than attempting ambidextrous strategies. Short-term cash flow then swiftly became a problem, reflecting the conclusions of the Kingston study (2009), and stressing the impact of a dramatic reduction of cash at bank and/or straight revenue losses. No one reported business as normal that was destroyed by a cash flow problem because the bank withdrew facilities due to the credit squeeze. On the contrary, it was apparent from the responses that any lack of bank facility was due to the significantly reduced trading position of the company and the likelihood it would not survive in the short or medium term. There were also no reports that bad debts or late payments by customers caused problems and there were no significant non-financial effects contributing to business failure, other than the unhelpful fall in the value of sterling for importers.

The survey was too small and random to say anything quantitative about demise and age, size and adaptability but it did highlight the disastrous effects of short-term cash flow problems even on nominally profitable firms.

5.4 Conclusions about the research problem

The results challenge the role of selection only in explaining survival in populations of firms and confirm that adaptability is also important for firm survival. The research demonstrates that both competitive selection and developmental adaptability combine to explain industrial change and that those differences in adaptability between firms are of significance.

In a sharp recession, however, only the more adaptable – specifically in production – have an advantage relative to their rivals that can confer relatively greater longevity and

survivability. Other factors related to age contribute more strongly to survival than in non-recessionary times and, while adaptability still matters, the slightly lower average adaptability of populations of older firms masks the positive value of this aspect of adaptability in a recession.

The methodology demonstrated how routines, even when defined as behavioural tendencies, could be observed and measured. This is a novel aspect of the research that contests Buenstorf's view (2006) that, when defined as above, routines become non-observable and un-falsifiable. The methodology also involved a relatively large sample of observations of a representative set of small and medium-sized enterprises to address the lack of empirical work on datasets of a whole population of firms taken from multiple industries and sectors. The overall approach also made it possible to re-sample respondents in the depths of a recession 18 months later in order to look at the relationship between previously calculated adaptability and subsequent degree of survival.

The findings support the overall thrust of the dissertation that there is a false dichotomy presented in the literature between adaptation and selection and that they are not mutually exclusive. The findings help support the proposal that any evolutionary process that involves selection must also involve adaptation as well and that adaptation matters with regard to selection. The approach corresponds with recent developments in the theoretical framework known as Generalised Darwinism, discussed at 2.12 and fleshed out in the next section.

5.5 Implications for theory

The research results confront mainstream business economics with the fact that the concept of adaptability has been largely written out of the textbooks and they challenge analysis based solely on static, equilibrium-based theories of the firm. The approach shows that an evolutionary account can be formulated empirically to better accommodate the realities of firm behaviour and determine the implications as challenged by Winter (2005). In addressing Friedman's challenge, the work observes that there is no proper mainstream account of the role of developmental adaptability in explaining industrial change and that competition alone selecting the fittest for survival provides an inadequate account of the

industrial landscape. It is the combination of both competitive selection and developmental adaptability that explains industry change and any differences in adaptability between firms are of significance.

The results also challenge strategic choice theories to incorporate more comprehensively the concepts of inertia that provide real limitations on the implementation of a number of seemingly appropriate strategy choices. Trying to optimise competencies for survival in strategic textbook fashion may be a losing strategy without an understanding of the real capabilities of firms in terms of their underlying dispositions or propensities to act. Choosing a textbook strategic solution or a business consultant's strategic response may well lead to poorer outcomes if the firm has no real 'handedness' to implement the desired strategy. The result can help explain why ambidextrous strategies are hard to achieve in practice and why they carry such a high risk. The research also shows that high levels of adaptability do not automatically translate into high performance in outcomes such as revenues or profit. Indeed, trying to optimise for both performance and adaptability may be a losing strategy and longer-term survival may be better predicted by adaptability than profits. This is discussed further in the section on implications for commercial businesses at 5.6.2. While survival is partly a management problem that is potentially aided by better entrepreneurs and managers, there is still a substantial role for competitive selection that weeds out not only the incompetent as suggested by strategy theorists.

The results particularly challenge the organisational ecology view that inertia-disrupting organisational change leads to reduced performance and death – or at least the view that, even if inertia is relative and organisations do change all the time in some way, inertia slows change such that it outweighs adaptability. Innovation, especially when the willingness to try new ideas is matched by the ability to implement new ideas successfully, was shown to be survival enhancing, calling into question organisational ecology's focus on selection only. Finding a way for organisational ecology to better incorporate both selection and adaptation impacts might help provide a more complete account of industry change.

Within the Darwinian evolutionary approach, Chapter 2 discussed how the general concept of evolvability within organisational evolution modifies the standard Darwinian inheritance, variation and selection model to take account of the possibility that selection is not the only factor in evolution and that differences between firms might come about as a result of the

interaction of routines with the environment the firm finds itself in over its lifetime rather than from the distinct functioning of individual routines. The 'routines within a firm' framework, adopted here to look at how both developmental adaptability and competitive selection work together to explain industrial change, corresponds closely with recent developments in the theoretical framework known as Generalised Darwinism.

As discussed in 2.12, Generalised Darwinism is a general theoretical framework for understanding evolution in any complex system that involves inheritance by individual entities of instructions to replicate, some variation in those replicators and interactors and then selection of the consequent interactors in a population. The Generalised Darwinian approach insists that selection works on phenotypes, not genotypes, but it is logically independent of any biological frame of reference (Aldrich et al., 2008). For any particular branch of study, the particular explanations of the dynamic processes of inheritance, variation and selection have to be spelled out and it is within this overarching framework that Hodgson and Knudsen (2004) suggest that, for the economic domain, habits and routines are the replicators and firms are the interactors. While the approach of Generalised Darwinism has been a matter of dispute in the literature, (Witt, 2003, 2004; Cordes, 2006, 2007), the challenge has been to show that it can serve as a useful guide for empirical enquiry (Hodgson, 2010). The results presented here demonstrate just how the replicator/interactor framework can remove the dichotomy between adaptation and selection and how such a theoretical approach can indeed guide an empirical investigation that incorporates more of a 'bottom-up' approach and steer the operationalisation of a more abstract concept of routines.

A Generalised Darwinian view would also argue that, since inheritance mechanisms are missing from organisational ecology, addition of the replicator concept to organisational ecology would allow for a proper Darwinian selection process which accounts for inheritance (Dollimore, 2012), even if this involves some sort of Lamarckian inheritance.

5.6 Implications for policy and practice

The research findings have profound implications both for public sector policy analysts and civil servants as well as on the business and strategic management policies and implementation practices of the private sector.

5.6.1 Implications for public sector policy towards SMEs

A good starting point here is the stated aims of the Enterprise Directorate within the UK Department for Business, Innovation and Skills (2011) for boosting enterprise, start-ups and small business growth by helping small and medium businesses to start and thrive through:

- improved access to finance
- a more positive business environment which supports growth and ease of starting a business, and where new businesses and economic opportunities are more evenly shared between regions and industries
- a major programme to reform the way that people running a business get the information, guidance and support they need to start and grow a business
- building a more entrepreneurial culture, equipping people with the skills and ambition to start a business.[41]

The implications of the findings of this study for the above policies, especially in the recovery period as the recession slowly recedes, are:

5.6.1.1 Improved access to finance

The aim here is for more UK entrepreneurs and businesses, both start-ups and those wishing to grow, to be able to access the finance needed to enable greater levels of enterprise and innovative activities. Current UK Government initiatives include:

- the Enterprise Finance Guarantee Scheme, a Government-guaranteed scheme that facilitates additional commercial lending to viable SMEs unable to obtain a normal commercial loan because they have insufficient security
- the National Loan Guarantee / Funding for Lending scheme designed to reduce the cost of term loans, hire purchase agreements and lease agreements

[41]For completeness, there is a fifth aim: recognising and celebrating successful business through the Queen's Award for Enterprise.

- a proposed ‘Business Bank’ that would offer longer-term loans with a maturity of about 10 years that small businesses find hard to secure from high-street banks
- a mix of Government and private equity funds to fill in the ‘equity gap’ between £1m and £5m, where firms require more than Business Angels will lend but less than is usually of interest to Venture Capital funds.

The finding that older firms are more adaptable and that adaptability assists in longer-term survival, possibly more than maximising profitability, suggests that the effective application of funding requires a greater engagement with, and understanding of, the firm rather than a reliance on computer models or well-crafted business plans. Lending against or investing in a plan that maximises profits at the expense of adaptability might be more risky than it seems, especially in a recession where profitability can slip away very fast, and the flexibility to accommodate unexpected changes in demand (above or below forecast) and unanticipated disturbances in the supply chain and cash flow is a valuable attribute for survival.

An excellent, even professionally written, business plan designed to secure bank lending may also be a worse risk than it seems if execution of the plan requires substantial internal adaptation to make it work and the firm has no real propensity to manage such a transition. One well-established firm making electronic component assemblies that participated in the initial quasi-structured interviews on the survey pilot had excellent bank support for a change management process designed to reduce production cycle time. The owner, an accountant by training, was unable to get the long-established 25 man production department to implement the desired change, despite taking on a specialist to make it happen, and was increasingly unable to service the debt on his loan. By contrast, another firm interviewed that had been trading for 18 months making and selling new health food supplements, was unable to secure any bank or equity-gap financing despite the management team having a track record in business and a track record of rapid adaptation to market demand and product feedback, and despite having pre-orders for a range of innovative new products including a ‘vitality water’.

As the results also suggest that the entrepreneurship of the senior management team is one of the keys to adaptability and longevity, lenders might do well to insist that a business shows by whatever feasible and credible means possible that the owner and senior managers

have the staying power and track record to make the plan a success. This might be along the lines of the funding criteria of the Venture Capital community, where five of the top ten most important criteria have to do with the experience of the entrepreneur/Chief Executive Officer and the management team (Macmillan, Siegal and Narashima 1985). This approach may result in better justification for funding or for the refusal of funds and may make any investment, loans or equity, more secure through a greater probability of survival of the firm.

The research results also indicate that the willingness of the senior management team to take external advice is related to higher adaptability. This author's ethnographic experience of some 500 SMEs is that firms seek advice either when in trouble or when they have very specific issues (often human resources or accounting issue) to deal with, but they do not typically have non-executive directors. The research suggests that lenders might insist for everyone's benefit that the firms they finance take on a non-executive director. The UK Corporate Governance Code positively recommends that a smaller company should have a least two independent non-executive directors, although SMEs have no obligation to appoint them.

The finding from the recession survey that factors other than adaptability, notably cash-flow management, contribute more strongly to survival than in non-recessionary times supports the need for longer-term sources of finance so that sound businesses can better manage very short-term cash flow issues. Bank lending is by far the largest source of external finance currently used by businesses in the UK and the research supports the potential for longer-term loans with a maturity of 10 years or more that small businesses find very hard to source. Such financing has served well the Mittlestand, the small and medium-size companies in Germany, Austria and Switzerland, and its wider availability might help UK companies become more innovative and adaptable and so improve the chance of longer-term survival during which loans get repaid.

5.6.1.2 More positive business environment (better regulation for SMEs)

This policy is all about building a more positive business environment, making it easier to start a business and share economic opportunities more evenly between regions and

industries. Specifically, the aim is to make new regulations as small business friendly as possible to allow successful compliance. The current 'red tape challenge' campaign is asking businesses to say which regulations are working and which are not; what should be scrapped, what should be saved and what should be simplified.

The findings of this research have little to contribute to policies making it easier to start a business, as business start-ups and firms in their first year of trading were specifically excluded from the analysis. For the 'red-tape challenge', the findings here also have little to contribute other than the observation that what may be a burden for one firm may be reasonable corporate social behaviour for another, based on path-dependent preferences for compliance.

The policy of wishing to share economic opportunities more evenly between regions and industries is being implemented through the channeling of development money through Local Enterprise Partnerships – joint local authority-business bodies brought forward by local authorities themselves to promote local economic development and replacing the Regional Development Agencies. The finding of this study, that industrial change evolves through the mix of firm level adaptation and population level selection, serves as a reminder to development agencies that business deaths are as much part of the industrial landscape as business births. Progress comes from improving the balance of births over deaths so development effort is need both to encourage new business and help existing businesses improve their adaptability for longevity. Some of the funding aimed at supporting innovation and growth activities might well be spent encouraging and supporting the effective implementation of innovations as well as the generation of new ideas themselves.

5.6.1.3 Better and more targeted business support

The twin tracks of policy here are support through the online Business Link facility and the successor mentoring and coaching agencies as well as support from the Local Enterprise Partnerships. In particular, resources are aimed through the GrowthAccelerator programme, providing personalised support for high growth businesses that have the potential to achieve 20 per cent growth year on year, and through Mentorsme, a resource designed to provide mentoring services to SMEs.

The finding that adaptability and survival are related to both the willingness to take external advice and the associated willingness of senior managers to do things differently (but not with the number of senior managers brought in from other firms in the past 5 years) suggests that Government policy to encourage the use of external advice and guidance is likely to prove beneficial. The GrowthAccelerator programme, however, is focusing its efforts only on the estimated 26,000 companies in England that the Government says have genuine potential for rapid and sustainable growth, a small percentage of the millions of the country's registered businesses. The limiting eligibility criterion of 'high growth' for direct support, however, may be very limiting if high growth also means high risk and does not imply greater survivability, as indicated by the research findings. Indeed, any innovation 'premium' may well be wiped out by the potential liability of newness in a firm. Older firms with larger revenues will find it statistically more challenging to demonstrate the potential for 20 per cent year on year revenue growth than younger firms or recently started firms. There seems no reason why innovative activities designed to substantially reduce costs or refresh product lines that keep an existing firm and its associated employment in steady, profitable existence should not equally be eligible for sponsored advice.

For the Business Link website and national contact centre and for other government-sponsored advice and mentoring, the finding that firms have different and internally conflicting propensities to act suggests that standard text-book advice might sometimes do more harm than good. It may be worth making a sharper distinction between the mere presentation of business information, advice and guidance without some sort of health warning and advice that helps a firm think through the consequences of any actions based on the real 'handedness' of the firm for action in order to make better strategic trade-offs. Where BusinessLink East had previously asked firms about the benefits of accessing online advice (other than for a very specific issue) without Business Advisor support, many felt they lacked the skills to translate the information they were reading into practical action for their particular circumstances.

This author has experience of nine firms referred to the Manufacturing Advisory Service (MAS), funded by the Department for Business, Innovation and Skills, that provides initially grant-funded advice on streamlining processes, energy efficiency and general business improvements. In four cases, their advice was implemented and had a significant

impact on process times and costs (frame-making procedures, waste product reductions, sourcing and supply chain efficiencies and faster new product development). In the remaining five cases, however, the companies involved were not able to implement many or, in two cases, any of the technically appropriate and seemingly sound advice they were given. In one case, a small commercial bakery was unable to implement the process and procedure changes recommended simply because they had no processes at all for making such wholesale change. The advice from MAS, while comprehensive and relevant, did not address the implementability of the recommendations, or even recommend prioritized actions (in this case, better order quantity management and product line profitability analysis to assess a product's contribution to the bottom line) or suggest how at least these key actions could actually be put into practice. Similarly, a joinery firm fully accepted the benefits of re-organising their layout and stock-control so that work would flow faster and more cost-effectively, but found staff so resistant to change that the short-term risks to the business of making the change were perceived to outweigh the longer-term benefits and the plans were abandoned.

Without stretching biological analogies too far, just as the goal of pharmacogenetics is to maximise drug effectiveness while limiting drug toxicity based on an individual's DNA (broadly genotyping individuals so that genetic information can guide drug therapy decisions), so businesses may one day benefit more profitably from advice based on their own broad routine dispositions and preferences.

The research findings also have applications for the 'skills agenda' – the efforts to address the lack of basic skills among a large proportion of the UK workforce in comparison to other EU countries. The findings show that congruence of routines can assist adaptability and survivability and make the implementation of innovation more effective and efficient. If a non-linear rather than traditional, deterministic approach to innovation is beneficial, it is likely to be even more effective if the associated routine changes are also kept congruent. New technologies and the implementation of those technologies need staff in all areas of the firm to be trained to make them work and the research hints at the beneficial effects of new in-house, firm-specific skills development that ensures all the routines in all the constituent areas of the firm remain congruent and up to speed.

The Government's current training emphasis is on external qualifications such as non-vocational qualifications (NVQs) and NVQ-oriented apprenticeships. Under the skills agenda, there is also funding for senior management leadership skills development for eligible high-growth companies. The findings of this research suggest that support and encouragement for team or firm-wide training may prove more effective than just management development and that NVQ and apprenticeship training might have more impact on a business if they are more firmly linked to the changing routines and requirements of the business rather than just to a wholly external agenda.

5.6.1.4 Building a more entrepreneurial culture

The government's vision is for many more people in the UK to have the opportunity, aspiration and motivation to use their talent and initiative to be enterprising and to have an increased proportion of people starting a business through education and training, with the practical support coming from the other policy initiatives.

Although this research specifically excluded start-ups and firms in their first year of trading, the research findings of this study suggest the need for those planning a new business to be more realistic and conscious about the venture they plan, their own (path-dependent) dispositions for action, the need to take external advice and to continue to remain open to learning from others and from the employees they may take on.

The research also says that selection is still a powerful and dominant force and so entrepreneurs and entrepreneurial management teams, as well as early-stage businesses, need to be adaptable enough to consider changing their business model or even their business segment. Some well-known examples make the point. A young Chicago entrepreneur started a business manufacturing soap. When the soap was slow to sell, he switched to selling baking powder and, as a gimmick, included free chewing gum in every package. As the customers were more taken with the gum than with the baking soda, William Wrigley reoriented the company to produce chewing gum. A more modern example is that of PayPal. Founder Max Levchin originally saw PayPal as a cryptography company and, later, as a means of transmitting money via personal digital assistants (PDAs). Only after several years trial and error did PayPal find its niche as an online

payment system. The transition was not without effort and the company frequently discussed whether or not to continue and/or change business models, but their flexibility in the end proved to be their major asset. One of the pilot study interviewees was very proud that he started out selling anti-bacterial hand gels directly to corporations. When an investment bank said it did not want the gel as such but wanted it included in a personal survival kit for every staff member, he sourced and won the contract for personal survival kits, now the basis of his flourishing business.

The research results also hint that policymakers might want to promote 'intrapreneurship' as well as entrepreneurship, where employees become inside entrepreneurs and transform innovative ideas into better processes or profitable product lines or services, while operating within the firm. Well-known examples are Post-It notes from 3m, the Sony Playstation, and the Java programming language from Sun Microsystems. Google is well known for allowing its employees to use up to 20 per cent of their work week to pursue special projects unrelated to their normal workload. Google claims that many of the products in Google Labs started out as pet projects in the 20% time programme. While it is undoubtedly more difficult for SMEs to find the time and the resources to permit such intrapreneurship, the findings of this research point to the importance of cautiously developing embodied knowledge in a firm as opposed to trying to implement wholesale change imposed by an entrepreneurial leader (Hodgson and Knudsen, 2010).

5.6.2 Implications for commercial businesses

The key implication for commercial businesses arising from this study is also that, although adaptability is important for company survival, it is important to be aware that selection is a powerful and dominant force at the population level. But the search for greater adaptability might help postpone being cut down by the scythe of selection, especially if strategy is focused away from traditional strategic thinking about building market share or scale or a competitive product niche or the ability to be a low-cost producer, and success is redefined as the ability to adapt. A recent study by Reeves and Deimler (2011) demonstrates that market leadership is now not often correlated with profitability, with the probability of this being the case having dropped from 37 per cent in 1950 to just 7 per cent by 2007. Similarly, they report, the volatility of business operating margins, largely static since the

1950s, more than doubled by the 1980s, as did the size of the gap between winners (companies with high operating margins) and losers (those with low ones). Reeves and Deimler also say that the percentage of companies falling out of the top three rankings in their industry increased from per cent in 1960 to 14 per cent in 2008. The findings of this research strongly suggest that, instead of just being really good at doing some particular thing, companies must now also be really good at learning how to do new things and reacting fast, even to weak signals of change. This requires some sort of rapid prototyping not only of products and services but also of processes and strategies.

Although larger firms were not the focus of this study, they do provide clear exemplars of the point. For nearly a hundred years, no company commercialised the camera as successfully as Kodak, whose breakthroughs included the Brownie camera in 1900, Kodachrome color film, the handheld movie camera and the easy-load Instamatic camera. But Kodak's run ended with the advent of digital photography and all the printers, software, file sharing, and third-party applications that Kodak missed out on. Kodak tried diversifying into pharmaceuticals, memory chips, healthcare imaging and document management among other fields. As of this writing, Eastman Kodak is seeking several hundred million dollars in financing from hedge funds and other investors holding the company’s debt as it seeks to emerge from bankruptcy proceedings.

Research In Motion (RIM), long the dominant provider of smart Blackberry phones to business and, until two years ago, the overall market leader, has been overwhelmed by the ascent of Google's Android and Apple's iPhone. RIM was slow to realise the iPhone revolution that was taking place and mistakenly believed their tactile keyboards were under no real threat from large capacity touchscreen displays. RIM is now trying to sell cheap handsets and its BlackBerry Messenger service (which does not need a data contract to function) to countries such as Indonesia while it introduces its upcoming line of BlackBerry 10 smartphones. That product, however, continues to experience delays and by the time RIM gets around to introducing its own smartphone there will a clutch of more advanced products on the market, with buyers waiting to see what the latest version of the iPhone might offer.

A recent study of the impact of digital technologies on small firms in the audiovisual sub-sector of the creative media industries in the East of England (Dodourova and Randle, 2010)

shows that the dominant role of the owner/manager of a small firm can lead to a narrow strategic perspective, especially where owner/managers lack formal training or qualifications. Such strategic deficiencies can rapidly become a major disadvantage in a rapidly changing environment. Many firms in their study also demonstrated a serious lack of handedness for systematic search activities as far as new market opportunities are concerned.

The research suggests that dispositions for adaptability shape and are shaped by the way a firm experiences the world over time. The research also shows that high levels of adaptability do not automatically translate into high performance in outcomes such as revenues or profit. Indeed, trying to optimise for both performance and adaptability may be a losing strategy. The implication of this for owners and managers is for firms to be conscious of their enduring adaptability traits within the context in which they find themselves and so to make strategic and operational decisions that play to their preferential strengths where possible. The need is for conscious awareness that, if the market and customer environment change significantly in ways that really do not play to the dispositional strengths of the business, internal change to meet the changed circumstances is likely to be harder to achieve. Given the 'handedness' or preferences for action of a firm, the need is to work with them rather than against them. Choosing a textbook strategic solution or a business consultant's strategic response may well lead to poorer outcomes. It is not that change cannot be brought about; it will just be much harder and more risky, though not necessarily fatal.

Section 5.6.1 noted the lack of non-executive directors in many SMES and the ethnographic experience of this author is that taking strategic advice (as opposed to seeking advice on specific problems) is seen by SMEs as an admission of failure, whereas larger firm are both more willing to seek and to act on more strategic advice from consultants. The findings point to the advantages for adaptability and survivability of some combination of non-executive advice and external input on overall strategy.

The research also points to the benefits for firms of keeping routines as congruent as possible, whereas having a high level of formal procedures does not of itself seem to contribute to adaptability other, perhaps, when there are equally high levels of procedures in every area and they are all kept congruent. Recognising both the congruence of routines and

handedness for innovation may help a firm identify those aspects of change that are likely to be less accessible and better implement change and training that is more likely to improve the position of the firm. Certainly firms should explore the finding that adaptability is strongly related to success in copying new ideas and taking up new technologies in a timely fashion and not merely in creating new inventions or exploring disruptive technologies. At one level, a firm may also do well enough to just recognise how enduring are their dispositions and resulting capabilities for adaptability and so avoid strategic decisions based on unrealistic expectations of their capacity to change.

The results of the recession survey, that survival in a recession is related only to adaptability in production, expressed as the ability to adjust variable costs quickly so as to protect cash flows, points to firms sticking to the mantra common among bank managers that 'revenue is vanity, profit in sanity, cash is king'. While this is important during normal trading times, it becomes crucial during sharp recession and, as noted in 5.6.1.1, profitability can vanish rapidly as a recession bites. The flexibility to accommodate an unexpected fall-off in demand and unanticipated disruption from suppliers disturbances in the supply chain is a valuable attribute for survival, as is having a secure source of longer-term lending. Of the eight firms that responded to the survey of those that has gone out of business, all of them reported a rapid reduction in revenues for whatever reason, such that short-term cash flow became a problem, compounded in five cases by the unavailability of additional loan or overdraft facilities.

5.7 Limitations and delimitations

Section 1.7 and chapter 3 outlined in detail the major limitations of the research methodology and these are summarised below. This section also addresses how the study was bounded in scope.

5.7.1 Limitations

The main limitations of the study were detailed in chapter 3, which discussed issues arising from self-reporting on surveys, the representative nature of the population surveyed and the usable responses of the population as a whole. Specific limitations included:

- survey bias from the shape and nature of the questions
- respondent bias
- goodness of fit to those in the actual business population in the region surveyed
- the limitations of the cross sectional design integral to the research approach adopted
- significance of the results: decision rules on significance of results help minimise errors but, even if tests show little/no correlation between adaptability and any other variable, this may be consistent with there being no relationship; but it may also be consistent with there being a relationship additionally affected by another characteristic.

Chapter 3 detailed the methods adopted in the surveys to minimise these issues and the statistical techniques chosen to reduce the chances of error, recognising that the task was to gather data about adaptability and survivability as they exist in the real world setting and not in a laboratory experiment. Nonetheless, the conclusions need to be considered in the light of the health warning of the limitations.

5.7.2 Delimitations

The delimitations of the study concerned populations of firms specifically excluded from the analysis, the nature of the routines studied and the theoretical approaches not pursued in this particular study because the focus of the research was on developing a new theoretical framework for looking at competitive selection and developmental adaptability. Specific delimitations included:

- the exclusion of larger firms (250+ employees) on the basis they are able to influence their environments and fend off some of the pressures of selection. Larger firms are also more likely to survive major external shocks, such that the relative role of selection maybe less significant for them (Lumsden and Singh, 1990)

- the exclusion of non-commercial organisations and professional bureaucracies on the assumption they are driven by a different set of priorities than strictly commercial enterprises
- the exclusion of start-up firms in their first year of trading on the assumption their routine dispositions are likely to be forming as they interact with the market
- no internal investigation of specific routines as a good deal of abstraction and simplification is required for any theoretical or empirical analysis in this area
- no direct use of complexity and self-organisation as a theoretical basis for adaptability or detailed analysis using multi-level group selection in order to focus on the adaptation/inertia/selection nexus debate between organisational ecology and organisational strategy from the different theoretical framework of evolutionary economics.

Without further research, it is hard to speculate how the conclusions reached so far might be different for the business specifically excluded. One might presume that larger firms can only postpone selection a while longer than smaller firms, given that only a quarter of firms in the FTSE 100 index when it was launched in January 1984 still remain in it (though some were relegated rather than merged or dead). As for professional bureaucracies, the experience of law and accountancy practices, for example, driven by both legislative and market pressures, is that survival is increasingly linked to size, where adaptability equates with willingness to merge (Brock, 2006). For firms still in their first year of trading, one would expect to find a wider range of adaptability than in the sample surveyed but also a larger percentage of business failures, with credit-rating agency Experian suggesting small business failure rates can be anything from 20–30 per cent within the first year.

5.8 Implications for further research

While the findings of this research point to the need for a different theoretical framework in which to view adaptability in the economic analysis of the firm, the results and the delimitations also point to opportunities for further empirical research. Over the course of collecting and analysing data for this study, a number of issues came up that suggested lines of further research:

1. **Repeat analysis** of the survey and adaptability instrument in another set of counties or nationwide or other countries to validate the results.
2. **Analysis by sector/industry** of a new study aimed at gathering such information to parse out the differences in adaptability and survival due to the industry phase.
3. **Analysis on non-commercial organisations and professional bureaucracies** to assess whether the different priorities that drive such firms rather than strictly commercial enterprises have any different impact on adaptability and survival.
4. **Analysis on sets of larger firms (250+ employees)** in order to test the proposition that they are less susceptible to selection pressures than small firms.
5. **Analysis of the adaptability of start-up firms** in order to assess initial conditions, where and how habits and routines are acquired and how these change over the early months and years.
6. **Longitudinal studies** that followed survey respondents over time to help determine relationships between variables that are not related to various background variables.
7. **Detailed qualitative investigation of the adaptability components** as a good deal of abstraction and simplification was required for this research.
8. **Examination of the causes of adaptability** as the research focused on the consequences of adaptability and only hinted at possible causes, an area worth investigation in its own right.
9. **Multilevel research** on routines to investigate the balance between the individualism that seems important for management decisions and strategic choices and the need to take into account both individuals and the structured relations between them.

5.9 Summary

The results challenge the role of selection only in explaining survival in populations of firms and confirm that adaptability is also important for firm survival. Both competitive selection

and developmental adaptability combine to explain industrial change and differences in adaptability between firms are of significance. The work demonstrated how routines can be observed and measured even when defined as behavioural tendencies.

In a sharp recession, however, only those with more adaptability specifically in their ability to flex their outputs have an advantage relative to their rivals that can confer relatively greater longevity and survivability. Other factors related to age contribute more strongly to survival than in non-recessionary times. At the individual firm-level during sharp recession, indirect competition through customers choosing not to spend, or spend scarce resources elsewhere, rapidly de-selects those with weak cash flow management, poor cash reserves or poor credit worthiness. At the population level during sharp recession, the effects of structural inertia that hinder adaptation when the environment changes are magnified and the mollifying effects of adaptability are reduced.

The findings of this research point to the merits of a different theoretical framework from textbook economics, strategy-choice theory and organisational ecology in which to view adaptability in the economic analysis of the firm - one based on operationalising the context-specific mechanisms of evolutionary economics under the umbrella of Darwinian evolutionary principles. They also suggest the need for further research that blends the abstract framework of evolutionary economics with an empirical look at the detailed processes of routines in real firms.

In addition, while Generalised Darwinism still requires substantial conceptual and empirical work, the findings of this research support the promise that Generalised Darwinism holds out of a comprehensive and workable evolutionary approach for the socio-economic domain as a whole.

-ENDS-

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APPENDICES

APPENDIX 1 – CONTACT TEXTS

1. 1 First SME Adaptability Survey 2008 e-mail text

I would very much like to invite you to participate in a survey to find out more about the adaptability and flexibility of SMEs.

I am researching a PhD at the University of Hertfordshire into how small businesses work. This study is purely for my research and is not sponsored by any company or commercial interest. The survey should take 10 minutes or less to complete and is just a series of tick boxes.

You'll find the survey at:

http://managed.surveyshack.com/s/TsVPxrA5RvUlIDU

and I think you'll find it both stimulating and enjoyable.

Rest assured that no information you provide will be given either to Business Link or the University of Hertfordshire and all information provided will be treated in the strictest confidence and in accordance with the Data Protection Act 1998 and only used aggregated with the answers of others.

If you have any questions or would like further information about this project, please call me on 07825-189263 or e-mail me as above.

If you are able, thanks so much for taking the time to help me.

Stephen Herman

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On the phone: 08457 17 16 15

1. 2 Follow-up Adaptability Survey 2008 e-mail text

SME Adaptability Survey 2008 - UPDATE ON YOUR BUSINESS CATEGORY

Thanks so much for attempting my survey on the adaptability of small and medium sized businesses.

I note that you have not been able to complete the survey because the list of business categories does not show your particular business or trade.

Because I am more interested in differences between the broad categories of manufacturing and services, the default category of "business services and computing" would be appropriate for a service or creative business.

If you are still willing, do please complete the survey using this default category at:

http://managed.surveyshack.com/s/yY.51vL6j432U1Q

If you stopped after the first question or page, you should be returned to the point where you left off rather than having to go back to the beginning.

If you have any questions or would like further information about this project, please call me on 07825-189263 or e-mail me as above.

If you are able, thanks so much for taking the time to help me.

If you have decided the survey is not for you, please accept my sincere apologies for mailing you again.

Stephen Herman

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1. 3 SME Adaptability Recession Survey 2009 e-mail text

Thank you so much for all your help and co-operation so far with this project.

As you know, I am interested in the adaptability of SMEs and the current recession provides a once-in-a-lifetime research opportunity.

I would really like to know how well (if at all) the more adaptable fare than the less adaptable in the current circumstances.

So I invite you to participate in a short supplementary survey to find out about this.
The survey consists of just 4 questions and should take just 1 minute to complete. Just go to:

http://managed.surveyshack.com/s/0NUaKfIrPlb2QWV

Rest assured that no information you provide will be given either to Business Link or the University of Hertfordshire and that the study is purely for my research and not sponsored by any company or commercial interest. All information provided will be treated in the

strictest confidence and in accordance with the Data Protection Act 1998.

If you have any questions or would like further information about this project or Business Link, please call me on 07825-189263 or e-mail me at s.herman@businesslinkeast.org.uk.

Thank you so much for taking even more time to help me.

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1. 4 Follow-up SME Adaptability Recession Survey 2009 e-mail text sent to those who indicated they had gone out of business between surveys

Re: telephone survey on business failures

Thank you for all your help and co-operation so far with my research on small and medium businesses during the recession.

I appreciate your openness in being willing to tell me you went out of business during the recession and I would like to follow up with a very brief telephone call to see if there are any common reasons why businesses failed.

If you are willing to participate, do please let me have a telephone number I can call you on and when is a good time to call. Or you may prefer to call me on 07825-189263.

If you would prefer to continue the discussion by e-mail, just let me know and I'll send you some questions you can answer in your own way and in your own time.

Either way, I do appreciate your co-operation and I will be able to feed back the collective results to you very quickly.

Rest assured that no information you provide will be given either to Business Link or the University of Hertfordshire and that the study is purely for my research and not sponsored by any company or commercial interest. All information provided will be treated in the strictest confidence and in accordance with the Data Protection Act 1998.

If you have any questions or would like further information about this project or Business Link, please call me on 07825-189263 or e-mail me at s.herman@businesslinkeast.org.uk.

Thank you so much for taking even more time to help me.

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1.5 Text of free form e-mail responses and prompt list for telephone interviews

Thank you for agreeing to talk to me about business failures in a recession. Please feel free to answer the following questions in any way you wish and just e-mail your observations back to me.

There seem to be two broad effects at work during this recession, "financial" effects and "others".

A. Thinking about the financial effects, in your own situation, which of the following caused you the greatest problems:

1. Lack of availability of bank loans or overdraft facilities
2. Late payments by customers
3. Bad debts
4. Reduced credit terms from suppliers

B. Did one specific problem lead to another?

C. Can you comment further on any of the financial issues that contributed to your situation?

D. Thinking about other issues, in your own situation, which of the following if any caused you serious problems:

1. Cost of materials or supplies
2. Falling value of the pound
3. Rising transport and/or energy costs
4. Loss of key staff

E. Where there any other factors like these you would like to talk about that contributed to your troubles?

F. Overall, what would you say was the single most important factor that contributed to the loss of your business?

G. Finally, can you just let me know:

a. What sector were you in?
b. What was your final annual turnover?
c. How many people did you employ just before the end?

Thank you so much for taking even more time to help me.

Rest assured that no information you provide will be given either to Business Link or the University of Hertfordshire and that the study is purely for my research and not sponsored

by any company or commercial interest. All information provided will be treated in the strictest confidence and in accordance with the Data Protection Act 1998.

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At Business Link we aim to ensure that you are completely happy with our service. You may therefore be contacted at some point by an independent organisation that we have commissioned to survey your level of satisfaction. You will be asked to rate our performance. If you feel less than delighted with our service please let me know urgently so that I can take immediate steps to rectify any issues.

APPENDIX 2

The SME Adaptability Survey

Thank you for agreeing to participate in this survey to find out more about the adaptability of SMEs and to see how competition and adaptability affect each other.

The survey should take around 10 minutes to complete and is just a series of tick boxes or drop down menus in four sections. Do please complete all the questions as this gives a much richer picture.

Rest assured that no information you provide will be given either to Business Link or the University of Hertfordshire and that the study is purely for my research and not sponsored by any company or commercial interest. All information provided will be treated in the strictest confidence and in accordance with the Data Protection Act 1998.

I hope you will find the survey both stimulating and enjoyable and I would really appreciate any comments you may have on the form and presentation of the survey.

If you have any questions or would like further information about this project or Business Link, please call me on 07825-189263 or e-mail me at s.herman@businesslinkeast.org.uk.

Thank you so much for taking the time to help me.

Stephen Herman

Here are some background questions to get you into the swing of things. There are eleven questions in this section.

11. *	What business are you in? *

Select

2. *	**How long have you been trading (in your current area of activity)?** *

○	10 years or more	○	6-9 years	○	3-5 years	○	1-2 years	○	First year

3. *	**Is the firm:** *

○	A Limited company	○	A Partnership	○	A Sole Trader	○	A Social Enterprise or Not-For-Profit Company

4. *	**Is the firm: (tick all relevant)** *

☐	Independent	☐	A subsidiary	☐	A Franchise	☐	A Family firm

5. *	**What band does your total revenue fall in?** *

More than £50m	£25m-£49.9m	£10m-£24.9m	£5m-£9.9m	£2.5m-£4.9m	£1m-£2.49m	Less than £1m
○	○	○	○	○	○	○

6. * What % of your total revenue is accounted for by the top 20% of your customers? *

	80%+		50-79%		26-50%		25% or less

7. * What distance accounts for the majority of your revenue? *

	25 miles		50 miles		100 miles		200 miles		Whole of UK		International

8. * What band do your pre-tax profits fall in? *

Loss	Breakeven	£0-£49,999	£50-£99,999	£100-£249,999	£250-£499,999	More than £500,000

9. * How many people do you employ? (Add part-timers to make full-time equivalent) *

Less than 4	4-9	10-24	25-49	50-99	100-250

10. * What % of the senior management team (or your equivalent) joined from another firm in the last 5 years? *

11. * **Are you:** *

- The owner/manager
- The MD/CEO
- Other senior manager or director
- Other (please specify):

The next section is about change and adaptability and also has eleven questions.

Now some questions about change and adaptability and what you actually do. There are eleven questions here and then you'll be half way through.

1. * **How easy does your company find it to adapt to a SIGNIFICANT change in your environment such as a major technology change or a new competitive product or a major new player?** *

Very easy	Quite easy	Neither hard or easy	Quite hard	Very hard

2. * **How easy does your company find it overall to adapt to the MORE CONTINUAL change going on around you?** *

Very easy	Quite easy	Neither hard or easy	Quite hard	Very hard

3. * **When you carry out important changes in the following areas (not just minor improvements), how easy is it to do?** *

	Very easy	Quite easy	Neither hard or easy	Quite hard	Very hard
Production matters					
Sales and marketing					
Admin/human resources					
Strategic issues					

4. * **When you make less important changes in these areas, how easy is it to do?** *

	Very easy	Quite easy	Neither hard or easy	Quite hard	Very hard
Production matters					
Sales and marketing					
Admin/human resources					
Strategic issues					

5. * What level of formal procedures does your company operate in these areas? *

	Very informal	Quite informal	Neither formal or informal	Quite formal	Very formal
Production matters					
Sales and marketing					
Admin/human resources					
Strategic issues					

6. * How frequently does senior management review what you do in these areas? *

	Very often	Often	Sometimes	Occasionally	Never
Production matters					
Sales and marketing					
Admin/human resources					
Strategic issues					

7. * **How adaptable are your employees to change in the following areas?** *

	Very adaptable	Adaptable	Somewhat adaptable	Not very adaptable	Not at all adaptable
Production matters	○	○	○	○	○
Sales and marketing	○	○	○	○	○
Admin/human resources	○	○	○	○	○
Strategic issues	○	○	○	○	○

8. * **How often have you tried to copy good ideas from others?** *

○	Very often	○ Often	○ Sometimes	○ Occasionally	○ Never tried

9. * **If you have tried to copy good ideas, how successful was this?** *

Very successful	Successful	Neither successful or a disaster	Not very successful	Not tried to copy ideas
○	○	○	○	○

10. * **How easy would it be to carry out a significant change in the organisational structure of the company?** *

Very easy	Quite easy	Neither hard or easy	Quite hard	Very hard
○	○	○	○	○

11. *	**When a new technology comes along, is your company one of the first to try it or do you prefer to wait and see how it will pan out? ***

Usually one of the first	Not first but still a relatively early adopter	Neither first nor last	Prefer to wait	Usually one the last
○	○	○	○	○

Management Style: These questions ask about the way you do things as a company.

1. *	**How often do you involve staff in: ***

	Very often	Often	Sometimes	Occasionally	Rarely
Production matters	○	○	○	○	○
Sales and marketing	○	○	○	○	○
Admin/human resources	○	○	○	○	○
Strategic issues	○	○	○	○	○

2. *	**How entrepreneurial/risk taking is the management? ***

Very entrepreneurial	Quite entrepreneurial	Entrepreneurial but risk averse	Nor particularly entrepreneurial	Entirely risk averse

3. *	How often do good ideas get implemented? *

Very often	Often	Sometimes	Occasionally	Rarely

4. *	How well do the various departments/functions work together? *

Very well	Well enough	Adequately	Not very well	Poorly

5. *	How often do you use an external consultant (other than an Accountant or Solicitor)? *

Very often	Often	Sometimes	Occasionally	Rarely

6. *	How good is the company at: *

	Very good	Good	Adequate	Not very good	Poor

Getting your staff to do things differently					
Changing your senior managers to do things differently					
Getting your customers to do things differently					

7. * **How much have you increased staff training over the last three years?** *

A great deal	A fair amount	Some	Not a lot	Not at all

Thank you for your responses so far. The last section is about your customers and competitors and has just ten questions.

Thank you for your responses so far - this last section has just ten questions on customers and competition.

1. * **How loyal are your customers in as much as they make frequent repeat purchases of your product or service?** *

Very loyal	Quite loyal	Neither loyal or unloyal	Not very loyal	Not at all/one off purchase

2. * How long is your average customer relationship? *

○	More than 10 years	○	7-10 years	○	5-7 years	○	3-5 years	○	1-2 years	○	once off

3. * Does your company experience intense competition where price is genuinely the main customer driver? *

Very often	Often	Sometimes	Occasionally	Rarely
○	○	○	○	○

4. * Has competition for what you do increased, decreased or remained about the same over the last three years? *

○	Increased	○	Remained about the same	○	Decreased

5. * If you have a competitive advantage relative to your competitors (one that is difficult to mimic, sustainable and superior to the competition) is it: *

○	A product or service advantage	○	A relationship advantage	○	Both	○	No real competitive advantage

6. **How far will you go to resolve problems with CUSTOMERS even at a small loss to yourself rather than lose a customer?**

○	A very long way	○	A long way	○	A fair way	○	Not very far	○	Not far at all

7. * **If nothing else changed, what % of your revenues would you lose if ONE additional competitor (about your size, with similar products and prices) came into your marketplace?** *

Select

8. * **What distance accounts for the majority of your competition?** *

○	25 miles	○	50 miles	○	100 miles	○	200 miles	○	Whole of UK	○	International

9. * **How long since you last introduced new products and/or services (not just improvements to or extensions of existing lines)?** *

○	Five years	○	Three years	○	Last year	○	In planning	○	No substantially new product or service lines

10. * **What level of price increase would cause your product to appear so expensive or such poor value such that you would lose at least 10% of your trade?** *

Select

Thank you for completing the survey.

No information you have provided will be given to Business Link or the University of Hertfordshire and all information will be treated in the strictest confidence and in accordance with the Data Protection Act 1998.

I hope you found completing the survey enjoyable. If you have any questions or would like further information about this project or Business Link, please call me on 07825-189263 or e-mail me at s.herman@businesslinkeast.org.uk.

Thank you for taking the time to help me.

Stephen Herman

APPENDIX 3

SME Adaptability Survey - Recession Update

Thank you so much for all your help and co-operation so far with this project.

As you know, I am interested in the adaptability of SMEs and the current recession provides a once-in-a-lifetime research opportunity.

I would really like to know how well (if at all) the more adaptable fare than the less adaptable in the current circumstances.

So I invite you to participate in a short supplementary survey to find out about this. The survey consists of just 4 questions and should take just 1 minute to complete (if you have not done so already!)

Rest assured that no information you provide will be given either to Business Link or the University of Hertfordshire and that the study is purely for my research and not sponsored by any company or commercial interest. All information provided will be treated in the strictest confidence and in accordance with the Data Protection Act 1998.

If you have any questions or would like further information about this project or Business Link, please call me on 07825-189263 or e-mail me at s.herman@businesslinkeast.org.uk.

Thank you so much for taking even more time to help me.

Stephen Herman

1 **How well have you survived (if at all) in your current line of business? ***

○	Survived more or less intact	○	Survived – but only just in the current line of business	○	Survived-but through an asset sale or merger in the same line of business	○	Survived by moving largely into a new line of business	○	Gone out of business all together

2	**How many years have you been (or were you) trading in your line of activity? ***
3	**If you survived, how much has your turnover increased or decreased over the last year? (A management estimate is sufficient here.)**
4	**If you survived, how much has your net profit increased or decreased over the last year? (A management estimate is sufficient here.)**

APPENDIX 4

Frequency Tables

Descriptives								
Adaptability								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Usually one of the first	94	2.1835	.59647	.06152	2.0613	2.3057	1.00	3.35
Not first but still relatively early adopter	395	2.3527	.59519	.02995	2.2938	2.4115	1.00	3.80
Neither first nor last	237	2.5034	.61214	.03976	2.4250	2.5817	1.00	4.30
Prefer to wait	162	2.5546	.63661	.05002	2.4559	2.6534	1.00	4.20
Usually one of the last	21	2.7333	.76098	.16606	2.3869	3.0797	1.90	5.00
Total	909	2.4193	.62229	.02064	2.3787	2.4598	1.00	5.00

Descriptives								
Adaptability								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Usually one of the first	94	2.1835	.59647	.06152	2.0613	2.3057	1.00	3.35
Not first but still relatively early adopter	395	2.3527	.59519	.02995	2.2938	2.4115	1.00	3.80
Neither first nor last	237	2.5034	.61214	.03976	2.4250	2.5817	1.00	4.30
Prefer to wait	162	2.5546	.63661	.05002	2.4559	2.6534	1.00	4.20
Usually one of the last	21	2.7333	.76098	.16606	2.3869	3.0797	1.90	5.00
Total	909	2.4193	.62229	.02064	2.3787	2.4598	1.00	5.00

Robust Tests of Equality of Means				
Adaptability				
	Statistic[a]	df1	df2	Sig.
Welch	8.581	4	123.998	.000
a. Asymptotically F distributed.				

NEW PRODUCTS

Descriptives								
Adaptability								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
five years	20	2.6100	.69917	.15634	2.2828	2.9372	1.00	3.60
three years	72	2.5069	.58816	.06932	2.3687	2.6452	1.45	4.05
last year	499	2.3218	.58456	.02617	2.2704	2.3733	1.00	3.80
in planning	158	2.4475	.62937	.05007	2.3486	2.5464	1.00	5.00
no new product/service	160	2.6319	.67308	.05321	2.5268	2.7370	1.00	4.20
Total	909	2.4193	.62229	.02064	2.3787	2.4598	1.00	5.00

Robust Tests of Equality of Means				
Adaptability				
	Statistic[a]	df1	df2	Sig.
Welch	8.071	4	110.929	.000
a. Asymptotically F distributed.				

Copy good ideas

Descriptives							
Adaptability							
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	Minimum	Maximum

					Lower Bound	Upper Bound		
very often	107	2.1322	.62394	.06032	2.0127	2.2518	1.00	3.60
often	244	2.3768	.55515	.03554	2.3068	2.4469	1.00	3.80
sometimes	367	2.4605	.58900	.03075	2.4000	2.5210	1.00	4.20
occasionally	127	2.5110	.65774	.05836	2.3955	2.6265	1.00	4.20
never	64	2.6422	.79533	.09942	2.4435	2.8409	1.00	5.00
Total	909	2.4193	.62229	.02064	2.3787	2.4598	1.00	5.00

Robust Tests of Equality of Means

Adaptability

	Statistic[a]	df1	df2	Sig.
Welch	8.240	4	256.737	.000

a. Asymptotically F distributed.

Success in implementing

Descriptives								
Adaptability								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
very successful	52	2.0048	.62804	.08709	1.8300	2.1797	1.00	3.80
successful	492	2.3503	.59085	.02664	2.2980	2.4026	1.00	4.20
neither successful or a disaster	268	2.5371	.58559	.03577	2.4667	2.6076	1.00	4.20
not very successful	34	2.6618	.54343	.09320	2.4722	2.8514	1.70	4.00
Not tried to copy ideas	63	2.6675	.78201	.09852	2.4705	2.8644	1.00	5.00
Total	909	2.4193	.62229	.02064	2.3787	2.4598	1.00	5.00

Robust Tests of Equality of Means

Adaptability

	Statistic[a]	df1	df2	Sig.
Welch	13.122	4	128.427	.000

a. Asymptotically F distributed.

Descriptives								
Adaptability								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
very entrepreneurial	158	2.1392	.60342	.04801	2.0444	2.2341	1.00	3.60
quite entrepreneurial	366	2.3193	.56054	.02930	2.2616	2.3769	1.00	3.80
entrepreneurial but risk adverse	281	2.5587	.58798	.03508	2.4897	2.6278	1.00	4.30
not particularly entrepreneurial	91	2.7753	.60930	.06387	2.6484	2.9022	1.00	4.00
entirely risk averse	13	3.1308	.90934	.25220	2.5813	3.6803	1.75	5.00
Total	909	2.4193	.62229	.02064	2.3787	2.4598	1.00	5.00

4
5

ANOVA

Adaptability

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	39.629	4	9.907	28.707	.000
Within Groups	311.989	904	.345		
Total	351.618	908			

6

HOW FAR GO RESOLVE PROBLEMS					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	A very long way	395	43.4	43.6	43.6
	A long way	352	38.7	38.9	82.5
	A fair way	146	16.0	16.1	98.6
	Not very far	12	1.3	1.3	99.9
	Not at all	1	.1	.1	100.0

	Total	906	99.6	100.0	
Missing	System	4	.4		
Total		910	100.0		

% REVENUES WITH ENTRY OF COMPETITOR					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	40-45%	75	8.2	13.7	13.7
	45-50%	19	2.1	3.5	17.2
	50-60%	41	4.5	7.5	24.6
	60-70%	73	8.0	13.3	38.0
	70-80%	92	10.1	16.8	54.7
	80-90%	113	12.4	20.6	75.4
	90-100%	135	14.8	24.6	100.0
	Total	548	60.2	100.0	
Missing	15	361	39.7		
	System	1	.1		
	Total	362	39.8		
Total		910	100.0		

		Frequency	Per cent
Valid	25 miles	241	26.5
	50 miles	161	17.7
	100 miles	99	10.9
	299 miles	28	3.1
	Whole of UK	225	24.7
	International	155	17.0
	Total	909	99.9

YEARS SINCE NEW PRODUCT INTRODUCTION					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	five years	20	2.2	2.2	2.2
	three years	72	7.9	7.9	10.1
	last year	499	54.8	54.9	65.0
	in planning	158	17.4	17.4	82.4
	no new product/service	160	17.6	17.6	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

INCREASE IN PRICE CONSIDERED TOO EXPENSIVE					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	45-50%	149	16.4	17.9	17.9
	50-60%	61	6.7	7.3	25.2
	60-70%	155	17.0	18.6	43.8
	70-80%	169	18.6	20.3	64.1
	80-90%	170	18.7	20.4	84.5
	90-100%	129	14.2	15.5	100.0
	Total	833	91.5	100.0	
Missing	15	76	8.4		
	System	1	.1		
	Total	77	8.5		
Total		910	100.0		

MANAGEMENT RISK TAKING					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very entrepreneurial	158	17.4	17.4	17.4
	quite entrepreneurial	366	40.2	40.3	57.6
	entrepreneurial but risk adverse	281	30.9	30.9	88.6

	not particularly entrepreneurial	91	10.0	10.0	98.6
	entirely risk averse	13	1.4	1.4	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

IMPLEMENT GOOD IDEAS					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very often	163	17.9	17.9	17.9
	often	454	49.9	49.9	67.9
	sometimes	255	28.0	28.1	95.9
	occasionally	30	3.3	3.3	99.2
	never	7	.8	.8	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

DEPARTMENTS WORK TOGETHER					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very well	342	37.6	37.6	37.6
	well enough	331	36.4	36.4	74.0
	adequately	205	22.5	22.6	96.6
	not very well	25	2.7	2.8	99.3
	poorly	6	.7	.7	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

EXTERNAL CONSULTANT USE					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very often	31	3.4	3.4	3.4
	often	76	8.4	8.4	11.8
	sometimes	165	18.1	18.2	29.9
	occasionally	151	16.6	16.6	46.5
	never	486	53.4	53.5	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

STAFF DO DIFFERENTLY					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very good	238	26.2	26.2	26.2
	good	411	45.2	45.2	71.4
	adequate	197	21.6	21.7	93.1
	not very good	52	5.7	5.7	98.8
	poor	11	1.2	1.2	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

SENIOR MAN DO DIFFERENTLY					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very good	218	24.0	24.0	24.0
	good	354	38.9	38.9	62.9
	adequate	235	25.8	25.9	88.8
	not very good	71	7.8	7.8	96.6
	poor	31	3.4	3.4	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

CUSTOMERS DO DIFFERENTLY					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very good	88	9.7	9.7	9.7
	good	309	34.0	34.0	43.7
	adequate	356	39.1	39.2	82.8
	not very good	126	13.8	13.9	96.7
	poor	30	3.3	3.3	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

STAFF TRAINING INCREASE					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	a great deal	80	8.8	8.8	8.8
	a fair amount	215	23.6	23.7	32.5
	some	277	30.4	30.5	62.9
	not a lot	171	18.8	18.8	81.7
	not at all	166	18.2	18.3	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

LOYALTY OF CUSTOMERS					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very loyal	407	44.7	44.8	44.8
	quite loyal	378	41.5	41.6	86.4
	neither loyal or unloyal	85	9.3	9.4	95.7
	not very loyal	25	2.7	2.8	98.5
	not at all/one off purchase	14	1.5	1.5	100.0
	Total	909	99.9	100.0	

Missing	System	1	.1		
Total		910	100.0		

LENGTH OF AVERAGE CUSTOMER RELATIONSHIP					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	more than 10 years	157	17.3	17.3	17.3
	7-10 years	127	14.0	14.0	31.2
	5-7 years	203	22.3	22.3	53.6
	3-5 years	249	27.4	27.4	81.0
	1-2 years	132	14.5	14.5	95.5
	once off	41	4.5	4.5	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

PRICE AND COMPETITION					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very often	154	16.9	16.9	16.9
	often	201	22.1	22.1	39.1
	sometimes	240	26.4	26.4	65.5
	occasionally	153	16.8	16.8	82.3
	never	161	17.7	17.7	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

STATUS OF COMPETITION					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	increased	469	51.5	51.6	51.6
	remained about the same	401	44.1	44.1	95.7

	decreased	39	4.3	4.3	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

TYPE OF COMPETITIVE ADVANTAGES					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	a product or service advantage	237	26.0	26.1	26.1
	a relationship advantage	262	28.8	28.8	54.9
	neither	410	45.1	45.1	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

EASE WITH CARRYING OUT SIGNIFICANT CHANGE					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very easy	187	20.5	20.6	20.6
	quite easy	326	35.8	35.9	56.4
	neither hard nor easy	167	18.4	18.4	74.8
	quite hard	180	19.8	19.8	94.6
	very hard	49	5.4	5.4	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

NEW TECHNOLOGY - TRY FIRST OR WAIT AND SEE					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Usually one of the first	94	10.3	10.3	10.3
	Not first but still relatively early adopter	395	43.4	43.5	53.8
	Neither first nor last	237	26.0	26.1	79.9
	Prefer to wait	162	17.8	17.8	97.7
	Usually one of the last	21	2.3	2.3	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

SUCCESS IN COPYING					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very successful	52	5.7	5.7	5.7
	successful	492	54.1	54.1	59.8
	neither successful or a disaster	268	29.5	29.5	89.3
	not very successful	34	3.7	3.7	93.1
	Not tried to copy ideas	63	6.9	6.9	100.0
	Total	909	99.9	100.0	
Missing	System	1	.1		
Total		910	100.0		

COPY GOOD IDEAS					
		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	very often	107	11.8	11.8	11.8
	often	244	26.8	26.8	38.6
	sometimes	367	40.3	40.4	79.0
	occasionally	127	14.0	14.0	93.0
	never	64	7.0	7.0	100.0
	Total	909	99.9	100.0	