

Exploring Necessity-driven Entrepreneurship in a Peripheral Economy

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Abstract

The research explores intention formation for necessity-driven entrepreneurship in a peripheral region. Subjects of study are personnel at the Dounreay Nuclear Power Station in Northern Scotland. The United Kingdom Atomic Energy Agency's decision to close Dounreay will result in 1,500 employees/contractors (20% of local employment) losing their jobs over a number of years. With limited job opportunities in existing companies, those wishing to remain locally are being encouraged to consider starting new ventures. The research was designed to serve a practical role, informing design of entrepreneurship programmes for Dounreay's employees, and to provide a rare empirical study of necessity-driven entrepreneurship.

Most literature on entrepreneurship deals with the creation/exploitation of new opportunities among those with other choices; less is known about necessity-driven entrepreneurship. Shapero's work (1975, Shapero and Sokol 1982) on entrepreneurial intentions provides a displacement model thought to trigger intentions into action, and displacement could be a negative event making entrepreneurship necessary, as well as realisation of a positive opportunity.

Following a brief review of literature on rural entrepreneurship and the circumstances facing the workforce of the Dounreay Nuclear Power Station, an Intention Model that includes a consideration of displacement (Krueger 1993) is used to explore predictors of entrepreneurship in an investigation of necessity-driven entrepreneurial behaviour. The data are drawn from on-line and paper-based questionnaires completed by 384 Dounreay employees and contractors. The median age of respondents is 42, with 70% in their mid-career (ages 31 to 50). Scales are described for the measurement of entrepreneurial self-efficacy, desirability and intention; in addition to a measure of the individual's perceived urgency of need to find new work.

Quantitative analysis using SPSS/Amos provides insight into how those losing their jobs in this rural area respond to the relative immediacy of their circumstances, showing the importance of avoiding short-term economic dislocation. Structural equation modelling adds further support to the underlying Intention Model (Ajzen, 1991; Krueger, 1993 and 2000; Krueger et. al., 2000; Peterman and Kennedy, 2003; Shapero and Sokol 1982; Zhao et. al., 2005). Both desirability and self-efficacy strongly predict entrepreneurial intention, and they mediate the effects of gender, age and the presence of entrepreneurial role models. Economic displacement in the form of perceived necessity to find new employment is then shown to influence Desirability and Self-efficacy, but it also has an additional direct effect on Intention that those factors do not mediate. Impending necessity increases intention above and beyond the influence of entrepreneurial self-efficacy and desirability, and Desirability, Self-efficacy and perceived need for new employment together explain a substantial proportion of variance in entrepreneurial intention.

Findings enhance theoretical understanding of necessity-driven entrepreneurship. Lessons are identified for policy-makers/agencies who support would-be/new entrepreneurs in peripheral economies and for practitioners considering establishing ventures in such locations.

Keywords

entrepreneurship; opportunity; necessity-driven; intentions model; self-efficacy; desirability; peripheral.

Introduction

This research explores necessity-driven entrepreneurship in a peripheral region on the north coast of the Scottish Highlands. With the announcement that the Dounreay Nuclear Power Station will be closing, the local area faces the prospect of a steady economic decline due to lost jobs and payroll among a substantial population reluctant to leave its current way of life. The United Kingdom Atomic Energy Agency (UKAEA) has taken the position that entrepreneurship is necessarily an important element in any solution, creating a rare opportunity to understand the development of entrepreneurial intention in a well-defined population in adverse economic conditions.

The flow of this paper begins with a background on the challenge of using entrepreneurship as a solution in declining economic conditions, and explores some of the economic and social issues which both individuals and the wider economy need to consider and balance. Then a model found in the literature that explains the development process of entrepreneurial intentions is presented, calling attention to prior research that has been successful in representing how attitudes and experiences predict entrepreneurial desirability and self-efficacy, and that these two factors in turn heighten entrepreneurial intention. However, except for a discussion of a likely role of displacement in crystallising entrepreneurial intention (Shapiro and Sokol 1982, Krueger 1993), little attention has been given to possible effects of economic circumstance on cognitive processes. This review leads to a statement of the central purpose of this research: establishing a linkage between conditions of economic necessity to the leading model of cognitive development of entrepreneurial intention. A methods section describes the survey process, the characteristics of the respondents, and questions asked about the respondent's need to find new employment, entrepreneurial desirability, self-efficacy and intention; and then uses a well-established entrepreneurial model to test a hypothesised structure of the role of economic necessity in predicting entrepreneurial intention. A concluding discussion considers the implications of some of the results.

Economic development in rural areas

The backdrop for Dounreay is a continuing evolution of rural business activities. Once the main source of food production and home to a sizeable share of the population during the 19th Century, rural areas experienced marked outward migration as new forms of production and wealth generation developed in, primarily, urban locations. Today a number of factors are reversing that trend and changing the nature of rural business as rural areas experience marked shifts in the balance of activity which have changed their physical and economic landscapes. Focusing first on the agricultural sector, the aggregation of farms into larger units, increasing mechanisation and the application of science to areas such as animal husbandry and plant breeding are continuing to change the economics of farming areas. Such developments have been insufficient to enable some farmers to focus solely on traditional forms of agricultural activity to generate an income capable of supporting them and their families. Farm diversification has become an increasing trend as farmers and their families have sought to develop other revenue streams (Hjalager, 1996; Carter, 1998; Chaplin et al., 2004). Some have turned land over to develop golf courses and driving ranges, while farmers' wives/partners have started tourist-based activities, such as bed and breakfast lodgings and converted former farm labourers' cottages into holiday homes (Hjalager, 1996). More closely aligned business streams have emerged, such as those based around agricultural produce, with speciality ice-cream, yoghurt and cheese proving popular. Increasing numbers of farmers are also capitalising on organic output to cater for changing consumer tastes. The advent of farmers' markets as a direct route to market, cutting out the middle men, have made farmers increasingly aware of changing tastes and market opportunities.

Rural areas are also home to many other service-based and manufacturing businesses. Some local development agencies have established small-scale industrial estates and business parks in rural areas to attract the growing band of people who recognise that running a business from a rural location is both desirable and feasible (Cooper 1996). Some of those running rural-based businesses are locals, but increasing numbers are in-migrants, many of whom have opted to move away from heavily built-up and congested areas in search of a better work-life balance and an enhanced quality of life (Keeble 1987). Businesses which require little direct client contact lend themselves to rural locations, where the cost of business premises is significantly lower and marked improvements in physical transportation access and

infrastructure, coupled with enhanced information access and communications, reduce the liability of distance (Cooper, 2000).

In many cases rural businesses develop by recognising their limitations and advantages, undertaking economic activities that accommodate unavoidable physical and other limitations. For many rural businesses market access is particularly critical because of lower population densities. If the business caters to the local or passing tourist population access to a sufficient local or transient population is required. Where customers are located far away, management has to determine whether to deal with them directly or to work through distributors or other intermediaries. Firms whose products are bulky/heavy may be more constrained by the need to be near their customers, while firms whose products are low-weight/high-value may serve customers from distant locations. Many types of service-based firms are common in rural areas because they are relatively footloose in terms of from where they can operate so rural locations may fit their business model (Cooper, 1999). More generally, the rise of the Internet and other technological changes has made the operation of product and service-based businesses from rural locations more viable.

There are of course substantial disadvantages. Firms which require investment capital may experience some disadvantages, for example, if those investing in the venture prefer to be located near to their investment targets (Florida and Kenney, 1988; Mason et al., 2002). Even so, what appear to be serious limitations sometimes have solutions that while not eliminating difficulty, make it more manageable. Recruitment of appropriate staff may pose a challenge but many firms are proving that rural locales are able to provide viable operating locations. Such firms develop appropriate network relationships with those within and outside the area in order to enable them to operate effectively (Murdoch, 2000).

A natural consequence of some of these limitations is a majority of rural firms fall into the small and medium-sized category with fewer than 250 employees. Their ability to absorb large numbers of additional employees is likely to be limited by the size of their local or regional market. The aspirations of their founders towards business growth will also determine their likely size and capacity to provide additional employment. The entrepreneur who relocates to a peripheral/rural area may not wish to build a multi-million pound venture, preferring instead to establish and grow a successful business which will provide a comfortable income and lifestyle for them and their dependents. There are contrary examples, such as Norfrost based in the far north of Scotland, of very substantial businesses being developed in remote locations, but they are few and far between.

On balance, rural entrepreneurs appear to be relatively adroit at recognising opportunities that can support smaller companies in areas with lower population densities. A number of studies suggest that small firms operating in rural locations are just as innovative, if not more so than their more centrally-located counterparts (North and Smallbone, 2000), providing substantial hope that the Dounreay workforce might, indeed, find employment through local entrepreneurship over time. What makes the problem of Dounreay more daunting is its time scale and the fact that its rural location is such that the number of individuals involved exceeds the absorptive capacity of the local economy.

The economic and social effects of organisational closure in rural areas. Just as the emergence and growth of new economic activities often generates both wealth and employment, sectoral and organisational change can result in dramatic job losses which create both economic and social problems. When these job losses exceed by a substantial margin the capacity of the local economy to offer new employment, major disruptions are likely to follow. While the direct impact is felt by those losing their jobs, the knock-on, multiplier effects ripple outwards to influence the fortunes of suppliers as well as other local businesses which rely on employee spending, depressing the economy of the entire area. Decline in the steel industry, for example, saw thousands of jobs lost in locations such as Corby in the English Midlands while the closure of car manufacturing plants in the Midlands led to thousands of employees being made redundant in locations where relatively few alternative employment opportunities existed. The economic consequences were severe and extensive.

Major losses of employment from single organisations in rural areas are relatively rare but there is one sector in which, by its very nature, operating facilities tend to be located in just such areas, and those facilities have a limited life. The nuclear power industry has, traditionally, located its nuclear power plants in relatively remote locations, and their limited lifespan means that at some point they must be closed. The Dounreay Nuclear Power plant in the north of Scotland is one such site, currently undergoing closure and decommissioning.

Nuclear power, the economy around Dounreay and entrepreneurship

The Dounreay nuclear power facility was established in Caithness in 1955 as part of the UK government's fast breeder reactor programme (Dounreay Site Restoration Ltd, 2008). The location was chosen in part because of its location away from large centre of population. The original plan saw decommission and restoration of the site taking around 50-60 years (MacFarlane, 2007). Since the process started the target date has been brought forward on several occasions and currently stands at 2033 (www.power-technology.com, 2008).

Given that nuclear power has provided both wealth and local employment, decommissioning raises interesting issues regarding what might happen to both the local economy which will lose significant spending from the system, as well as the workforce. Dounreay supports over 2,000 jobs in Caithness and North Sutherland; this is split into around 1,000 people employed directly by UKAEA, approximately 800 people employed by sub-contractors undertaking work in support of site activities (MacFarlane 2007) and a further 220 people employed by the spend in the wider economy of the wages of the 1,800 people. Of concern is the low business start-up rate locally, as in 2004 and 2005, Caithness and Sutherland had the lowest rate of business start-ups per head of population in the Highlands and Islands Enterprise (HIE) area; however, a major contributing factor is the historic availability of secure, well-paid public sector employment, according to the HIE network.

The impact of the loss of these jobs on the skilled population, and the possible impact on local businesses in Caithness, where £67 millions are spent in the local economy by UKAEA (MacFarlane, 2007), is likely to be marked. In order to retain a skilled workforce and grow the economy to compensate for the closure of Dounreay it is vital that alternative sources of income and employment are found over the next 20 years.

Developing entrepreneurial intentions

Arguably those working in a public sector environment in an industry where risk is an anathema are not one's first choice of a population for entrepreneurship training. For many to embark on an entrepreneurial pathway requires a new way of thinking and the adoption of a new set of skills and approaches. Yet given the necessity to change, there is an opportunity to promote entrepreneurship by understanding how best to strengthen entrepreneurial intention.

The literature provides useful guidance on how this might be accomplished. There is an influential view that all intention develops in a two-step process, with social norms and personal values first influencing what career paths are attractive, and experience and training determining the confidence that individuals have that they can be successful in one or another work domain (Ajzen, 1991). This view has been pursued for some time in the entrepreneurship literature, as Bird (1988) argues that entrepreneurial intentions are influenced by beliefs and attitudes and Shapero and Sokol (1982) add that perceived desirability and feasibility are central to the intention to act. Today there is widespread support for the existence of what is called the Intention Model (Krueger 1993, 2000; Krueger and Brazeal, 1994; Krueger et al., 2000; Peterman and Kennedy, 2003; Zhao et al. 2005) that sees entrepreneurial intention as the result of individuals having both a desire to be an entrepreneur (Desirability) and a self-belief that they can perform the tasks necessary to become an entrepreneur (Self-efficacy). An interesting argument in this body of research to be considered below is a view that Desirability and Self-efficacy largely mediate whatever influence other factors might have on Intent. Put another way, such factors as personality, background and education influence Desirability and Self-efficacy, but are thought to have little direct effect on Intent.

While many education programmes seem to focus on making entrepreneurship more attractive, it is the element of Self-efficacy that is more often neglected. Confidence in one's abilities to perform successfully the tasks necessary in any activity are central to whether individuals initiate and pursue goal-oriented behaviours (Bandura, 1997). Whether or not an individual has high or low levels of self-efficacy is particularly important in determining whether they will undertake tasks in areas they perceive to be challenging and in which they will need to persist when faced by difficulty, a characteristic of most entrepreneurship pursuits.

What is less established is what role economic conditions play in intention development. Some of the earliest work by Shapero (1975, 1982) suggests the possibility that external forces can precipitate entrepreneurial intention and consequential action. As represented by Krueger (1993), after the formation of a desire to be an entrepreneur and a concomitant self-confidence that one can carry out the requisite activities, a first level of intention is formed and the individual begins to consider starting a company. Then this intention is heightened and

transformed into action by some form of displacement. The nature of the displacements is not detailed, but one might readily imagine it would include such events as the discovery of an important opportunity, the availability of funds to get started, some form of economic necessity or other factors that would displace individuals from their career paths.

This research seeks to explore the role of necessity in the Intention Model, bringing together the cognitive psychology of the individual and external economic conditions by including a measure of subjective perception of economic necessity to find new work. The plan of the analysis is to use survey data collected from Dounreay employees and contractors (henceforth "employees") to see if it conforms with the Intention Model, and/or whether there needs to be an adjustment in the Intention Model under conditions of economic necessity.

Method Overview

The research task, thus, becomes the study the development of necessity-driven entrepreneurship in a peripheral economy, applying the Intention Model to the special case of individuals facing serious decline in their employment prospects, and in so doing explore the role of economic conditions in the development of entrepreneurship. Specifically, the analysis will determine how individual characteristics and conditions shape the perception of economic necessity, and the role of necessity in shaping and increasing Desirability and Self-Efficacy for entrepreneurship. An important question to be addressed in the process is whether, like many other factors, economic necessity only influences Intent indirectly by its effect on entrepreneurial Desirability and Self-efficacy, or whether it also has an independent effect on current entrepreneurial Intent.

The approach used here will follow the precedent of others (Krueger, 1993, 2000; Krueger et al., 2000; Shapero and Sokol, 1982) on what concepts are studied and the method of analysis. Past research often uses entrepreneurial Self-Efficacy as a measure for Feasibility. Feasibility is thought to include both self-efficacy that one can perform necessary tasks, and some sense of expectation that if tasks was performed well the anticipated benefits will follow (Bandura 1986, 1997). One consequence of focusing on the self-efficacy aspect of Feasibility here is that this research has more direct application to the bulk of prior research that studies entrepreneurial intention.

A baseline model is created here by the construction of a series of linked hypotheses postulating that gender, age (used as a proxy for stages of career) and background presence of entrepreneurial role models predict entrepreneurial Desirability and Self-efficacy, and that the Desirability of being an entrepreneur and Self-efficacy in turn predict entrepreneurial Intent. As a further check on the standard model, the analysis also includes a test of whether Desirability and Self-efficacy mediate the effects of gender, age and role models such that these factors have no direct consequential effects on intention. Then the perceived Need for new employment is introduced into the model to show how it alters the operation of the Intention Model.

Method

In 2007, MacFarlane (2007) began discussions with the Dounreay facility management to conduct research that would identify the views of their workforce towards entrepreneurship. The purpose was both to provide research data for the study of urgency, and to use the results to design a course to be offered to their employees interested in learning more about entrepreneurship in September 2008. The survey was developed both for on-line administration and in the form of a paper questionnaire because of unequal access to the Dounreay on-line system. When the questionnaire was made available, Dounreay management actively encouraged employees and contractors to complete the survey instruments. Parallel discussions were carried out with union representatives who also encouraged their fellow workers to complete the instrument. Roughly 22% of the workforce completed the questionnaire, providing survey data on 384 individuals. Missing data was a serious problem in the survey because a gender question had been omitted despite the fact that it had been viewed as an important background factor in the study. After the cases with missing gender information are set aside, this study relies on data collected from 312 respondents.

Background characteristics and measures of concepts

Three types of background factors were included in the study that could be used for this purpose: gender, age, and the presence of entrepreneurial role models.

Gender. There is a substantial under-representation of women in the survey, with men constituting 68% of the individuals studied here. Further analysis found that the self-selection bias is particularly strong for older women. A question that was asked about the type of work the respondent was involved in finds that women are under-represented in technical fields, but there was very little difference in the proportion of men and women responding that they are involved in general management.

Age and stage of career. The individual's age is a useful indication of the stage of their careers. The median age of respondents is 42, with two-thirds of the respondents in mid-career (31 to 50 years old). One in every six is 30 years old or under, and the same proportion is over 50. It was assumed that those 50 or more years of age would be less interested in entrepreneurship because they are at or approaching an age where early retirement and other advantageous separation agreements are likely to be offered. However, individuals who had joined Dounreay early in their careers could have twenty years of service even though they are still in their forties. To identify where a cutting point might best be set, a question was used asking if they were perhaps not concerned about the Dounreay closing because they were close to retirement. Exactly half of those over 50, but also 11.9% of those aged 41 to 50, agreed or agreed strongly with that that this was the case. Given the 20 year window for the final closing of Dounreay, it appears that even many of those in their forties feel they might reach a time when early retirement might be available before they must leave. With this as background, and the complication of the under-representation of older women, the decision was taken to study age as a dummy variable comparing those under 40 with those 40 or over.

Role models and the entrepreneurial context. Entrepreneurial role models are available at all stages of the lives of individuals, but the relationship with entrepreneurial parents is the best documented. A consistent predictor of whether an individual pursues an entrepreneurial career is whether a parent has started their own business (Caryannis et al., 2003), but other individuals in the lives of the Dounreay employees could have started businesses. The survey asked whether the respondent's father, mother, or some other relative, their partner, one of their friends or neighbours and a fellow employee had started a business. When the number of different types of individuals the respondents know who have run their own businesses are summed one has a measure of the appearance of entrepreneurship in the social circles of each respondent, and the number is found to be quite high. In this sample at Dounreay, 29.2% have a father who had run their own businesses, 19.9% have mothers and 37.5% have other close relatives or family friends who had businesses at some time. A striking 44.6% of the respondents said they have a friend or neighbour who has run a business, 14.1% have a partner with a business, and 19.1% said that they have a colleague at work has that experience.

When the number of individuals in their lives who have run their own business is summed, 26.0% knew one, 21.8% knew two, and 27.2% knew three or more. These individuals have a rich source of knowledge and may have learned a great deal through the vicarious experience of watching others engage in entrepreneurship for some time. Only 25.0% knew no one in these categories who had run a business.

In addition to background questions and the presence of role models in their lives, this research creates scales from a few questions to measure the key variables in the Intention Model and the perception of economic necessity. Measures of Self-efficacy and entrepreneurial Intent consist of items used in past studies, and lead to similar results, while the measure of the Desirability of entrepreneurship shows its nature changes under conditions of necessity. The measure of perceived urgency of a need for new employment is new.

Entrepreneurial Self-efficacy. The concept of entrepreneurial self-efficacy reported on here has been used in the assessment of a number of university Enterprisers events (Cooper and Lucas, 2006). The first is modelled on the work of Lent and Hackett (1987) who studied self-efficacy for the pursuit of particular careers using questions about the individual's confidence that they know how to pursue a career. This approach has been used in the assessment of an on-going series of undergraduate entrepreneurship events, asking respondents to indicate their level of confidence that they "understand what it takes to start a business" and whether they could start a business if they wanted (Cooper and Lucas, 2006 and 2007). The alpha for this two item scale is .754.

Entrepreneurial Intent. Three items originally used in a study of MIT undergraduates in 2004 have since been used with some variations in a number of studies of students in the UK, the US and Australia with consistent results, generally finding that this scale enjoys Cronbach's alpha coefficients of just over .8. The items include a statement of immediate readiness ("If I

see an opportunity to start a company, I'll take it"), continuing interest ("I often think about ideas and ways to start a business"), and long term commitment ("At least once I will have to try mm and start my own company"). The alpha coefficient for these three items in this study is .804.

Perceived Need for New Work. While the long-term economic prospects in the Dounreay environment seem quite dim, not all individuals are equally concerned about their employment prospects, and how soon it will be necessary to find a new position. The measure of perceived urgency is used to assess how the objective economic conditions facing a substantial majority of the Dounreay workforce are seen by different individuals. Two items in a set of Likert agree/disagree items asked for agreement or disagreement to statements that "I need to find a new job as soon as possible," and "I will stay on in my current job as long as I can". The second item is reverse coded. The two items together had a marginal Cronbach's alpha coefficient of .679.

Desirability of Entrepreneurial Work. A scale has been developed and used to study the desirability of entrepreneurship for the assessment of a number of undergraduate entrepreneurship events held in the UK using the respondent's view of the attractiveness of different types of work (Cooper and Lucas, 2007). In past studies of undergraduates, factor analysis led to an entrepreneurship Desirability scale consisting of the first, third and fourth items shown in Table 1. Those undergraduates focused on forms of entrepreneurship that involve positions of ownership, either alone or with others, in small companies. In that research, employment in start-ups, self-employment and not for profit work were seen as something apart.

At Dounreay, however, simply being employed by a start-up appears to be a pursuit closely related to founding companies (Item 2, with a loading of .722), leading to the view that at Dounreay the concern for employment is in entrepreneurial businesses generally. All four items are used together to form a scale (with alpha = .758) to measure the form of entrepreneurial Desirability found here.

Table 1: Factor analysis of attractiveness of types of positions for Desirability scale.

	Component	
	1	2
Being a part owner and member of a management team in a small new company.	.797	
Being employed in a newly started venture.	.722	
Holding full ownership of a small and stable business that employs others.	.708	
Being on a small company management team working to grow and then sell the business.	.704	
Being self-employed with no full time employees.	.526	
Being the founder or co-founder of a not for profit organisation.	.467	
Retiring early on an attractive pension.		.814
Working part-time.		.669
Being employed in a large established company.		.477

Rotation Method: Varimax with Kaiser Normalization. Explained variance is 46.3%. First four items on the first component with loadings of .6 or higher are used to form a scale of desirable entrepreneurship. Cronbach's alpha for the bolded items = .758.

These measures are used to provide insight into how those at risk of soon losing their jobs in this rural area respond to urgency of their circumstances, showing how the need to avoid short-term economic dislocation influences the development of entrepreneurial intention. The analysis relies upon Amos, the SPSS structural equation modelling program (Arbuckle, 2007), to calculate standardised regression values that are used to test the goodness of fit of the proposed models. In a first step, the standardised regression coefficients are shown that support the applicability of the Intention Model to the Dounreay employees without regard for the role of economic circumstance. By showing gender, age and entrepreneurial role models have little to no direct effect on entrepreneurial intention, the analysis both supports the Intention Model and justifies deleting those relationships from the next model. Perceived economic necessity is then introduced into the model shown in Figure 1. It is first used to show

how the perception of urgency to find new work is influenced by background factors, and then how impending need for work changes the Intention Model.

Confirming the Value of the Intention Model as a Baseline

As a first step, the analysis determines whether the classic Intention Model fits the relationships found in the Dounreay data without a consideration of perceived economic necessity. The results (see Table 2) provide strong support for the Intention Model.

The first proposition of the Model is that Desirability and Self-efficacy together have a major effect on entrepreneurial Intention, and as demonstrated by the bolded standardised regression coefficients, the largest effects on Intention are found for entrepreneurial Self-efficacy (beta = .411, $p < .001$) and Desirability of entrepreneurial employment (beta = .318, $p < .001$). The relationship between Desirability and Self-efficacy (beta = .333, $p = .001$) is quite strong, and it is necessary to include this relationship to have a well fitting model. No comparisons can be made with prior research because this relationship is usually not reported in the literature. No assumption is made here about the possible direction of influence, leaving aside any causal inference that might be drawn about the relationship between these two concepts.

Looking at gender, age and the presence of role models, most of the relationships are relatively small. It is clear that the dominant relationship (beta = .354, $p < .001$) is that those who have a number of individuals in their lives who have run their own businesses have considerably higher levels of entrepreneurial Self-efficacy, believing that they know what needs to be done to start a new company and that they are confident that they can perform the necessary tasks. Interestingly the availability of role models seems to have little consequential relationship with Desirability (beta = .090, n.s.).

Table 2: Entrepreneurial Intention Model with Role Model, Age and Gender Effects

Independent variable	Predicted	b	Std error	beta	C.R.	p
Number of role models	→ Self-efficacy	.623	.093	.354	6.711	.001
Age 40 or over	→ Self-efficacy	.419	.266	.086	1.577	.115
Men	→ Self-efficacy	-.306	.283	-.059	-1.079	.281
Number of role models	→ Desirability	.051	.032	.090	1.595	.111
Age 40 or over	→ Desirability	-.087	.082	-.056	-1.058	.290
Men	→ Desirability	.001	.091	.001	0.014	.989
Self-efficacy	-- Desirability	.107	.018	.333	5.894	.001
Desirability	→ Intent	.397	.061	.318	6.555	.001
Self-efficacy	→ Intent	.164	.019	.411	8.467	.001

"--" is used to indicate that the direction of influence should not be assumed.

Chi square = 1.686, df = 4, $p = .793$, RMSEA = .000, PCFI = .267 and explained variance of entrepreneurial Intent is 36.4%.

A second suggestion in past research that has become part of the Intention Model is that background factors generally do not have a direct effect on Intention (e.g., Krueger, 1993). To test this suggestion, the three paths from Age, Gender and Number of role models to Intent are added to the paths shown in Table 2, and all path co-efficients are then recalculated. The results for the other paths are virtually identical to those in Table 2 and are not shown, while the standardised regression co-efficients for the three additional paths are reported in Table 3. The results support the view that these variables have no direct effects on Intent.

Given the small relationships found above in Table 2 between Age 40 or over and both Self-efficacy (beta = .086, n.s.) and Desirability (beta = -.056, n.s.), the absence of a direct effect of Age on Intent would be expected. As shown in Table 3, Age 40 or over does not influence Intent (beta = -.036, n.s.). Gender's relationships in Table 2 with Self-efficacy (beta = -.059, n.s.) and Desirability (beta = .001, n.s.) are even weaker, and it too has no relationship with Intent (beta = .012, n.s.). However, as noted above the number of role models has a very strong relationship with Self-efficacy, yet it has no consequential direct effect on Intent (beta = .052, n.s.). It can be said that Self-efficacy mediates the influence of the presence of entrepreneurial role models on entrepreneurial Intent.

Table 3: Intention Model with direct effects of role model, age and gender effects

Independent variable	Predicted	b	Std error	beta	C.R.	p
Number of role models	→ Intent	.036	.034	.052	1.065	.287
Men	→ Intent	.025	.097	.012	0.256	.798
Age 40 or over	→ Intent	-.070	.091	-.036	-0.763	.445

Adding these relationships to the model in Table 2 creates a saturated model. Statistics calculated after the Gender to Desirability path is removed. Chi square = .000, df = 1, p = .989, RMSEA = .000, PCFI = .067 and explained variance of entrepreneurial Intent is 36.7%.

The superiority of the standard Intention Model is tested by comparing the goodness of fit statistics of models with and without these three paths included. The models are over-all quite similar, and they both have statistics consistent with a well fitting model. The standard representation of the Intent model with only Desirability and Self-efficacy influencing intention has a Chi square of 1.686 with four degrees of freedom (a ratio of .422), p = .793 (where high p values represent good fit, RMSEA = .000 and the model explains 36% of the variance in entrepreneurial Intention. The second model is saturated with all paths, and can only be calculated for one degree of freedom if a path, in this case the non-significant path between gender and Desirability, is deleted. When the new statistics are calculated, the fit statistics have higher fit values (Chi square zero and one degree of freedom with a ratio approaching zero, p = .989, and RMSEA = .000). In this instance, however, the revealing statistics are that the explained variance of Intent remains at 36%, and the addition of these paths decreases the Parsimonious Comparative Fit Index (PCFI) from .267 to only .067. The addition of these paths makes no useful contribution to the model, and Desirability and Self-efficacy can be said to mediate the effects of the exogenous variables in the model.

Need for New Work and the Intention Model

The next step is to introduce the Need for New Work variable to see if it improves the fit with the Intention Model for Dounreay. The first result (Table 4) is that background factors have a considerable influence over how much urgency individuals feel about finding new work. Men and women seem similar (beta = .047, n.s.), but one must remember that there was a strong possibility of greater levels of self-selection to participate in the survey among women that could be minimising gender differences. The distinction between those who are under 40 years old and those who are older does affect perceptions of how immediately they must find new work (bolded, beta = **-.230**, p = .001), suggesting that many older employees are comfortable with waiting to see what develops. Why those with more entrepreneurial role models in their lives are more anxious about finding work (beta = .180, p < .001) is less obvious. One possibility is that those who have had more contact with entrepreneurship have a clearer view of the considerable time and work it will take to be successful, and they feel they must make an immediate start.

Other results involve role models, age and self-efficacy. The work by Bandura (1986, 1997) repeatedly points to the importance of an individual's experience in a domain of activity, and the additional value of vicarious performance, watching tasks being completed by others. While watching others perform tasks not be as important as taking on tasks yourself, it still can have a marked effect on individual self-efficacy. One would consequently expect those who have more work experience in general, and those with more contact with those engaged in entrepreneurship, would have higher self-efficacy. Dounreay participants in this study under 40 and who consequentially have less work experience are, as expected, less confident in their competence to pursue entrepreneurship (beta = .136, p < .05), and those with more relatives, friends and colleagues who have run their own businesses are considerably more confident that they could start a company (beta = .315, p < .001).

Need for New Work has a substantial influence on the core concepts in the Intention Model. It predicts Self-efficacy (beta = .218, p < .001), and Desirability (beta = .195, p < .001). Where it is easy to understand why a need for work would increase the desirability of starting or working in a start-up of one kind or another, the direction of the Self-efficacy relationship is problematical. One might speculate that those who have the confidence that they can pursue new work are more likely to face the fact that the need for work is real, which suggests that it is self-efficacy that contributes to perceived necessity and not the reverse.

Whatever the interpretation, the reader should note the double headed arrows in Figure 1 indicate that the model as presented here does not offer any evidence of the direction of influence.

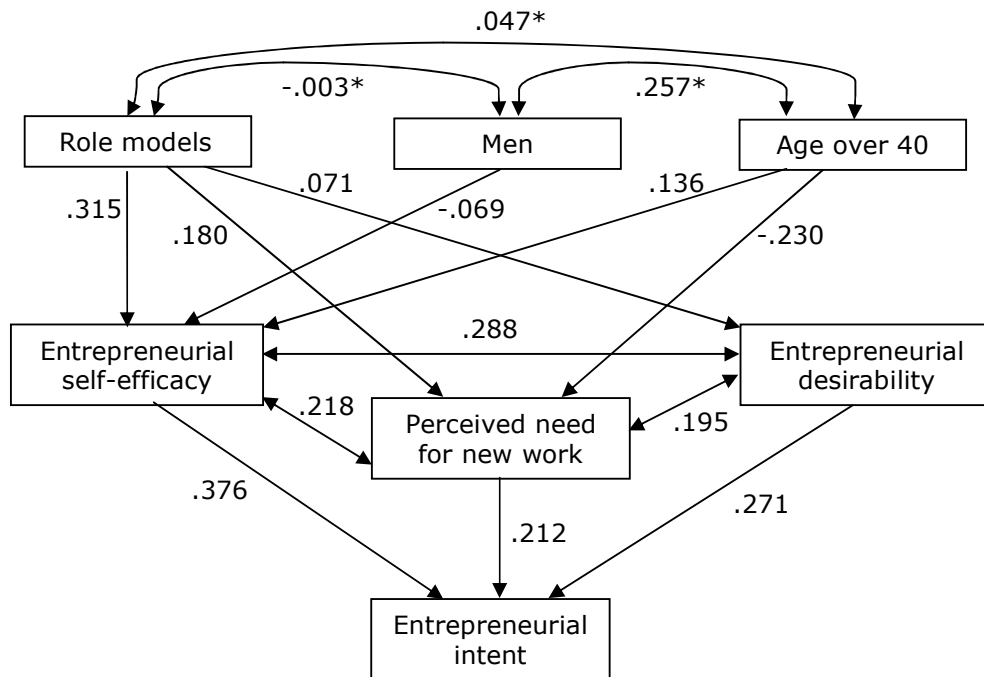
Table 4: Intention Model with Perceived Need for New Work

Independent variable	Predicted variable	b	Std error	beta	C.R.	p
Number of role models	→ Need for New Work	.128	.039	.180	3.299	.001
Age under 40	→ Need for New Work	-.454	.111	-.230	-4.078	.001
Men	→ Need for New Work	.099	.119	.047	0.838	.402
Number of role models	→ Self-efficacy	.544	.092	.315	6.020	.001
Age 40 or over	→ Self-efficacy	.663	.266	.136	2.498	.012
Men	→ Self-efficacy	-.360	.276	-.069	-1.300	.193
Number of role models	→ Desirability	.040	.031	.071	1.277	.202
Age 40 or over	→ Desirability	-.016	.083	-.010	-0.192	.847
Men	→ Desirability	-.019	.089	-.011	-0.208	.835
Need for New Work	--- Self-efficacy	.539	.132	.218	4.087	.001
Need for New Work	→ Desirability	.154	.044	.195	3.544	.001
Self-efficacy	--- Desirability	.092	.018	.287	5.047	.001
Desirability	→ Intent	.339	.060	.271	5.651	.001
Self-efficacy	→ Intent	.150	.019	.376	7.902	.001
Need for New Work	→ Intent	.209	.046	.212	4.590	.001

"---" is used to indicate that the direction of influence should not be assumed.

Table 4 shows the results when the variable Need for New Work is used to predict in turn Desirability, Self-efficacy and Intention and added to the relationships in Table 1. Chi Square = 0.670, df =3, p = .880, RMSEA = .000 and PCFI = .143.

Figure 1: An Intention Model with perceived Need for New Work



To estimate a best fit model, the paths Age → Desirability and Men → Desirability with standardized regression coefficients less than .05 are removed. The goodness of fit improves to Chi square = .751 (df = 5), p = .980. RMSEA = .000, and PCFI= .238. The explained variance in Intention = 40.4%. *Correlations among the exogenous variables.

Finally, Need for New Work is seen to be a consequential predictor of entrepreneurial Intent ($\beta = .212, p < .001$), a substantial effect that is not mediated by Desirability or Self-efficacy. It should be noted that the introduction of a new variable results in a decrease in the estimate of Self-efficacy's influence on Intent, dropping from a beta coefficient of .411 in the Table 2 to .376 in Table 3 after the Need for New Work is in the model. The influence of Desirability similarly drops from .311 in Table 2 to .271 in Table 3. A summary estimate of the value of this model is found in the R^2 of 40.4% of variance in Entrepreneurial Intent that is explained by Desirability, Self-efficacy and Need for New Work.

Testing for the direct effect of Need for New Work

To explore the importance of the direct effect of perception of Need for New Work on Intention, an alternative form of the Intention Model is postulated that includes Need for New Work and the other relationships shown in Figure 1 with the one exception: the direct path between Need for New Work and Intent is removed. It includes the Need for Work variable as a perception shaped by gender, age and role models, and as a predictor of Self-efficacy and Desirability, but excludes any direct effect on Intent. It thus takes the form of the standard Intention Model, with only Self-efficacy and Desirability predicting Intent.

In comparing the models, one must first remember that in the test of the fit of a model, the smaller the Chi Square, the better the fit. Further, a useful rule of thumb is that a model can be usefully evaluated by the ratio of the Chi square divided by the degrees of freedom (Arbuckle, 2007). The model in Table 3 has a Chi square for the goodness of fit of .670, three degrees of freedom, and a Chi square ratio of .223. Since it is well under 2.0, as well as having other satisfactory results reported in the notes of Table 3, this model would appear to be a satisfactory representation of the relationships among these variables.

When the goodness of fit of the model without the direct path between Need for New Work and Intent is calculated, the Chi square is 21.139 with six degrees of freedom, the Chi square/degrees of freedom ratio is 3.523, and the explained variation in Intent represented by the multiple R^2 drops to 36.4%. This is an unsatisfactory representation of the relationships in both absolute as well as relative terms when compared to Figure 1, so the predictive relationship from the Need for New Work to the Intent variable is important. In the economic conditions facing Dounreay employees, the perception that an individual needs to act expeditiously to find new work has a direct, unmediated effect on entrepreneurial Intent.

Discussion and conclusion

The issues raised in this paper include the suggestions of Shapero (1975), Shapero and Sokol (1982), and Krueger (1993) that displacement factors are important for understanding the development of entrepreneurial intention. This idea might be seen more broadly as a suggestion that economic conditions might influence the cognitive process of intention formation, and that the Intention Model might be used to bring together cognitive dynamics and economic circumstance. The decommissioning of the Dounreay Nuclear Power Station and the decision to promote entrepreneurship as a primary means of ameliorating that decision's economic effects on the local area provides a valuable opportunity to study the development of entrepreneurial intention in a rural area where entrepreneurship is an explicit strategy for finding work and other alternatives are limited.

While this study provides some insight into the role of displacement, it should be noted that one cannot address the temporal nature of the influence of economic displacement to see if it primarily plays a role later in the process of intention development as suggested by Krueger (1993). That is best done in a study of a panel of potential entrepreneurs at more than one point in time. Here one can only address whether perception of an exogenous economic condition outside the control of the individual shapes the standard cognitive model of entrepreneurial intent.

It should be stressed that the Intention Model is found to be a useful representation of the inter-relationships between both entrepreneurial desirability and entrepreneurial self-efficacy with intention. In the first step it supported a successful baseline representation of the development of entrepreneurial intention in a condition of economic necessity, broadening the empirical base of evidence supporting the importance of the model as a point of departure. The fact that it can be adjusted to include economic conditions suggests it is a robust scaffolding for future work.

The immediate practical value of this work is that it is being used to design a course on entrepreneurship to be offered at Dounreay. Having seen that necessity broadens the nature of desirability of entrepreneurship to include employment in start-ups, one can include attention to employee readiness to take on entrepreneurial tasks in start-ups led by others. Given that the explanatory power of necessity increases intention above and beyond that explained by its desirability, a training programme might pay attention to resolving some of the internal conflict that may then arise by addressing some of the negative aspects of entrepreneurship.

Equally, if not more importantly, one must support the development of self-efficacy. Looking at the importance of role models, if vicarious performance (and perhaps actual performance when the role model is a partner) has such an important place in the development of self-efficacy, it would appear that including performance of actual entrepreneurial tasks in education programmes would be even more effective. Any entrepreneurial education should concentrate on strengthening entrepreneurial self-efficacy, the confidence that they can perform entrepreneurial tasks by providing skills training and providing them with the opportunity to test those skills.

This work shows a promising line of research through the inclusion of perceptions of economic circumstance into the entrepreneurial Intention Model, with results that also have pragmatic value for entrepreneurial education. Further investment in the study of Shapero - Krueger (1993) displacement model seems warranted, particularly since it holds some promise of bringing an inter-disciplinary lens to an understanding of the formation of entrepreneurial Intention.

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