

The entrepreneurial marketing management and commercialisation arrangements of born global bio-enterprises: The case of UK companies

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Abstract

Born global bio-enterprises are a unique “breed” of relatively small biotechnology enterprises operating in multiple countries. The companies are nimble and seemingly well-prepared for challenges that ephemeral markets such as the internationalised biotechnology sector brings. The international marketing management challenges they encounter appear to stimulate their entrepreneurial marketing and commercialisation instincts. Surprisingly, there is a dearth of studies that examine their entrepreneurial predispositions. As such, this study is an attempt to explain their entrepreneurial tendencies by investigating the marketing and commercialisation strategies adopted by born global bio-enterprises in the UK’s biotechnology industry. The study assumes a multi-case approach examining five archetypical born global bio-enterprises currently active in the UK. It contributes to the international entrepreneurship and marketing management literature. Specifically, it provides international business managers with new knowledge about various marketing manoeuvres they can apply in international networks for their marketing mileage. In doing so, the study proposes a theoretical framework mapping out entrepreneurial marketing and commercialisation arrangements in internationalised biotechnology markets. Its findings are useful to various stakeholders including: policy makers, managers of technology-based companies and business management researchers.

Keywords: born globals, bio-enterprises, commercialisation, marketing, entrepreneurial marketing, networks, biotechnology, entrepreneur

1. Introduction

The last two decades have recorded a marked rise, in numbers, of new bio-enterprises participating in international biotechnology markets. This has been made possible by the exponential growth in the number of approved products as a result of biotechnology processes, market capitalisation and revenues (Kermani and Bonacossa 2003). Although the sampled bio-enterprises are small in size they seem to be taking advantage of this development in biotechnology by forging business-like links in multiple countries enabling them to access strategic marketing capabilities (Johnson *et al.*, 2008). These small but international-oriented companies, whose business model was seen as identical to that of a multinational enterprise in Simba (2013), were first reported in a study by Rennie (1993). Rennie termed these companies born globals.

In his study, Rennie (1993) also described these born globals as relatively small and young companies which began exporting, on average, two years following their inception and three quarters of their sales were generated from exports in their 3rd year of operation. Their smallness or newness in international markets were identified as barriers that somewhat confine their ability to carry out marketing and commercialisation activities (Aldrich and Auster, 1986; Baum *et al.*, 2000). Hallback and Gabrielsson (2013) explained that this forced them to implement entrepreneurial marketing methods in targeted international markets. Based on this rationale, it would be especially interesting to explore the marketing and commercialisation arrangements of born global bio-enterprises in a constantly evolving international life science market. Extant literature suggests that international-oriented companies should carefully manage, organise, and control their outward and inward-oriented activities if they are to succeed (Freeman *et al.*, 2013). Zahra *et al.* (2000) and Roudini *et al.* (2012) collectively agreed that in transient markets, the ability to acquire product-related knowledge, customer requirements and the strategic positioning of a company can be important determinants of prosperity. Chetty and Wilson (2003) go as far as suggesting that developing productive networks in international markets assist SMEs and new firms to overcome early resource constraints (Teece *et al.* 1997) resulting from liabilities of smallness or newness (Aldrich and Auster, 1986). In that sense, it can be expected that the marketing and commercialisation methods adopted by born global bio-enterprises positively or negatively impact their success in international markets. As such, the key questions to be addressed in this research are as follows:

- (1) Which specific marketing and commercialisation arrangements do born global bio-enterprises adopt with a view to achieve economic prosperity in international complex biotechnology markets?
- (2) How do born global bio-enterprises mitigate their smallness, newness and resource deficiencies in sophisticated international markets for successful marketing and commercialisation?

The research questions outlined above are answered in this study by examining multiple cases of British born global bio-enterprises selected from the UK's East Midlands region. The sample cases consist of two university and three technology-based spin-off firms. Nordman and Melén (2008) explained that university spin-offs are established by academic researchers who develop an innovative product from their work in a lab while Dahlstrand (1997) maintained that technology-based spin-off firms' initial service idea originate from the previous employment of the founders. Notwithstanding their origins, this study defines the selected companies as born globals consistent with the views of Oviatt and McDougall (2005a) who expressed that university and technology-based spin-offs often become born globals. The sampled new and young bio-enterprises became born globals because of the market conditions in the UK's East Midlands region. The region has a high concentration of biotechnology firms (Smith and Ehret. 2013) described in Brassington and Pettitt (2006) as a saturated market. Additionally, the internationalised configuration of the life science sector itself propels new entrants to seek international market opportunities elsewhere.

Kocak and Abimbola (2009) pointed to the speed and the rate at which the technology-based industries emerge, transform and evolve as another push factor. As such, a look into the marketing and commercialisation strategies and tactics of born global bio-enterprises will exact our understanding of the intricacies of their international marketing management arrangements in such chaotic and unstructured global life science markets.

2. Literature review

Entrepreneurial born global companies have multiplied their presence beyond their proximity in search of strategic marketing and commercialisation capabilities. The companies have engaged in communities of economic co-operation and co-ordination with a view to market and commercialise their services with sufficient intensity. Tolstoy and Agndal (2010) explained that collaborative and partnership networks have become a key strategic manoeuvre that businesses use to broaden their scope and direction by exploiting the capabilities they offer. In Knight and Cavusgil (2004) the convergence of international markets was singled out as the push factor contributing to the establishment of integrated exchange systems allowing firms, regardless of their age, experience, and resource base to actively participate in the international marketplace. Noticeably, born global firms are increasingly embracing a co-creation approach enabling them to bridge their knowledge gaps. According to Lewin *et al.* (2009) this has permitted them to be efficient and to perform better because they are able to tap into global talents and resources. Existing research is littered with examples of entrepreneurial biotechnology companies which have utilised international marketing management strategies to broaden their presence in international markets (see for example Liebeskind *et al.*, 1996; Gurău, 2002; Konde, 2008; Lindstrand *et al.*, 2011; Simba, 2013). Their studies positively identify pro-activeness, flexibility and the collaborative propensities of biotechnology firms as the main characteristics that have enabled them to adapt their business models to withstand rapidly changing market conditions.

Similar views are articulated in Tahvanainen and Steinert (2013); Mariussen and Ndlovu (2012); Carayannis (2009); Ghoshal and Nahapiet (1998) who all observed that by adapting innovative business models, entrepreneurial companies will be well-positioned to take advantage of, or to exploit social capital embedded in their networks. Zucker *et al.* (1998), Gartler and Levitte (2005) collectively acknowledged that entrepreneurial companies benefit from international collaborative networks. Keegan (2014) maintains that born global companies are beneficiaries of integrated international marketing channels. Consistent with this, Gabrielsson *et al.* (2008) explained that born-global firms rely on an intricate combination of collaborative networking, knowledge and outsourced expertise to boost their international business prowess. Indeed, modern day born-global firms are dynamic; they constantly re-invent themselves to mimic the ever-changing international business environment that they operate in (Freeman *et al.*, 2013).

The literature (see for example Freeman *et al.*, 2013; Simba, 2013; Kuivalainen *et al.*, 2012; Knight and Cavusgil, 2004; Powell, *et al.*, 1996; Oviatt and McDougall, 1994) universally acknowledged that by tapping into established networks and business-like relationships, born global firms have an opportunity to leapfrog beyond their limitations and access cutting edge resources and market opportunities internationally. Synthesising the debate on born globals, it appears that these entrepreneurial companies adopt sophisticated marketing and commercialisation strategies which have thus far, been difficult to contain in simple traditional marketing models. Therefore, the complexities of the approaches they have adopted especially in the biotechnology industry have necessitated the need to develop a more nuanced marketing model to adequately explain this new phenomenon.

2.1 The operationalisation of the born global concept

The literature is littered with different definitions of what born globals are. For example, Oviatt and McDougall (1994) define them as international new ventures (INVs) that seek to derive competitive advantage from the use of resources and the sale of outputs in multiple countries. Other scholars (see Knight and Cavusgil, 1996; Jones, 1999) use a variety of measures for defining these international new ventures such as: the vision and strategy to become global, time of internationalisation and overseas sales volumes. Scholarship on international entrepreneurship appears to use the term born global interchangeably to describe the born global companies and/or INVs. Madsen (2013) explained that there is however, some acknowledgement among different scholars on the theoretical delineation of the different views on the born global/INVs concepts, but the differences arise when it comes to their operationalisation. These potential differences have been somewhat addressed by scholars. While others have agreed that this has been the case others maintained that born globals and INVs do exhibit different characteristics (Crick, 2009). In Crick (2009) born globals are conceptualised as companies that have a global foci achieving a 10% turnover in each of the triad's three regions (i.e. USA, Japan and EU) whereas INVs were viewed as having an international objective to achieve 30% in their first three years of trading. Considering the different labels used to define born globals a distinguishing feature in all their delineations is that, they adopt a global strategy evidenced by their structural dimension which encompasses various actors in multiple countries (Oviatt and McDougall, 1994). Equally important to this discourse Oviatt and McDougall (2005a) suggested that there is evidence which points to the fact that high-tech companies often become born globals. Notwithstanding this observation, there is still no universal agreement to a single definition of born-globals. In all the confusion and misconceptions regarding their conceptualisation, this study adopts a commonly applied (Gurau, 2010) definition of born globals which draws attention to the fact that at least 25% sales of a typical born global company should come from outside its home market in the first three years of inception (see for example Freeman *et al.*, 2013; Gabrielsson and Kirpalani, 2012; Oviatt, and McDougall, 2005b; Knight and Cavusgil, 1996). Perhaps the last word on this debate can be left to Ferreira *et al.* (2010). Ferreira and others explained that irrespective of the label used to define born global companies they have to exhibit a clear trend indicating the commercialising of products or services on a global scale.

2.2 Entrepreneurial marketing and bio-enterprises

Since the 1980s, the concept of entrepreneurial marketing has become a topical issue in relation to the way entrepreneurial companies design their marketing strategies. Entrepreneurial marketing is a term used in Al-Manasra *et al.* (2013) to describe the marketing processes adopted by firms which pursue opportunities in chaotic and unstructured market conditions such as those offered by the life science sector. An interesting perspective to entrepreneurial marketing is discussed in Hallback and Gabriellsson (2013) who argued that innovative marketing strategies which involve inter-functional co-ordination significantly add value to entrepreneurial firms in turbulent market conditions. Related to this view, Al-Manasra *et al.* (2013) maintained that anticipating change is the core activity of an entrepreneur as it enables him/her to take advantage of his/her networks with minimum financial resources and restrictions on the time to engage in market research. Morris *et al.* (2002, p.8) cogently argued that “the proactive identification and exploitation of opportunities for acquiring and retaining profitable customers through innovative approaches to risk management, resource leveraging value creation” are central to entrepreneurial companies. Consistent with this, Mort *et al.* (2012) pinpointed four key strategies underpinning entrepreneurial marketing comprising: opportunity creation, customer intimacy-based innovative products, resource enhancement and legitimacy. According to Gabriellsson (2005) international new ventures use brand partnerships with a view to create marketing synergy.

It is however essential that when discussing the entrepreneurial predispositions of born global companies an understanding of the concept of international entrepreneurship is also developed. McDougall and Oviatt (2000) described international entrepreneurship in a border sense as a “combination of innovative, proactive and risk taking behaviour that crosses or is compared across national borders and it is intended to create value in the business” (p.903). Furthermore, Oviatt and McDougall (2005a) conceptualised international entrepreneurship as “the discovery, enactment, evaluation, and exploitation of opportunities across national borders to create future goods and services” (p.540). An important point arising in Oviatt and McDougall (2005b) description of international entrepreneurship relevant to this study is that of studying the actions of organisations that take advantage of international trade and the impact of their engagements. In other words this research is a study of international entrepreneurship. Related to this, there is evidence in the extant literature indicating that much effort has been directed towards studying international entrepreneurship by various scholars. Indeed, this demonstrates the theoretical link between entrepreneurship and international business (see for example Hisrich *et al.*, 1996; McDougall and Oviatt 2000; Dana, 2004; Wright and Ricks, 1994). Quite clearly, international entrepreneurship research has mirrored research on strategy and at the same time combining international business and entrepreneurship to explain complex organisational manoeuvres in international markets (Zahra and George, 2002). Based on this, our attention was drawn attention towards exploring the international entrepreneurial strategic approach of a specific category of high technology-based enterprises – bio-enterprises identified as born globals for the purpose of this study.

2.3 The commercialisation strategies of bio-enterprises

The life science industry has witnessed a marked rise of financial investments in technological entrepreneurship (Schilling, 2010). This has partially contributed to the proliferation of small, nascent firms developing inventions and technology with considerable commercial application (Gans and Stern, 2003). Research has shown that commercialisation is at the centre of strategy formulation and the success of research-intensive companies (Kascha and Dowling, 2008; Rothaermel and Deeds, 2004). Gans and Stern (2003, p.335) explained that “for many technology entrepreneurs, the commercialisation stage is the first opportunity to truly define a firm’s strategy and positioning”. Teece (1986) explored the determinants of a commercialisation strategy. He pointed out that firms need to develop complementary assets such as product development, production and marketing for successful commercialisation. Furthermore, Teece (1986) proposed a framework for developing complementary assets that assist in successful commercialisation. The model illustrates that firms can choose to develop their assets in-house or to co-operate with other companies with a view to access complementary skills. In science-intensive sectors such as the biotechnology industry co-operation occurs in different ways; ranging from arm’s length market transactions to equity-based co-operation (Shan, 1990), and via outsourcing arrangements (Roudini *et al.*, 2012; Teece, 1986). In Kasch and Dowling (2008, p.1766) co-operation is regarded as, “an intermediate form of integration and market transactions”. The biotechnology industry is characterised by extensive co-operation between diverse agents that include established pharmaceutical companies, investors and government agencies (Rafols *et al.*, 2012). It therefore, follows that to commercialise a new drug, a young biotechnology firm would require complementary assets such as specialised labs for production, as well as marketing expertise (Kasch and Dowling, 2008). From that perspective, this study aims to investigate how born global bio-enterprises mitigate their newness and resource deficiencies in sophisticated international markets for successful marketing and commercialisation thereby contributing to the concepts of international marketing management.

2.4 An overview of existing theories

Existing studies treat commercialisation (Conceicao *et al.* 2012; Kasch and Dowling, 2008) and entrepreneurial marketing concepts (Al- Manasra *et al.*, 2013; Eriksson and Rajamäki, 2010; Huck and Rennhak, 2013; Hallback and Gabrielsson, 2013; Gans and Stern, 2003) separately. This does not reflect the specific entrepreneurial marketing management and commercialisation arrangements of born global bio-enterprises. From that point of view, this study combines the two operational strategies mentioned above with empirical evidence. The duality informs the development a theoretical model (presented on p.19) which adequately explains the activities of born global bio-enterprises exhibiting a clear trend of entrepreneurial marketing management and commercialisation of products or services on a global scale.

3. Research Methodology

3.1 Methodological approach and case selection

The main purpose of this research study is to propose new theory concerning the marketing and commercialisation arrangements of born global bio-enterprises. As such, the authors of this article deemed the qualitative multi-case strategy to be an appropriate methodological approach. Context was considered to be vital because it helps to understand their specific marketing and commercialisation arrangements. Therefore, to strengthen the development of theory and propositions the study utilised multiple cases (Yin, 2003; Gerring, 2005). Furthermore, a co-ordinated research approach of induction and deduction described as abduction in Saunders *et al.* (2012) was adopted enabling the study to benefit from the use of existing theory and to critically examine empirical evidence. The duality allowed the study to develop an in-depth understanding of the entrepreneurial abilities of bio-enterprises and to establish casual explanations (Miles and Huberman, 1994) between their entrepreneurial predispositions and marketing arrangements in their communities of economic co-operation and co-ordination (networks). The criteria for selecting cases was purposeful and it was based on theoretical sampling (Patton, 1990). The cases were chosen on the basis that similar results were predicted to be produced within each case – a process termed *literal replication* in Yin (2009).

After establishing a sample selection strategy, BioCity Nottingham (BCN), Enterprise Europe Network (EEN), Pera Innovation Network (PIN), Loughborough Innovation Centre (LIC) and Medilink databases were used to identify suitable biotechnology companies. Appropriate cases were classified using the following criteria: (1) an enterprise had to conform to a commonly used definition of born globals which accentuates that at least 25% of their sales had to come from outside their home market in the first three years of their inception (see for example Gabriëlsson and Kirpalani, 2012; Oviatt, and McDougall, 2005b; Knight and Cavusgil, 1996). (2) The enterprises were also expected to use the East Midlands region as their home market. The logic underpinning this classification was that the region has a high concentration of University and technology-based spin-offs. The study considered research activities at BCN, LIC, Nottingham Trent University, University of Nottingham, the University of Leicester, Loughborough University and AstraZeneca's re-organisation as the key factors contributing to the formation of small biotechnology companies in significantly large numbers. This was presumed to have led to market saturation, forcing the biotechnology companies under investigation to consider international markets. (3) The firms had to use scientific knowledge for new drug discovery services and technical know-how to assist their clients to develop new clinical processes. (4) The companies had to be involved in communities of co-operation and co-ordination both domestically and overseas. (5) Well-established biotechnology companies were excluded from the sample because of their tendency to develop less flexible structures. The criteria set above for selecting companies led the study to five born global bio-enterprises (see an overview of the companies in Table I on p.8).

Table 1: An overview of sampled born global bio-enterprises

	<i>Company A</i>	<i>Company B</i>	<i>Company C</i>	<i>Company D</i>	<i>Company E</i>
Year of registration	2002	2011	2004	2010	2003
Location	BCN East Midlands	BCN East Midlands	BCN East Midlands	LIC East Midlands	BCN East Midlands
Trade description	Manufacture of pharmaceutical preparations	Research and experiment development on biotechnology	Integrated drug discovery services to the pharmaceutical and biotechnology market	Scientific and technical activities in biotechnology	Research and experiment development on biotechnology
Company size (2013)	Micro/small	Micro/small	Small	Micro/small	Micro/small
No of Employees	13	9	69	6	6
Total turnover	£618,315	£124,962	£6,951,533	£300,681	£163,616
Overseas sales in year 3 (2013)	£381,348	£86,642	£2,244,018	£165,884	£61,742
% Overseas sales	61%	69%	32%	55%	37%
Overseas partnerships	4 in the USA and Europe	6 in the USA, Canada, India and China	3 in North America and Europe	2 in America and Europe	2 in China and the USA

3.2 Data collection and analysis

In order to improve the quality of the conceptualisation or operationalisation (construct validity) of the main theories the study utilised a range of sources of evidence and methods of analysis. Specifically, primary data was collected from key informants in each company who included: CEOs, business development officers (BDO) and senior scientists. To corroborate the accounts given by the participants, 30 face-to-face interviews were carried out lasting between 105 to 150 minutes with an average duration of 115 minutes. In each case, 4-6 interviews were carried out to increase the reliability of the data to be collected for analysis (Eisenhardt, 1989; Huberman and Miles, 1994). To ensure consistency and validity of collected data the same semi-structured questions were used to guide all the interviews. The interviews were audio-recorded and subsequently transcribed. Additionally, secondary data materials were accessed using company databases, Companies House and publicly available literature. Follow-up emails and telephone calls were made in instances where additional information was required. The credibility of the information collected from the key informants was enhanced when the study reached a point of saturation i.e. a point where the participants were giving previously presented events. At that stage no further interviews were deemed necessary (Riley, 1996). Following data collection the next stage was to analyse the data. Within case analysis was carried out and a descriptive write-up (Pettigrew 1988) of each case was done in order to develop a rich and in-depth insight into their international marketing activities. Following this, a cross case synthesis (Yin, 2003) was done to identify patterns of their marketing management activities.

At the data analysis stage a thematic technique was used. Both researchers were involved at the data collection stage and its analysis and in identifying the key themes emanating from the literature and the empirical findings (Bellamy and Perri, 2009). The main goal was to increase the reliability, credibility and the strength of the inferences of the research – a process described in Denzin (1970) as *investigator triangulation*, which refers to the use of more than one researcher in the field to gather and interpret data. The analytical tool used in this study is termed *explanation building* (Gray, 2014). The idea for using this analytical technique was to develop a frame to assist in explaining the components that were considered to be associated with the entrepreneurial marketing and the commercialisation strategies of born global bio-enterprises. In that sense, our aim is to analyse the entrepreneurial marketing management and commercialisation strategies of the sampled companies. Concomitant with this activity, the study made theoretical propositions.

4. Empirical Findings

This part of the study presents the research findings detailing the marketing and commercialisation strategies and tactics of born global bio-enterprises outlined in Table I on p.8.

4.1 Company A

To export its pharmaceutical preparations company A relied, to a great extent, on collaborative networks established in the US and Europe. The biotechnology company followed a cost-effective intermediary system whereby it licensed its products/services to international health ventures. As part of the arrangement the entire financing package for the project was funded by the venture. The bio-enterprise benefited from this commercialisation arrangement by receiving marketing advice, assistance, royalties and R&D investments to fund its new drug discovery projects. This assisted the bio-enterprise to reach product development milestones. The company's CEO gave more insights into the benefits of its marketing and commercialisation arrangements stating that:

We acquire marketing, pharmaceutical-related expertise, PR, and financial support from our business partners to back our products and these are things that we do not have in-house and they are necessary to achieve our goals

The company's international entrepreneurial strategy was reflected by its participation in international conferences designed to bring together a diverse science community of biotechnology companies and special-interest groups. The bio-enterprise was effective in the way it used its communities of economic co-operation and co-ordination for its commercial reasons. This is reflected in the quotation below:

The use of university expertise for imaging drug deposition and clearance will greatly enhance the development of this formulation (teriparatide formulation). This project will draw on interdisciplinary collaborative research from international experts and EU funding. (BDO)

In a related discussion on marketing and commercialisation strategies in biotechnology, with a senior scientist, also involved in developing strategic partners for the biotechnology company, echoed similar sentiments:

.....often than not you find that in these internationalised biotechnology markets if you want to publicise your innovations you find yourself talking to another company in another part of the world.

The bio-enterprise appeared to select partners with a strategic fit for commercial reasons. Its BDO explains this more fully:

We travel worldwide for example; we attend seminars in the USA, and in Europe seeking for partners with complementary commercialisation capabilities. We engage with global networks to access crucial market-specific information which we feel is important for our business. Our product is unique and we do not have any other companies within the East Midlands which complement our services so we venture to countries such as the US and to countries in the EU.

To guarantee the marketing success of its pharmaceutical preparations the biotechnology company preferred to enter into collaborations with partners who were committed and were successful/established pharmaceutical companies. The partnership selection process was meticulous and it was based on product compatibility, reputation, technical know-how, marketing management expertise and financial soundness. Irrespective of the fact that the drug will succeed, the company initiated its commercialisation process during a drug's transition period using a partnership approach. According to the company's BDO the idea behind what he termed 'early commercialisation' was to...

....test the commercial potential of our compounds early in the drug development process. We are aware that market and regulatory forces could change in the time required to bring our product from pre-clinical testing to launch therefore, this early process which involves our strategic business partners and clients reduces the time to market.

The companies selected through this commercialisation arrangement were either directly involved in human drug development or they were key stakeholders in biotechnology. The underlying motive was to accelerate the commercialisation of its developments on an international scale; table I on p.6 illustrates a significantly high percentage (61%) of overseas sales as a fraction of the company's total revenue for 2013. This demonstrates that the international marketing and commercialisation arrangements of the bio-enterprise were achieving the desired effect.

4.2 Company B

Although company B is the newest in the research sample, it entered the market with a highly structured international distribution system designed to reduce time to market. In the US the company was quick to establish a distribution channel through a business partner in San Diego California.

Using a piggybacking marketing arrangement with its San Diego-based partner the bio-enterprise was able to provide its US-based clientele with drug metabolism and pharmacokinetics (DMPK) services from an early stage of drug discovery through to its development. The CEO of the company was clear about how his company and its clientele were benefiting from the piggybacking marketing strategy. This is what he had to say:

Our collaboration combines state-of-the-art in vitro, in vivo and bio analytical capabilities with our expert pharmacokinetic/pharmacodynamic (PK/PD) data interpretation. This integrated approach provides clients with the information required to successfully achieve their drug discovery and development goals.

The chief scientist of the bio-enterprise reaffirmed similar views when he explained that:

Our combined consultative approach to problem solving provides our overseas clients with increased flexibility, focused data, high content and quality and ultimately time and cost savings.

The company's piggybacking strategy was a very effective way of utilising its international channel systems. Its selected strategic business partners were presumed to be not in direct competition with the bio-enterprise. Nonetheless, the companies were chosen on the basis that their services appealed to the same type of customers and that they complement the company A's drug metabolism and pharmacokinetics (DMPK) services. Based on its common approach with its business partners, an agreement was reached in 2011 with its San Diego California-based partner to cover the shipping costs of its science compounds to its US first-time clients. To this end, its US-based partner commented that:

.....is located in the UK and we are offering to cover the cost of shipping compounds for first time clients. We work with reliable couriers that are able to deliver compounds to clients quickly and cost-effectively.

The piggybacking strategy was not only applied in the life science sector in the US alone. The enterprise had a wide network of established pharmaceutical companies/clients in the Far East, UK and Europe. Its BDO elaborated this view and expressed that:

We are an international contract research laboratory-based business. We carry out tests on research compounds to ensure that they have suitable metabolic stability in 'vitro' for our local and international clients. We collaborate on an international scale with companies in the China, India, Canada, Europe and the US to ensure our services satisfy the development needs of clients' metabolism and pharmacokinetics processes.

The company identified and recruited its business partners by engaging in purposefully designed international conferences.

Its networking strategy for marketing and commercialisation was deliberate and it was intended to take advantage of the resources embedded in its strategic partners (usually reputable pharmaceutical companies) established in world-renowned science networks of biotechnology such as Boston's biotechnology metropolitan area, Massachusetts Institute of Health Science and Cambridge's network of networks. This was explained more fully by the company's CEO in the quotation below:

Working in partnerships and collaborative projects in 'open science' networks with our US and British counterparts increases our level of commercialisation and it considerably bridges the gap between our internal capabilities and the threshold level required to penetrate overseas markets. We also benefit in terms of low operational costs from our strategic partners and from those partners who have a good reputation especially, those business partners who are part of well-developed networks such as Boston, Medicon Valley, MIT and the Golden Triangle of Cambridge, London and Oxford we get access to their markets and marketing expertise.

The company's top management team attended bio-science events to access cutting edge resources and market opportunities. A look into their itineraries revealed that they routinely booked to attend events organised by Bio-Europe; a deliberate international partnering conference usually convened in European countries. Attending such events was seen as an on-going marketing strategy by the enterprise. The BDO of the enterprise commented that:

Having attended the BioSpain conference in September of 2012, our plan is to build more connections with like-minded companies and seek further partnering opportunities

As part of attending conferences such as BioSpain, the top management team presented its laboratory research findings. This was a company-wide international marketing strategy designed to publish its research findings following successful lab tests. The ultimate goal was to reach out to a large clientele as well as attract commercial partners (both small and large pharmaceutical companies). The company's overseas sales percentage of 69% illustrated in table 1 on page 7 demonstrates the impact of its international entrepreneurship and marketing predispositions.

4.3 Company C

In the second year (2005) of its establishment, company C was pre-occupied with identifying foreign distribution channels and production partners experienced in the commercialisation of Pharmix technology. Its business idea was to work in partnerships with established pharmaceutical corporations with a view to breakthrough into international markets. The president of the enterprise expressed the view that:

.....is well placed to take advantage of the increasing opportunities presented to it by this globalised pharmaceutical industry. Drug discovery and development is an expensive and time-consuming process, the chances of successfully producing a new marketed drug remain small, and the industry is going through an unprecedented period of change and uncertainty.

In the face of these challenges, as we undertake pharmaceutical R&D we require, more than ever trusted strategic business partners, regardless of their location, with extensive industry experience to accelerate our drug discovery services as well as increase their commercial value.

The remarks above give the impression that company C's marketing efforts were fixated on developing effective commercialisation arrangements with a determination to add value and extend the range of its services far and wide. In 2008 the bio-enterprise entered into a trade agreement with a German-based pharmaceutical company which provides protein-structure accelerated drug discovery services to more than 80 pharmaceutical and biotechnology clients in North America, Europe and Asia. Establishing a business-like relationship with a company that has such a large pool of clientele allowed the bio-enterprise to broaden its customer base while, offering a standardised drug discovery service. Furthermore, this commercialisation arrangement was seen by the CEO of the enterprise as a crucial undertaking of enhancing customer value as his company was able to provide its clientele with an integrated drug discovery service both domestically and internationally. When asked about the importance of establishing partnerships to his bio-enterprises' marketing and commercialisation strategy, its CEO explained that:

With the addition of to the 'federated' CRO Model, it enables us to offer our customers a world class, fully-integrated drug discovery service which would allow us to design novel compounds, synthesise and screen in vitro. The X-ray protein structure analysis undertaken at, metabolic liability and toxicity assessed at and then tested atand in pharmacodynamic and disease-relevant models. This powerful federation of alliance partners will help accelerate our clients' drug discovery programmes towards development.

At the beginning of 2013 the bio-enterprise was selected to be one of Europe's seven Lead Factories of molecule data supported by Innovative Medicines Initiatives (IMI). The IMI's role was to build a library of science compounds accessible to both private and public organisations offering promising new targets for drug discovery screening. This presented the bio-enterprise with an opportunity to publish and attract potential clientele for its drug discovery services. In addition to its use of an open European science library, the company also used online marketing. From time to time, it emailed a newsletter/magazine to its customers and the science community highlighting new developments in terms of drug discoveries or ground breaking lab test results, more so, it's newly acquired science capabilities. This enhanced its brand image and reputation. These were the key success factors which enabled the company to accelerate its growth in Europe and the US. In a conversation we had with the CEO of the bio-enterprise regarding its recent strategic alliance in Europe, he commented that:

.....has specialist skills in early stage drug discovery that are highly-complementary to our own. We tap into their outstanding reputation for providing unique and best-in-class technologies to broaden our client base.

Most of the alliances that were developed by the company were in the form of partnerships intended to facilitate R&D, distribution, marketing and to establish brand credibility. As such, developing complementary business partners in Europe and the US enhanced company performance and boosted its revenues as evidenced by figures illustrated in table I on page 6 showing that almost a third of its revenue was generated from overseas in their third year of trading.

4.4 Company D

The company's marketing and commercialisation strategy was mainly driven by its owner. During the first few years of its formation the company appeared to aggressively pursue collaborations and partnerships in multiple countries. It positioned itself in the biotechnology markets as a consultancy firm working on contract basis. For its marketing; presentations at seminars were used as the main media for communicating with potential clientele. Specifically, the bio-enterprise adopted a direct marketing approach which was mainly anchored on its founder who stated that:

I personally have social relationships with people who I have known for a long time. I have some contacts in America where my business started way back in 1998 as a model based on a drug development firm. I still communicate directly with firms I did consultancy work for and friends in the USA and in Europe informing them of how our technical capabilities have evolved – basically I will be bidding for more work. I also engage with a number of scientists at our annual meeting code named PAGE. (Company D CEO and Founder).

The company's website was also used as a powerful marketing tool – communicating information about the enterprises' science capabilities. The experience in life science of key team members is publicly available on its site. This marketing technique was used to attract pharmaceutical companies who use consultants with a proven record in *Pharmacometrics* and PKPD modelling and simulation to outsource their drug testing/development services. Before the company relocated to Loughborough from Nottingham, its preferred approach for creating publicity was through research syndicates. Such alliances were part of the company's marketing campaign for advertising its science capabilities. Specifically, they were used as a showcase of its science modelling and simulation capabilities in the process of developing life-saving drugs to treat malaria and poverty-related diseases in under-developed nations. The founder and CEO of the business claimed that the marketing strategy which was designed to enhance his enterprises' reputation worked well. This is how he put it:

This way of doing business brought significant benefits to our company associated with credibility and reputation which are essential for contract research organisations such as ours. I was motivated to continue pursuing alliances of this type (research syndicates) because I realised their value to us. The malaria consortium was pivotal to our international strategy and it significantly assisted our economic development and growth.

Interestingly, when the company relocated in 2012, a knowledge transfer partnership (KTP) approach was adopted as a commercialisation strategy for company-based capabilities and for marketing purposes.

The BDO of the enterprise stated that:

We are interested in collaborating with universities and computer firms to jointly develop simulation mathematical combinations. This cross fertilisation is important in the sense that it enables us to develop what we intend to produce. We have established these partnerships in Europe and the US whereinitially traded as a consultancy.

To engage in extensive promotion and marketing of its human drug services the enterprises' CEO put it this way:

The conference we usually attend in Glasgow hosts a large pool of scientists, health professionals, academics, MHARA (to do with authorising new medicines). This makes it more worthwhile for us to attend in the sense that we are in a position to access vital market-specific knowledge and information essential for marketing our consultancy work.

The enterprise's entrepreneurial marketing moves were well complemented by the marketing infrastructure created by these huge science community assemblies guaranteeing brand recognition and endorsement.

4.5 Company E

Company E distinctly developed a customer-centered marketing approach – a point made clear by its CEO who remarked that:

There is a real need for rapid acting, ready-to-use haemostats that are safe and cost-effective, and we believe our technology can deliver these benefits to surgeons and their patients

The enterprise employed an innovative marketing strategy. Through its trade agreement plan, the enterprise increased its involvement by forming long-term partnership-based relationships. The enterprise's trade agreements typically involved the negotiation of equity investment and the co-promotion and co-marketing of its technology, allowing it to generate a steady stream of revenue. Its network of trading partners was dominated by companies which provide investment funds and grants as well as mobilise research, networks and skills. When discussing about the role of external funding to his enterprise's technology development process, its CEO explicated it this way:

Funding is vital to the continued development of our technology. Last month we received a significant financial injection to back our clinical development of new haemostat to control surgical bleeding. This Award and the share-holder investment will enable us to generate more data to support the translation process from research to patients.

In addition to R&D funding it received; its investors contributed, business management and marketing experience, and they brought networking contacts which added considerable value to the bio-enterprise and its clientele. As a university spin-off, the company used university bulletins to publish its research activities with the intention to attract funding and potential investors and to gain credibility. The same platform was used to inform its targeted audience (doctors, nurses and surgeons) about the importance of its technology to the work they do.

This marketing technique was being used by the enterprise to boost its reputation and credibility. The enterprise also used niche marketing as a tactic to lure investors by demonstrating that its technology matched a specific market need. This enabled the bio-enterprise to attract more funding. Commenting on the financial agreement to fund company E's technological development, the head of business development of an investing company pointed out that:

Improved control of bleeding is vital for safe and effective surgical procedures. We are pleased to offer our continued support to this project and look forward to seeing the technology advance towards clinical use

The bio-enterprise maximised its marketing economies of scale by taking advantage of its investors' online presence. The enterprise also used its own online presence to inform potential partners and clientele about its science capabilities and the cumulative experience of its founder and the top management team.

4.6 Cross-case analysis

In this section, the research analyses the marketing and commercialisation strategies and tactics of all five born global bio-enterprises, particularly, focussing on how the strategies and tactics were executed, managed and organised. Using cross-case analysis enabled the study to map out the marketing and commercialisation strategies of all the companies. This process involved the use of secondary data and empirical evidence obtained from each born global bio-enterprise. The study constantly compared existing theory and data from the research sample, iteratively moving towards a close fit between the two (Gray, 2014).

The ultimate goal was to identify any emerging patterns that would assist theory formation regarding international marketing management and international entrepreneurship in born global bio-enterprises. Synthesising themes identified in the literature and data collected from cases of born global bio-enterprises (as illustrated in table 2 below) indicated that they use various marketing and commercialisation methods in the internationalised biotechnology sector. The study found that irrespective of the origins of the studied bio-enterprises (whether university or technology-based spin-off) they appeared to follow an identical marketing framework. In all the cases there was evidence of entrepreneurial marketing predispositions. The standardisation of the elements of the marketing mix specifically promotion, distribution and services was crucial to how they established their brands domestically and in overseas markets. Marketing mix standardising was achieved through the formation of strategic alliances in multiple countries. In view of this, it is plausible to suggest that standardising components of the marketing mix is an appropriate strategy to follow in international markets (Brassington and Pettitt, 2006). Evidently, during their first few years of operation the companies were quick to search for complementary partners which they used as conduits for their marketing activities while at the same time tapping into their commercialisation capabilities. Partnerships, trade agreements and networking enabled the companies to enjoy economies of scale. These methods of marketing and commercialisation particularly facilitated low-cost marketing (co-promotion and co-marketing) and shared R&D risks.

Table 2: Biotechnology marketing and commercialisation arrangements

	Standardised marketing and commercialisation arrangements				Market entry strategies
	Bio-enterprise initiatives	Co-ordinated international marketing activities	Commercialisation arrangements	Distribution systems	
Company A	Seeks complementary capabilities locally and internationally. Taps into partners' existing marketing channels, sponsors PhD researchers	Presents at international bio-science events. Uses strategic partners and company website. Maintains relationship with science community at exhibitions	Enters into research contracts (co-operative commercialisation) with established pharmaceutical companies in multiple countries	Uses strategic partner's service distribution channels. Also uses network contacts	Licenses IP rights, strategic alliances, networks
Company B	Employs experienced scientists. Owner uses personal contacts as sources for capabilities. Takes advantage of partners' marketing capabilities. Joint commercialisation	Same as company A. Also uses trade magazines and contacts customers by emailing news bulletins. Co-sponsored a booth at exhibition in the US. Participates in USA roadshows with its partner	Same as company A. Also outsources drug discovery activities to strategic partners	Same as company A	Piggyback, networks, partnerships
Company C	Exploits partners' customer base. Joint commercialisation and engages in collaborative R&D projects	Contributes to a public European science library (brand building). Uses e-science magazines. Joint publications in academic journals	Same as company A.	Uses partner's service distribution systems	Trade agreements with foreign companies, networks, strategic alliances
Company D	Personal contacts used for market intelligence, Uses knowledge transfer partnerships, Employs university graduates. Facilitates work placements	Provides lectures at seminars, research publications, direct marketing, participation at conferences	Part of a research consortium of 24 companies.	Uses previous contacts in the US, Italy and Switzerland.	KTP, Academic partnerships
Company E	Has strong university links, Applies for research funding, Targets a niche market (operating theatres)	Advertises in academic bulletins and a university website. Produces research publications	Relies on Venture Capitalists (VCs), Charitable organisations, government institutions for funding to develop its technology	Uses VCs contacts/networks for product distribution	Trade agreements, Research contracts

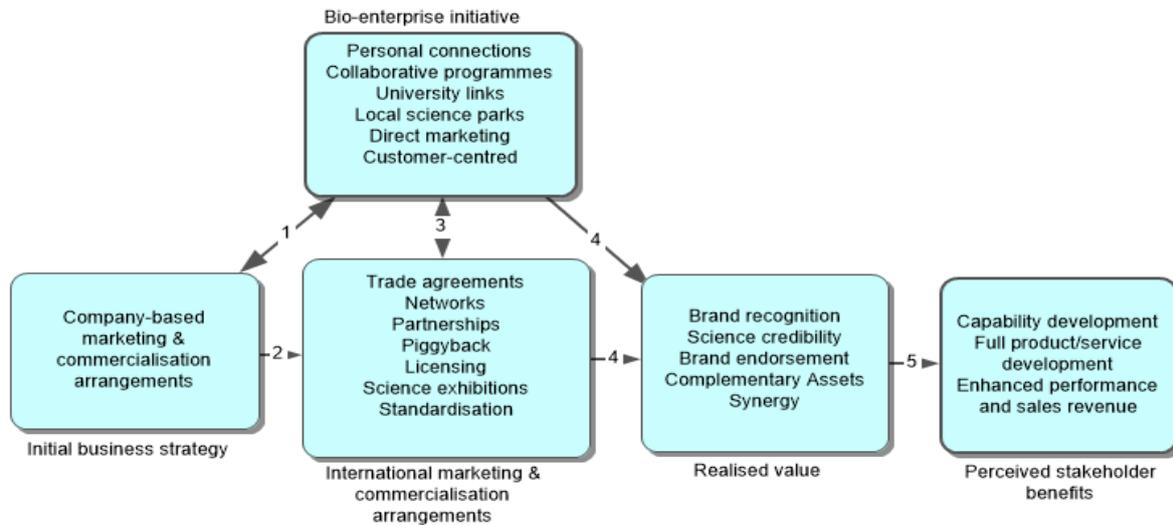
In the international marketing management literature (see Jeannet and Hennessey, 1995; Brassington and Pettitt, 2006; Doole and Lowe, 2012) partnerships are seen as an appropriate strategy that allow companies to join R&D forces with a view to develop a specific product, market, share a distribution channel and to sell each other's product. The process of selecting business partners was also an important event for all the companies. The criteria for choosing partners were anchored on 'strategic fit'. Specifically, it was based on product compatibility and distribution networks, synergy, marketing and financial soundness. In the first three years of their operations all the enterprises achieved more than 25% of overseas sales (see table 1 on p.8). This suggests that their marketing management and commercialisation strategies and tactics were effective. This was possible because they were able to bring together complementary assets and skills using their entrepreneurial dispositions (Johnson *et al.*, 2008; Schilling, 2010).

Company D and E had strong university links which they used for publishing their lab tests to the internationalised life science markets. Exhibitions, conferences and research seminars were used by all the companies as a platform for showcasing their science competencies. Science exhibitions were also used to target potential clientele and as an opportunity for opening up dialogue with identified business partners. Companies A, B and C used their founders' personal connections to facilitate the distribution of their services. None of the companies established their own subsidiaries in the countries they had clientele, but rather they used their business partners as intermediaries, indicating that networking was the most preferred market entry strategy. External partners especially, VCs were identified as the most important agents which financially supported and enabled various marketing and commercialisation activities to occur in biotechnology. A major finding was that, in all the companies, their top management teams consisted of internationally recognised scientists with commercialisation and 'deal-making' experience in biotechnology. Some of the directors were even involved in more than two companies. Their wide links, expertise, and experience were subsequently used to provide the scope and direction for the bio-enterprises, with a view to succeed in the often chaotic and unstructured international biotechnology markets.

5. A new entrepreneurial marketing management and commercialisation framework

As has already been mentioned in the study, born global bio-enterprises are involved in science-intensive markets, dealing with sophisticated technology, which makes it difficult for simple traditional marketing frameworks to adequately capture the detail of their marketing and commercialisation strategies and tactics in international markets. As such, this study proposes a new model designed to capture these phenomena more accurately. Developing a theoretical framework was a strenuous process. It involved a procedure whereby the researchers investigated the underlying facets of international marketing management in bio-enterprises to understand the logical reasons for their chosen business approaches. The proposed theoretical framework uses the international marketing management literature and empirical research evidence. Many scholars agree that theory developed in this way is one that is imbued with merit (see Collier and Mahon, 1993; Gerring, 2001; Goertz, 2005; Bellamy and Peri, 2009). The study established a strong connection between born global bio-enterprises and extant literature permitting the formation of a testable, relevant and valid conceptual framework (Glaser and Strauss, 1967). The new frame of reference is presented in figure 1 below. The model demonstrates a deliberate and calculated process of clear internal skills appraisal, followed by efforts to identify relevant complementary skills and capabilities to enhance a bio-enterprises' commercial and international marketing management acumen. Partnering strategies guaranteed better performance, customer satisfaction and improved sales revenues. The process encapsulated in the model is discussed, in detail, in the ensuing sections. The authors invite other scholars to further develop the proposed entrepreneurial marketing management instrument, so as to extend its applicability in marketing management.

Fig.1. A conceptual model of entrepreneurial marketing management and commercialisation in born global bio- enterprises



5.1 Company-based marketing and commercialisation arrangements

The studied bio-enterprises demonstrated a strong sense of clarity and self-awareness, beginning with a clear articulation of their aims and objectives from inception. This was overlain by an honest introspection and appraisal of their internal skills capabilities. With their core skills, competencies and capabilities now catalogued, the bio-enterprises seemingly built their core businesses around the identified core sets of skills. The initial company strategies were seemingly built around the skills and experiences of the business founders. They forged productive partnerships and often surrounded themselves with skilled scientists, university graduates and people with commercial skills usually contracted from local and international markets as and when required. After an internal skills appraisal, there appeared to have been a deliberate process of mapping available skills against the companies' overall objectives, leading to a gap analysis. Thereafter, the newly developed model presented above suggests that born global bio-enterprises conducted an environmental scanning exercise aimed at identifying suitable skills and competencies that complement firm-based capabilities. It was crucial that the bio-enterprises built a set of specialist complementary skills to realise their objectives. There seemed to have been a two-pronged strategy of exploiting personal networks and contacts, on one hand and on the other hand, networks and/or commercial communities of co-operation were explored to identify and bring into the enterprise the required skills and competencies. In the literature about born global (see Gurău *et al.*, 2010; Laanti, *et al.* 2007; Madsen and Servais, 1997; Sharma and Blomstermo, 2003; Oviatt and McDougall, 1994) there is near universal agreement that founders and the top management teams of born global firms use their experiences in science to assist their firms to acquire new capabilities and to successfully enter foreign markets.

Thus, the study proposes the following:

Proposition 1: *Business and personal connections of the founders and the top management teams perform an important function in born global bio-enterprises by providing them with scope and direction in the internationalised biotechnology markets.*

5.2 Bio-enterprise initiatives

The studied bio-enterprises demonstrated an affinity for partnerships with universities and local science parks. This is consistent with Houlder (1995) who explained that strategic alliances can help an organisation to enter new markets, access expertise and technology and to achieve economies of scale much more quickly. A prominent characteristic of the studied bio-enterprises was that their initial marketing management, commercialisation strategies and tactics were customer-centered demonstrating their efforts to satisfy specific customer requirements. Engaging in collaborative programmes enabled bio-enterprises to access financial support, specialised laboratory equipment essential for R&D, drug testing and development equipment, critical scientific communities as well as multi-purpose built accommodation. This significantly reduced the time to market for them. There was also a prevalent use of direct marketing strategies whereby the companies' and partners' websites were used to showcase key staff capabilities, expertise and the organisations' core competencies. Two of the bio-enterprises which had their origins in universities used their resources to foster further collaborations with a view to enhance their profiles. Where personal networks were exhausted, companies used local science parks and took advantage of government support. Born global bio-enterprises sought assistance from the government and established science institutions which often came with some input from science experts in the form of coaching.

As such, the study makes the following proposition:

Proposition 2: *The entrepreneurial predispositions of born global bio-enterprises enable them to identify knowledge gaps in their enterprises. As such, the implementation of entrepreneurial marketing techniques in the internationalised biotechnology markets is a tactical manoeuvre that assists them to bridge their knowledge gaps; access essential marketing and technical capabilities proclaim their existence and simultaneously establish their brands.*

5.3 International marketing and commercialisation arrangements

The studied bio-enterprises were aggressive in the way they targeted business opportunities as a result of trade liberalisation in today's international markets. A prominently strong feature of their strategies was their networking abilities in multiple countries – a view also expressed in Freeman *et al.* (2010); Rasmussen and Madsen (2002). Top management team members often attended international conferences, science seminars and other trade exhibitions. At these events, they publicised their laboratory findings and technological capabilities and they were also able to: (i) showcase their company's services, science capabilities and to promote their services.

This was purposefully done in order to attract potential funding and/or commercial partners from an international audience, (ii) scan the market, to identify emerging science technology and to scout for potential distribution networks. Purposeful international marketing management and commercialisation arrangements ensued from these initiatives, primarily employing strategies such as piggybacking and licensing. This permitted the born global bio-enterprises to benefit from the complementary assets of their strategic partners which provided them with synergy and marketing mix standardisation. By combining technological resources and marketing capabilities, the firms were able to expand their market knowledge and do so more rapidly than they would alone (Schilling, 2010). This study therefore proposes the following:

Proposition 3: *The liberalisation of international markets allows born global bio-enterprise to take advantage of the resources embedded in specialised science communities that transcend their immediate proximity. In such close-knit communities bio-enterprises are able to standardise their marketing and commercialisation strategies through partnership arrangements. Partnerships are a conduit which accelerates foreign market entry and brand development.*

5.4 Realised value

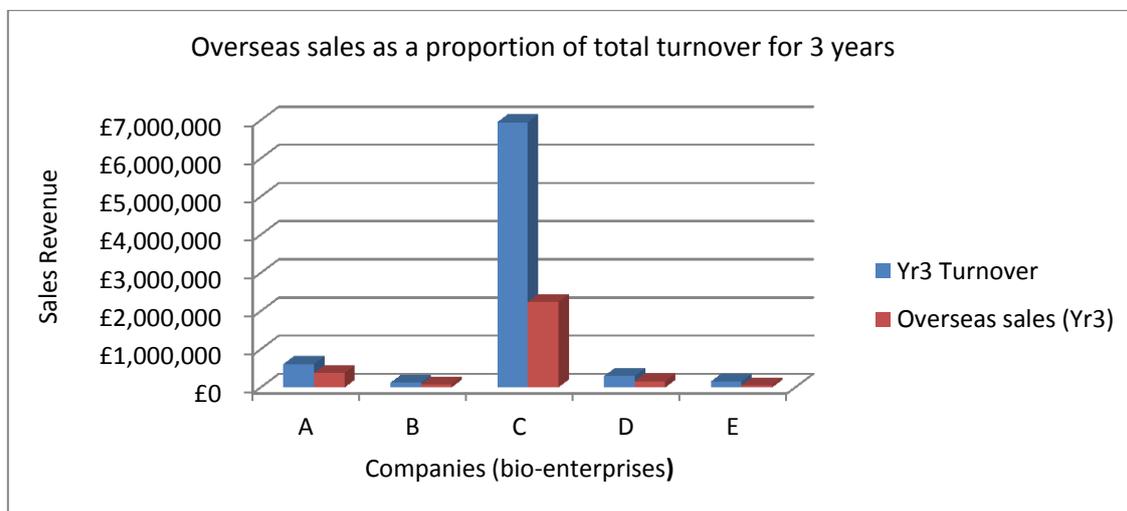
The underlying motive for using various marketing management and commercialisation tactics in international biotechnology markets, by studied enterprises, was to first of all satisfy customer needs and secondly to do so profitably. In the literature (Oviatt and McDougall, 1994; Knight, 2000) a typical born global firm is conceptualised as having achieved at least 25% overseas sales in their third year of trading. The studied bio-enterprises seem to have surpassed the threshold constantly referred to in the literature. The lowest achiever (Company C) made 32% overseas sales while the highest achiever (Company B) realised 69% overseas revenues as a proportion of their total revenue in the third year of their respective operations. These results are astounding, considering that the three years leading up to the reported trading period (2013) were characterised by a debilitating global recession where most firms reported a decline in their sales revenues (Sharma, et al. 2011). Based on the empirical evidence the study therefore proposes that:

Proposition 4: *The profitability of born global bio-enterprises is very much dependent on how they carefully manage, organise, and control their outward and inward-oriented activities irrespective of the commotion in the international markets. Their impetus to use entrepreneurial instincts cushions and propels their businesses to survive even in harsh conditions.*

Figure 2 on p.22 gives a graphical illustration of overseas sales against total turnover for each of the five companies. The financial results reported below demonstrate a healthy overseas sales performance suggesting that the bio-enterprises have greatly enhanced their marketing and commercialisation by using entrepreneurial marketing management strategies and tactics. Interestingly, the time taken to achieve these high percentages of total revenues in overseas markets has been short for all the bio-enterprises. This suggests that the time to market was significantly reduced through the use of international network channels.

Clearly, the realised value of bio-enterprises came from their deliberate and proactive efforts in biotechnology.

Fig. 2: Overseas sales vs. total turnover in the third year of the trading period ending June 2013



The international collaborations and commercial arrangements between the UK bio-enterprises and their complementary partners resulted in multi-dimensional skills transfer, with all partners gaining new insights into the expertise and processes of the other partner. Judging by the current revenue trends on *figure 2* above, it is conceivable that in their sixth year of trading all the studied bio-enterprises would be generating more than 50% of their total sales revenue from international markets. This finding is important for technology-based organisations in the sense that it enables them to realise that choosing a partner with 'strategic fit' places them in a better position to access global markets and hedge against R&D risks, particularly in turbulent times.

5.5 Perceived stakeholder benefits

In view of the aforementioned throughput of born global enterprises, their clientele also benefited by accessing new drug discovery services, and technologically advanced drug testing processes. The pursuit for international commerce by the UK bio-enterprises created an economy of practice built around their inventions, creating value for all the partners involved, while also generating sales and enhancing overall performance. The skills-transfer has meant that all personnel involved were fully equipped as a result of their involvement in co-operative networks and therefore better-placed to deal with international marketing management challenges.

6. Discussion

Entrepreneurial companies, such as those studied in this research, use their own initiatives for example; they engage in collaborative programmes; exploit resources embedded in local and international science laboratories and they localise their drug discovery services through marketing mix standardisation, with the sole purpose of adding value to their brand.

The companies combine this with international marketing management strategies that involve trade agreements, piggybacking, licensing, networking, partnerships and open science libraries to boost their propositions. In the marketing management literature (see Piercy, 2002; Levitt, 1960), intangible assets such as brand, core competencies, skills and organisational processes (distribution systems for example) are seen as essential components that can be used to build marketing strategies. The rate at which the internationalised biotechnology industry evolves pushes bio-enterprises to adopt international marketing management methods that enhance their internal processes, while adding value to their clientele. Technology-based companies face significant financial challenges such as marketing and R&D costs involved in developing advanced technology and this is even made harder in saturated markets. Statistically, the East Midlands biotechnology sector has a high concentration of biotechnology companies (Smith and Ehret, 2013) and this requires born global bio-enterprises, operating in such an environment to structure their businesses in a way that permits them to leapfrog into the international arena more rapidly. Additionally, there are a number of factors that may push for this – it may be that there are less market pressures in niche markets due to low levels of protectionism giving born global bio-enterprises the impetus to exploit such market structures. An in-depth examination of the bio-enterprises examined in this study produced sufficient evidence indicating they are nimble, proactive and yet extremely well-managed and organised. They utilised existing and newly developed systems of co-ordination and co-operation (networks) within their vicinity and in multiple countries to guarantee their success. More importantly, this study revealed that in the biotechnology industry effective marketing and commercialisation of services is underpinned by marketing management strategies that consider both internal and external marketing forces. Based on this, it is plausible to suggest that designing effective marketing management programmes is very much dependent upon how well an organisation establishes productive connections with the main agents in their networks.

7. Conclusion research implications

The study makes a contribution to entrepreneurial and international marketing research. It clearly maps out the marketing and commercialisation methods adopted in the biotechnology sector. It also offers a fresh perspective on, and an alternative way to think about, marketing management strategies utilised by born global bio-enterprises which are valuable in the technology-based sector. In the study a frame of reference was proposed following an iterative process of literature review and empirical data. The newly developed conceptual framework is a powerful management instrument which can be employed in high or low tech industries to explain the marketing management processes of businesses. An interesting finding of this study is that; regardless of the size of a born global bio-enterprise forging productive networks in multiple countries alleviates risks associated with smallness or newness. Forging productive networks is made possible by the opening up of international markets as a result of trade agreements. Crucially, the exploration and exploitation of close-knit communities of co-operation, as conduits for accessing essential strategic resource embedded in them, is prevalent in biotechnology markets.

As such, the study infers that marketing management strategies that consider the internal and external environment are a pre-requisite in such technology-based industries. Results from case by case and cross case analysis disclose that bio-enterprises develop strategic partnerships with a view to facilitate co-promotion, distribution and to share R&D risks. This could be important knowledge for technology-based companies which may still be operating as lone rangers unaware of the marketing and commercial benefits of networking in today's inter-connected markets.

Furthermore, we suggest that the results of this study could be useful for policy makers (e.g. in the EU and for the UK government) who have a duty to support the international business environment by engineering multilateral trade agreements, to facilitate the movement and the exchange of resources. Furthermore, the study demonstrates that the founders of born global bio-enterprises surround themselves with an experienced top management team. The founders use these key members to perform essential management functions such as selecting business partners with a 'strategic fit', particularly those partners that have complementary marketing, commercialisation and distribution systems. This is an important finding which provides managers in the current technology markets with practical knowledge that can be invaluable in managing their businesses. The study helps business managers to be informed about the considered role of standardised marketing in terms of guaranteeing success in internationalised technology markets. As much as the deemed research approach is considered to be plausible the researchers are aware of its inherent limitations.

The research sample used for this study predominantly consists of five bio-enterprises located in the East Midlands, which limits the extent to which the model/results can be generalised. Therefore, we suggest future studies that test the applicability of the proposed theoretical framework using a larger sample from different setting, so as to identify the propositions that hold and/or modify the ones that are superficial.

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