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THE IMPACT OF IP NONDISCLOSURE ON AND SUCCESS FACTORS INRESEARCH-BASED / ACADEMIC ENTREPRENEURSHIP

Jean-Pierre Himpler MSc
Ph.D. Candidate, University of Sopron, KTK Doktori Iskola, Hungary
jp@himpler.eu

Abstract

For many years commercial products that developed out of university research are a topic of raising interest in academia. The major focus of existing investigations about commercialised academic research is put on developments with patent, thus formal intellectual property (IP) protection. Focus of this study is on unpatented research outcomes and their commercialisation at the example of a balance support tool. Further the study looks at other factors that have an impact on academic entrepreneurship. Whereas – so reveals the study – the pure existence of a patent attracts investors, it does not seem to influence the quantifiable success of a business. Product characteristics, the team behind, the product's applications, market size and also the work with the academic research institution behind including its network have a major impact on the business's outcome in numbers. Further influencing factors are the cost absorption of the product as well as feelings and luck of the entrepreneurial team. The aforementioned research results are findings of a qualitative single case study with additional interviews, and thus do not claim completeness and need to be tested on a larger quantitative scale.

Keywords: University spinouts, IP protection, patents

JEL Classification: I11, O32, O34

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1. Introduction

So far it is clear, that different forms of entrepreneurship exist, including the creation of a new free standing start-up, the development of new business concepts within existing companies and the development of new entrepreneurial ventures out of university-developed technology (Pittaway, 2012). This study specifically investigates the last mentioned form, the commercial exploration of outcome of university studies. This type of entrepreneurship is also known as Academic Entrepreneurship (AE), the new company is a spinout; if the initial research has been undertaken at an academic institution it is a university spinout. Main focus of this study are the factors that have a significant impact on the success of the founded company; specifically to what extent IP-nondisclosure has an influence.

The case study

The research study is a medical technology single case study investigating the spinout process of a product developed out of research at Maastricht University. The invention by Prof. Kingma a renown otorhinolaryngologist and specialist in the field of the vestibular system is a medical device helping patients who lack a feeling of balance. The invention helps sufferers to overcome spatial discoordination caused by vestibular loss.

Given the growing interest of academic institutions to capitalize on the developed intellectual property Maastricht University – as many others – has a so called technology transfer office that focuses specifically on such monetary return of research (Lundqvist & Middleton, 2013). For this case study Maastricht University supported the cooperation of the researcher with the TTO over a period of 11 months with a business developer and also a range of consultants. Further, to involve policy making – which is of growing importance in research-based entrepreneurship (Wright, Clarysse, Mustar, & Lockett, 2007) – the regional development agency (RDA) also got involved and covered some of the research expenses.

The Research question

Given the growing interest in the field of Academic Entrepreneurship this study is investigating aspects that impact the quantifiable business success. Core focus of the study is to close the research gap that emerged, given that current research primarily focuses on the spinout development of research products whose IP has been formally protected by a patent. This focus is paramount because handling IP is moving away from solely claiming patents and moving towards a collective protection strategy (Smith & Hansen, 2002).

Thus, the following research question evolved:

What are the key success factors for the commercialisation of university inventions and how does IP protection in form of nondisclosure influence quantifiable business outcome?'

2. Literature Review

Academic entrepreneurship (AE)

AE is growing in popularity (Djokovic & Souitaris, 2006) and is a field of increasing economic interest for several years (Steffensen, Rogers, & Speakman, 1997). Like for

entrepreneurship, there is also no common definition for AE. Whereas e.g. Roberts (1991), an experienced and academically renown specialist in the field of high technology entrepreneurship in the USA (MIT Sloan School of Management, 2014), defines that AE includes that the entrepreneur was involved as a researcher in the development of the product at the research institution; Pirnay, Surlemont and Nlemvo (2003) explain that the entrepreneur must be linked to the university – yet, their paper does not clarify in which way. Both definitions are too narrow and too limited for this study, because the connection of the entrepreneur to the university is not fundamental. What is here perceived to be crucial though, is, that a new business is created which commercializes on an invention created at a research institution. New opinions including "informal and non-commercial activities" (Abreu & Grinevich, 2013) to also form part of AE have not been given importance in this study. For the purpose of these investigations AE and spinouts are defined as follows:

Research-based entrepreneurship is the foundation of companies out of academic research with the goal of exploiting the created intellectual property (e.g.: Di Gregorio & Shane, 2003; Djokovic & Souitaris, 2006; Roberts, 1991; van Geenhuizen & Soetanto, 2009).

Stakeholders

To define who the stakeholders of AE are, first a definition of stakeholders is necessary: "Stakeholders […] are the individuals and constituencies that contribute, either voluntarily or involuntarily, to […] wealth-creating capacity and activities, and that are therefore […] potential beneficiaries and/or risk bearers." (Post, Preston, & Sachs, 2002, p. 19). In this study the following stakeholders have been investigated with the purpose of getting to a list of factors that have a positive impact on the quantifiable success of university spinouts:

- Entrepreneur (Malik & Mahmood, 2012; Meyers & Pruthi, 2011; Shane, 2004)
- Customer (Friedman & Miles, 2006; Meyers & Pruthi, 2011)
- Researcher Team (Malik & Mahmood, 2012; Roberts, 1991; Shane, 2004)
- Specialists (Shane, 2004)
- TTO (Lockett, Siegel, Wright, & Ensley, 2005; McAdam, Miller, McAdam, & Teague, 2012) & university leadership (Meyers & Pruthi, 2011)
- RDA (McAdam et al., 2012)
- Sources of Finance (Friedman & Miles, 2006; McAdam et al., 2012; Shane, 2004)
- Consultants (Lockett et al., 2005)
- Competition / competitors (Friedman & Miles, 2006)

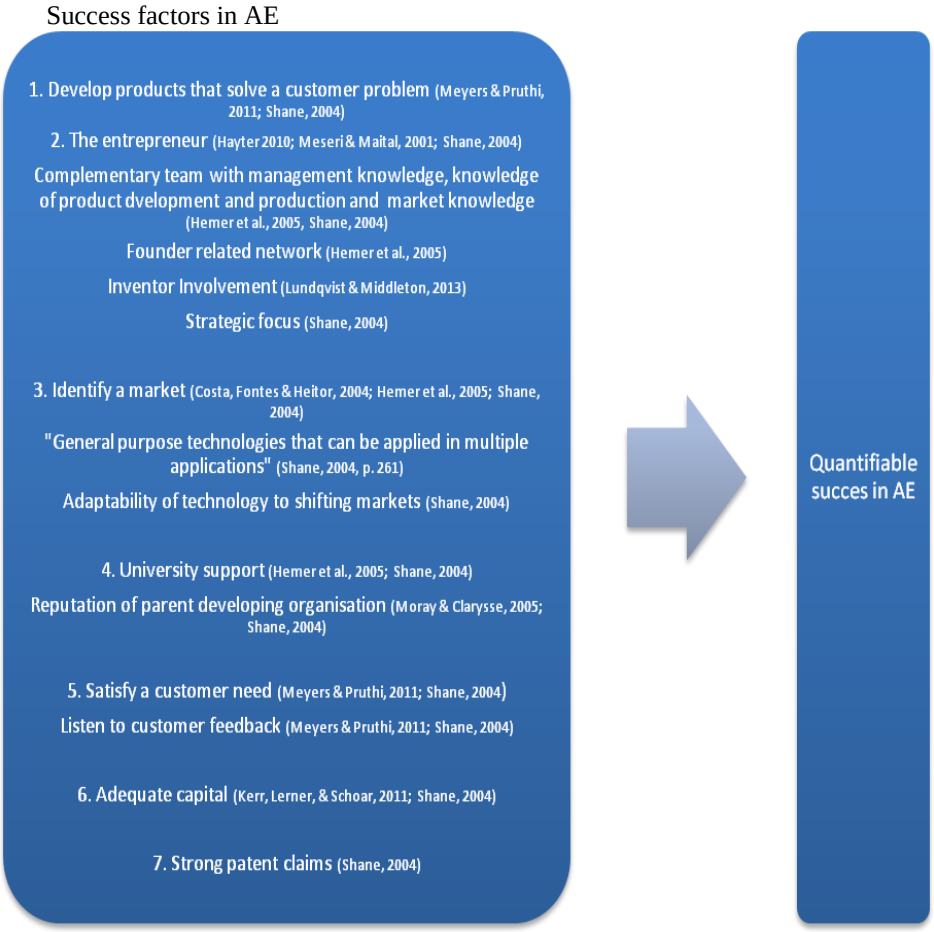

Figure 1: Influences on quantifiable success in AE, literature
(main source: Shane, 2004; other references: Costa, Fontes, & Heitor, 2004; Hemer et al., 2005; Kerr, Lerner, & Schoar, 2011; Lundqvist & Middleton, 2013; Meseri & Maital, 2001; Meyers & Pruthi, 2011; Moray & Clarysse, 2005)

Research unveils that a variety of factors affect the success of spinouts (Hemer, Walter, Berteit, & Göthner, 2005; Shane, 2004) – to know how and what they influence, success as such needs to be defined. Success cannot be measured only quantitatively or in financial terms, it is defined by the entrepreneurs that commercialise on the inventions and manage the businesses (Hayter, 2010). Success is to "harmonise or coordinate a conglomerate of heterogeneous and partly diverging goals of the societal groups interested in the enterprise" (Hemer et al., 2005, p. 4). Consequently, there are varying forms of success, considering the different expectations of the involved parties. For the sake of this paper success has been defined as quantifiable commercial success.

Out of Shane's book chapter, "The performance of university spinoffs" (2004, pp. 240–276), a range of factors influencing AE have been listed and are visualised in figure 1. The visualisation though is not limited to Shane, but also refers to further literature especially focusing on technology transfer. In this way, the figure intends to give a broader overview of the factors that influence success in AE. Thus, seven groups of influences have been found in the literature to affect quantifiable success in AE. Meyers, Pruthi (2011) and Shane (2004) mention in their publications that first and foremost products need to solve a customer problem. Several authors (Hayter, 2010; Hemer et al., 2005; Lundqvist & Middleton, 2013; Shane, 2004) discuss the entrepreneur or management team and the skills that are required for successful commercialisation. It can be summarised out of the literature that an entrepreneur or management team of a new company needs to have technical, managerial as well as market knowledge. Technical knowledge due to e.g. inventor involvement (Lundqvist & Middleton, 2013) is rarely lacking, management knowledge, however, sometimes seems to be an issue (Costa et al., 2004). As supposed to happen with the AVS, students taking over the role as lead entrepreneurs can be a good complement to the management team. This also helps to avoid having the researcher with no business knowledge to become managing director which also is least preferred by the parent university (Lundqvist & Middleton, 2013). It is common sense that strategic focus is important in entrepreneurship; Shane explains that this also applies to AE (Shane, 2004). The market is also a frequently mentioned aspect in the literature, either referring to the necessity to identify it (Costa et al., 2004; Hemer et al., 2005; Shane, 2004), or to the fact that the about to be commercialised technology should be adaptable to a developing one and applicable in several ones (Shane, 2004). Furthermore the contact to the parent organisation and particularly its network (Moray & Clarysse, 2005; Shane, 2004) do have an effect. Customer satisfaction and feedback (Shane, 2004), which is so far sometimes not given the necessary importance (Meyers & Pruthi, 2011) also has a major impact. Adequate capital refers to suitable investors and sources of money covering the cash necessities of a new business (Kerr et al., 2011; Shane, 2004). The protection of IP is an important aspect in entrepreneurial firms exploiting newly developed ideas (Smith & Hansen, 2002). Shane (2004) goes as far as stating that strong patent claims are vital for the success of a spinout, a statement to be challenged here.

IP protection and its importance

Literature looks at IP protection primarily in the form of patents (Shane, 2004), but there are also other forms of IP protection such as copyrights and trademarks (Bradley, Hayter, & Link, 2013). Let it be as it may, first the patent: A patent is defined as: "a government authority or licence conferring a right or title for a set period, especially the sole right to exclude others from making, using, or selling an invention" (Oxford Dictionaries, 2014). It turns out that patenting is not always the best and most valuable way to protect IP. As IP can always be copied (Smith & Hansen, 2002), the business which is holding the patent is responsible to monitor infringements. Thus, holding a patent may come with a lot of costly obligations – especially since all the knowledge behind the patent is disclosed already at the time of patent application (Markman, Gianiodis, & Phan, 2009); if a patent is not granted, then all data has been disclosed to the public and thus also to the competition for nothing. Smith and Hansen (2002) in a non AE context explain that non-disclosure is also a way to protect the IP. In contrast to

that, Shane (2004, p. 259) finds out in research interviews with MIT spinoff managers though, that patents are perceived as the key business success factor. In support of that, they further explain that "it takes real aggressive, competitive IP management […] to succeed" (Shane, 2004, p. 259). Smith and Hansen explain that a patent is only worth its cost if a company can capitalize on it (Smith & Hansen, 2002). As previously pointed out, there is currently very limited research on AE if no patents exist. This study aims to make a first qualitative attempt to explore the importance of patents in AE, and – by doing so – it makes a first step towards closing this gap of knowledge.

3. Methodology

Academic research in the field of entrepreneurship is still relatively new and theories are not yet fully developed (Pittaway, 2012). Thus, this study is oriented more towards exploration so that theory – which is to be tested in future more quantitative research – can be generated. The here discussed investigations are of purely qualitative nature and hold – given the length of eleven months – some longitudinal elements. Throughout the study triangulation was applied wherever possible. The techniques that were combined included interviewing, collecting, examining, observing and feeling. The above-mentioned techniques were chosen in combination to maximize the outcome of the multiple realities of human cognition. The data was not only interpreted in order to objectivize the quantifiable impact of IP non-disclosure, but also to lead to a list of factors significantly impacting the quantifiable success of AE. Observation, focus groups and semi- as much as unstructured interviews were held with all stakeholder groups discussed in section 2.2. To structure the qualitative input of about 40 research subjects table 1 has been developed.

Table 1: Subject grouping

	Internal	**Related**	**External**
1. Specialists	**4.**Researcher (I-S1) **5.**Research Assistant (I-S2) **6.**Research Technician (I-S3)	**7.**Focus group of technical specialists and professors (R-S)	**8.**Focus group with 2 craniosacral specialists and 2 physiotherapist Osteopath (E-S1a-d) **9.**Osteopath (E-S2) **10.** Orthopaedist (E-S3) **11.** Otorhinolaryngologist (E-S4)
2. Business side	**12.** Longitudinal observation Business developer TTO (I-B1) **13.** Manager TTO (I-B2)	**14.** Advisor from investment bank (R-B)	**15.** Kamer van Koophandel (E-B1) **16.** RDA (E-B2)
3. Academic Entrepreneur	**17.** Business developer that takes a current product further (I-AE)	**18.** Previous MU spinout manager (R-AE1) **19.** CEO of a Medtech	**20.** 2 CEOs of software-based medical companies (see, E-AE1-2) **21.** 7 CEOs of non-software-based medical companies **22.** Operations manager

		Company (R-AE2)	medical company (E-AE5a)
4. Consultants	**23.** Group interview with 2 Medtech consultants (I-C1a, I-C1b) **24.** Medtech consultant (I-C2) **25.** Self-Employed Business development Consultant (I-C3)	**26.** Senior Sales manager (R-C1) **27.** 1 Tax advisor (R-C2)	**28.** Start-up Consultant Germany (E-C1) **29.** Retired Entrepreneur and President of stock listed companies (E-C2) **30.** Consultant focusing on medical catalogue Germany (E-C3)
5. Finance	**31.** Informal Investor that was about to invest (I-F1) **32.** Financial accountant (I-F2)	**33.** Interregio Conference (R-F1) **34.** European Venture Contest, Denmark (R-F2)	**35.** Senior Venture Capital Manager (E-F1) **36.** Senior Consultant medical Consulting company (E-F2) **37.** CEO and Angel Investor (E-F3)
6. Patent lawyer			
7. Entrepreneur			

4. Discussion

The results revealed that there are many factors which influence the success of a university spinout; some of which have already been mentioned in the literature (see figure 1). The investigations in combination with the literature have shown that there are eight major influencing factors affecting quantifiable business success in AE (see figure 2).

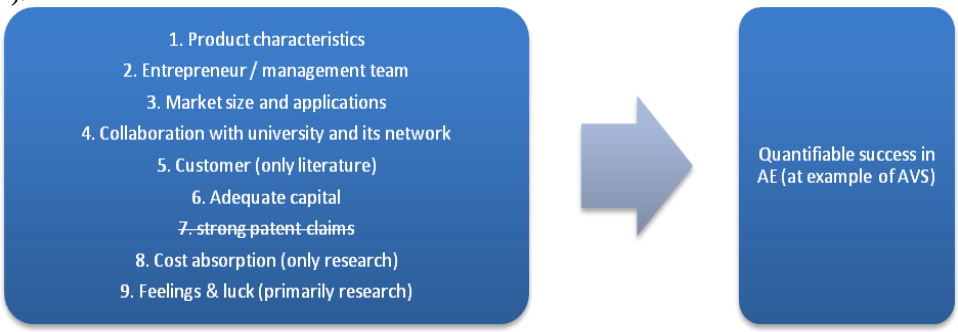

Figure 2: Influences on quantifiable success in AE, literature and research

As Shane (2004) already explained, different product characteristics (see 1. Product characteristics, figure 2) are important for the success of a university spinout. Whereas Shane (2004) specifically elaborated on the solution of customer problems, this was only one of many product features that were mentioned by the participants of this audit. Features, which were specifically mentioned, were the reliability of the product (R-S, E-

S1a, E-S1b, R-C2, E-C1) and that the product as such proves to work (R-S, E-C1, I-F2, I-S2). According to manifold respondents (I-B1, I-C2, R-C2, E-C1, E-C2, E-F1, E-F3) the product was supposed to be promising. This, admittedly, leaves space for wide interpretation. With such statements, subjects referred to product characteristics but also to feelings as in point 9. 'Feelings & luck' (figure 2) which is explained later on. In accordance with the literature (Hayter, 2010; Hemer et al., 2005; Shane, 2004) it was also found that the right entrepreneur (see 2. 'entrepreneur', figure 2) or as the literature points out management team is a vital aspect affecting prosperity (E-AE9, R-C1, E-C2, I-F2, EF1, EF3). Whereas, Hemer et al. (2005) point towards the founder related network, this, in this small study, has not been mentioned by any of the investigated attendants. One of the academic entrepreneurs (I-AE) notably discussed the university's network – or as he specifically states, the one of the TTO to be key to success – a point taken up in 4. 'Collaboration with university and its network'. Enthusiasm and passion of the entrepreneur which was also mentioned a few times (R-AE1, E-AE5, E-AE9, R-F2), again refers to point 9. 'Feelings & luck' (figure 2). Feelings came up several times in this study; going large scale at the right time – a statement that was repeated independently by several respondents (I-B1, E-AE3, E-AE5a, E-AE6, E-F1, I-C3) is also closely linked to it. The right time is difficult to be defined, thus, luck – as mentioned by E-AE9 and EC2 – is part of the story. Just like Hemer et al. (2005) and Shane (2004) numerous respondents talk about the market (see 3. 'Market size and applications', figure 2) to be a major point. Whilst the mentioned authors explain that the identification of a specific customer segment was critical, the investigated subjects specifically pointed towards the size of the potential target group (I-C2, R-C2, E-C1, E-C2, I-F1, I-F2, E-F2, E-F3). Remarkable is the fact, that market size is not mentioned by any of the entrepreneurs as success determinant, that financiers and consultants, however, see it as paramount. In accordance with Shane (2004) multiple applications and the adaptability to several audiences were seen as helpful (E-C2, R-F2, E-F1). As already indicated, the (see 4., figure 2) collaboration with the university and its network is important. Moray and Clarysse (2005) already explained beforehand that the reputation of the parent developing organisation is crucial. This was a point that has not been mentioned in the research; notwithstanding I-AE pointed towards the network of the TTO, which can be understood as the network of the university – one that is larger if the university has an outstanding reputation. Given that this study does not research customers (point 5. figure 2), statements about their influence on success cannot be made. Nevertheless, the foundation in the literature (Meyers & Pruthi, 2011; Shane, 2004) makes one assume that this holds true. E-AE9 in fact explained that adequate capital at the right time is necessary for successful commercialisation which is in accordance with the literature (Kerr et al., 2011; Shane, 2004). Point 7. 'Strong patent claims' of figure 2 has intentionally been stroked through in this final visualisation. It is an outcome of this study that patents are not a major success-influencing factor. Nonetheless, patents can have an influence on the commercial success of an invention if certain conditions are met. The consultation with specialists has added a further point to the debate: 8. 'Cost absorption' (see figure 2). Several of the subjects – namely R-S, E-S3, E-S4, and E-C1 – pointed out that it is important that the product is affordable. E-S3 and E-S4 further explained that coverage by the health care provider is positively correlated. Last but not least, the study displayed a further aspect which was mentioned implicitly by some respondents and which was not found in the literature specifically relating to AE: 9.

'Feelings & luck'. As many of the participants stated, belief and the right feelings of the entrepreneur or the commercialising team are indispensable (statements such as: E-C2: "You have to have a clear vision and you will find a way!"); luck as explained is also part of the story.

5. Conclusion

Key success factors in Academic Entrepreneurship (AE)

The field of AE is evolving is also of raising academic interest. This study shows that a range of aspects influence university spinouts and in particular their quantifiable success. Following these recommendations does not guarantee success but is advantageous for commercial success of new university spinouts.

1. Product characteristics

For successful large-scale commercialisation a promising product that solves an existing problem is necessary. The product needs to function well and be reliable; if medical application is the goal, medical validation is indispensable.

2. Entrepreneur / management team

A passionate management team or entrepreneur with technical and managerial skills is necessary. Experience and an own network can be advantageous

3. Market size and applications

To have a high success likelihood the primary market of the product should be large and calculations should allow for a margin of error. Already at the point of commercialisation several alternative market applications should be known as plan B to either increase success or to have a backup plan if the commercialisation of the primary application fails.

4. Collaboration with university and its network

The parent academic institution has a large network, which was grown over the years. Collaboration with the university does not only allow for tapping a well-grounded source of knowledge but also gives access to a network, potentially larger than one's own in the respective field.

5. Customer

All stands or falls with the customer. Customer feedback is crucial and customer satisfaction as in any business very important. Listening to the customer does not only secure continued collaboration but also reveals potential needs which can be exploited commercially in the future.

6. Adequate capital

The right type and amount of capital at the right moment in time are necessary for maximum exploration of the commercial potential of a product.

7. Cost absorption

The customer is only willing to pay a certain price. Cost absorption massively influences the success potential of a product; spinout products have to either be in the affordable range or should be covered by funding other than from the end-user. This might be trivial but the case has shown that affordability and cost coverage tend not to be given the required importance.

8. Feelings & luck

Positive feelings of the entrepreneur and investors are vital. Only if there is belief, there can be a vision and only if there is a vision there is a potential to persuade investors. At the end of the day luck is also part of the story, but, as one of the entrepreneurs states: "You can force the luck!"

The impact of IP non-disclosure

This study revealed that patents are not decisive for the quantifiable success of a university spinout. In fact, several subjects confirmed and stressed that the costs of not only filing a patent and its regular fees are not the biggest expenses linked to holding a patent. In addition, a patent holder must have the financial strength to protect the patent by monitoring the market for violation and legally defending the patent at court. Only advantage of patents in such a stage – no matter its fees – is the positive marketing towards investors. Excluding the potential naivety of fund-givers it seems that non-disclosure of IP is the way to go. Patenting implies full public disclosure of all research results – and that prior to protection – a risk only big companies or institutions with significantly over-proportional funds can afford. It might according to some subjects eventually be clever to buy the investor advantage of a patent at the price of patent-protecting a less important part of the invention and much rather not disclose the really relevant IP of the product. Going such ways might limit the follow up costs of the patent. Such claims as these, however, require future quantitative investigations.

Research recommendations

As a result of this study three major research recommendations arise. First and foremost, the real cost of patents including market observation and legal defence should be investigated. By doing so it will be possible to make clear statements about the monetary sense of patent-protection of IP also and specifically in SMEs. Further quantitative research is necessary in order to measure the quantifiable impact of the above-mentioned success factors. The overall agreement of the research subjects was, that patents have a significant impact on the interest of investors in specific inventions or much rather into investing in such. Further quantitative research is necessary to prove such claims on a largerscale.

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