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The evolution and performance of spin-off ventures: integration and elaboration of existing models

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ABSTRACT

The article aims to give an overview of the main models in the spin-off research field and to streamline further research in this domain. The main evolution and performance models known in literature will be analysed. The evolution models will be discussed in increasing order of complexity. However, the existing models will prove to be inadequate to reflect the real-life situation. Therefore, a new integrative model will be discussed.
Afterwards, the main performance models will be presented, after a short overview of the factors influencing venture performance that have already been identified in literature.

KEYWORDS

Innovation management; Spin-off ventures; Integrated model; Evolution model; Performance model

1 INTRODUCTION

Humans have been trying to model and describe all kinds of realities for several centuries. The rather recently emerging trend of spin-off ventures and technology transfer from public to private enterprises is no exception. Both the academic and the business world have recognised the need for cooperation. These increasing efforts to valorise the academic research results (Goldfarb and Henrekson, 2003; HEFCE, 2003; Pirnay et al., 2003; Klofsten, sine dato), have risen the interest of both the industrial and the academic world. This study aims to provide an overview of the existing research models concerning both the evolution of spin-off companies and their performance. As reproducible research should be based on clear and unambiguous definitions, this concept will first be defined.

The authors have made a review of existing definitions and typologies concerning both academic and industrial spin-off ventures. The wide variety of literature descriptions and definitions of spin-off, reveals the underlying need for uniformity and integration of existing concepts. The proposed definition is an integration of definitions proposed by several authors and is built around 4 main concepts: the formation of a new company, the parent company, the exploitation of knowledge (in whatever form) and the transfer(s). Therefore, we propose a new definition of a spin-off company, which will be used in this study:

> *"A spin-off is (1) a new legal entity (company) (2) founded by one or more individuals seconded or transferred (sometimes part-time) from a parent company (3) to exploit some kind of knowledge (4) gained in the parent company and transferred to the new company."*

This way, a spin-off company encompasses the different types of academic and corporate spin-offs. This study will try to integrate the main existing insights on the evolution of spin-off ventures and their performance.

The remainder of the article is structured as follows. The first part will deal with literature models on the evolution of an academic spin-off company, varying in degree of complexity and number of peripheral aspects. The general, linear evolution model is provided by Ndonzuau et al. (2002). In a more advanced and complex model, Hindle and Yencken (2004) depict several side aspects explicitly. Their model is based on the insights of Vohora et al. (2004), who developed an evolution model similar to the Ndonzuau et al. model. However, these models will prove being unsatisfactory in the search to describe the real-life business situation adequately. Therefore, a new integrative model will be presented and elaborated in more detail. The second and last part discusses performance models concerning this research domain. Next to more general, often financial, performance and failure prediction models, the article discusses some models developed for the very specific target group of spin-off ventures. The common element in the 3 discussed models is the multidisciplinary approach, as opposite to the previous models relying on purely financial indicators as predictors of performance and failure. The Business Platform Model (BPM) of Davidsson and Klofsten (2003) is probably the most renowned. Earlier, Bell and Mason (1991) developed the Bell-Mason Diagnostic (BMD) for (American) IT start-up companies, thereby reducing the application field of the model. However, the BMD provides interesting insights in different aspects of new venture creation. Recently De Coster and Butler (2005) presented their model, having assessment of investment projects at commercial banks in view. Their quantitative approach is similar to the BMD-approach, but covers some other topics concerning the evaluation of new projects. More in-depth analysis will be provided in the fourth paragraph.

2 EVOLUTION MODELS

Researchers always have tried to conceptualise phenomena in evolutionary models in order to visualise the process. Roberts and Malone (1996), as cited in Carayannis et al. (1998), where one of the earliest authors to distinguish several stages in the evolution of a spin-off venture. This section pays attention to different models developed to describe the aspects of the valorisation process of research results, in particular via spin-off creation. The presented models vary gradually in degree of complexity. First, the general model of Ndonzuau, Pirnay and Surlemont (2002) provides the general framework for further analysis and discussion. Afterwards, the more complex model of Hindle and Yencken (2004) will be analysed, together with its underlying model of Vohora et al. (2004). Afterwards, the authors will present a new integrated model, in order to catch as much specificities as possible. The integrated model of Braet and De Cleyn will be discussed in detail.

A general remark concerning organisational evolution models (and the valorisation process in general) is the importance of the 'watch' function. During or at the end of each stage, some evaluation should occur, guaranteeing enough added value or correcting the added value perspectives. Depending on the result of this analysis and in case of correction of the added value model, a go-no-go decision can be necessary.

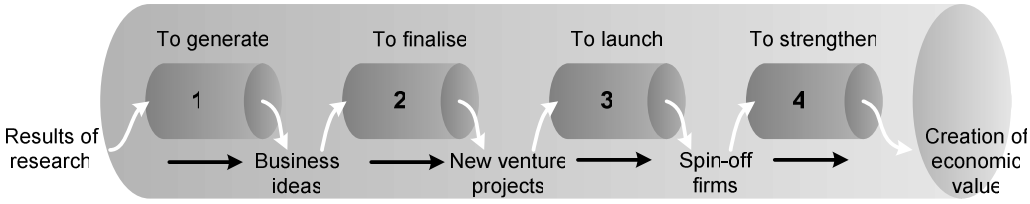
More than its individual components (technology, market, human and environmental aspects), the coordination function ('watch' function) will be of crucial importance to guarantee and secure the added value of the project. Summarising, the viability of the innovative projects should be evaluated at least at the end of each stage (better is a continuous 'watch' over all critical parameters such as added value). Thereby, it is important to apply a general perspective rather than a focus on individual elements.

2.1 The general framework of Ndonzuau et al. (2002)

Ndonzuau et al. (2002) provide the most general conceptual model on spin-off evolution. In their 4 stage evolutionary model, a 'natural' selection occurs between each stage, suggesting an ecological approach as general framework (Daft, 2004). The driving force between this approach is the natural selection, introduced by Darwin. Only the strongest, most adapted research proposals receive funding and support and will have the opportunity to proceed to a next stage. Indeed, not all research results turn out to be commercial opportunities.

The general model of Ndonzuau et al. consists of 4 successive stages, which are "not wholly independent of each other" (Ndonzuau et al., 2002). The starting points of each academic valorisation process are the academic research results. In the first stage, commercial opportunities have to be identified out of the research results. The entrepreneurial insight of the researcher or someone in his surroundings is crucial in this identification. After 'discovery' of the opportunities, the most promising projects have to be translated into new venture projects. The selection mechanism drives out (or at least should drive out) the non-feasible business ideas. The third step consists of converting the projects into real spin-off companies in order to be able to create economic value as the ultimate goal. Of course, only few research results actually lead to the creation of economic value via spin-off firms.

Figure 1.
The global process of valorisation by spin-off.



Reference: Ndonzuau, F. N., Pirnay, F., Surlemont, B., 2002.

This framework provides very useful insights in the nature of the spin-off process. As stated before, the linear representation of the process gives a wrong idea of the real situation. Ndonzuau et al. (2002) observe themselves that the process has back couplings and dependencies.

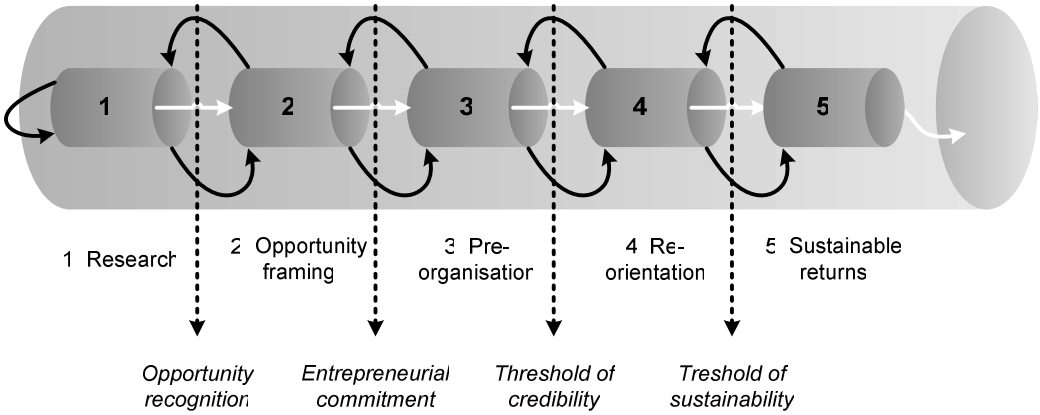
As the end goal of economic creation is presented, spin-off firms are not the only way of reaching it. Next to new venture creation, licensing is a popular and interesting way of technology transfer and valorisation of (academic) research.

2.2 The more complex model of Hindle and Yencken (2004)

The study of Ndonzuau et al. (2002) presents the evolution of a spin-off company in a linear model, without taking into consideration too many side-aspects. This aspect is the main difference with the evolution model presented by Yencken and Gillin (as discussed in Hindle and Yencken (2004)).

The Yencken-Gillin model is based on the principles set forth by Vohora et al. (2004), presented in figure 2, where the evolution of a spin-off company has the same basic characteristics of linearity and selection mechanisms after each development phase as in the Ndonzuau et al. model. The most striking difference – at least visually – with the Ndonzuau model is the explicit representation of feedback mechanisms between each of the development phases. In addition, Vohora et al. (2004) mention the nature of the selection mechanism between the phases. As comparison between the two representations reveals, the basic principles are identical to the Ndonzuau et al. principles.

Figure 2.
The development of spin-off companies according to Vohora et al. (2004)



Reference: Vohora, A., Wright, M., Lockett, A., 2004.

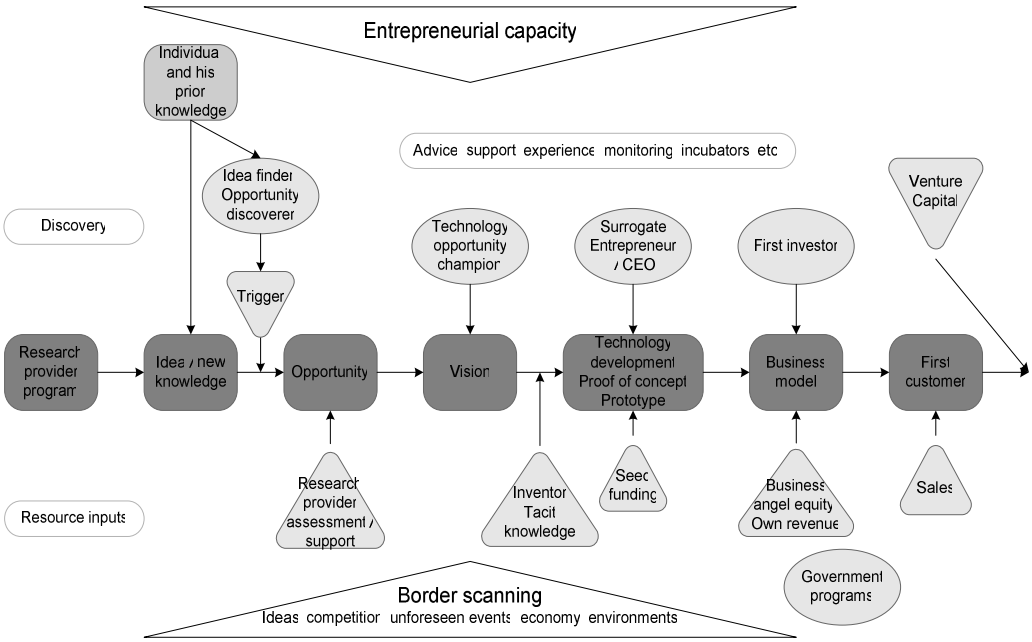
Figure 3 shows the evolution model of Yencken and Gillin. The heart of the process is recognisable from the 2 previous models. The peripheral aspects of spin-off creation, surrounding the development process, have been presented alongside the linear heart of the process, which is basically identical to the Ndonzuau et al. (2002) and the Vohora et al. (2004) model.

The development process is again represented linearly, but normally it will be "iterative and messy" (Hindle and Yencken, 2004, p.800). The upper circles depict

the importance of entrepreneurial inputs and the access to it, while the lower triangles emphasize the required external knowledge inputs.

As this model takes more peripheral aspects into account, the conformity with the reality is increased. This evolution towards an integrative evolution model of spin-off companies is important in the understanding of this new 'phenomenon'. However, the Yencken and Gillin model has the exit point of Venture Capitalist entrance. As an important number of spin-off companies manage to attract venture capital in the early development phases, this end point can be misleading. The entrance of VC's is undoubtedly an important occurrence in the development of a spin-off company. However, VC's entrance can occasionally occur in the early stages, where the spin-off development still has a long way to go. Therefore, VC entrance should not be seen as the final stage of spin-off development.

Figure 3.
The development of spin-off companies according to Yencken and Gillin



Reference: Hindle, K., Yencken, J., 2004.

This kind of schemes and models does however not reflect the real-life situation. The linear succession of different stages seems problematic to the authors. What is more, the linear representation has been nuanced by Ndonzuau et al. (2002) in their analysis. They suggest that the linear representation veil the back coupling effects that happen in reality. Vohora et al. (2004) manage to integrate this insight in their spin-off evolution model. However, the succession of different stages and the back couplings don't give full satisfaction in the search for the best fitting representation of the real situation. Therefore, the authors present a new integrative model of spin-off evolution stages.

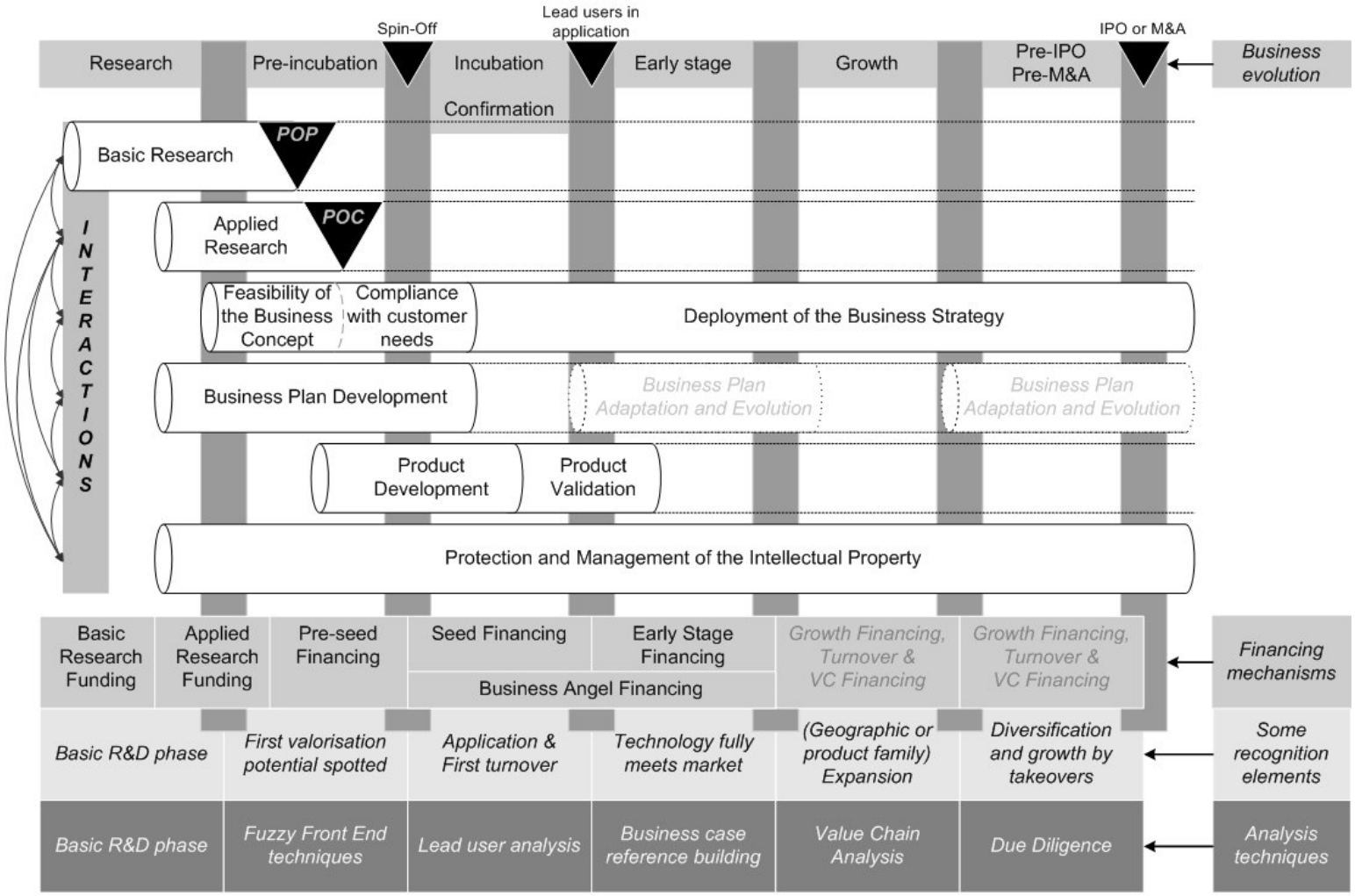
2.3 An integrated evolution model

As stated in the previous paragraph, the succession of different evolution stages is misleading, even together with the back drawings between each consecutive stage. In reality, the main evolution stages merge into one another, overlapping each other. Therefore, Figure 4 depicts the integrated evolution model of Braet and De Cleyn, reflecting and complementing the previous discussion. It is based on literature insight, theoretical knowledge and field experience. The white cylinders are the main evolution stages of an innovative idea. Three important remarks have to assure correct interpretation of the model. Firstly, the starting and end point of the presented stages are not absolute. For example, the applied research stage is presented to start in the Research phase and to end in the Pre-incubation phase. However, it could be that the applied research is only initiated in the Pre-incubation and the Proof of Concept (POC) is realised in the Incubation phase. Secondly, the stages are represented as independent of each other. However, as in the previous models, each stage has interrelations with and back drawings to the other stages. They are only depicted concisely in order not to overload the figure. Thirdly, the Initial Public Offering (IPO) or Merger & Acquisition (M&A) may not be seen as the end point of the evolution of an innovative idea. The evolution of an idea (when it has become an organisation) only ends when the legal entity is dissolved. In addition, the evolution depicted is a general model of the surviving organisation. A large amount of companies never goes through all the stages, neither reaches the IPO or M&A situation.

The starting point of each spin-off company is the *basic research*. During this stage, researchers try to elaborate new concepts, materials or other new steps in the specific knowledge of their research domain, without particular focus on future application possibilities. The basic research stage ends with the Proof of Principle (POP), a milestone where evidence shows that the new invention 'works' in the lab environment. However, as the clouds surrounding the research results disappear, the research team – or part of – starts focusing on the application of the new knowledge in specific products or services during the *applied research*. At least this second stage continues for the lifetime of the spin-off venture. In modern competitive environment, the business companies cannot afford to rely on a single and unchanging product or service. Innovation has become an absolute necessity to be a stayer in the competition field. The applied research finds its (first) end point where the application proves stable and working (the Proof of Concept or POC). However, serious testing in a customer environment will have to make sure that the product / service meets its requirements and proves to be stable on a longer term in the demanding production conditions.

In the next stages, the *feasibility of the business concept* has to be proven, in *compliance with customer needs*. Early market analysis and identification of the customers and their needs will be indispensable to formulate and elaborate a viable *business plan* further on. This will be important to secure financing for the early stages, because a spin-off venture has not the possibility to rely on slack resources for its first product / service development and market introduction. Based on the business plan and the feasibility of the business concept, the *deployment of the business strategy* is the way the spin-off approaches the customer.

Figure 4.
Integrated evolution model of Braet and De Cleyn.



POP = Proof of Principle; POC = Proof of Concept; IPO = Initial Public Offering; M&A = Merger and Acquisition; VC = Venture Capital

The actual *product development* – the integration of the general principles of the product / service into an end-user interface – has received attention in other studies and books. Of main importance is the integration of human, technological and economic principles right from the beginning (Verhaert, 2003). The most important milestones of the product development phase are a working prototype and the attraction and commitment of one or more lead users for reasons of *product validation*.

Proper contemporary product development is based on an integrated product development method, combining from the start the three disciplines technology, economy and human related aspects. This method is a phased approach where creativity and verification are alternated. This multiple verification allows a much better monitoring and control of the added value of the new product along the product development trajectory. This item is discussed in more detail in 'The Practice of New Products and New Businesses' (Braet and Verhaert, 2006).

Overlapping many stages, the *protection and management of Intellectual Property* through patents, trademarks copyrights and industrial designs or even trade secrets and Non-Disclosure Agreements are major concerns to establish and maintain a strong competitive advantage. IP matters will be dealt with in other articles by the same authors.

Figure 4 depicts the main evolution stages, both in the business evolution and the financing mechanisms context. The specific government and private financing programs differ between countries or even regions. At the bottom line, some analysis tools and techniques are presented. In the early phases, they are grouped under the term Fuzzy Front End (FFE).

Some concluding remarks wind up the discussion of the integrated evolution model of Braet and De Cleyn. As discussed earlier, back drawings exist between the different evolution stages (notwithstanding they are not depicted extensively for reasons of clarity of the picture). In addition, the starting and end point of the stages are dynamic, i.e. they can occur in an earlier or further stage, depending on the evolution of the spin-off and the business sector. Furthermore, the stages are depicted as equal in length. However, no conclusions can be drawn from this picture regarding the time aspects. Biotech spin-offs for instance will have a much longer research phase than other spin-off ventures. In addition, the evolution of spin-offs and other commercial organisations is an ongoing dynamic pattern. The IPO or M&A can not be seen as the final point. Most of the organisations even never reach these milestones. Finally, the presented model discusses the situation for a single-product spin-off venture. Most of the stages are repeated for each new product or service. Even for new versions, extensions of the product family or upgrades of the existing product, several stages will (have to) be covered again.

3 PERFORMANCE MODELS

Right from the beginning of business research, analysts have tried to model the performance of companies, with the purpose of failure prediction and pre-investment analysis. The most-applied models rely on purely financial indicators to reveal top performing ventures, sky-rocketing investment opportunities or nearly failed

companies. This section aims to give an overview of this research topic, with specific attention and elaboration of some non-financial models. Before addressing performance models, a short discussion will be drawn on separate studies on factors influencing venture performance without the integration in a complete model.

3.1 Separate research on factors influencing venture performance

Much research has already been done on individual factors influencing venture performance. These insights can be very useful in defining topics to be addressed in spin-off performance modelling. Literature suggests a huge amount of information on venture performance. However, this information is concentrated on some domains (financing, market and team). These three aspects will be treated with more detail further in this section. The other important dimensions of new venture performance have much less been addressed (product development, technology features, IPR and other). This is an opportunity for further research to fill up these knowledge gaps. In addition, the present research status seems to contain widespread heterogeneity on the significance of the performance indicators. Often, studies contradict each other. In addition, few studies investigate a large number of possible performance prediction factors in several of the influencing domains. Dahlstrand (1997) and Kakati (2003) are some of the rare examples of integrating studies.

The most addressed topic in venture performance studies is the organisational team characteristics. The researched topics vary from the ethnicity and gender of the entrepreneurial team (Dahlqvist et al., 2000), the prior (joint) entrepreneurial experience (Aspelund et al., 2005; Clarysse and Moray, 2002; Dahlqvist et al., 2000; De Coster and Butler, 2005; Grandi and Grimaldi, 2005; Hindle and Yencken, 2004; Shane and Stuart, 2002), the heterogeneity and complementarities in the founding team (Aspelund et al., 2005; Davidsson and Klofsten, 2003; Grandi and Grimaldi, 2005; Hindle and Yencken, 2004) or the networking capacities (Colyvas et al., 2002; Davidsson and Klofsten, 2003; Grandi and Grimaldi, 2005; Perez and Sanchez, 2003; Shane and Stuart, 2002). Other aspects have been treated in single studies, without replication in other.

Financing aspects have always attracted the attention of researchers, as they are the most 'tangible' outcome of organisational performance. The investigated aspects receiving substantial attention address different financial topics. In the first place, a group of studies focus on the capital structure and the amount of financial resources (Bell and McNamara, 1991; Cassar, 2004; Davidsson and Klofsten, 2003; Hindle and Yencken, 2004; Klofsten et al., 1999; Perez and Sanchez, 2003; Rasmussen et al., 2005; Zacharakis and Meyer, 1998). Next to the capital access and structure, authors focus on financial ratio's to provide performance indicators (Pompe and Bilderbeek, 2005; Ooghe et al., 2001). Research by Pompe and Bilderbeek (2005) has shown that virtually every single financial ratio has some predictive value for failures. The financial side of venture performance will be discussed in greater detail in the next section.

The third venture performance aspects receiving much research attention is the market aspect. A variety of criteria has been developed to assess the influence of the market in general and the target market addressed by the venture specifically on the performance of the company. Both macro-economic indicators (Vermandere, 2002; Zacharakis and

Meyer, 1998), meso-level factors on the targeted industry sector (Dahlqvist et al., 2000; Feldman and Klofsten, 2000; Hindle and Yencken, 2004; Ooghe and Waeyaert, 2003; Perez and Sanchez, 2003; Shane and Stuart, 2002) and product-specific criteria (Bell and McNamara, 1991; Davidsson and Klofsten, 2003; De Coster and Butler, 2005; Grandi and Grimaldi, 2005; Perez and Sanchez, 2003) have been used in previous research.

The importance of other, less researched performance indicators is not minimised. It should be clear that additional indicators are indispensable to provide the complete picture of spin-off performance. However, within the scope of this study not all aspects can be treated in equal detail.

3.2 Financial performance and failure models

As stated earlier, many performance models focus on merely financial indicators to assess the quality of company results and to predict failures. A recent study by Balcaen and Ooghe (2005) summarised 35 years on financial business failure models. Therefore, this study will be limited to a very short discussion on financial failure models. For more detailed information on financial performance models, we refer tot the Balcaen and Ooghe study. Their overview contains a table with the most influential performance models based on financial data sets.

As financial information is the expression of past performance, the question raises to what extent it can be used to predict future performance. Of course, this argument is valid for every performance model. But financial information is already the expression of a summary and combination of heterogenic indicators. Therefore, the authors argue that single reliance on financial information will not give a complete image on real venture performance, nor provide enough information to predict future performance reliably. In combination with other, rather qualitative performance models however, an interesting synergy might occur. Further analysis in the research domain could provide more in-depth information on this topic.

3.3 Business Platform Model (BPM)

During several years, Klofsten and Davidsson developed the Business Platform Model for assessment of spin-off companies. The Business Platform stands for a target status, which makes spin-offs less vulnerable in the competitive environment.

The basis of the model consists of 2 main concepts. First, the Business Platform stands for the minimal level of performance that has to be attained by spin-off companies in order reach a less “vulnerable status” (Yencken et al., 2002, p.5). Success is then defined as “how well the firm builds and maintains its Business Platform” (Davidsson and Klofsten, 2003, p.3). This Business Platform can be reached through satisfaction of 2 criteria: (1) gaining access to the required inputs and resources and (2) developing the internal expertise to manage and utilise these resources (Davidsson and Klofsten, 2003). The second main concept is the notion of cornerstones. These are the most important dimensions during the development process of a spin-off venture. According to Davidsson and Klofsten (2003, p.3), “the purpose of the cornerstones is to describe

the early development process in a holistic manner on the microlevel". A summary of these cornerstones can be found in Table 1, with a short content for each dimension.

Table 1.
Cornerstones of the BPM.

Cornerstone	Content
Formulation and clarification of the business idea	Know-how can be communicated both internally and externally; internal understanding of company objectives and priorities
Development to finished product	Stage of product development; acceptance of new product by customers; ability to satisfy market needs
Definition of market	Definition of large, profitable market segment(s); clear strategy for market approach; definition of 'priority customers'
Development of an operational organisation	Organisational structure allowing functional coordination, flexibility, innovation and external relations; clear division of labour; clear definition of authority and responsibilities
Core group competence	Access to technological and commercial expertise; elaborated plan for enhancement of competence
Commitment of the core group and the prime motivation of each actor	At least one highly motivated person; commitment of key actors
Customer relations	Strong relationships with customers to generate enough revenue; large number of customer who have bought the product(s); repeat purchases
Other relations	External relationships to have access to additional capital, management know-how and other know-how

Reference: Davidsson, P., Klofsten, M., 2003.

Davidsson and Klofsten (2003) use the Likert five-value scale to score the spin-off projects on their cornerstones (Yencken et al., 2002). For the assessment of each cornerstone, three to six separate statements were tested, with a total of 36. The reasoning behind the approach is that a spin-off has to reach minimal levels on each of the cornerstones to achieve a stable Business Platform. This way, top performances on certain cornerstones can not conceal weaknesses on other. The most interesting application of the BPM occurs in dynamic situations, where assessment at different points in time raises the possibility to analyse the evolution of the spin-off. Klofsten and Davidsson then argue that spin-offs reaching insufficient performance levels to realise the Business Platform will disappear (Davidsson and Klofsten, 2003).

As the authors themselves describe this model as a first attempt, it is quite evident that improvements can be suggested. In the first place, it can be observed that some important aspects of new venture development have not been addressed in this model.

Financial performance and protection of Intellectual Property Rights have not been addressed. In addition, the quality of the underlying R&D or risk assessment of production facilities has not been included. The focus is rather on the team capabilities and market approach. These cornerstones are necessary, but further research must prove whether they are enough to perform a complete assessment of a spin-off company.

3.4 Bell-Mason Diagnostic (BMD)

The Bell-Mason Diagnostic (BMD) has been developed in the United States with research on hundreds of Information Technology spin-off companies and new ventures. Hereby, Bell and Mason use a simple approach:

> *"You don't have to understand the technology to ask the right business questions." (Bell, 2000, p.3)*

The BMD applies a four-group approach, with 3 dimensions in each group (Bell, 2000; Bell and McNamara, 1991). The first group – market – combines the dimensions of the business plan, marketing and sales. People, the second topic, include questions on the CEO, the company team and the board of directors. Thirdly, finance and control is about cash, finance ability and organisational control. Finally, the product group contains the technology, product and manufacturing features of a spin-off venture. Each of these 12 dimensions is presented in table 2 with a short description of the content.

To assess spin-off ventures, the BMD (Bell and McNamara, 1991) manages to generate a quantitative performance measure out of both qualitative and quantitative data. In follow-up, through personal interviews trying to answer more than 1000 carefully selected research questions, the BMD is designed to make an assessment on each of the 12 dimensions (Bell and McNamara, 1991). For each dimensions, a score can be allocated. Combination of these 12 scores in a 12-dimensional radar diagram gives birth to a 'performance surface', with indication of the weaknesses (low scores on some dimensions) and strengths. The compensatory character of the model – the bigger the surface the better – gives the opportunity to obscure weaker dimensions by top performances on other. In addition, the model is designed to provide follow-up assessment to visualise and evaluate the evolution of a spin-off venture. The BMD therefore relies on a four-stage evolutionary model similar to the Ndonzuau et al. model (2002). The four development phases are labelled (1) concept, (2) seed, (3) product development and (4) market development (Bell and McNamara, 1991). For each stage, minimal performance levels are defined. Figure 5 depicts the radar diagram with the performance objectives for the 4 stages.

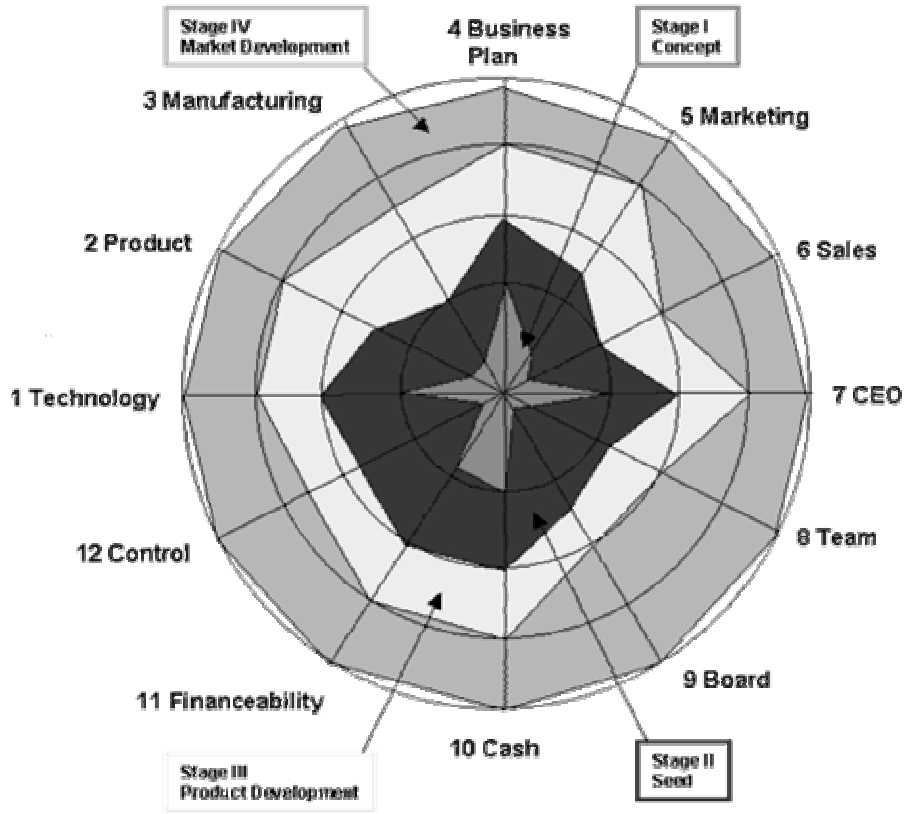
The clear target group focus of the BMD – IT spin-off companies – contains its principal advantage. The entire model can be fine-tuned for this specific category of companies, with its unique features. Next to the target group, the BMD has a clear application. The BDM is designed to help Venture Capitalists in their assessment of IT spin-off companies, with the purpose of investments in these ventures (Bell and McNamara, 1991).

Table 2.
Dimensions of the BMD.

Dimension	Content
Business Plan	Working and realistic five-year plan; corporate vision and mission; detailed plan for resources and milestones; financial realism of the business plan
Marketing	Strategic and tactical marketing plan; definition of the product features and benefits, market segments and distribution channels
Sales	Motivated sales group; experienced sales leader; knowledge to realise the selling cost and time model
CEO	Intelligence, energy, ethics and quality to realise a stable organisational culture; recruitment talent; management and team building competence; capabilities to attract external resources
Team	Experience and expertise in the various areas; ability to attract new, high-level personnel; team spirit and ability to play the role
Board of Directors	Complementary and high-level expertise and expertise to supplement the organisation's competence for the current *and* future development stages; ability to act as reviewers rather than as managers
Cash	Cash reserve to complete the current stage and head for the next; ability to get through a three-month period and have access to finance within this three-month period
Finance ability	Willingness of investors to provide financing for the next development phase(s)
Operations / control	Realisation of milestones; clear understanding of short and long term goals with a formal schedule; processes to control spending and hiring in order to assure progress
Technology / engineering	Superiority of technology; proven qualities of engineering group; clear technology plan containing technology base, standards, product development, engineering and manufacturing specifications, technical resources and other
Product	Clear definition of product features and unique selling proposition; ability to generate follow-up generation of the product or family of product around the present product
Manufacturing	Proven processes to produce product in time and at low cost and high quality; management system for raw materials and inventories; rapid introduction of products in manufacturing

Reference: Bell, C. G., McNamara, J. E., 1991.

Figure 5.
Radar diagram of the Bell-Mason Diagnostic



References: Bell, C. G., McNamara, J. E., 1991.
Bell, C. G., 2000.

However, the strength of the BMD can also be seen as the principal weakness. IT spin-off companies have unique features, distinguishing them from other high-tech ventures. Intellectual property aspects are an example of uncovered topics, despite its importance in the 'average' spin-off company. Therefore, the applications field of the BMD is limited to a small group of ventures. To broaden this application field, the concept can be duplicated but the content should extensively be revised (De Cleyn, 2005). Next to the limited application field, the feasibility of the assessment technique is a topic of discussion. The extensive questionnaire (more than 1000 questions) leads to a huge amount of required data to perform the assessment. The cost in terms of work hours and data processing can jeopardise the benefits of the in-depth analysis. Therefore, further research can be done to concentrate the required data in a more efficient questionnaire, using statistical techniques to indicate the most information-containing and significant questions.

3.5 De Coster-Butler Model (DCBM)

The most recent performance model with regard to spin-off companies is developed by De Coster and Butler (2005). Their model (abbreviated DCBM) identifies performance

criteria to guide the investment decisions of commercial banks while analysing high technology ventures. This clear target group both limits its application field and enhances the ability to fine-tune the model for this specific goal. Apart from the quality and interesting approach of the DCBM, Zacharakis and Meyer (2000) report the limited use of decision models by venture capitalists. However, their decision process can be improved applying performance models in the assessment process. Often, VC's want a quick decision, based upon human capital criteria of the management team, i.e. CV's of the managers (De Coster and Butler, 2005).

The assessment criteria of the DCBM are divided into 8 separate categories, representing the most crucial elements in the performance of new businesses. Table 3 gives an overview of the 8 dimensions, with a short indication on the elements addressed in the dimension. The parallelism with the cornerstones of the BPM is striking.

Table 3.
Dimensions of the DCBM.

Dimension	Content
Technological and commercial risk	Existence of a prototype, evaluation by potential customers, detailed manufacturing plan
Level of product innovation	Competitive products, unique selling proposition, competitive advantage
Market criteria – how it satisfies a market sector	Problem solving aspects, present market solutions
Market criteria – timeliness	Interesting market development favouring the product, market readiness, time-to-market
Product extensions – longevity / repeat orders	Lifetime of the product, possibilities for repeated business (replacement, services, …), fashion or fad aspects
Product extensions – family of products	Possibilities with product, added value potential, accessories and other versions
Entrepreneurial background	Areas of functional expertise, previous successful products, previous manufacturing experience
Protecting competitive advantage	Intellectual Property Rights, entry barriers, cooperation with patent agents and other professional assistants.

Reference: De Coster, R., Butler, C., 2005.

De Coster and Butler (2005) apply a scoring method to complete the assessment. In every respect, the applied methodology is innovative and an interesting approach to the problem. For each criterion, five options ranging from the least credible to the best possible position are defined, getting scores of 1, 3, 5, 7 or 10. The total end score of a spin-off company is however not the simple sum of the separate dimension scores, but a

weighted average as not all the criteria are considered to be of equal importance. As final assessment criteria, two indicators are calculated: the weighted sum and the scaled product. The first is the sum of the weighting factors multiplied by the dimension scores (i.e. the weighted values), with a possible maximum of 100. The higher this score, the better the spin-off is assessed. The second indicator, the scaled product, is the multiplication of all the weighted values (dimension score multiplied by the weighting factor) divided by 15.000. On this principle, some cases can be ranked as interesting when the score of the weighted sum is taken into consideration, but rejected after analysis of the scaled product. A lower scaled product often reveals severe weaknesses in some dimensions, due to wide spread individual dimension scores.

This very particular MCDA method carries some pitfalls. Firstly, the distance between the scores is not equal. Therefore, the results will be distorted in favour of more interesting projects. Secondly, weak scores on less important dimensions tend to be neglected or compensated by the model. It should be clear that – at least for some of the criteria – minimal levels have to be reached. Under these minimal levels, it should not be possible that compensation can occur. Indeed, in reality, a total failure to meet one of the criteria could mortgage the future of the project. Thirdly, the conversion of qualitative data to quantitative data should occur with great caution. It is very difficult to draw reliable conclusions when qualitative data have been translated into quantitative outcomes.

Overall, the DCBM has an interesting and innovating approach to the assessment problem, gathering qualitative data to form quantitative assessment. However, the model does not take all relevant aspects for early stage spin-off companies into account. The product development and its team, the underlying characteristics of the R&D or the financing mechanisms are examples of non-addressed dimensions. The absence of financial information can both be seen as strength and as weakness. Too often, financial criteria are overvalued or even the only decision criteria. Therefore, the DCBM-approach is at least complementary to the financial performance models. The combination of the two types can generate interesting synergies.

4 DISCUSSION AND CONCLUSIONS

The focus of the article lies on different models concerning spin-off companies. As comparability can enhance the knowledge accumulation in a research domain, we clearly defined the spin-off concept as:

> *"A spin-off is (1) a new legal entity (company) (2) founded by one or more individuals seconded or transferred (sometimes part-time) from a parent company (3) to exploit some kind of knowledge (4) gained in the parent company and transferred to the new company."*

As stated above, the article mainly discussed models concerning the evolution and performance of spin-off ventures. As modelling can be interesting for instance to set up general support programs for the 'average' spin-off company, research will always try to new modelling approaches. Firstly, this study addressed evolution models, which describe the successive development phases in the spin-off life. Again, these have to be seen as the 'average' trajectory of a spin-off venture, without claiming absoluteness.

Every single spin-off has unique characteristics and its own evolution. Therefore, modelling will always bring the disadvantage of loosing some information. However, building models still remains interesting because generalisation can yield new insights. The model of Ndonzuau et al. (2002) has been presented as the basic linearly depicted evolution model, despite the analysis showing interactions and drawbacks between the separate development phases. The slightly more complex model of Vohora et al. (2004) integrated this interaction element with the linear – or better successive – aspect provided by Ndonzuau et al. However, the basic ideas of both models are identical. The main difference is formed by the interactions depicted in the Vohora et al. model, while they had not been depicted in the Ndonzuau et al. model (although it has been remarked in the discussion of the model). Building on these two evolution models, the Yencken and Gillin model has been discussed as the integrated evolution model for spin-off ventures. Again, the linear heart of the process remains intact, but the peripheral aspects have much more been elaborated. The totality of insights on these development models form a stable basis for future research.

The discussion of the Yencken and Gillin model revealed some shortcoming in their representation of the spin-off evolution. Different stages overlap, interact and melt into one another. In order to build an integrated framework for spin-off evolution, we presented a new model, combining the business evolution, the financing mechanisms and some analysis techniques. The presented "Integrated evolution model of Braet and De Cleyn" basically contains the same business stages as the earlier described models, but our model aims to provide an entire framework for both the business and financial evolution of a spin-off venture.

Finally, the article addressed the organisational performance issue. Research on financial performance and failure prediction model has been proven to be extensive. As the financial results of companies are easily accessible and comparable, the choice of purely financial indicators is understandable. Balcaen and Ooghe (2005) have summarised 35 years of study on performance and failure prediction. Their article and the underlying financial models are of high value. However, the authors argue that merely financial data sets do not cover the entire field of performance indicators of spin-offs. Few studies have tried to integrate insights from various research domains to form an interdisciplinary model of venture performance. Therefore, this study highlighted more qualitative data sets as basis for quantitative prediction models. The financial aspect is often integrated in these approaches. From our point of view, interesting synergies can occur when financial and non-financial performance models are used as complement, without excluding one another. As studies still continue to present unstable significance effects on identical performance parameters, much research has to be conducted in this field. The common understanding of the basic concepts has to be the required stable basis for this future research.

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