



EDUCATION FOR ENTREPRENEURSHIP AND INNOVATION: “MANAGEMENT CAPABILITIES FOR SUSTAINABLE GROWTH AND SUCCESS”

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Abstract: Entrepreneurship and innovation education has derived from established university curriculum and the context is set of concepts and tools used in the corporate world. The challenge of transforming a start-up company into a business success needs different capabilities. It goes beyond the development of an idea and writing-up a comprehensive business plan. This study analysed over 200 technology-driven companies which have been created under the formal requirement of a business plan competition since 1996. The objective was to identify drivers for innovation and success. From the results, an agenda of entrepreneurial and innovation education was derived and is discussed.

Keywords: entrepreneurship education; innovation management; business plan writing; management capabilities; continuous learning.

INTRODUCTION

Innovation and entrepreneurship are vital for a flourishing economy. Innovation is the production, diffusion and use of new and economically useful knowledge, a key factor for competitiveness and growth while entrepreneurship the process of business start-up, business creation and

growth, the entrepreneurial dynamism is key to economic renewal and growth. Stimulating entrepreneurship and practical invention should play a central role in the development of business and industry in our society. Students have to be aware of the importance of these drivers for prosperity which create the values and workplaces of the future. Hence it has become important

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in our knowledge society to guide the human capital in form of management capabilities, know-how, and inventive talent to foster entrepreneurship and continuous innovation. A report of the European Commission (2008) on entrepreneurship in higher education highlighted the importance of entrepreneurship education and the need to develop entrepreneurial capacities and mindset along learners. Further the report revealed that there is a gap between the current teaching methods used and those that are recognised as the most effective and relevant. In this paper we aim to show how this gap can be bridged.

Well known indicators of economic success are: firm entry and exit (turnover), and firm survival and growth. However, the survival and growth curve of new ventures in Europe often span fairly short periods and it seems that some entrepreneurs are not equipped with the capabilities to run and grow businesses in a sustainable way. We have observed since the late 1990 the dot-com bubble bursting, a hype establishing bio-technology companies and lately a run of launching businesses in the arena of web 2.0. Companies tend to be established in areas where growth is promised in a short timeframe, encouraged by VCs, Business Angels and strong media influence who look for a quick return on investment. How many dot-com's have survived? How many companies had the right talent on board to steer the company in turbulent times and the capabilities to undergo processes of continuous change? Useem (2001) categorised for example the dot-com business founders as 'opportuneurs' rather than entrepreneurs. The 'opportuneurs' objectives are different, decoupling wealth from contribution, replacing risk taking with risk faking, and exploiting external resources instead of following inner vision.

More and more companies are incubators which found their origin within university infrastructures triggered by university business plan competitions and supplementary centres of entrepreneurship. Therefore entrepreneurial education must be two fold: Firstly, it is important to learn from successful entrepreneurs and enterprises, to develop this knowledge and transfer it into education processes. Secondly, learners need to have contact to founders of companies which faced the challenges of starting and growing a business, which failed, changed or succeed with their vision.

The aim of this paper is to challenge the context of entrepreneurship and innovation education. We build our arguments in step with actual practice analysing data from over 200 innovative companies which have been created under the formal requirements of a regional business plan competition between 1997 and 2007. This study explores the crucial capabilities to start an innovative business and discuss the capabilities have to be developed to sustain innovation and business growth. In this study entrepreneurship is of relevance to successfully manage innovation and growth and these two facets should be seen as combined than distinct. Many entrepreneurship programmes consider often the start-up aspect, while neglecting the capabilities and knowledge needed to manage the growth phase of small enterprises.

Therefore, it can be hypothesised that entrepreneurship and innovation education provided by Universities, Centres for Entrepreneurship and through coaching by Business Plan Competitions should focus on building awareness for the necessity of innovations and prepare inventors, entrepreneurs and students for not simply starting an enterprise but the change process in growing companies. The questions are not of whether or not to educate people about

entrepreneurship and innovation but rather what are the context and the capabilities needed to sustain business and become an innovative and successful entrepreneur?

The European Conference on Entrepreneurship Education in Europe (2006) highlighted that entrepreneurship education must be seen different from general business and economic studies. Elements of relevance include:

- the development of personal attributes and skills that form the basis of an entrepreneurial mind-set and behaviour (e.g., creativity, sense of initiatives, risk taking, autonomy, self-confidence, leadership, and team spirit)
- the improvement of specific business skills and knowledge of how to start a company and it successfully.

Different capabilities are needed in different stages of business growths and Di-Masi highlights in this conjunction:

“... the entrepreneurial characteristics required to launch a business successfully are often not those required for growth and even more frequently not those required to manage it once it grows to any size. The role of the entrepreneur needs to change with the business as it develops and grows, but all too often he or she is not able to make the transition.” (Di-Masi, 2006, p.1)

This is caused by two main facts, firstly growing organisations become more complex and not only the growing infrastructure has to be managed but also the awareness of the change and transition process. Secondly, the dynamic and competitive environment requires continuous adoption and innovation.

Taking the viewpoint of Drucker (1985–1999) innovation and entrepreneurship

are interlinked. He explains and analyses the challenges and opportunities of a new entrepreneurial economy.

“Innovation is the specific tool of entrepreneurs, the means by which they exploit changes as an opportunity for a different business or service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced.” (Drucker, 1985, p.32)

The term innovation is derived from the Latin term *innovare* (to make something new) and most definitions about innovation highlight the exploration and exploitation of new knowledge. The first point to make is that innovation is not invention. Invention must be seen as the initial step “in a long process to bringing a good idea to widespread and effective use” (Tidd et al., 2003, p.38). Innovations are the commercialisation of inventions. However, the conception of innovation has evolved significantly in recent times. It appears that the complex theories of innovation can be explained by the increasing extent of social ingredients in the explanation of innovativeness. Originally based on tangible forms of capital and the necessity of pull and technological push, innovation management is today integrated in a much larger system (see Lewrick, 2007a).

ENTREPRENEURSHIP EDUCATION

Entrepreneurship has become offered as a course in many business schools and universities, even entire study paths have emerged since the 1970. It seems that entrepreneurship or the facets of being an entrepreneur can be taught. Drucker (1985) asked about the entrepreneur mystique and states: “It’s not magic, it’s not mysterious, and it has nothing to do with the gens. It’s a discipline. And, like any other discipline, it can be learned”.

Many other publications agree on the fact that entrepreneurship can be learned or at least that learners are somehow inspired by the 'mystique' entrepreneurship to go this path. Such a research outcome does not provide any specific recommendation on the content of entrepreneurship education. Globally, it seems that countries try to establish a "enterprise and entrepreneurial culture" to keep-up with the challenges globalisation brings (e.g., OECD, 1999, 2001, 2006). It seems that the public celebrates the business idols which become multi-million enterprisers over night by selling a well marketed business idea. The statistics of companies' survival rate however, show a different picture. Only a few companies are leading edge start-ups and even less companies have the capabilities to grow and sustain a business.

A study from the US Small Business Administration indicated that only 67% of all start-ups are successful after four years. The survey was conducted among 12,185 ventures in 2003 (USA Today, 2003). The study also revealed that businesses are most likely to succeed if they are equipped with more than \$50,000 in capital, an owner with a university degree and running the business from home (Hopkins, 2003). Earlier studies in the 1990 such as that of Phillips (1993) found that 76% of all firms survive at least two years, 47% survive at least four years, 38% survive at least six years, and 29% survive at least eight years. However, out of 100 new businesses launched tomorrow, only 30 will still be alive in five years. Of those, 20% will be scraping by, 60% will be doing middling well, but only 20% will be spectacularly successful. In 1990, a research by the Small Business and Special Surveys of Statistics Canada found that 56% of all Canadian firms started in 1990 and 1991 survived at least two years, and 39% survived at least four years. In Scotland, a study published by

The Scotsman (see Lyons, 2003) newspaper drew attention to the high number of liquidations of businesses in Scottish cities. Glasgow, for example peaked with nearly 60% of liquidations in the first quarter of 2003, compared to Edinburgh with 19%. In the first three months of 2006, 4818 British companies collapsed. A research conducted by Experian (2006) highlighted that the failure rate increased by 15.3%, making the highest rise since 1999. In Germany, according to Niefert et al. (2006), the success rate of start-ups participating in regional and national business plan competition is 83%. Over the last 20 years the success rate of new ventures in Germany has been estimated to be 58% (Niefert et al., 2006).

From this work it seems that the likelihood of failure is fairly high, because companies often mismanage the venture process. For example, they are too risk adverse, their cultures are inappropriate, they fail to provide sufficient incentives, and they involve the wrong managers.

To identify 'what' should be taught in entrepreneurship education some views and opinions from various scholars are outlined in the following. It seems that entrepreneurship should be treated differently from general management (Gartner and Vesper, 1994). There is a need to focus on developing core skills needed to be a successful entrepreneur. McMullan and Long (1987) pointed out that often these are skills associated with leadership, steering a product development process, exploring and exploiting innovations, etc., but also capabilities to obtain resources for starting a venture (Vesper and McMullen, 1988; Zeithaml and Rice, 1987). Other areas to be included in educational programmes are associated with entrepreneurship as career possibility (Donckels, 1991; Hills, 1988), and the protection of ideas and

patents (Vesper and MacMullen, 1988). Views from McMullan and Long (1987) and Plashka and Welsch (1990) highlight the importance of the challenges in each stage of the venture process (Solomon et al., 2002). Gibb (2002) argues that entrepreneurial education should deal with complexity and uncertainty and the education programmes should be embedded in a globalisation frame to lecture at an appropriate context.

Beside class room learning a variety of paths are known in entrepreneurial education to provide a more practical education. This might include computer simulations, virtual start-up competitions, real business plan competitions, entrepreneurial workshops, discussions and knowledge exchange with participating entrepreneurs, and work experience and internship in the start-up activities of a company. Ramsden (1992) follows this and argued that there is a need to enhance opportunities for 'deep' learning through a mind change towards a more active engagement of learners.

Most educational programmes in Europe highlight the positive impacts of entrepreneurial behaviour to economic growth and the motivation of people to become entrepreneurs. Garvan and O'Connell (1994) recommend the need to focus on knowledge acquisition relevant to entrepreneurship, skills development and the use of techniques, identification and stimulation of entrepreneurial drive and talent, risk evaluation and analytical techniques. The aspects of developing, enjoying and supporting a venture, development of attitudes to change, and encouragement for start-up and ventures creation are stressed. However, none of the elements are associated to the capabilities needed to grow a business from a start-up phase to a more mature phase of business.

The USA and Europe have encouraged entrepreneurs to explore the venture process by developing a business plan (Gartner and Vesper, 1998; Hills and Morris, 1998). However, Gibb stated that the business plan might not be the adequate metaphor for the entrepreneurial act. He argued that

“the business plan is more a reflection of the attempt by the providers of banking, accounting, and commercial services to the entrepreneur and owner-manager to reduce the world and make sense of things in their terms.” (Gibb, 1996)

The scope of teaching business plans derived mostly from strategic literature developed for larger organisations (Armstrong, 1982). It seems that the business plan element is common in entrepreneurship education because of the assistants for company founders to outline complex and uncertain activities (Ames, 1989; Burns, 1990; Kahrs, 1995; Rich and Gumpert, 1985).

From an ontological perspective it might be necessary to discuss the education approach by the context offered to students. Kyro (2000) posits the theory that the entrepreneurial paradigm must be fundamental to the postmodernist world. He suggested including emotions, values and interests rather than characterising the entrepreneur as a rational thinking decision taker. Other scholars like Chia (1996) argue that entrepreneurial education should stay away from analytical problem-solving and they suggested characterising the entrepreneur as an 'intellectual entrepreneur' or someone "crating of relationships between sets of ideas". In contrast Fiet deny the importance of theory in social science by arguing that:

“Entrepreneurship theory as a set of empirical generalisations about the world

economy and how entrepreneurs should behave that allows for prediction of true outcomes.” (Fiet, 2001, p.101)

The data used for the study reported in this paper has been derived from two questionnaires which had the objective to obtain data from firms classified as start-up (less than two years old) and mature (more than two years old). The questionnaires contained over 60 questions in domains related to the management capabilities, market and customer orientation, competitive environment, knowledge infrastructure and strategy, learning and diversification, the measurement of innovation and success as well as the use of different network types (business, personal, organisational). The degree of innovativeness is measured by the amount of (radical and incremental) innovation realised in a typical year in different innovation typologies (product, service, process, administrative, technical). The total amount of innovativeness was measured by the sum of incremental and radical innovations realised. All participating companies in the study have been established under same formal requirements of the Munich Business Plan Competition. Demographic questions have been added to obtain information related to business performance, company age, business sector, core competences, number of employees, and position of the respondent. 216 out of 530 companies completed the

questionnaire data cleaning resulted in a further reduction of 45 responses yielding a response rate of 32%. The distribution by level of total innovativeness as measured by number of innovations per annum, by business type is displayed in Table 1.

No significant differences were found in the degree innovativeness across the different business sectors examined in this research. This suggests that at least in the high technology cluster region of Munich that the management of innovation is generic rather than industry specific.

To analyse the survey data factor analysis with varimax rotation was conducted on the 60 questions, and 12 factors were generated to provide insight of the importance of key capabilities for sustaining innovation and success. The variation in the factors was examined to determine if they are related to incremental, radical and total innovation. To do this multinomial logistic regression in SPSS 16.0 was used to determine the likelihood that a particular case belongs to the category of less than 10, between 10 and 30 and over 30 total innovations per annum. This categorisation was used to indicate companies who had a low, medium and high propensity to innovate. The models obtained are displayed in Table 2 taking the lowest grouping of innovation as the baseline. For incremental

Table 1 Innovation by business sector

| | N | Percentage total innovativeness | | |
|----------------------|----|---------------------------------|-----------------------|------------------------|
| | | <10 innovations (%) | 10–30 innovations (%) | 3 > 30 innovations (%) |
| Health industry | 32 | 21.9 | 56.3 | 21.9 |
| Knowledge services | 31 | 29.0 | 54.8 | 16.1 |
| Manufacturing | 43 | 41.9 | 46.5 | 11.6 |
| Traditional services | 53 | 28.3 | 54.7 | 17.0 |
| Energy sector | 12 | 16.7 | 50.0 | 33.3 |

Table 2 Multinomial logistic regression models of innovation

| | Incremental innovations | | | | | | Radical innovations | | | | | | Total innovations | | | | | | | | |
|------------------------------|--------------------------|------------|-------|---------------------|--------|------------|--------------------------|---------|--------|----------------------|-------|---------|--------------------------|------------|-------|----------------------|---|------------|------|---------|--|
| | 5 to 15 innovations | | | 5 to 15 innovations | | | 5 to 15 innovations | | | 10 to 30 innovations | | | 10 to 30 innovations | | | 10 to 30 innovations | | | | | |
| | B | Std. error | Sig. | Exp (B) | B | Std. error | Sig. | Exp (B) | B | Std. error | Sig. | Exp (B) | B | Std. error | Sig. | Exp (B) | B | Std. error | Sig. | Exp (B) | |
| Intercept | 2.668 | 0.750 | 0.000 | | 0.556 | 0.354 | 0.116 | | 0.985 | 0.475 | 0.038 | | 0.985 | 0.475 | 0.038 | | | | | | |
| Capability | 0.728 | 0.420 | 0.083 | 2.071 | -0.220 | 0.281 | 0.433 | 0.802 | 0.479 | 0.319 | 0.134 | 1.614 | 0.479 | 0.319 | 0.134 | 1.614 | | | | | |
| Knowledge enhancement | 0.202 | 0.290 | 0.487 | 1.223 | 0.237 | 0.229 | 0.299 | 1.268 | 0.269 | 0.301 | 0.373 | 1.308 | 0.269 | 0.301 | 0.373 | 1.308 | | | | | |
| Competitor orientation | -0.734 | 0.405 | 0.070 | 0.480 | 0.503 | 0.280 | 0.072 | 1.654 | -0.666 | 0.343 | 0.052 | 0.514 | -0.666 | 0.343 | 0.052 | 0.514 | | | | | |
| Interorganisational networks | -0.117 | 0.412 | 0.777 | 0.890 | -0.486 | 0.296 | 0.101 | 0.615 | 0.446 | 0.359 | 0.214 | 1.562 | 0.446 | 0.359 | 0.214 | 1.562 | | | | | |
| Organisational learning | 0.546 | 0.467 | 0.242 | 1.727 | 0.406 | 0.338 | 0.229 | 1.500 | 0.661 | 0.400 | 0.098 | 1.936 | 0.661 | 0.400 | 0.098 | 1.936 | | | | | |
| Knowledge acquisition | 1.102 | 0.432 | 0.011 | 3.011 | 0.129 | 0.358 | 0.719 | 1.137 | 1.082 | 0.392 | 0.006 | 2.950 | 1.082 | 0.392 | 0.006 | 2.950 | | | | | |
| Market orientation | 0.900 | 0.500 | 0.072 | 2.459 | 0.340 | 0.316 | 0.282 | 1.404 | 0.105 | 0.436 | 0.810 | 1.111 | 0.105 | 0.436 | 0.810 | 1.111 | | | | | |
| Performance measurement | 1.249 | 0.556 | 0.025 | 3.486 | 0.398 | 0.269 | 0.138 | 1.490 | 1.208 | 0.417 | 0.004 | 3.346 | 1.208 | 0.417 | 0.004 | 3.346 | | | | | |
| Informal networks | -0.242 | 0.652 | 0.711 | 0.785 | 0.672 | 0.367 | 0.067 | 1.959 | -1.599 | 0.725 | 0.027 | 0.202 | -1.599 | 0.725 | 0.027 | 0.202 | | | | | |
| Outcomes | 1.132 | 0.566 | 0.045 | 3.102 | 1.061 | 0.332 | 0.001 | 2.889 | 1.786 | 0.543 | 0.001 | 5.968 | 1.786 | 0.543 | 0.001 | 5.968 | | | | | |
| Formal networks | 0.572 | 0.454 | 0.207 | 1.772 | -0.087 | 0.294 | 0.767 | 0.916 | 1.034 | 0.455 | 0.023 | 2.811 | 1.034 | 0.455 | 0.023 | 2.811 | | | | | |
| Key performance indicators | -1.183 | 0.613 | 0.054 | 0.306 | -0.336 | 0.349 | 0.335 | 0.714 | -0.752 | 0.479 | 0.117 | 0.471 | -0.752 | 0.479 | 0.117 | 0.471 | | | | | |
| | More than 15 innovations | | | | | | More than 15 innovations | | | | | | More than 30 innovations | | | | | | | | |
| Intercept | 0.924 | 0.869 | 0.287 | | -4.316 | 1.672 | 0.010 | | -1.049 | 0.744 | 0.158 | | -1.049 | 0.744 | 0.158 | | | | | | |
| Capability | 1.699 | 0.543 | 0.002 | 5.470 | 0.680 | 0.742 | 0.359 | 1.975 | 0.672 | 0.527 | 0.202 | 1.959 | 0.672 | 0.527 | 0.202 | 1.959 | | | | | |
| Knowledge enhancement | 0.437 | 0.459 | 0.340 | 1.549 | 2.127 | 0.871 | 0.015 | 8.389 | 1.554 | 0.645 | 0.016 | 4.729 | 1.554 | 0.645 | 0.016 | 4.729 | | | | | |
| Competitor orientation | -0.067 | 0.468 | 0.885 | 0.935 | -0.447 | 0.683 | 0.513 | 0.640 | -1.358 | 0.553 | 0.014 | 0.257 | -1.358 | 0.553 | 0.014 | 0.257 | | | | | |
| Interorganisational networks | -0.213 | 0.545 | 0.696 | 0.808 | -3.492 | 1.230 | 0.005 | 0.030 | -0.870 | 0.633 | 0.170 | 0.419 | -0.870 | 0.633 | 0.170 | 0.419 | | | | | |

Table 2 Multinomial logistic regression models of innovation (continued)

| | Incremental innovations | | | Radical innovations | | | Total innovations | | | | |
|--------------------------------|--------------------------|------------|--------|--------------------------|------------|-------|--------------------------|------------|--------|-------|--------|
| | B | Std. error | Sig. | B | Std. error | Sig. | B | Std. error | Sig. | | |
| | More than 15 innovations | | | More than 15 innovations | | | More than 30 innovations | | | | |
| | Exp(B) | | Exp(B) | | Exp(B) | | Exp(B) | | Exp(B) | | |
| Organisational learning | 0.690 | 0.559 | 0.217 | 1.993 | 0.857 | 0.188 | 2.357 | 1.038 | 0.531 | 0.051 | 2.823 |
| Knowledge acquisition | 1.755 | 0.601 | 0.004 | 5.783 | 1.040 | 0.737 | 2.830 | 2.457 | 0.745 | 0.001 | 11.675 |
| Market orientation | 1.238 | 0.574 | 0.031 | 3.448 | 0.826 | 0.634 | 2.285 | 0.625 | 0.557 | 0.261 | 1.869 |
| Performance measurement | 1.347 | 0.666 | 0.043 | 3.844 | 1.312 | 0.881 | 3.713 | 1.319 | 0.649 | 0.042 | 3.738 |
| Informal networks | -0.294 | 0.845 | 0.727 | 0.745 | -0.700 | 1.284 | 0.497 | -1.203 | 0.941 | 0.201 | 0.300 |
| Outcomes | 1.619 | 0.646 | 0.012 | 5.049 | 1.392 | 0.556 | 4.025 | 1.839 | 0.623 | 0.003 | 6.288 |
| Formal networks | -0.092 | 0.617 | 0.881 | 0.912 | -2.375 | 1.140 | 0.093 | 0.116 | 0.671 | 0.863 | 1.123 |
| Key performance indicators | -0.812 | 0.704 | 0.249 | 0.444 | -0.215 | 0.658 | 0.807 | -0.892 | 0.622 | 0.151 | 0.410 |
| Cox and Snell | 47.27% | | | | 47.27% | | | 54.58% | | | |
| Nagelkerke | 55.87% | | | | 55.87% | | | 63.40% | | | |
| McFadden | 34.19% | | | | 34.19% | | | 40.01% | | | |
| Percentage correctly predicted | 75.90% | | | | 66.40% | | | 70.70% | | | |

orientation knowledge acquisition, market orientation and focus on outcomes were all significantly positively associated with increased incremental innovation while for radical innovation positive correlates were interorganisational networks, formal networks, knowledge enhancement and focus on outcomes. When total innovations are modelled knowledge enhancement and acquisition, performance measurement and focus on outcomes appeared as positive correlates. It is of note that competitor orientation has a negative association with innovation and this was significant for total innovations. Further details can be found in Lewrick (2007a). In addition, the link of innovation to sales increase is explored to give justification to the assumption that innovation drives companies' performance. A strong association between sales and total innovativeness, significant at the P level of <1% was found.

The actual change in these factors over the time perspective is examined to determine how core capabilities change and why it becomes important to educate and

prepare entrepreneurs about the change. The difference of the main domains in the time perspective is examined and linked to the factors derived above.

Depicted in Figure 1 is how total innovativeness varies with the factors generated from over 60 statements. Some factors have a significant positive correlation to incremental innovations and or radical innovations, while other factors not show any significant relation to innovativeness, notably management ability, formal networks and key performance indicators. For most of the factors, scores are negative for the low propensity to innovate and the highest positive scores appear with the high propensity to innovate category.

This first exploration helps to define some important capabilities for growing companies to sustain innovation. From Figure 1 it becomes obvious that knowledge is paramount to generate a high amount of innovations. Innovativeness is triggered by a continuous process of upgrading current knowledge and skills for familiar

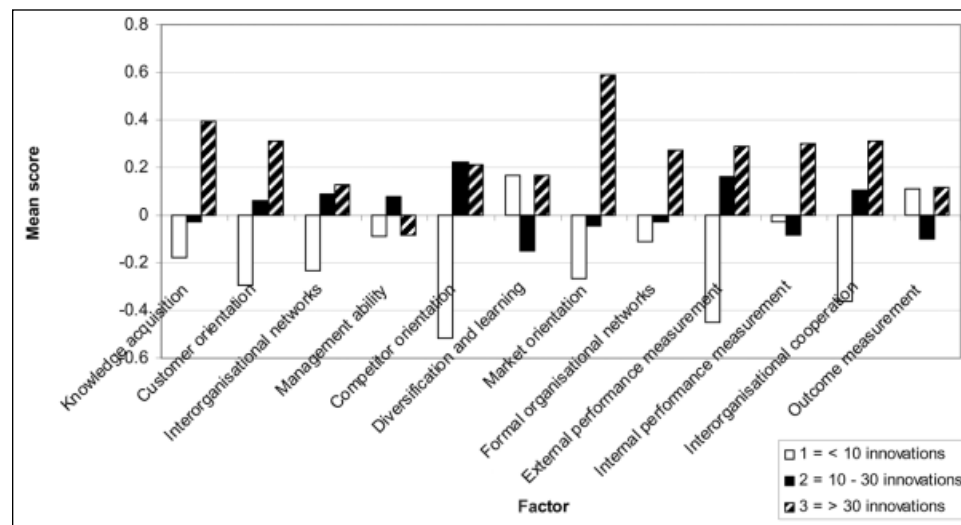


Figure 1 Variation in innovativeness across factors for overall innovation

products and technologies to sustain mainly incremental innovations. The growing companies must invest to enhance skills in exploiting mature technologies with the overall aim to improve productivity of current innovation operations. This is one of the most important capabilities which have to be developed with regard to the management of knowledge (Lewrick, 2007a). Further it seems to be mandatory to put strong emphasis on the constant improvement of the product development process even the company possesses already significant experience. In the process from a start-up phase to a mature phase of business the enterpriser has to create a culture where knowledge can be shared freely and build awareness for knowledge platforms.

A strong correlation is also observed in the orientation towards the customer and innovation success. To sustain innovations it seems to be necessary to constantly monitor and reinforce the understanding of the current and future customers and their needs. This improves the knowledge about emerging customers. It is important for a growing company to develop and utilise research techniques such as focus groups, surveys, and observation to gather customer information and to enrich customer intelligence. While competitor orientation has an insignificant impact on innovativeness it is different for market orientation. In some cases a strong competitor orientation has even a negative impact on radical innovations for mature companies (Lewrick, 2008). A strong market orientation allows reacting to changing customer preferences. This also includes the constant observation of actions of local and foreign competitors.

A strong impact on innovation and success is seen in the ability to build strong interorganisational networks. The inter-

organisational network might be helpful to accelerate growth of the company by establishing cooperative R&D agreements with other companies. The interorganisational collaboration for the design and manufacture process has also been identified as important factor as well as an agreed and systematically planned introduction of new products or services to the market. These findings are very much in line with the desirability of the concept of open innovation as advanced by Chesbrough (2003).

The measurement of innovations and business performance seems to be essential to sustain innovations. Especially the internal performance measurement is essential to for generating high innovation output. The measurement of the outcomes of the innovation process is also important.

Next, a summary of the actual change in the 11 domains which had a significant effect on innovation is presented. The comparison shows the different focus of companies in a start-up phase in comparison to a more mature phase of business in different performance levels. The performance levels are based on firms' current sales performance/increase per annum. Displayed in Figure 2 are the domains customer orientation, competitor orientation, and the market and competitive environment. It is notable that market orientation is a fundamental element to sustain innovations and business success. Successful firms have in a high customer focus when starting the business while low performing firms tend to have a more product centric focus.

The Competitor Orientation in many cases is very high in the start-up phase of companies. It seems that two success paths are possible depending on the innovation agenda of the company. Almost all start-ups

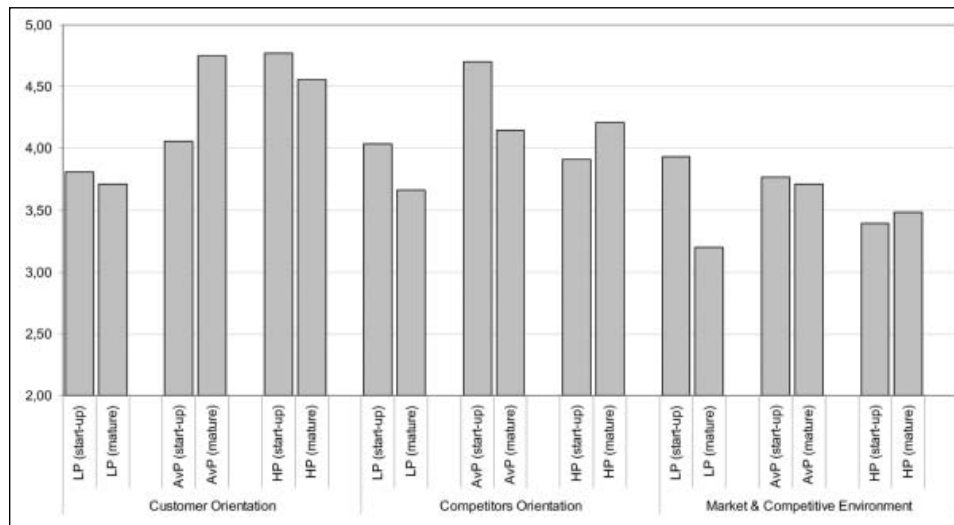


Figure 2 Change of important capabilities (Customer orientation, competitors orientation, market and competitive environment)

tend to investigate the competitors carefully within the start-up activities. This might be caused by the necessity to compare the company's strategy with major competitors within the development activities of a solid business plan. Companies focusing more on radical innovations tend not to focus on competitor orientation in bringing innovation successfully into the market. They might co-develop these innovations with customers, using prediction methods or tapping into new undeveloped markets, following a blue ocean strategy.

The Market and Competitive Environment seems to be another trigger or driving force for innovations. Low performing companies might not be close enough to the market to experience the pressure of global competitors. It is important for innovations to monitor the actions of local, national and global competitors to know their market movements.

The exploration of diversification and learning, resources for innovation, and

the management of knowledge are laid out in Figure 3. It seems that diversification and learning are essential to sustain long term strategy of innovation. Successful companies tend to put more emphasis on diversification and learning which results in higher innovation outputs. The low performing mature companies provide an excellent example of how an environment without continuous learning and exploring new business fields result in low innovation outputs.

Resources for innovations are important to sustain innovations and to increase companies' performance. High performing companies tend to have the capabilities to maintain resources at a high level. Perhaps average performing companies show that they are able to generate more resources in shorter time which will lead to higher innovation performance in the future. Losing the capability of generating resources in the transformation process from a start-up to a more mature phase of the business affects the innovativeness and leads to a low

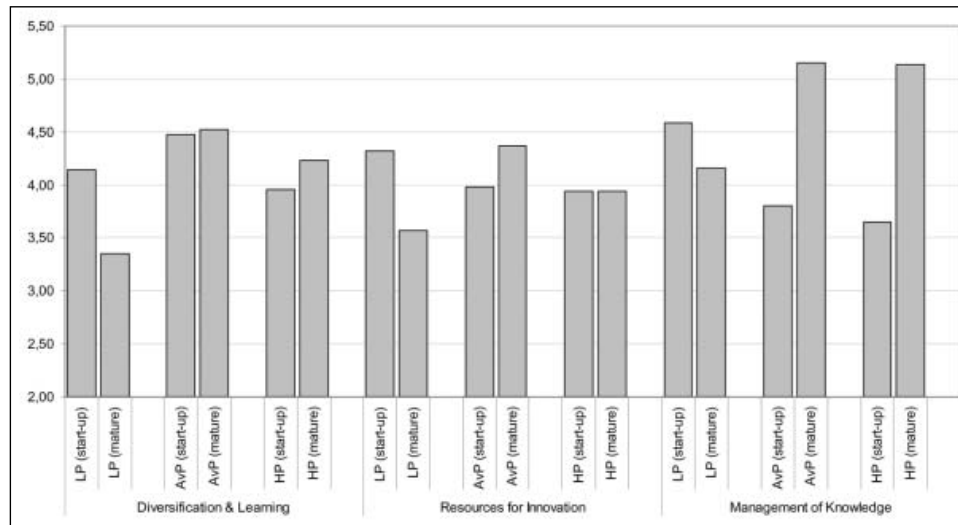


Figure 3 Change of important capabilities (diversification and learning, resources for innovation, management of knowledge)

likelihood of success. The management of knowledge becomes one of the key factors in converting ideas into innovations. Both, average performing and high performing companies demonstrate a strong focus on the management of knowledge and this is highly associated with innovation success. Start-ups companies without strong emphasis on sharing and acquiring knowledge tend to become low performing companies.

The changes required in management capabilities, organisational network and inter-organisational network are illustrated in Figure 4. The required management capabilities to grow the business and to sustain innovations show the importance of the background, education and experience of the management team (Lewrick, 2007b). It seems that successful companies are equipped with more experienced managers in comparison to low performing companies which have less powerful management capacities within their organisations. Successful companies tend to expand and

develop management capacity while low performing companies tend to decrease their management capabilities.

The development of the organisational network depends on the growth of the company. Low performing companies increase only slowly and without impacting on their organisational network. In contrast high performing companies show a high propensity to increase in developing and expanding the organisational network in the change process from a start-up to a more mature phase of business. A similar pattern is seen in the interorganisational network. Average and high performing companies double their efforts in developing cooperative R&D, joint market strategies and in teaming-up with other companies in open innovation to jointly design and manufacture new products or utilise new technologies.

Finally, outlined in Figure 5 are the changes in conjunction to strategic focus versus financial focus and the importance

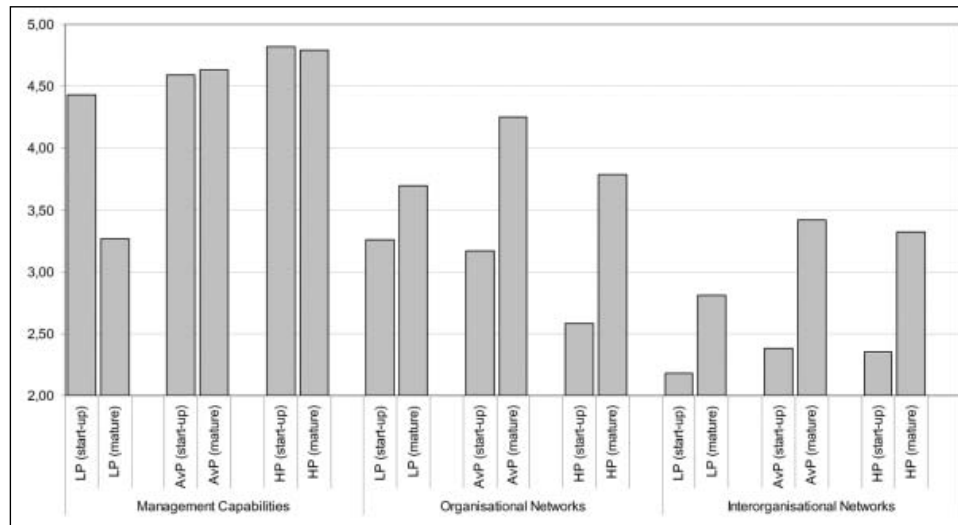


Figure 4 Change of important capabilities (management capabilities, organisational networks, interorganisational networks)

to measure innovation and success. This indicates that almost all companies tend to become more financial and control driven after the change from start-up to mature. However, it seems that companies which are less financial driven become more successful in growing and becoming innovative. To measuring key performance outcomes it is indicated that mature companies have developed a strong process and have tools in place to measure innovation and performance.

From these findings it is possible to set an agenda for entrepreneurship and innovation education. In the following it is outlined how these capabilities might be transferred into an educational setting. It is hoped that this might help to structure and develop entrepreneurship and innovation educational curriculum in the future.

It is clear that in the context of innovation and entrepreneurship education that there is a need for building awareness for the change process of new ventures in order to

become successful mature companies. The pre-requisite is to see the management of innovations embedded in a larger complex system. However, Lewrick (2007a) shows that focusing on R&D in conjunction with the management of innovations does not necessarily lead towards a more open view of the triggers, supporters and drivers for innovation and ultimately success. The different typologies of innovation, such as product innovation, service innovation, process innovation should be discussed in classes. In this the focus should be on identifying which innovation typology might be relevant for each stage of a company's life-cycle. In addition, the external drivers might be added to show for example how the competitive environment forces companies to innovate. The results from research show that some capabilities which effect companies performance and innovation success. Teaching entrepreneurship and innovation must include debate on ways of how to expand and the development and how to sustain innovative capabilities. Current entrepreneurial education

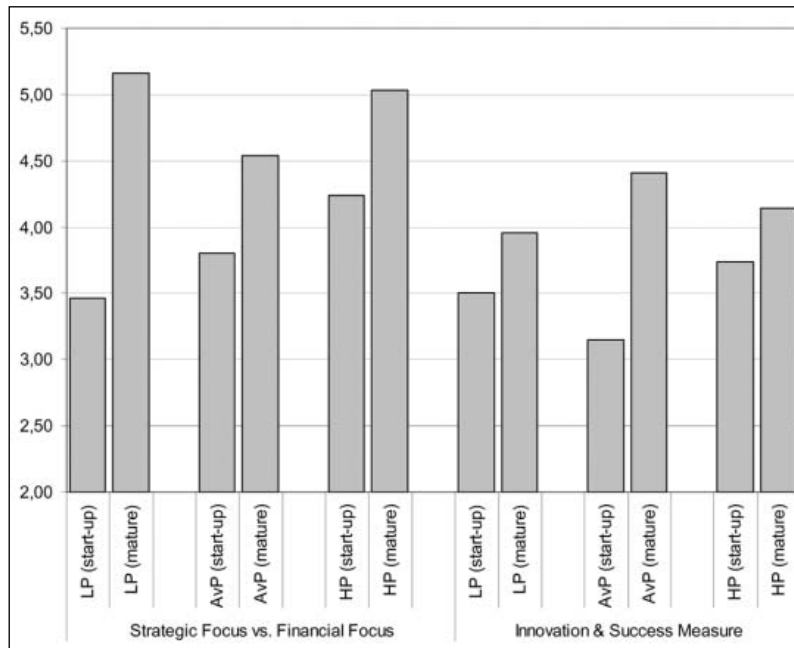


Figure 5 Change of important capabilities (strategic focus vs. financial focus, innovation and success measure)

programs focus too much on the capabilities of the entrepreneur and the immediacy of starting a business. This might be important but even more important is in our view is the capacity of the entrepreneur to go through a continuous development process which allows surviving and growing the business. Successful start-ups have in most cases an experienced management team with knowledge in a specific industry. The management team need to have general management skills gained in large or small firms by experiencing operational practice. Further, entrepreneurship and innovation education has to build awareness for the necessity of learning and diversification. Both elements are of paramount importance to bring a unique idea towards the market. In addition, it seems to be necessary to discuss to investigate and compare radical and incremental innovations. In many cases being a follower i.e., 'me-too' products and services

do not lead to business success. Markets are already occupied by established companies with a strong customer relationship. New entrants might be successful to participate actively in a regional setting but tend not sustain the business on a national or global scale. It is also important to educate about the need for resources to develop and market ideas. Successful companies managed to have resources available from an early stage and they tend to continue generating resources on a high level. Companies starting with a low budget and without the potential to tap into fresh money have problems to sustain innovations. Another important factor which needs to be considered for entrepreneurial and innovation education agendas are the development of social networks and the access and mobilisation of social capital embedded with in them. Recalling the earlier argument about the need for resources, a strong network including venture capitalist,

business angels, and bankers might be very helpful to facilitate access to fresh financial resources. In many cases the personal networks to former peers help to discuss ideas and provide entrance to potential customers and clients. The management of knowledge has been identified to be one of the major drivers for innovation and success. Entrepreneurial and Innovation education is also about education on the value of knowledge, knowledge sharing and dealing with all kinds of challenges of keeping and acquiring knowledge. Entrepreneurship and Innovation education need to provide learners with methods and tools to evaluate and secure the knowledge within the company.

After educating learners about the complexity of innovations and the capabilities needed it is the responsibility of educators to show the challenges starting a company and to show at the same time how change can be managed actively to promote business growth. Starting a new company is a risky endeavour but the real challenge is to grow the company and steer change and sustain business in the future. The ability to educate the founders in the different evolution stages of the company becomes essential. Learning from mistakes and taking decisions towards new business models, organisational behaviour and/or joint projects with other companies need to be understood as important to the management capacity needed.

Further learners must be aware of the rising organisational requirements which are needed in a growing company because these elements influence the innovation performance and how this is to be managed. Again, investigation of the life-cycle of a venture will help to identify major challenges and prepare learners on how to keep-up with the change in the dynamic environments.

This might include discussion about actions needed in the first stage including the conception of a business idea, business plan writing, analysis of the competitive environment, building prototypes, co-developments with customers, or selling the service the first time to customers and how to identify market trends and obtain feedback from customers. Starting the business is already a big change from conceptualising the business idea because: resources are needed, price and business portfolio strategies have to be developed, social networks need development and attention, strategic partners might be necessary to bring ideas to market, high performing and operational employees are required. Further, the company has to develop measurement systems to control innovation initiatives and strategic direction. Reporting systems should be implemented and standardised processes developed to facilitate efficiency. However it is important to retain the spirit of creativity and innovation within the organisation. In addition to all this sales structures and distribution strategies must be created and implemented. As the company becomes more mature more challenges will face the management team including efforts to get fresh funds for innovation and growth, innovating in different typologies, creating diverse products and services, or improving existing products incrementally, creating appropriate corporate culture and communication the change process to all stakeholders of the company, rationalising the strategy of the company and so forth. In the process from a start-up to a more mature phase the organisation leaves a zone without limitations (start-up) into a controlled zone (mature). This change becomes crucial for survival and growth and thus the educational agenda must educate and build awareness for the change process. Our findings support the findings of the 2008 Expert Group on entrepreneurship in

higher education (European Commission, 2008). This includes the focus on developing core capabilities for entrepreneurship and sustainable business success (e.g., through innovations), real-life experience by involving 'outsiders' in the learning process, and a stronger focus on aspects and challenges of growing companies

CONCLUSIONS AND DISCUSSION

Entrepreneurs and start-up companies play a vital role in the innovations that lead to breakthroughs in technological development and productivity growth as these companies grow they need to be educated to develop an awareness of how the change is best managed (see Lewrick, 2007c). This needs to be an integral part of entrepreneurial and innovation education and entrepreneurial education should not to focus solely on business start-up. Being taught how to write a comprehensive business plan might be essential but it seems even more important to teach how to sustain business success, raise companies' survival rate and educate students and entrepreneurs about the challenge of the transformation from a start-up phase to a more mature phase of business. Learning from successful companies is one path to generate best practice examples but it is also essential to show that a lack of core capabilities will lead to failure or even bigger challenges in the future to survive and to sustain innovations. Therefore it becomes necessary to teach and develop personal attributes and skills that form the basis for both entrepreneurship and the challenges of growing companies. Hence we argue that entrepreneurial education should not be just about quick business start up, fast cash, investment and liquidity, and short term thinking but there is a need to realise how organisational attributed need to change to ensure sustainability.

BIOGRAPHY

Michael Lewrick received his PhD from Napier University Edinburgh and holds a MBA from Bristol Business School. His research interests centres on the management issues related to the development and commercialisation of technological and business model innovation. Specific areas of focus include developing capabilities for innovativeness and business success. Currently he is a Managing Partner of S:SENSE, a consulting and training company, focused on challenges of Innovation and Knowledge Strategies and the Management of Change.

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