

Innovation and Organisational Size in Irish SMEs: An empirical study

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ABSTRACT

The aim of this paper is to conduct an empirical study of innovation incorporation in Irish SMEs, primarily from an organisational size perspective.

Changes in markets and in large organisation strategies have resulted in the need for SMEs to re-examine and modify their competitive strategies to increase innovation. Although there is some literature on innovation incorporation in SMEs, there is a lack of direct studies on this issue, with a reliance on related but indirect studies such as Reengineering and New product development in SMEs. Furthermore, there is a

paucity of studies and data on the innovation incorporation in different organisational size categories within SMEs.

This study uses a grounded SME innovation model developed from earlier studies as the basis of a questionnaire survey of 2086 SMEs in Northern Ireland. The results indicate that SME organisational size categories has a significant effect on innovation incorporation in relation to leadership, people and culture, TQM/CI, product and process and Knowledge and information management.

MANAGERIAL AND POLICY IMPLICATIONS

- Leadership is perceived as less visual, creative, innovative or proactive within the smaller company.
- Smaller firms face more problems with communications, resources and providing a working environment that makes their workforce more content.
- Smaller firms can compensate for their lack of strategic planning by being inherently flexible and close to the customer.
- Larger SMEs can more readily use knowledge and innovation in a systematic manner to increase innovation.
- Small firm's focus on operational issues can have a detrimental effect on people development.

Keywords: Innovation & SMEs, incorporation and organisational size, conceptual model.

INTRODUCTION

SMEs are becoming increasingly involved in global competitive markets, either as part of supply chains or due to expansion and growth (Cagliano et al, 2001). Niche markets, once the preserve of SMEs is being aggressively targeted by larger organisations, which have become more agile and responsive to more refined market segmentation. This pressure is particularly strong in more peripheral regions where indigenous SMEs have traditionally relied more on local markets and now find themselves ill-equipped to face market challenges of the need for growth and exports in a highly competitive environment. In addition to local government help, SMEs in these regions must “re-examine and modify their competitive strategies by fully incorporating innovation within their people processes and products (Ghobadian and Gallear (1997). Although there is some literature on innovation incorporation within organisational levels and activities (e.g. Vossen, 1999), there is a lack of direct studies on this issue, with a reliance on related but indirect studies such as Reengineering and New product development in SMEs. Furthermore, there is a paucity of studies and data on the innovation incorporation in different organisational size categories within SMEs.

Thus a number of key questions remain, for example, how can innovation be expanded beyond that of just a technical taxonomy to address a much wider view of innovation suitable for SMEs (Cagliano et al, 2001)? Moreover, can a wider view of innovation be evaluated within SMEs? There is also a need to avoid, where possible, any study being affected by different regional policies and infrastructures for innovation (Vossen, 1999).

Thus, any study, which can clarify these issues, will have a twofold benefit. Firstly, SMEs and local government agencies will be able to make more informed decisions in regard to targeting their scarce resources for incorporating innovation and hence increase competitiveness. Secondly, there will be a contribution to knowledge, from which models, methodologies and further studies can be developed.

The aim of this paper is to conduct an empirical study of innovation incorporation in Irish SMEs, primarily from an organisational size perspective. The study is within a single region, namely Northern Ireland, to minimise the effects of regional variation and to concentrate on a peripheral region in need of indigenous SME growth. The paper briefly reviews the literature, describes the innovation model derived from previous studies, the research methodology and the results and discussion.

DEFINITION OF INNOVATION WITHIN SMES

Zairi (1994) states “what makes innovation challenging is the fact that it is very difficult to agree on a common definition, and also to decide which firms are the most innovative and how to quantify innovation activity”. Peters & Waterman (1982) state “innovative companies are especially adroit at continually responding to change of any sort in their environments and are characterised by creative people developing new products and services”. Both of these definitions make reference to the terms change and creativity - they imply that innovation is the harnessing of creative ability within individuals and the workforce in response to change.

Tushman & Nadler (1986) refer to product and process innovation. They contend that “Innovation is the creation of any product, service or process, which is new to a business.....the vast majority of successful innovations are based on the cumulative effect of incremental change in ideas or methods”. It is a process of continuous renewal involving the whole company and is an essential part of Business Strategy and every day practice (DTI, 1998). Therefore, reflecting the above discussion, effective business innovation will be defined as the harnessing of creative ability within people and processes in an organisation, in response to customer and market led change.

INNOVATION IN SMES

Building on this organisational definition, innovation is discussed in relation to the general characteristics of SMEs, in order to identify the capabilities, which support innovation in small firms.

Innovation in relation to leadership, people and culture

The literature defines leadership as being of central importance to all organisations seeking to develop innovation throughout the organisation (Tidd et al, 1999). In SMEs developing innovation, leadership is especially vital for success for a number of reasons. In most SMEs the owner-manager or management has a larger influence effect when compared with large organisations (Hale et al, 1996). Thus the leader’s vision and drive must be focused on innovation if it is to be successfully incorporated in the organisation. Davenport and Bibby (1999) speak of the “entrepreneurial dynamism” which leaders in SMEs can instil in the behaviours of others in the

organisation. This effect instills a dynamic innovative culture within the organisation. Furthermore, SMEs can make rapid decisions when the leadership is dynamic and focussed on innovation (Voss, 1998). Ghobadian and Gallear (1997) stress that SMEs with leaders close to the action can act as the main innovative catalysts for change.

Ghobadian and Gallear (1997) state that “SMEs are more likely to be people-orientated than system orientated”. Throughout the innovation literature the central role of people and the ensuing culture this creates are continually identified as being the key to innovation (e.g. Voss, 1998, Schmidt, 1990). In this area SMEs must weigh up their basic lack of people resources against their increased flexibility and response. Furthermore, the SME leaders must go beyond autocratic control and facilitate empowerment amongst the SME workforce (Davenport and Bibby, 1999) and achieve effective two-way communications (Ghobadian and Gallear, 1997). Innovative ideas from employee’s ideas must be backed by planning and resource allocation and appropriate and timely reward systems (Ghobadian and Gallear, 1997).

Innovation in relation to processes, knowledge and continuous improvement

Scarce resources of people, materials, finance and other types must be carefully managed in organisations which seek to develop (Tidd et al, 1999). SMEs have a generic lack of resources and overall resource strategies and action plans. Gunasakeran et al (1996) states that “overall productivity and quality improvement strategies are lacking in SMEs”. Thus rapid decision making by inspired leaders can fail to incorporate innovative practice due to a basic lack of fundamental resources. Mosey et al’s (2002) research into innovation in SMEs showed that what they called “low growth incremental improvers” made poor use of knowledge and information,

especially external customer and market information, in comparison to innovative high growth SMEs. Effective knowledge and information management includes new knowledge construction, knowledge embodiment, knowledge dissemination and knowledge use/benefit (Demerest, 1997). Thus, knowledge and information management has the potential to be a catalyst for innovation within organisations. Voss (1998) considers close customer proximity and hence knowledge of the customer to be a key factor in innovation in SMEs. This knowledge will inform SMEs about potential product or service changes in their immediate market. When this knowledge is linked to that of rapid decision making then SMEs can make beneficial innovative decisions in a relatively short space of time (Wiele and Brown, 1999).

In innovative organisational change Gunasakeran et al (1996) and Bessant and Cafyn (1997) consider continuous improvement to be a fundamental step along the innovation pathway. Continuous improvement can thus lead to radical innovation where reengineering is attractive to SMEs who want to develop innovation, in that cross-functional activity occurs naturally within SMEs (Raymond et al, 1998). This process approach can enable SMEs to improve supplier compatibility with large organisations, where, for example, 50% of sales in manufacturing is generated by SME suppliers (Ghobadian and Galleary, 1997). Appiah-Adu and Singh (1998) suggest this more radical approach can lead to innovation in new product development: “business practitioners and executives of SMEs should combine innovativeness and product quality because such a combination is likely to result in higher levels of new product success rates”. Soderquist et al (1997) also sees Reengineering’s link with key customers as being supportive of radical innovation within SMEs. This view is

supported by Mosey et al's research where 90% of companies incorporating radical innovations were growing, compared with 45% of incremental improvers.

Innovation in relation to customers and the market

Appiah-Adu and Singh (1998) see the need for new product development leading to market differentiation as a major opportunity for innovative SMEs in competitive markets. Their research involving 500 SMEs concluded that "there is a strong positive link between the extent of adoption of innovation orientation and the degree of customer orientation in SMEs". In discussing the relative strengths and weaknesses of SMEs in regard to innovation Vossen (1999) identifies the ability to react rapidly, or even to anticipate, market changes as a key element of innovation. For most organisations market changes are reflected in the actions of their main customers (Tidd et al, 1999). SMEs must use customer-based knowledge to develop innovative products and services through a customer-pull approach (Temtime and Solomon, 2002) as distinct from the job-shop ethos. They must become closer to the customer and ensure they are making innovative use of privileged customer information. Soderquist et al (1997) points out that SMEs have little choice but to foster closer links with a very few key customers due to a lack of resources and increased market sector competition.

INNOVATION AND SME SIZE CATEGORIES

SMEs are frequently categorised as organisations below a given number of employees (usually 250 or 500 employees). However, there is lack of homogeneity within SMEs in this category beyond that of being different to large organisations. Although size

classifications within SMEs are not the sole differentiating factor, they represent a key factor and initial starting point for studying innovation incorporation in SMEs, which is not restricted to large-SME comparison studies.

Ghobadian and Gallear (1997) indicate that size classifications of SMEs “vary markedly”. For example, the European Observatory, produce a range of sizes which attempt to reflect that over 99% of EU and UK businesses are SMEs, representing more than 60% of the turnover and 65% of employment. Welsh and White (1981) encourage size classification studies within SMEs by stating that “a small business is not a little large business”, pointing out that differences exist in many areas. Furthermore, Cagliano et al’s (2001) study on world class innovative practices in a large-scale study of SMEs indicates substantial size effects within the 250-employee range. Thus innovation models for SMEs must be developed for SMEs, rather than accepting scaled down versions of large organisation innovation models (McAdam, 2000). Studies have shown that SME size classification affects behaviour, structure, decision-making, process development and leadership style, communications and change implementation, for example TQM (see Ghobadian and Gallear’s (1997) study of 5,279 UK SMEs with supporting follow up case studies). These findings were supported by Husband and Mandal’s (1999) study of the literature and conceptual model building for SMEs. Both sets of authors highlight the lack of studies with size classifications within SMEs. Therefore, size classification studies are essential in initially investigating innovation incorporation in SMEs, where innovation is seen as affecting the entire business.

A range of authors (e.g. Cagliano et al, 2001) using both large scale surveys and case based methodologies to investigate change in SMEs have used a number of different size classifications within both the 500 employee and 250 employee limits) - helpfully summarised in table form by Martin (1999). As indicated by Cagliano et al (2001), the size classifications are best set in survey work by firstly conducting exploratory studies of the data set across a range of size classifications, and secondly, by matching these classifications to those used in the literature, where possible, in order to increase the opportunities for comparative studies. The current data set and previous studies (Mosey et al, 2002) have shown that an upper limit of 250 employees for SMEs is appropriate (this limit is applied in most UK SME studies) given the structure of the organisations, the markets and the method of government grant apportionment. Therefore the size classifications chosen were, 1 to 25 employees; 26 to 50 employees; 51 to 200 employees and 200 to 250 employees.

PREVIOUS RESEARCH AND MODEL BUILDING

Previous exploratory EU funded research was undertaken (McAdam et al, 2000) to determine the keys issues involved in incorporating a wider definition of innovation, as derived from the literature, in SMEs. The research methodology was a combined quantitative and qualitative study. In the qualitative approach the research survey involved a study of 30 SMEs, all with less than 250 employees to investigate how innovation can be incorporated in SMEs. For this initial research the CENTRIM Innovation model was used to measure innovation. This model was initially developed for large organisations by the University of Brighton, with the wording adapted to be more suitable to SMEs. SME's were selected which had shown a high

level of growth and which had a commitment to ongoing change. The hope was that many of these companies would exhibit innovative practice. Information regarding company selection was sourced from government funding agencies.

In total 30 Companies were surveyed. The exploratory research programme involved the collection of two types of data - Qualitative data was obtained from the interviews with the Managing Directors and Management Teams. The analysis of these interviews was produced by the University research team (McAdam et al, 2000). Secondly, focus groups representing a 'diagonal Slice' through the organisation were asked to complete a questionnaire based on the model. On average 27 questionnaires per company were collected - 810 in total. These questionnaires were analysed using SPSS. In addition to feedback from the University research team, each business received a report on the questionnaire analysis.

Furthermore, Action Learning Sets were formed involving three clusters of the 30 organisations. These Sets were monitored over a two-year period to see how innovation had been longitudinally incorporated within the SMEs.

Based on this earlier research a conceptual model for innovation within SMEs in NI has been developed to "reflect the factors and influences forming the very fabric of an SME" as stated by Husband and Mandal (1999) in constructing a conceptual model based on existing research. The current model is shown in figure 1.

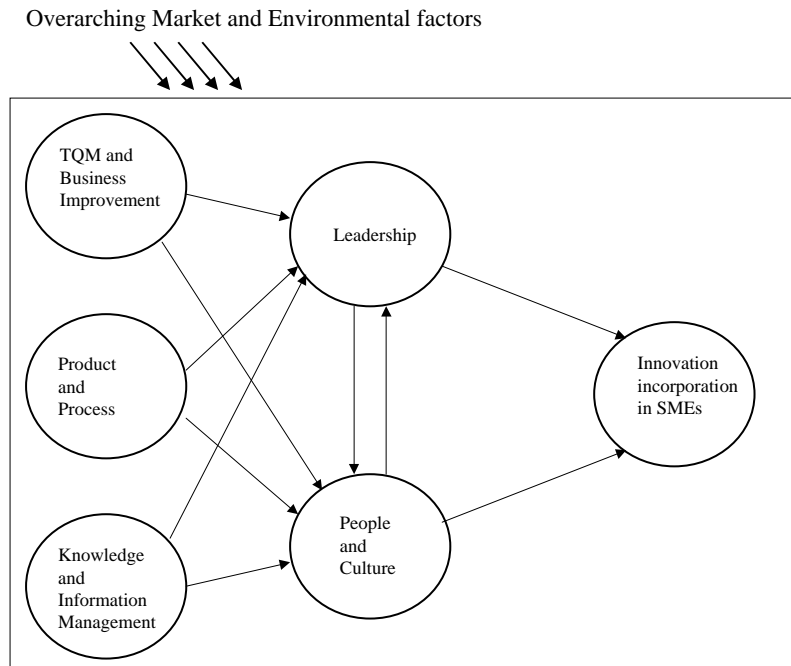


Figure 1 – The Innovation Model for SMEs

A survey questionnaire was developed from this model and the exploratory research to give a fuller and more specific representation of innovation incorporation in SMEs, as distinct from large organisation models being extrapolated to SME contexts. The current data set will be used to test and further refine this model (figure 1).

THE NEED FOR FURTHER RESEARCH

The discussion on the literature with regard to SMEs and innovation has revealed a number of points. First, most of the innovation studies on SMEs focus on national systems of innovation, rather than the processes whereby innovation is incorporated in SMEs. Second, innovation studies on SMEs are lacking in size classification data below the 250 or 500 employee mark and often are limited to SME – large organisation comparisons. Third, during a grounded model building phase an SME

specific innovation model has been developed. This model will require model testing. Finally, it has been found that the effects of SME size classification is a key starting point for examining the current data set in preparation for model testing.

RESEARCH METHODOLOGY

To address the aims and research questions of the paper it was decided that a large-scale postal survey approach should be adopted. This method was chosen as it is suited to model testing (Remenyi et al, 1999) and determining the effects of size categories within SMEs (Cagliano et al, 2001). Questions were derived for each section of the grounded model postulated from the exploratory research. Therefore, each question had been derived from a triangulation of case data, previous questionnaires and semi structured interviews in line with the suggestion of Remenyi et al (1999); a survey was carried out based on a questionnaire. Furthermore, the questionnaire was piloted in 10 SMEs and with 10 academics working in related disciplines, each with extensive SME experience. These pilot tests led to improvements in the wording throughout the questionnaire and removal and addition of some questions. The final version of the questionnaire contained 84 closed questions relating to each of the areas shown in figure 1, namely Leadership, People and Culture, Total Quality/Continuous Improvement, Product and Process, and Knowledge and Information. Issues relating to innovative practices and activities were examined within the context of the market environment. Physical business characteristics such as turnover, size, the number of employees and business sector were also noted. The questionnaires were designed using Formic (design and capture software) and SPSS for handling and analysis.

All SMEs in Northern Ireland (NI) with 250 employees or less, as determined from the Fair Employment register were surveyed (do we need to say this(registration is compulsory in NI). This amounted to 2086 SMEs. There was a usable percentage return rate of 19%. Given the absolute size of the sample, no attempt was made to increase the response rate as this size of response was considered to be representative of the main population as indicated by Remenyi et al (1999). Checks were made to confirm that the response rate was representative of the population in terms of industry grouping.

RESULTS AND DISCUSSION

The focus of this paper is to explore the innovative characteristics (within the previously identified areas) of companies within the context of the size of the company. Results follow the format of the questionnaire, using the reported practices within each of the following sections, (Leadership, People and Culture, Total Quality/Continuous Improvement, Product and Process, and Knowledge and Information). Within each section respondents were offered five options by way of a response, ranging from “Strongly Disagree” to “Strongly Agree” with a middle option indicating they neither agreed nor disagreed with the statement. For ease of interpretation each of the responses were recoded into a numeric format reflecting the five choice options ranging from $-2 =$ ‘Strongly Disagree’ to $2 =$ ‘Strongly Agree’. Mean scores were produced for each question within the five sections. A Pearson’s correlation coefficient was then used to measure whether a linear association existed between company-size and the answers to each question in the various sections

previously outlined. For brevity only those reported as statistically significant are reported.

Company size was recoded into four categories, depending on the number of employees: 1-25, 26-50, 51-200, 200-250. Table 1 shows the percentage breakdown of useable returns relating to company size.

Employment size	No. of respondents	Percent
1 to 25	49	12.4
26 to 50	139	35.2
51 to 200	153	38.7
200-250	54	13.7
Total	395	100

Section 1 – Leadership

This section contained thirteen questions relating to issues of leadership within the organisation. Table 2 contains mean scores (based on the underlying variables ranging from -2 to 2^1) and the level of statistical significance ($*=.05$, $**=.01$ and $***=.001$) of the correlation coefficient of being able to reject the null hypothesis that there is *no* linear association between the answers to each question and the size of the company.

Question 1 in the section dealing with Leadership in the Organisation asked respondents to rank the extent to which they agreed/disagreed with the statement that ‘the senior management makes a point of being seen around the organisation’. Overall the mean response to this question (with a score of -1.65) indicates that firms were

¹ Thus, an overall mean score of 0 signifies ‘neither disagree nor agree’, while a negative (positive)

somewhere between 'strongly disagree' and 'disagree'. Companies 200+ were less likely to disagree compared to companies employing between 1-200. Overall, the null hypothesis that smaller companies disagreed more strongly is accepted at the 5% significance level.

There are also strong (i.e. significant) associations between company size and the answers respondents gave to the questions on whether 'management fosters creative thinking and innovation in the company' (Q3), 'our top managers like to try new ways of doing things' (Q4) and 'management spend adequate time planning change' (Q5). With regard to the latter, large companies employing over 200 tended to agree with the statement while the smallest (employing 1-50) on average disagreed. In contrast, when asked to rank whether 'the rate of change in the organisation is quite fast' (Q7), perhaps not surprisingly smaller companies tended to agree (or be fairly neutral in their response) while the largest companies employing over 200 disagreed. Thus, there is a strong linear association with size for Q7 but this time in the opposite direction to that indicated in Q's 3-5. Interestingly, larger companies were also more likely to disagree with the statement 'the organisation is working to a clear business plan'.

Finally, in this first section, there was a significant relationship between firm size and the answers to the question "the management team doesn't seem to have the time to think constructively/creatively about the future": the smallest firms were more likely to agree, presumably reflecting their lower access to resources.

value is in the disagree (agree) range.

Overall the findings for this first section indicate that leadership tends to be seen as less visual, creative, innovative or proactive within the smaller company (up to 50). This is consistent with the findings of Cagliano et al (2001) who found that SMEs in this bracket are more operationally focused and dependant on “contingent and accidental factors”. In the companies with 200-250 employees the most important leadership issue was perceived as the failure to work within a clear business plan. Cagliano et al (2001) indicate that in this size bracket there is more of a focus on strategic development.

Table 2 – Mean Value of Responses to questions on Leadership in the organisation							
Company Size	Q1	Q3	Q4	Q5	Q7	Q8	Q13
	*	**	**	***	***	**	*
1-25	-1.65	-0.71	-0.43	-0.19	0.03	-0.30	0.91
26-50	-1.83	-1.05	-1.01	-0.50	-0.18	-0.31	1.01
51-200	-1.63	-0.48	-0.28	0.06	-0.28	-0.32	0.68
200+	-1.15	-0.40	-0.32	0.35	-0.88	-1.07	0.76
Overall	-1.65	-0.72	-0.59	-0.14	-0.28	-0.42	0.84
Level of statistical significance: *=.05, **=.01 and ***=.001							

Table 3 – Mean Value of Responses to questions on People and Culture

Company Size	Q1	Q3	Q5	Q6	Q7	Q10	Q11	Q12	Q13	Q15	Q16	Q17
	*	*	**	*	***	**	**	*	**	**	***	***
1-25	-0.50	-0.53	-0.65	-0.17	-0.47	-0.88	-1.08	0.48	-0.84	-1.00	-0.43	-0.65
26-50	-0.56	-0.74	-0.92	-0.42	-0.96	-1.03	-0.81	-0.01	-1.08	-1.13	-0.28	-0.43
51-200	-0.35	-0.23	-0.38	-0.17	-0.52	-0.43	-0.66	-0.23	-0.90	-0.84	-0.15	-0.13
200+	-0.06	0.29	-0.28	0.19	0.24	0.13	-0.38	-0.05	-0.19	-0.30	-0.13	0.31
Overall	-0.39	-0.35	-0.60	-0.21	-0.53	-0.60	-0.72	-0.03	-0.85	-0.89	-0.22	-0.21

Level of statistical significance: *=.05, **=.01 and ***=.001

Section 2 – People and Culture

This section contained seventeen questions relating to issues of organisational culture and change, communications and performance (including target setting). Again only those questions where there was a significant difference with respect to the size of the company are considered.

Question 1 asked respondents whether “there is a strong team spirit at all levels of the organisation”. Overall (see Table 3 last row) respondents tended to disagree with this statement, but particularly the smaller the company concerned. With respect to communications (Q3), larger companies (those employing 200+) generally agreed that two-way communication happened at all levels of the organisation, but smaller companies disagreed. In terms of what is expected of staff (Q5), on average respondents disagreed with the statement that “everyone knows what is expected of them”, especially those belonging to smaller enterprises (particularly those employing between 26-50). Larger companies tended to agree (or at least not disagree) that “the structure of the organisation facilitates change” (Q6), while smaller companies were less convinced that this was the case. In terms of Q7 (whether the organisation is not bureaucratic), small firms were significantly more negative on this issue and thus tended to disagree. Related to this (Q10: “there is a feeling of openness in this organisation”), smaller companies were much more likely to disagree that the firm was characterised by ‘openness’, while larger firms were generally neutral on this issue. Similarly, small companies were likely to disagree with the statement (Q11) that “the whole management team is competent”, while larger firms also had an overall negative response to this but with a score close to 0 (indicating a neutral position).

In terms of remuneration packages, Q12 asked if “bonuses are paid according to the organisation’s performance”, and the smallest companies (employing 1 – 25 staff) were more likely to agree with this while larger firms were relatively neutral in their responses. When asked if “overall, employees have access to all the resources needed to get the job done” (Q13), smaller firms were much more likely to disagree than were larger firms, reflecting greater resource constraints in smaller businesses. Q15 asked respondents to comment on whether the organisation was an enjoyable place to work, with smaller companies providing a significantly more negative response in reply. Similarly, smaller companies were more likely to disagree with the statement that “everyone in the company has a good grasp of how the organisation is performing” (Q16) and whether “employees get useful feedback about their work”. With respect to the latter, respondents working in companies employing over 200 were much more positive in their replies.

Overall in this section, there is evidence that smaller firms face more problems with communications, resources and providing a working environment that makes their workforce more content. In a related study Smith et al (2002) found that the smaller firm’s focus on operations led to a lack of people development and feelings of insecurity in relation to jobs and promotion.

Section 3 – Total Quality and Continuous Improvement (TQ/CI)

The questions in this section were clearly taken to be more appropriate for manufacturing operations. Moreover only 2 of the 13 questions asked resulted in a significant difference across companies with respect to size.

Q12 (Table 4) asked whether a number of financial benefits had been achieved from the TQ/CI programme. Overall, responses were generally positive although tending towards being neutral; however, the largest companies employing over 200 were more inclined to disagree that there had been financial benefits. Similarly, when asked if other business benefits had been achieved (Q13), smaller companies were positive (verging between neutral and agreeing) but the largest companies were more negative.

Table 4 – Mean Value of Responses to questions on TQ/CI		
Company Size	Q12	Q13
	**	*
1-25	0.43	0.36
26-50	0.39	0.36
51-200	0.23	0.20
200+	-0.26	-0.15
Overall	0.26	0.23
Level of statistical significance: *=.05, **=.01 and ***=.001		

Section 4 – Product and Process

This section concentrated on new product and process innovations and improvements, and therefore concentrated on the technological capabilities of companies.

Table 5 – Mean Value of Responses to questions on Product and Process					
Company Size	Q1	Q7	Q8	Q11	Q12
	**	***	**	***	**
1-25	0.46	0.74	0.53	-0.06	0.53
26-50	0.50	0.30	0.28	-0.50	-0.03
51-200	0.73	0.08	0.26	-0.99	-0.02
200+	0.81	-0.06	-0.22	-1.00	-0.21
Overall	0.63	0.23	0.25	-0.66	-0.02
Level of statistical significance: *=.05, **=.01 and ***=.001					

Q1 asked respondents to consider if “we are committed to making our existing products and services obsolete by introducing new ones”. Overall, there was agreement with the statement, with stronger commitment the larger the company. As to whether existing products/services had a high level of technology built into them (Q7), the smallest companies (employing 1 – 25 workers) generally responded that this was the case, with positive agreement declining with firm size with the largest companies tended on average to slightly disagree that technology standards were high. As to the sources of technology, Q8 stated that “customers are regularly involved in the development of new products and services”. Again, small companies tended to agree while the largest were significantly more likely to disagree. Q11 asked if “technology is important in this organisation”; generally companies tended to disagree with this statement, but much less so for smaller companies vis a vis larger companies. Finally, when asked if the products and services produced use better technology than competitors (Q12), companies employing 1 – 25 workers tended to agree, while larger companies were more likely to disagree (the more so the larger the company). This confirms that small firms tended to use technology to establish niches

through exploiting new ideas and through having to be more up-to-date in order to survive.

Overall this section suggests that small companies are more technologically innovative and that larger companies within the sample recognise the need to replace older, more obsolete products and services in order to maintain their competitive stance in the markets in which they operate. Thus, these results, in agreement with those of Cagliano et al (2001), suggest that the smaller SMEs can compensate for their lack of strategic planning by being inherently flexible and close to the customer and thus addressing product and process issues in new product development.

Section 5 – Knowledge & Information

This section contained fourteen questions relating to issues on the transfer and management of knowledge and information within the organisation. Again only those questions where there was a significant difference with respect to the size of the company are considered.

Table 6 – Mean Value of Responses to questions on Knowledge & Information in the organisation.						
Company Size	Q1	Q2	Q3	Q4	Q5	Q8
	**	***	***	***	***	**
1-25	-1.05	-0.59	-0.38	-0.15	0.04	-0.04
26-50	-1.22	-0.82	-0.63	-0.18	-0.07	-0.66
51-200	-0.98	-0.38	-0.28	0.05	0.22	-0.11
200+	-0.39	0.07	0.21	0.39	0.47	0.22

Overall	-0.99	-0.49	-0.34	0.00	0.14	-0.23
Level of statistical significance: *=.05, **=.01 and ***=.001						

Question 1 asked respondents whether “everyone is in possession of the information/knowledge necessary to do their job”. Smaller companies disagreed more strongly with this statement, (in particular the 26-50 employee group). Regarding the effective management of knowledge and information, question 2 asked respondents whether they felt “information/knowledge is effectively managed and used throughout the organisation”. Once again the (26-50) disagreed more strongly with this statement, whilst the 200+ company group reported a neutral to positive response regarding the use and management of information/knowledge. Regarding the capture and use of information and knowledge (Q3) the responses were very similar, with companies in the 26-50 category viewing this negatively whilst the larger the company the more positive their view on this statement became. Question 4 followed the capture and use of knowledge asking, “responsibilities for information/knowledge capture are clearly defined”. Again the larger the company the stronger the agreement. This theme was followed in question 5 “knowledge that employees hold in their heads is managed and captured effectively”. The larger companies unsurprisingly agreed more strongly with this statement although disagreement was less pronounced within the 26-50 employee category and was almost neutral/positive in the 1-25 employee category. Finally companies responded to the statement “lessons learned from daily experiences and projects are captured and disseminated”. Consistent with previous responses in this section larger companies reacted more positively to this statement although the 51-

200 employee category took a more negative to neutral stance. Again the 26-50 employee group disagreed more strongly with this statement.

Overall, as intuitively expected, the larger the company the more likely the management and use of knowledge and information was supported by clear structures both through the systems created and with clear guidelines regarding personal responsibility. These findings are consistent with those of Mosey et al (2002) who show that the larger SMEs can more readily use knowledge and innovation in a systematic manner to increase innovation within the organisations.

SUMMARY AND CONCLUSIONS

The aim of this paper is to conduct an empirical study of innovation incorporation in Irish SMEs, primarily from an organisational size perspective. The study has included a brief analysis of relevant literature; the construction of a conceptual model with the help of previous exploratory research and a large scale survey based on the model of SMEs in the Northern Ireland region.

A study of the literature reveals that there is a lot of information on national systems of innovation, however, there is a paucity of studies on how SMEs can incorporate the principles and practices of innovation. Furthermore, there are few studies that use size classifications within SMEs. Such an approach treats SMEs as a homogenous grouping and restricts studies to that of SME: large organisation comparisons and contrasts. Based on the literature and the earlier exploratory research a conceptual model of innovation in SMEs has been developed and then applied in this paper. The

key areas within the model were Leadership, People and Culture, Total Quality/Continuous Improvement, Product and Process, and Knowledge and Information and the overriding influence of the Market and Customers.

The first stage of model testing, investigating the effects of SME size in relation to innovation, has shown significant effects in a number of areas.

Regarding issues of leadership this survey supports the findings of Cagliano et al (2001) that smaller SMEs are more operationally focussed and depend on more contingent and accidental factors, whereas the larger SME (200-250) focussed more on issues relating to strategic development.

In relation to people and culture within the organisation smaller SMEs experience more difficulties with communication, resources and providing a working environment that make the workforce more content. This supports the findings of Smith et al (2002) suggesting that the small firm's focus on operational issues can have a detrimental effect on people development.

Section 3 addressed issues of Total Quality and Continuous Improvement. This section (although perceived as perhaps more appropriate to the manufacturing sector) elicited generally overall positive responses in terms of the positive benefits of the introduction of TQ/CI. Surprisingly the smaller SMEs reported that the positive effects of introducing TQ/CI in terms of financial and business rewards were greater than for the larger SME.

The final section examined issues relating to the management of Knowledge and Information. As expected the larger SME had in place structures to support the storage and movement of information as well as clear divisions for the responsibility of managing that knowledge. This supports the findings of Mosey et al (2002) who suggest that the larger organisation manages knowledge and information more systematically.

The findings of this survey highlight the differences in terms of how 'innovativeness' is incorporated into SMEs from small (1-25) to larger (200-250) companies. For policy makers and advisers who are responsible for the design of interventions to increase the innovative nature and competitive edge of the SME sector, it is vital that they take into account the range of practices and perceptions held by SMEs (according to size). This study has identified several important differences in terms of practices according to firm size that could potentially lessen the effectiveness of programmes or interventions introduced. One of the purposes of this survey was to examine the appropriateness of defining SMEs as one group with homogeneous practices. The survey sheds doubt on this approach, suggesting that a variety of interventions are necessary if advisors/policy makers intend to improve either innovative behaviour or competitiveness across all SMEs.

In terms of how innovation is incorporated into SMEs through the utilisation of the conceptual model, it has been demonstrated that size effects the practices used. The effects of SME size classification is a key starting point for examining the current data set in preparation for future model testing.

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