

Understanding of Entrepreneurship in the Emergency of High Technology Firms: the Impact of the Longitudinal Case Study within a Construction Industry Context.

Emmanuel Opoku Ware¹ Adu Nti Michael² Adusei Boadu Michael³

1.School of Business, Sunyani Polytechnic,Ghana

2.Sunyani Polytechnic,P.O.Box 206,Ghana

3.Takoradi Polytechnic and Cape Coast university,Ghana

Abstract

Entrepreneurs create companies, employment and are often in the vanguard and view technology developments and applications- they are the Schumpeterian agents of 'creative destructive'. This is widely recognized reality which underpins national and regional policies to create the conditions necessary to encourage and sustain entrepreneurial start-up companies. It is therefore surprising there is a dearth of research in to entrepreneurship within a construction industry context-given the high company formation rate in most within a construction sectors. This deficiency is further accentuated by the lack of understanding of entrepreneurship in high technology domains in an era when we seek new technologies to improve the environmental and whole lifecycle performance of buildings. This paper reportson an ongoing Construction Knowledge Exchange funded project which is tracking time, real time, the start- up and growth of a company which developing and introducing a range of leading edge light emitting diode technologies. Interim results will be presented on the interplay between business environment conditions and the complex emergence of the company: from the original motivation of the founders of the firm, to its growth strategy and organizational design and its business development and marketing strategy.

Key words: entrepreneurship, high technology, light emitting diode, Context,Industry

1.Introduction

Small high technology firms play a pivotal role in being the vanguard of disruptive innovation (for example, see Monck et al.,1988), the development and exploitation of rich market opportunities (for example, see Makri et al,2006_ and employment creation (for example,seeOakey,1991). The contribution of small companies to the construction industry is beginning to be better understood and appreciated in terms of, for example, innovation (Sexton and Barrett, 2003) specialist subcontractor inputs (Dainty et al, 2005) and professional practices (Lu and Sexton 2009). However, there is a dearth of research into high addressed for two key reasons. First, there is a growing recognition of the systemsintegration role of the construction industry in absorbing and embedding high technology from other

Study industries (for example, see NESTA, 2007). Second, there is a raft of market and policy induced pressures for the construction industry to deliver more economically, socially, and environmentally sustainable built environments which are requiring the adoption and diffusion of a corresponding raft of new technologies. In unison, these pressure are creating the Schumpeterian Type 1 condition for entrepreneurial start- up companies to lead the next wave of 'creative destruction'. There is , therefore an urgent need for research to understand the establishment and growth of such high technology firms if their contributions to construction industry are to be calibrated and maximized.

This paper begins to contribute to this agenda by offering early results of a longitudinal case study of the start-up of a high technology light emitting diodes (LEDs) company. The results highlight the core market, entrepreneurial, organizational and technological resources which have been developed in its early stages. The case study is appropriate, as LEDs technologies are very much disruptive in nature in that they offer potentially radically enhanced benefits over existing dominant technologies. In addition,catalyst for the rapid advancement of the LEDs technology and its markets are small high technology firms-rather than the incumbent large lighting companies. The structure is as follows. First , a brief review of the company emergence literature will be given , which will culminate in an initial framework being adopted to structure the case study interim findings. Second, the unique features of high technology and high technology and high technology firms will be described .Third,the research methodology being employed will be summarised. Next,interim result will be presented. Finally, conclusion will be draw and future intentions for the going longitudinal case articulated.

2.ORGANIZATIONAL EMERGENCE

The research in to the emergence of firms is generally an under researched field(for example, see Reynolds and white 1997: 39). This research gap is certainly evidence in an construction context where the authors could find

very little theoretical or empirical research on construction firm emergence. What research there is has tended to focus on the growth of firms already established. Neves and Bugalho (2008), for instance, provide insights in to the emerging multinational construction cooperation; Huo et al. (2006) offer a range of factors for successful entrepreneurship with the construction and property sectors in Hong Kong; while Sexton and Barrette (2003) propose a hierarchy of growth stages for small construction firms from survival, through to stability and growth. But, to reiterate, in such research, the focus is on firms that already exist. There are, however, a number of frameworks which have been developed in other sectors contexts which may be of use. The common theme of these frameworks is idea that there are core elements which need to be in place and that these elements are systemic in their interaction. Katz and Gartner (1988), for example, offered frameworks that accounts for company formation by detailing the properties of emerging organizations. Beginning with the assumption that companies emerge from the interaction between individuals and environment, Katz and Gartner posit that four core properties are central to organizational emergence.

These properties are: intentionality – the purposeful vision and effort involved in organization emergence; resource – the tangible and intangible building blocks of an organization; boundary- the creation of protected or formalized areas in which emergence occurs (eg. The creation of legal company entity); and, exchange – the crossing of boundaries to either secure inputs (eg. Resources) or output of the organization (eg. Sales) this process view of organizational emergence is evidence in other work. Van de Ven et al. (1989) argued, for instance, that research exploring the business creation process should focus their attention on “(1) how a business idea (or strategy) emerges over time, (2) when and how different functional competencies are created to develop and market the first proprietary product, (3) when and how manufacturing process through the systematic of scientific and technical knowledge.”

Intrinsic to this conceptualization of high technology is that for the high technology firm it has to respond to the following heightened uncertainties experienced by its actual and potential customers (compare to low technology products): market uncertainty, technical uncertainty and competitive volatility (Mohr et al., 2005). Market uncertainty is the high degree of ambiguity about the type and extent of customer needs that can be satisfied by the new technology. Technological uncertainty refers to whether or not the new technology (and/or the firm providing it) can deliver on its promises to meet those specific needs. Finally competitive volatility portrays the rapid change in the determinant of competition, the entrance and exists of firms, and the basic and applied technologies being used. These characteristic are intensified in ‘disruptive technologies’. A disruptive technology results in significant changes in the price-performance boundary (Christensen, 1997; Anderson Tushman, 1990) its appeal over existing products rest on superior functional performance rather than cost (Abernathy and Utterback, 1988) it has been found that when a disruptive technology is first brought to market, it is frequently not fully developed and the commercializing firm must, therefore, often introduce it in a smaller, peripheral market (Adner, 2002). As a performance improves, the products come closer to meeting the performance demands of the large, mainstream market. It enters the low-end part of this market, moving steadily up market as performance continue to improve. (Adner, 2002; Christensen, 1997) the carriers of disruptive technologies are often start-up high technology firms which can challenge, and some time replace significantly larger and more powerful, experience incumbents (Christensen, 1997).

High technology start-up firms, drawing upon the Vesper (1990) frameworks outlined above, need the necessary resource capabilities to sense and manage these acute uncertainties during its emergence and growth. It is this development and better understanding of this sensing making and emergent organization of a high technology start-up company within a construction context which is central to this longitudinal case study described in the next section.

3. RESEARCH METHODOLOGY

The research, part funded by the construction knowledge exchange, is at the early stages of what will be a longitudinal case study of a number years which will be track the emergence and growth (or decline) of START-UP, a start-up LEDs lamp manufacturer. (START-UP is a fictitious name for reasons of anonymity.) A longitudinal case study methodology has been adopted to capture and map the unfolding journey in real time (Van de Ven, et al., 1999). This approach is consistent with Gartner (1998) who stressed the limitation of historical investigation of the start-up and growth of firms and extolled the need for new venture creation process to be best studies ‘in the raw’ in order to develop and maintain a true and unbiased perspective of the phenomenon.

The data collection process began in August 2008 has taken the form of periodically sitting on START-UP meetings when important issues are being discussed (in particular, new products development issues), conducted semi-structured interviews with the founding entrepreneurs and with key clients, and analyzing relevant company.

STARTUP - Five principal component of the firm

1. Technical know how

The initial knowledge came from the three founders of the firm who set the firm up in July 2007 – all of which had significant experience of the LEDs industry. The chief executive officer had ten years experience expertise in setting up and managing manufacturing plant and integrated supply chains. This experience had an international dimension with periods spent in Belgium, china, California and Malaysia. The second founder and the president of the firm has extensive technical knowledge and experience of LEDs and has been involve in the development of international technical standards. The final founder of the chief technology officer and he is the technical authority within the firm and has principal responsibility for the development of the patient of the portfolio. All three of the founders met while working in one of global lighting firms and, prior to setting up STARTUP, were equity partners in a LEDs spin-off firm from that global company. The founding group, therefore, had a long history of working with each other. The founders were aware that they had a comprehensive technical LEDs knowledge but lacked complementary in-depth market knowledge. At an early stage they headhunted a person from the global firm they had all worked for and made him an iniquity partners in February 2008.

The new vice president of R and D marketing had twenty years experience of new business development and marketing in the solids state lighting sector with global network of contacts in client organization and original equipment manufacturers (OEMs) the complementary knowledge and experience bases of the four equity partners of STARTUP are described as follows:

‘So four very complementary set of expertise so we building up the story. There are all of us saying the how we going to survive with (a) defensive strategy in the global lighting market. Secondly, with knowledge in our hands, it is marking break through products (to) start-up in lighting industry.

The firm recruited six additional members of staff in February 2008 and has recruited more people in 2009 so that by march it STARTUP has sixteen staff.

2. Products idea

The core product idea is the novel use of phosphorus coatings (which STARTUP has patented) in a suite of LED modules. STARTUP has a range of patents in this technology. No particular feature of the model is market leading with its self, but its overall technical performance in terms colour point consistence and photometric performance and so on makes it, STARTUP claim, a unique product offering in the market:

“.....our technology is probably not unique. Nor is unique neither in colour point, nor in unique in size. However, put this together it becomes unique. No products are the same in the market”.

The initial products development was very much technology push’ in nature, with the technical people in the R and D laboratory coming up the technical sophisticated model idea but without any idea whether or not there was market demand for them.

One of the first tasks the new marketing vice- president did was to have two day workshop to filter out unviable idea and then, with the specified in his personal network, develop specifications:

“.....first of all, few months before I join they played around with different technologies that are two or three or four ideas.....with some basic ideas then I came. I have viable STARTUP sees it as critical to launch this as orders are being delayed in anticipated of this upgraded module.

4.CONCLUSION

This paper has reported early results from what is anticipated to be a longitudinal case study over a number of years which will map the start-up and growth journey of a high technology firm. The priorities of the firm for the first eighteen months of its life has been to secure knowledge capital through careful recruitment of staff; the harnessing of a limited number of OEM relationships to establish legitimacy of STARTUP and to co-produce the specifications for the new module products; and the setting up of manufacturing capacity in Malaysia. The firm has not generated any revenue to date – this will now be the priority over the coming 12 months. This is going to be hampered by the current severe global recession. If the revenue is insufficient, the founders of the firm is sensitized to the reality that they may need to seek venture capital. This is not something that they want to do – as they want to keep the autonomy of the management of the firm intact.

The case study is also yielding results on the critical zone of the original equipment manufacturer as intermediate user in shaping the new product design and application of LEDs. The ongoing capture and understanding of this phenomenon in the longitudinal case study will be informed by (and hopefully be of interest to) the socio-technical innovation systems research community which is expanding our understanding of the role of users in shaping and interpreting technology within a construction context (for example. see Harty. 2008.)

Acknowledgements

The authors are grateful to the construction knowledge Exchange (CKE) (www.cke.org.uk) who funded the 'Demand led light Emitting Diodes (LED) lighting new project development for the retail sector' project on which this paper is based.

Reference

- Abernathy, W.J. Utterback, J.M (1888) "patterns in industrial innovation". In M.L.T.W.L. Moore (Ed.) reading in the management of renovation, 2nd edition, New York: Harper business, pp 25-36.
- Ander, R. (2002) "when are technologies disruptive? a demand-based view of the emergence of competition". Strategic management journal. 23:8, 667-688.
- Anderson, P.C and Tushman, M.L. (1990) "technological discontinuities and dominant designs: a cyclical model of technological change". Administrative science Quarterly, 35, 604-633.
- Dainty, A.R.J. Ison S.G and Briscoe G.H.(2005) "the construction labour markets skills Crisis: the perspective of small-sized firms". Construction management and economics, 23: 4:,387-398.
- Christensen, C.M. (1997) the inovator's dilemma. Harper business, new York .
- Strategies unlimited (2008) The market for high-brightness LEDs in lighting applications-2008. August, strategies unlimited: California.
- TSB/DIUS board (2007) research into technologies to improve the energy efficiency of light source, technology strategy board/ department of innovation, Universities and skills, HMSO, London.
- Van De Ven, A.H., polley, D.E., Garud,R.andVenkataraman,S (1999) the innovation Journey, oxford university press, oxford.
- Van de Ven, A.H., Venkatara, S., Polley, D. and Garud, R.(1989) 'processes of new business cretion in different organizational settings'. In A.H. van de Ven , H.L. angle. And M.S. Poole (eds) research on the management of innovation, Harper and Row, new York, pp. 221-297.
- Strategies unlimited (2008) the market for high brightness LEDs in lighting applications 2008. August, strategies unlimited: California.
- TSB/DIUS Board (2007) research into technologies to improve the energy efficiency of light source.Technology strategy Board/ department of innovation, universities and skills, HMSO, London.
- Van De Ven A.H.,D. E., Garud, R. and Venkataraman, S. (1999) the innovation Journey, oxford University press, oxford.
- Van De Ven , A.H., Venkatara, S., Polly, D. and Garud, R. (1989)"processes of new business creation in different organizational setting". In A.H Van de Ven, H.L. Angle and M.S. Poole (eds) research on the management of innovation, Harper and Row, new York, pp. 221-297.
- Vesper,K.H. (1990) new venture strategies, prentice hall, Englewood cliffs.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
<http://www.iiste.org>

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: <http://www.iiste.org/journals/> All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: <http://www.iiste.org/book/>

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library, NewJour, Google Scholar

