

Scientists as Entrepreneurs: The Importance of Entrepreneurial Districts

Dr. Erik Poutsma
Nijmegen Business School / University of Nijmegen
P.O. Box 9108
6500 HK Nijmegen, Netherlands
Tel. +31 24 36 15628 /+31 24 36 12028 / Fax. +31 24 36 11933
E-mail: E.Poutsma@BW.KUN.NL
Tel/Fax home/IT-WORCS: +31 6778978

Abstract

This paper discusses research findings of a survey among Knowledge Based Firms. The reason for the survey was the growing interest of universities in the Netherlands to promote enterprise and spin-offs from their employees' knowledge-based activities. Insight into the entrepreneurship or the entrepreneurial basis of these started businesses is limited. Attention for these highly educated entrepreneurs and their enterprises appears to be highly rhetorical. Concrete measures on a national level to promote the entrepreneurship of university graduates and scientists appear to be limited in Dutch context. Only a few universities have developed a guiding network for the entrepreneurs.

The research consisted of expert-interviews and a survey among knowledge-based firms in three university regions. The focus of the study was the problems that highly educated entrepreneurs meet when starting up and develop their business and what knowledge and skills they need to prevent or solve these problems. In addition, attention was drawn to the supporting context.

Theoretical Framework

The theoretical framework of the research is based on the literature on determinants of entrepreneurship and role models of entrepreneurship (Shapiro & Sokol, 1982; Scherer, 1989), and on the contextual network approach (Johannison, 1992). The research used the process-contingency approach in which the start-up and development-process of an enterprise is considered as a social process that has to cope with contingent factors (social, economic, cultural) that determine the entrepreneurial choices. In addition, the entrepreneurial development parallels the career path of an individual entrepreneur and influences the choices made. The context wherein the entrepreneurial career takes place has to be recognized in order first, to understand the conditions for new and habitual entrepreneurship and, second, to design ways of supporting entrepreneurs.

Contextual Network Approach

Whether ascribed or achieved, entrepreneurial capabilities are dependent upon the societal context. This was stated as early as the work of McClelland who argued that capabilities for

economic initiatives reflects society and its culture. At a later stage, with the development of society and mixed economies, the economic and social spheres have been recognized as mutually dependent. More recent conceptual and empirical research however suggests that economic activity in general, and entrepreneurial activity in particular, are embedded in socio-cultural structures (Johannisson, 1984). This means that local entrepreneurial operations are stimulated by a favourable context.

The personal network and the networking of the entrepreneur reflect the notion of embeddedness of entrepreneurship in socio-cultural structures. Entrepreneurs in their personal networks include ties to not only the product markets but also to other "markets", that of (public) support and the supply market. With the networking entrepreneurial initiative will provide also new "meaning" and values that continuously create new business opportunities.

The Entrepreneurship-System

A recurrent (academic) question is whether entrepreneurship is an organizational feature reflected in certain structures and processes or a phenomenon which goes back to a certain ability of the person, the entrepreneur. The first viewpoint has led to the belief that entrepreneurs will be successful in the venturing process if they properly manage their internal resources. A consequence is the development of a broad repertoire for encouraging and supporting business venturing by public bodies and private institutions. However, entrepreneurial competences are beyond formal training, and financial resources are secondarily positioned against other kinds of internal and external resources.

The second viewpoint stress the importance of the individual growth-driven person and his or her firm and has led to stress the importance to determine/ to select the right persons. However, ventures and firms are emerging enterprises, they become integrated by way of personal networks that make it possible to capitalize upon the tacit competences that experience accumulates (cf. Johannisson & Nowicki, 1992)

Accordingly entrepreneurship should be seen as a dynamic process (Poutsma, 1994). Entrepreneurship encompasses the conception, perception and realization of (business) opportunities. The entrepreneurial process involves all the functions, activities and actions associated with perceiving opportunities and the creation of new organizations to pursue them. An entrepreneurial event involves the creation of a new organization to pursue an opportunity. An entrepreneur is someone who perceives an opportunity and creates an organization to pursue it.

Opportunity in these definitions of entrepreneurship systems should not be overestimated as a general innovative, pro-active response of the entrepreneur. The quality of a business-startup is related to the immediate context. The basis of entrepreneurship is not a general definition of innovativeness of the activities but a relative definition of uniqueness. That is, relative to the context in which the entrepreneurial activities emerge.

In Summary, this emergence of entrepreneurial activities, the start-up, should be seen as a series of events. Both personal factors and factors from the environment 'guide' the start-up process. These factors consist of personal features and motives (Dolton & Makepeace, 1990; De

Wit & Van Winden, 1989; Curran & Burrows, 1988), education and experience (Dolton & Makepeace, 1990; De Wit & Van Winden, 1989), milieu and social background (Van den Tillaart, 1981), the availability of role-models with the personal network (Shapero, 1980; Scherer, 1989), and the effective implementation and activation of networks (Johannison & Nowicky, 1992). This implies that the research framework should take a process-contingency approach.

Economics of Overview

Entrepreneurial activity is based on experiential learning. This includes mistakes which provide guiding experience. It can only be carried out in accordance with own intentions within an action frame where the entrepreneur can identify and exploit opportunities. Supplementary resources, provided episodically by the personal network, therefore are crucial. This suggests entrepreneurship by way of "economics of overview": That is, the individual entrepreneur:

- realize visions through concrete actions
- are experiential learners
- demarcate an action frame where they are well versed in
- organize through networking.

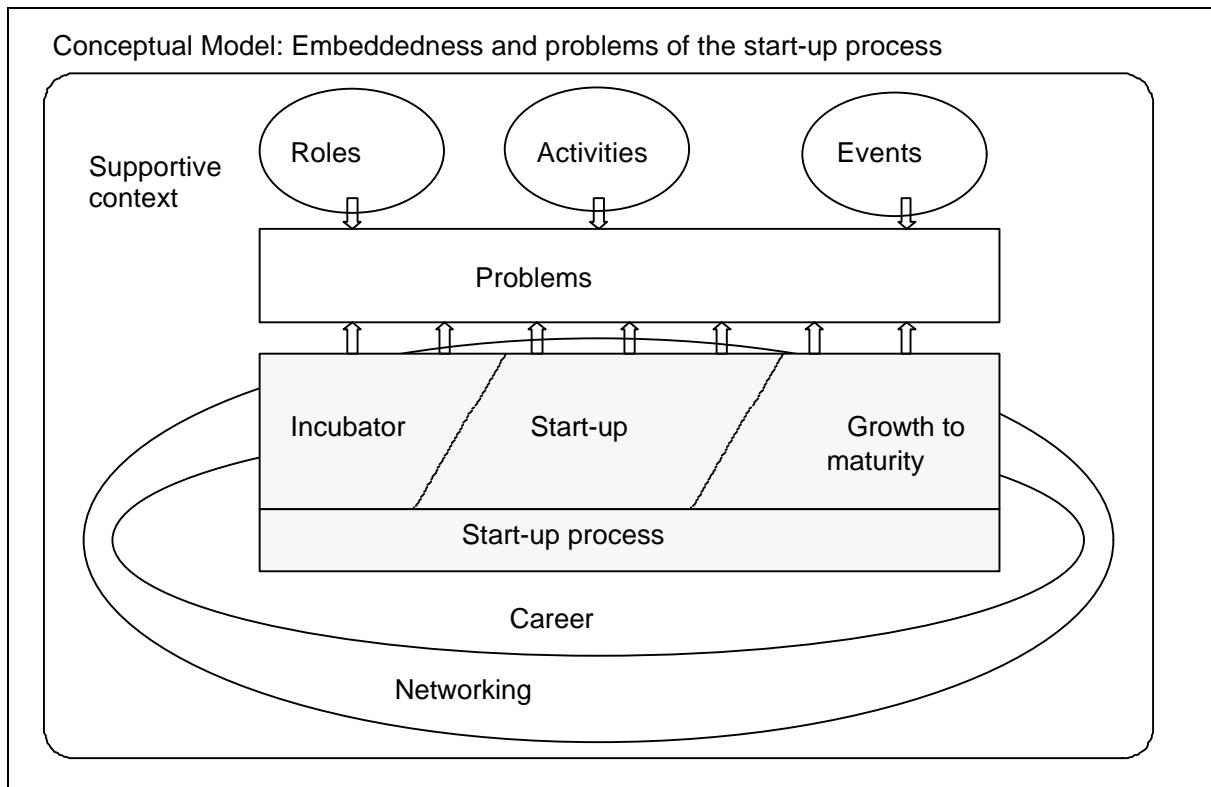
Economics of overview and supply-oriented personal networks suggest the importance of the interfaces between formal and informal enterprise, between business and community, and between the individual entrepreneur (and his/her family) and the community.

Supportive Contexts

From the literature and empirical research we know that some contexts occupy and support entrepreneurs more fully (see Piore and Sabel, 1984, Pyke et al., 1990, Bull et al., 1991). These regional contexts comprise:

- self-supportive, small-business structures in the community
- family-business structures that spontaneously regulates both market and community exchange
- "community entrepreneurs" who activate local and regional identity as a mediating force for entrepreneurial activity of the collective business community (Johannisson and Nilsson, 1989).

Given the overview of the literature the following conceptual model has guided the research.



The Survey

The research consisted of expert-interviews and a survey among knowledge-based firms in three university regions. The focus of the study was the problems that highly educated entrepreneurs meet when starting up and develop their business and what knowledge and skills they need to prevent or solve these problems. In addition, attention was drawn to the supporting context.

Methodology

The population of highly educated start-ups that use their academic discipline for the development and emergence of an enterprise is not registered. Statistics are not available. We selected three regions in the Netherlands where a medium sized university is located: district Twente with the University of Technology Twente, district Wageningen with the Wageningen University of Agriculture and district Arnhem/Nijmegen with the Nijmegen University (general university). We investigated the supportive contexts of these regions by way of expert interviews. Next to this we used data from the chamber of commerce in these districts and information from science-parc locations. We gathered names and addresses of knowledge based university enterprises that made their start-up not later than 10 years ago. We held a check on the knowledge based character by a short investigation of the activities of the enterprise. For instance the academic person that employs a grocery trade or a bar is not seen as a knowledge-based firm. The total database consisted of 246 enterprises. These 246 enterprises received a structured questionnaire,

with open questions included, based on the above conceptual model. The response was 54; three enterprises again appeared not to fall within our definition of the population of knowledge based firms. As a result 51 cases could be analysed. This analysis could also be compared with the results of a national panel research of start-ups in the Netherlands due to the use of same questions (Van Uxem & Bais, 1996)

Brief Overview of the Results of the Survey

Knowledge Based Firms appear to be business-services type of firm. In most of the firms that produce a 'hardware' product, large part of the activities consist of services related to that product. The firms mainly produce software and 'orgware'. The type of firms differs between the districts which appears to be the result of the differences between the universities. In Twente and Wageningen the type of firms are more hardware and technical oriented while in the district Arnhem/Nijmegen the firms produce more orgware related products as the Nijmegen University has more faculties in Arts and Social Sciences than the other universities.

Innovation And The Relationship With The Universities

More than two-third of the firms have developed their product and services themselves. More than 40% marketed an innovative product or service, that is they produced a product or service that did not exist. More innovative firms are those that are older (started more than 5 years ago), validate the relationship with the university more important than others, and the entrepreneur has more often studied technical sciences. These innovative entrepreneurs also searched for financial support more often. They stress more than other Knowledge Based Firms the importance of networking for their success

The relationship with the university is maintained by more than 75% of the firms. They experience this relationship as important for the access to new research and information, for cooperation on certain projects and important for Public Relations and promotion.

Differences With Other Non-Scientists Start-Ups

These Knowledge Based Firms appear to be job-creators. They doubled their employment volume in three to four years. This relates to the development of the turnover that shows the same growth. Hardware oriented companies create more jobs than other firms, more than all other start-ups.

Like other entrepreneurs these academic entrepreneurs appear to have an entrepreneurial social background; their parents more often are also entrepreneurs. But different from other entrepreneurs they start on their own and do not take over their parents companies.

Other differences with non-scientist start-ups are:

- unemployment is not the event for scientists to become an entrepreneur
- the idea of entrepreneurship is developed during their study at the university or during their career at a firm; they 'hitchhike' to entrepreneurship

- more than other entrepreneurs they start as a team with other colleagues
- their motives are more offensive and related to the development and marketing of their own product or service

Preparation For Entrepreneurship

Scientists as entrepreneurs appear to prepare themselves for entrepreneurship more thoroughly. Nearly 40% of them followed a specific course on entrepreneurship compared to only 6% of all start-ups in the Netherlands. They also made a businessplan more often: 75% compared to 40% of all start-ups. They view the businessplan as an instrument for strategy-development. This more profound preparation for entrepreneurship is in part caused by the specific support programme at the universities.

Despite the more profound preparation these scientists as entrepreneurs experienced quite a number of problems during the start-up and beyond. The great majority of entrepreneurs are of the opinion that they were not well prepared for entrepreneurship during their study at the university. The expected role-conflict between the scientist and the entrepreneur was experienced. More specific the entrepreneurs experience great deficit of personal skills needed. Nearly half of the respondents stated that social skills, risk-taking and persuasiveness were far more important than expected and needed more training and effort. These skills have to do with the skills to market the product and services.

To the respondents 60 domains of activities of management and entrepreneurship were presented. They were asked to indicate which domains needed more attention during their start-up and beyond, which domains needed more education and training and how far they were able to manage the problems due to the experienced deficit. From these sixty domains most problems occur with acquisition skills, negotiation skills, management of external relations, and Public Relations. More than 40% needed more education and training. The same percentage of the respondents mentioned management-accounting and taxes. Most remarkable is that a substantial part of the respondents mentioned problems with the core-domains of entrepreneurship: strategy-development (31%), prices (27%) and business plan (27%).

A number of the mentioned problems relates to the stages of development of the enterprise. As expected from stage-models and life-cycle literature certain deficits occur at certain stages of the development. Deficits on financial and personnel-management and problems with the institutionalisation of the firm: liability, intellectual-property rights and contracts occur at later stages.

Orientations of Scientists as Entrepreneurs

Part of the mentioned marketing-type of problems, however, are explained by two initial orientations of scientists as entrepreneurs. The first initial orientation derives from the role of the scientist. Striving for objectivity and validity as a scientist implies a thorough methodological path where the search for all the right information is far more important than the actual result. As an entrepreneur time to market means making decisions on the basis of limited information and a

pragmatic use of instruments. The guideline is functionality for the firm and not for theory. The effect of the scientist-role is that scientists as entrepreneurs face difficulties in accepting this time-bounded situation. The second initial orientation relates to the situation that scientists develop their own product and services. They are craftsmen. This might lead to an internal orientation towards technology and craftsmanship and less external orientation to the market and customers. In his thesis Samsom (1990) found that the roles of scientist and craftsman in science-based enterprises explained the dominance of technology within the firm.

Success-Determinants

The respondents were asked to rank 15 success-determinants. These 15 success-determinants were selected from the batch of literature on success-determinants. Two of these were ranked high on the top. The first one is 'knowledge and application by the entrepreneur of his or her entrepreneurial capabilities' and the second is 'motivation to become an entrepreneur'. With some distance two other determinants were mainly ranked three and four: 'transparency and knowledge of the market' and 'capability to combine craftsmanship with entrepreneurship'. On rank number 5, 6 and 7: 'building and management of networks', 'the first customer' and 'commercial experience in a former job'. The determinant 'reaction on market demand and pull' ranks 10 and at the lower end of the scale we find 'find adequate finances' and 'use of a businessplan'. The respondents placed on the lowest end: rank 15 'the use of knowledge from the available supporting institutions'.

Conclusion, more personal factors, including the effective combination of craftsmanship and entrepreneurship, next to knowledge of the market and networking are seen by these entrepreneurs of these Knowledge-Based Firms as the determinants of their success. Moreover, the more innovative entrepreneurs rank networking higher than other entrepreneurs.

Evaluation and Implications for Supportive Contexts

In evaluating the results of this survey we asked ourselves the question: "What implications have these results for the development of a supportive context?" General conclusions that are important for the development of a supportive context are:

1. Direct support is in contradiction with the entrepreneurial motive to be independent. The support of institutions is not seen as a determinant for success. Highly personal factors and networking are successfactors.
2. Starting a business means a change in career that relates to a certain individual lifecycle and different attitudes and orientations within that lifecycle. Through their educational career and job-career scientists are socialized towards a certain role and subsequent behaviour. Taking up a career for entrepreneurship could mean role-conflict and change of behaviour.
3. The process of business creation starts long before an actual enterprise exists. Start-up process appear to be a sequence of events specific for the type of business and the entrepreneur. There are no certain specific breakpoints that makes intervention easy.
4. The environment determines to a certain extent the feasibility and acceptance of entrepreneurship. Social background and the availability of role-models in the personal network of the entrepreneur is important also for the scientists as entrepreneur.

5. The local community is the basis for condensation and effectiveness of networking. Networking is important for innovators and for success.

Business creation appears to be an intangible process which makes intervention by support institutions hardly possible. Context is here defined as the concrete and symbolic circumstances that surround the venturing process and make it intelligible to the entrepreneur. Every business is linked to a business sector. However, such primarily economic sectors are not appropriate for all small businessman. The businessman does not exist in a socio-economic vacuum but uses his or her personal community as a spring board in order to overcome entry barriers. In consequence, the necessary contextual support with respect to entrepreneurs is more general. It includes socio-cultural factors in addition to traditional, material and financial resources. If the entrepreneur is focused as a complete human being, it becomes obvious that the individual way of life reflecting social background and habitat will define the type of support strategies feasible to help entrepreneurs make their venture viable (Johannisson, 1993).

The point stressed here is that entrepreneurship cannot be managed by inducing structures and providing education.

- planning is apted for recurrent activities while entrepreneurship is about (breaking) emerging new patterns.
- plans and formal organization reflect decision rationality while entrepreneurs are guided by action rationality.

The framework for entrepreneurship promoted a.o. by Johannisson suggests that the existential arena for the operations of the emerging firm is circumscribed by the personal network of the entrepreneur. It defines the community with which the entrepreneur identifies him- or herself and thus builds and maintains self-confidence and willpower. The existential setting of entrepreneurs as defined by their personal networks thus suggests that the spatial vicinity or context is pivotal, and that the context is organized by way of networking. Characteristics of the region, then, must determine, first, the potential for an enterprise spirit and, second, which measures can be taken in order to create a new, or nurture an already established spirit.

Johannisson stress that contexts should be the focus and he suggests the following model of the impact of regional characteristics on firm formation based on four models:

the market model: new firm-formation is based on dynamic markets with a flow of opportunities. The role of contextual networks is to provide information on these opportunities.

- the resources model: the making of a venture calls for resources, also socio-cultural. The role of the network is to provide a business exchange structure that mobilizes resources.
- the milieu model: new business calls for a creative environment. The network provides for social exchange of ideas.
- the career model: entering entrepreneurship means (radical) career change. The network mediates pull and push factors for this change.

Although hypothesized and incomplete the four models guide the reflection on the support strategies that are appropriate. Obviously the market and resource models are more consistent with induced, short term strategies than the milieu and career models.

The models and associated measures might preferably integrated in industrial and regional policies. The following scheme suggests support strategies on different levels.

Summary

Knowledge based firms in these university districts appear to be highly innovative companies. The start-up entrepreneurial event develops gradually 'hitchhiking' along the educational career during study-time or along the academic career as a lecturer or researcher within or outside the university. In most cases the relationship with this incubator appears still to exist in later phases of the development of the enterprise. This relationship is important for entry to new knowledge and ideas, for cooperation in R&D, for receiving orders and for public relations and promotion. Support from these incubators in management and financial matters is not expected.

Although these entrepreneurs prepare themselves more thoroughly for their career as an entrepreneur than other categories of entrepreneurs these entrepreneurs face quite a number of problems. The problems these highly educated entrepreneurs face are related to the roles-conflict between the scientist and the entrepreneur. The academic discipline and the academic career hamper the development of an entrepreneurial attitude and a lack of knowledge and skills is found on finance, and management accounting as well as marketing skills. In those cases that the environment provides a favourable entrepreneurial climate these problems are prevented and solved more adequately. An appeal is made for the development of entrepreneurial districts that meets the entrepreneurial career of graduates and scientist. In these districts a contextual support strategy should use the contextual network approach to the entrepreneurial process.

Entrepreneurial districts` support system

	Micro	Intermediar	Macro
Market	Stimulate local market surveys	Sponsor sub-contracting and spin-off	Organize regional fairs; Stimulate privatization
Resources	Sponsor facilities	Organize networks for investors and others	Provide collective R&D Centres
Milieu	Stimulate initiatives on a broad range	Stimulate networking activities; Organize meetings between entrepreneurial networks and other social cultural networks	Invest in leisure activities and cultural infrastructure
Career	Stimulate entrepreneurship training-courses	Create a pool of role-models, mentors and coaches	Stimulate entrepreneurial climate at schools

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