Action-based entrepreneurship education

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Abstract

Innovativeness through the creation of new companies and new business areas are seen as key factors to achieve economic goals at the firm, the regional, and the national level. A restricting factor is the availability of competent individuals to manage projects and become entrepreneurs. Universities can address this need by increasing the motivation and competence of their graduates to become key persons in innovative and entrepreneurial activity. Entrepreneurship education has traditionally focused on teaching individuals, but many initiatives are increasingly becoming more action-oriented, emphasizing learning by doing. This paper presents a number of action-based activities at five Swedish universities. The cases show that entrepreneurship education focuses less on teaching individuals in a classroom setting and more on learning-by-doing activities in a group setting and a network context. Several initiatives have multiple goals, such as educating entrepreneurs, establishing new ventures, and commercializing university research. Implications for setting up an action-based entrepreneurship education program are provided.

Keywords: Entrepreneurship education; Start-up; University

1. Introduction

Entrepreneurship, through the creation of new ventures or taking place within existing firms, represents one of the major engines of economic growth. There seems to be an intimate relation between entrepreneurship and regional and local development (Malecki, 1997). Reynolds et al. (1994) found that high start-up rates are a necessary, although not sufficient, condition for economic growth. This has resulted in an explosion in terms of public and private initiatives to promote entrepreneurial activity, propelled by the hope to accelerate innovation, technology development and job creation (Reynolds et al., 2001). The public debate often focuses on R & D activity, public and industrial infrastructure, or seed and venture capital as scarce factors to develop new economic activity. None of this would have much effect, however, without committed and competent persons to develop and manage new firms and new business activity.

Currently, universities are expected to play a new role in society, in addition to research and teaching, by applying a ‘third mission’ of economic development (Etzkowitz et al., 2000). This development has been apparent at many US universities for decades, and is currently accelerating also in Europe (Rasmussen et al., in press). Universities can contribute to entrepreneurship both indirectly, through education of candidates, and directly by commercialisation of research and by being the seedbed for new ventures. The flow of candidates, or ‘future innovators’, constitutes a great potential and a responsibility for the universities to address the need for a more entrepreneurial workforce in general, and for highly qualified competence in this area. At the same time, the research conducted at universities constitutes a source of ideas and inventions with commercial potential that is far from being fully utilized at most institutions (McMullan and Melnyk, 1988).

The question whether it is possible to educate individuals to become entrepreneurs has been raised (Fiet, 2001; Sexton and Upton, 1987). Numerous reports about successful programmes at single institutions, often measured in number of companies started, have lead to increased expectations. It is found that graduates with an entrepreneurship major are more likely to start new businesses and have stronger entrepreneurial intentions than other graduates (Kolvereid and Moen, 1997). As found...
by Peterman and Kennedy (2003), entrepreneurship education programmes can significantly change the entrepreneurial intentions of participants. Hence, in addition to the direct effects of entrepreneurship education programmes through new start-ups, the participants may repeat the entrepreneurial process many times during their entire working career, by starting new companies, new business areas in existing companies, by running their businesses more competently, or by assisting other entrepreneurs.

The number of relevant institutions, and the amount of resources put into entrepreneurship education programmes at universities is rapidly growing (Katz, 2003; Vesper and Gartner, 1997). This can be seen as recognition of the importance of entrepreneurship, and that this field needs professional education in line with other fields in business like management, marketing, or finance. Still, this field of education is in its infancy and there seems to be no common framework or agreed best practice for how to educate entrepreneurs (Brockhaus et al., 2001; Fiet, 2001).

Although there is a high variation in topics taught, Laukkanen (2000) claims that the dominant pattern of education has been based on an individual-centred mindset. This individualistic entrepreneurship education strategy aims to give general education to individuals on how to become entrepreneurs. Laukkanen (2000) proceeds by suggesting a parallel strategy in entrepreneurship education, the business generation strategy, aiming to give specific training in setting up a business in a given context. This strategy seems to be in line with the recent development in entrepreneurship education towards specific programmes where the establishment of an actual business is a part of the education (McMullan and Gillin, 1998).

The term entrepreneurship education can be interpreted in two ways; either learning about entrepreneurship as a phenomenon, or learning useful skills in order to become an entrepreneur. This paper focuses on how universities can educate successful entrepreneurs. This can be seen as recognition of the importance of entrepreneurship, and that this field needs professional education in line with other fields in business like management, marketing, or finance. Still, this field of education is in its infancy and there seems to be no common framework or agreed best practice for how to educate entrepreneurs (Brockhaus et al., 2001; Fiet, 2001).

The development in entrepreneurship research is also reflected in the development of entrepreneurship education. As stated by Swedberg (2000:278): ‘the study of entrepreneurship has advanced quite a bit during the last 10–15 years, and that it today is possible to teach something that earlier many people thought not could be taught.’

2. Frame of reference

A dominant issue in entrepreneurship research has been the entrepreneur and what he or she does. Gartner (1988) argues that trait- or personality-based approaches to explain entrepreneurship have been unfruitful, and that behavioural approaches would be more productive perspectives. Issues pertaining to process and context have been added on, and Stevenson and Jarillo (1990:23) provide the following definition of entrepreneurship: ‘entrepreneurship is a process by which individuals—either on their own or inside organizations—pursue opportunities without regard to resources they currently control’. Further, Bruyat and Julien (2001) argue that in order to understand entrepreneurship, the individual, the project, the environment and the links between them over time have to be in focus.

The role of opportunities (Gartner et al., 2003; Shane, 2003; Shane and Venkataraman, 2000) has been included in entrepreneurship research and many factors outside the individual have been recognised as important for entrepreneurship. For instance the role of culture (Mueller and Thomas, 2000), teams (Kamm et al., 1990), networks (Burt, 2000; Grandi and Grimaldi, 2003), resources (Bergmann Lichtenstein and Brush, 2001), and environment conditions (Johannisson, 1990; Malecki, 1994), have come more into focus. Hence, entrepreneurship is seen as a complex process where the outcome is only partially dependent on the characteristics of the entrepreneur. As the identification of an entrepreneurial opportunity is a cognitive act (Gagliò and Katz, 2001; Shane, 2000), the individual is still considered to be the core element, whether it is as a sole entrepreneur, part of a team, or only during a part of the process.

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2.1. Entrepreneurship education

There has been a rapid growth in the number of universities offering entrepreneurship courses from just a few in 1970 to more than 400 in 1995 (Vesper and Gartner, 1997). An increasing number of universities offer more than one course, and study programmes of half a year or more are offered at many institutions. Reviews of entrepreneurship education programmes (Gorman et al., 1997) and courses (Fié, 2001) show that there is little uniformity and considerable diversity regarding objectives, philosophy, content, pedagogy, and outcomes.

The dominant pattern of education has been based on an individual-centred mindset, with the aim of moulding single individuals to become entrepreneurs (Laukkanen, 2000). In short, the candidates receive knowledge and capabilities through a linear educational process, or what Gibb (1993) refers to as a didactic model. It is then expected that these individuals more likely will start new ventures after finishing their study. Although there is no reason to doubt the effectiveness of professional education programmes following this model, some critical remarks can be made (Laukkanen, 2000): First, the focus is on single individuals, and the role of teams, context, and business concepts are underplayed. Further, the belief that entrepreneurial capabilities are inborn, rather than learned, might be overemphasised. Also, the programme may be generalising too much and contextualising too little, e.g. paying little attention to the selection and composition of the students.

The individual-centred model reflects the traditional individual focus in the academic system. As argued by Etzkowitz (2003) there is currently a shift from an individualistic to a group focus in all three academic missions. Research groups have firm-like qualities, especially when research funding is awarded on competitive basis. Education is not only focusing on individual students, but are increasingly taking on the mission of shaping and training organizations before they leave the university, and firm formation from academic institutions has been systematised (Etzkowitz, 2002). This might be an expansion of the individual-centred model, or as observed by Etzkowitz (2003:112) ‘…although some persons may not be willing or able to become entrepreneurs individually; they are able to do so collectively’.

The traditional focus in entrepreneurship education is seen as inadequate (Gibb, 2002). As entrepreneurship is seen as the concrete enactment of new ventures, this calls for an action-oriented approach, and that it is important to stimulate the individual’s action rationality (Johannisson et al., 1998). Johannisson et al. (1998) found that university training has an impact on students’ action capability.

As an alternative to the individual focus, Laukkanen (2000) conceptualises the ‘business generation model’ as an educational strategy for entrepreneurship education. Its aim is to foster the necessary conditions for new ventures and for the strategic expansion of regional SMEs: the emergence and fusion of viable business concepts, entrepreneurial actors, resources, and a munificent environment. In an educational setting the students should meet and internalise a realistic business concept from the outset. Further, they should be operationally involved in real business contexts. The educational process should be linked to resource bases in the business context and beyond (Laukkanen, 2000). A business generation model is addressing many aspects that

![Fig. 1. University strategies for entrepreneurship education.](image-url)
seem overlooked in the more traditional individual entrepreneur model, like business concept, business context, networks, and team skills.

An increased focus on the context and learning by doing, implies greater student involvement during the study. Involving the students in working on real business cases could range from case-based teaching, to involving the students in real start-ups (e.g. Erikson and Gjellan, 2003; Johannisson et al., 2001), and finally by letting the students start their own company. In addition to the degree of individual involvement from the students, the nature of the opportunity or business idea is important in entrepreneurship (Shane, 2003). The students could work on projects ranging from practical exercises which do not have any business potential, to real business projects with limited potential (e.g. regional scope), and finally high-potential global business ideas. The degree of student involvement, and opportunity or business idea potential are illustrated in Fig. 1.

In the following we will compare initiatives at five universities with special emphasis on different implementations of the learning-by-doing approach by involving the students. We will also focus on the scope and potential of the projects, and the resources needed in order to set up the programme in its current context.

3. Method

In Sweden, the interest for entrepreneurship has been significantly growing during the 1990s. More professorships, new courses, and training programmes constitute clear evidence of this (Klofsten, 2000). Out of 70 academic programmes for entrepreneurship education in 1996, only 18 were established before 1990 (Johannisson et al., 1998). Also, a significant share of academic literature in this field is written by Swedish researchers. Since the beginning of the 1990s there have been transformations in the Swedish university system towards more entrepreneurial institutions (Jacob et al., 2003). Thus, we concluded that Sweden would be a fruitful territory to investigate current trends and successful initiatives in entrepreneurship education. The study was conducted in a manner similar to the process suggested by Eisenhardt (1989). First, relevant issues for inquiry were defined, and a convenient sample of illustrative cases was selected among acknowledged Swedish entrepreneurship programmes. The investigation is based on data collected at the following five institutions in Sweden:

- Chalmers University of Technology, Gothenburg
- Jönköping International Business School, Jönköping
- Linköping University, Linköping
- Mälardalen University, Västerås/Eskilstuna
- School of Economics and Commercial Law at Gothenburg University, Gothenburg

Most information was gathered during a 1 day visit at each site during March and April 2002, with two researchers present. We conducted approximately 20 personal semi-structured interviews at the five universities. People in various positions were interviewed, including: managers, faculty, coordinators of entrepreneurship education programmes, and other individuals that engage in related activities such as incubator managers. Persons for interviews were selected on the basis of an overview of the formal organisation and in co-operation with well-informed persons at each university. In addition, information was gathered through other secondary sources like books, reports, articles, and websites. By combining the different sources of data we wrote case descriptions about the context and the initiatives of entrepreneurship education at each case. From the issues emerging in the case descriptions, we were able to point out key themes during the data analysis.

4. Case presentations

This section contains an overview of entrepreneurship education at each of the five universities. Each case description has the same basic structure starting with a brief introduction about the institutional setting, followed by a description of entrepreneurship education and business generation initiatives, and concluded by a short sum-up.

4.1. Chalmers school of entrepreneurship

Chalmers University of Technology in Gothenburg is the second largest technical university in Sweden with about 10,000 students, 2500 employees, and a strong focus on research. Chalmers has traditions for innovation support from about 1970, including an infrastructure for commercialization of research and a track record of 225 direct spin-offs as by 1998 (Jacob et al., 2003).

Chalmers School of Entrepreneurship (CE) began as a pilot project in 1996 aiming at commercialising research-based ideas, while at the same time educating students to become future entrepreneurs. This pilot project has been continued and developed further towards its current form. CE recruits students from engineering, business, and design schools at the bachelor level. Each year 20–25 students are selected on the basis of comprehensive applications and interviews both by CE’s staff and psychologists. About one third of the applicants are found qualified to participate in the one-and-a-half year study program. The aim of the selection process is to identify students who are motivated and capable of becoming entrepreneurs.

The study is built around a real innovation project where groups of three students are establishing a new venture on the basis of a research-based idea. Many of the ideas are acquired from researchers at the Chalmers University. For an idea to be accepted, the inventor should be motivated to become a partner in the project group. Other criteria for
an idea to be of interest to CE are that the intellectual property right issues are clear, that the idea has a high (global) potential, and that it is technically validated.

The students are provided with relevant courses, action-based projects, and after half a year they choose what team and what project to work with. A limited company is formed around each project and located in CE’s incubator facilities. Experienced business people are involved as board members. The education is based on, and adjusted to, the challenges and needs of each company. The operating cost of CE is about one million EUR a year, funded by the university, other public funds, as well as private funds. Evaluations show that 12 new companies and 131 jobs were created by the first three classes from CE, which counted 45 students in all.

To sum up, the CE programme aims both at educating entrepreneurs and at establishing new businesses. The results are of interest in two ways. First, the students are fully involved as entrepreneurs in the start-up process, from idea selection, team composition, to venture formation and the process of attracting investors. This process gives a real experience of starting up. Second, the programme specializes in business ideas with a high (global) potential. The students get experience in setting up technology- and research-based firms, learning about the special requirements of such ventures. As an additional effect, a number of these start-ups would probably not have been commercialised without this programme, as the students fill the role as entrepreneurs. The availability of high-potential ideas is scarce, however, and the resources put into such programmes are substantial. Hence, this kind of programme can only be offered to a limited number of students. An initiative such as CE requires a setting with access to both ideas with commercial potential and sufficient resources. In addition, backing from the leadership at the university is necessary, because the cross-disciplinary arrangement and pioneering pedagogy do not fit with the traditional norms of university education.

4.2. Jönköping international business school (JIBS)

JIBS is a part of Jönköping University with a total of 6500 students and 600 staff within the schools of education and communication, engineering, and health science in addition to the Business School. JIBS was established in 1994 and has an international approach with focus on entrepreneurship and renewal in industry and commerce. The focus on entrepreneurship is apparent through a strong research activity in this field and a range of education and support initiatives.

All students at JIBS get an introductory course in entrepreneurship in the first semester, and there are a number of voluntary activities and events related to entrepreneurship throughout the study. In addition, there are a number of courses in entrepreneurship and related areas, but no defined study programme or major. Rather than having extensive study programmes, the philosophy is to have entrepreneurship as an integrated part of all activity and to support entrepreneurial activity among the students. All students can have a personal mentor from a company in the region, and the university is flexible towards students running their own business when it comes to deadlines etc.

‘Future enterprise’ is a course available for all students at Jönköping University where teams of student can establish their own company, parallel to their study. The students get access to experienced mentors and relevant teaching activities during the study. Many activities are coordinated by Creative Center (CC), which is a non-profit organisation at the university. CC runs the Business Lab, a pre-incubator where persons get an environment to explore the potential of their ideas. The Business Lab contains office space, assembly rooms, creative rooms, and is the joint location for many activities. At the next floor there is an incubator for start-up firms. CC has assisted more than 200 start-ups during a five-year period.

One of CC’s activities is the Summer-entrepreneur programme where projects that can be accomplished during the students’ summer holiday are obtained from regional industry. Instead of being employed by the companies, the students have to start their own company and carry out the work as self-employed. Some advisory service is available during the summer. It is reported that both the employers and the students have positive experiences, and more than half the student companies carry on their business activity. The concept has been implemented at seven other locations in Sweden.

To sum up, the JIBS offer their students both traditional entrepreneurship courses and facilities for students who want to start their own business. Many students set up their own business in parallel with their study. Considerable resources such as mentors and incubator facilities are needed to organise such activity, and significant support is obtained from both the university and the local business community. Most activities are very action-oriented, emphasising a high degree of student involvement, such as the Summer-entrepreneur programme, while requirements on the potential of the business ideas seem less prevalent. This allow for a high volume of activity and low threshold for students to participate.

4.3. CIE at Linköping University

Linköping University constitutes 3000 employees and 23,000 students within technological, humanity and medical studies. Centre for Innovation and Entrepreneurship (CIE) is a small network-based organisation, which have been in operation since 1993. CIE runs two initiatives for entrepreneurship education, the SMIL Entrepreneurship School (SMILES) and the Entrepreneurship Programme (ENP) (Klofsten, 2000). Linköping is known as a successful city in developing new technology- and knowledge-based ventures (Klofsten et al., 1999), and the people we
interviewed emphasized the strong cooperative spirit among the actors in the local innovation system. CIE is a neutral actor operating in the early phases of new venture development.

SMILES offer a series of five university courses within technology- and knowledge-based entrepreneurship with both a theoretical and a practical focus. The courses are not a part of a study programme, but are offered as an elective to students and other persons with the sufficient background. The courses are planned and carried out in cooperation with a regional network of SMEs (SMIL), enhancing the regional cohesion (Autio and Klofsten, 1998).

ENP is a programme for students, researchers, and other persons with their own business idea who are considering to, or are about to, start their own venture. The programme is built around making a business plan for the idea, and consists of 12 workshops combined with practical work during a 4 months period. Each idea is coupled with an experienced mentor and gets access to networks with other companies in the region. Usually two ENP programmes in Linköping are offered every year, each with 15–20 participating ideas. An evaluation shows that eight ENP programmes resulted in 80 businesses with about 800 employees (Klofsten, 2000). There is no fee required to participate in the programme, as it is sponsored by regional and national public funds. The total cost of one programme is about 50,000 EUR, and participation in the ENP programme is compulsory for a start-up company to be accepted in the incubator at the local science park. The programme concept has also been implemented at several other locations in Sweden.

To sum up, the Linköping case has both traditional courses in entrepreneurship (SMILES) and programmes aimed directly towards individuals in the process of starting a new venture. Even with limited backing from the university and modest resources available, the initiative shows significant results in aiding new business generations. This is made possible through the active use of mentors and by building networks between entrepreneurs and other companies in the region. By establishing groups of entrepreneurs facing the same challenges, both an inspiring environment for the entrepreneurs is created, and it becomes easy to give specific advice on important issues facing the entrepreneurs. The initiatives in Linköping do not so much address the need for educating students to become entrepreneurs in the first place, but focus on supporting those who are in the process of starting a new venture, and to include them in the regional business environment.

4.4. Mälardalen university

Mälardalen University is a young and expanding university with 13,000 students and 800 staff at two campuses. The local science park, Teknikbyn housing 120 companies, is active in stimulating entrepreneurship and has aided about 80 start-up companies in 4 years. Their most important initiative is the Kick Start programme, based on the same model, and assisted by, the ENP programme in Linköping.

At Mälardalen University there is an entrepreneurship education pilot offering a one-year extension programme to students that want to specialise in this field. The Entrepreneur-school consists of courses in business development and practical commercialisation projects from industry, university, or in some cases the students’ own projects. External funding represents a value of about 100,000 EUR annually. So far, the experience is that very few students apply for the one-year study. According to faculty, one reason might be that the students do not get any formal university degree from the programme. As such, this programme is caught between two categories; being of no particular interest to students looking for a university degree, and neither of any interest to persons in the process of starting their own company.

Another project connected to Mälardalen University is the Idelab (idea-lab), an initiative to stimulate idea generation, idea development, and new business formation among the students. In 2001, Idelab was in contact with 248 ideas, out of which 68 were developed further, resulting in 35 new companies. Idelab has a staff of five, and an extensive network of mentors, being located on two-floor premises centrally at one of the two university campuses. The ground floor is a flexible gathering area with meeting facilities, while first floor contains office space, creative rooms, etc. In these facilities, persons with an idea can work a few months to verify if the idea is feasible and find out whether they are motivated to start a business or not. Idelab arranges courses, lectures, meeting-points, and has a high profile at the university. There is no incubator facilities connected to the university, but companies started from the Idelab seem to find office space nearby the university campus and maintain contact with each other and the Idelab. Most funding comes directly from the government and altogether there is available about 400,000 EUR annually to run and build up the activity at Idelab.

To sum up, the Mälardalen University has extensive activities in order to stimulate students to start their own companies with a high volume of activity. The entrepreneurship education pilot suffers from limited commitment among the partners involved, and a lack of integration with the existing structure of study programmes. Hence, the action-based initiatives and support are well-developed for students who want to explore entrepreneurial opportunities, having a low threshold when it comes to the potential of the business ideas explored. The academic initiatives for general and specialist education are, however, less developed.

4.5. School of economics and commercial law
at Gothenburg university

As a part of Gothenburg University, the School of Economics and Commercial Law comprises 7000 students
Based entrepreneurship programmes to some extent are otherwise might have been neglected. Second, students who carried out successfully, several objectives are obtained. First, this approach leads to further development of ideas that incorporating business generation as a 'side effect'. The concept is in many ways similar to Chalmers School of Entrepreneurship although it is younger, has shorter duration, and has access to fewer financial resources.

4.6. Empirical findings summarized

The empirical findings are summarized in Table 1.

5. Analysis and discussion

This study has revealed intriguing aspects related to the importance of regional context and regional networks when setting up an action-based entrepreneurship programme. Several of the programmes reported in this study are developed in cooperation with other regional actors and are highly dependent on both financial and practical support from these actors. This suggests that developing action-based entrepreneurship programmes to some extent are related to the opportunities given in the regional context. Moreover, the initiatives mapped in this study utilise a large amount of voluntary resources, such as experienced business people and successful entrepreneurs who seem motivated and willing to contribute as mentors, advisors, and board members of the student-based companies. This is a very important contribution for many reasons. First, the voluntary support makes it possible to offer higher quality and quantity of education than what is allowed by the existing university- and financial resources. Second, the external resources contribute with relevance and up-to-date real-life experience, which is especially important in an action-oriented field like entrepreneurship. Third, these external persons provide a network and access to other networks, thus helping the participants to build their own networks and relate to external contacts. Fourth, external entrepreneurs constitute role-models and can contribute significantly to move the project or start-up company forward. Nevertheless, this study shows that these initiatives cannot solely rely on voluntary resources. There is a considerable need for public and private funding in order to facilitate the development of action-based entrepreneurship programmes. These sponsored facilitators are of vital importance in order to release voluntary resources in the regional context.

We also see that some of the programmes can contribute to the university mission of technology transfer by commercialising university inventions. Research results might provide entrepreneurial opportunities, while the researchers do not want to become entrepreneurs themselves. Research results often require further involvement from the researchers to be developed into a commercial concept, and need more development to be of interest to existing companies (see e.g. Jensen and Thursby, 2001). Hence, entrepreneurial students might be in a good position to further develop research-based ideas in cooperation with the inventors. Combining students and research-based ideas as a strategy for entrepreneurship education is indicated in the upper-right quadrant of Fig. 1. This might be a daunting task, but if carried out successfully, several objectives are obtained. First, this approach leads to further development of ideas that otherwise might have been neglected. Second, students who
wish to start their own company get access to better ideas than they would normally come up with themselves. Third, working with such high-potent ideas gives the students training in developing high-growth businesses. Finally, this approach may lead to the establishment of successful firms. An example of this approach is found at Chalmers where all these objectives have been realized.

In addition to increasing the number of entrepreneurs, another aim of an entrepreneurship education programme is to turn out more competent entrepreneurs who possess the ability to develop new ventures with a high growth potential. With some exceptions the students’ ideas are reported to have a rather limited commercial potential. It could be questioned whether launching a one-person consulting business as a student would develop the skills necessary for founding a high-growth venture later. As such, linking the students with highly potent ideas might provide an education which is more relevant for building high-growth businesses. Inevitably, it is difficult to get a good quantitative measure of the success in this task. Still, we see that Chalmers School of Entrepreneurship, the most extensive programme in this study, can show to both a number of new companies created and considerable growth in these companies.

The cases show that entrepreneurship education does not only focus on traditional teaching of individuals, but have increased the focus on the business opportunity and contextual issues. The entrepreneurship education also pays less attention to teaching cases and focus more on active involvement by the students (Fig. 1). Hence, entrepreneurship education to students can be seen in relation to other objectives such as commercializing research and new venture creation. Table 2 summarises how the initiatives at the universities investigated in this study are related to different objectives of entrepreneurship education programmes.

One of the most intriguing findings in this study is that the extent of entrepreneurship education has grown dramatically the last few years, as evidenced by the short history of all programmes investigated. Perhaps the most striking evidence is all those who are involved in activities on a voluntary basis. This was especially apparent in Jönköping, a university with no full study programme, but entrepreneurship was said to be an integrated part of the activity at the university. With more than 200 student start-ups during a period of 5 years, this could be viewed as an implementation of a business generation model of entrepreneurship education, where learning by doing and student involvement is the core activity. Having access to sufficient infrastructure and mentoring capacity, it has been possible to build an extensive activity and to give many students the opportunity to explore and develop their entrepreneurial skills.

The main contribution from the various entrepreneurship programmes is that they play a key role as facilitators for entrepreneurship. The business generation programmes give students the possibility to gain experience in a real business context where the formation of entrepreneurial teams is emphasised. This is in line with the reasoning outlined by Etzkowitz (2002); that some individuals will not be able to become entrepreneurs individually, but are able to take part in a collective start-up. Most initiatives in this study promotes team start-ups, and often the students also have to operate in close cooperation with inventors (e.g. Chalmers and Gothenburg), and external mentors having board positions etc.

The focus on action-based learning and the substantial resources required for these entrepreneurship education programmes may be in conflict with existing teaching practice and the university culture. The requirements of a start-up process do not fit perfectly into the timetable of university studies. Neither can the idiosyncratic learning process of starting a new venture be standardised in a course description. These challenges call for flexibility from the university management, and attention towards legitimising the initiative internally at the university. For instance, the low number of applicants for the Entrepreneur school at Mälardalen might be because this study does not lead to any standard university degree. Other cases have either developed entrepreneurship education into a degree awarding study programme (e.g. Chalmers and Gothenburg), or stimulated student entrepreneurship without formal connection to the study programmes (e.g. Idelab, and Business lab).

Table 2
Objectives of entrepreneurship education programmes

<table>
<thead>
<tr>
<th>University</th>
<th>Chalmers</th>
<th>Gothenburg</th>
<th>Jönköping</th>
<th>Linköping</th>
<th>Malårdalen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main focus</td>
<td>CE</td>
<td>GU</td>
<td>Sum. Ent.</td>
<td>Bus lab</td>
<td>ENP</td>
</tr>
<tr>
<td>Teaching entrepreneurship to students</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>(x)</td>
<td>(x)</td>
</tr>
<tr>
<td>Commercialising university knowledge</td>
<td>X</td>
<td>(x)</td>
<td>–</td>
<td>–</td>
<td>(x)</td>
</tr>
<tr>
<td>New venture establishment</td>
<td>X</td>
<td>X</td>
<td>(x)</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
6. Conclusion and implications

To fill a new role as active contributors to regional economic development, universities are asked to promote entrepreneurship in general, and commercialisation of knowledge and research in particular. A natural role for universities to play in this respect is to provide education of entrepreneurs. The traditional approach to entrepreneurship education has been indirect, aiming to educate individuals that subsequently are supposed to start new ventures. Newer conceptions of entrepreneurship adds the role of opportunities and context (Gartner, 1985; Shane, 2003), and emphasises learning-by-doing (Fiet, 2001). By broadening the perspective and actually including the formation of new ventures as a part of the education, a better match with these conceptions can be achieved. In addition, new venture creation will be in line with the overall university mission to contribute to economic development. To succeed it seems necessary, however, to include a broader range of activities than those conducted in a classroom setting, and to employ substantial resources compared to most other study programmes.

Many of the initiatives in this study are student-based, or rely heavily on involvement by the students. Other models where students are coupled with business ideas that are assumed to have a high (global) potential may demand more resources, but will also satisfy several aims, for example through the establishment of viable new ventures and commercialization of university research. The cases show a variety of activities to educate entrepreneurs and to stimulate the formation of new ventures. Most initiatives can be characterised as action-based or learning-by-doing. The cases in this study indicate that action-based entrepreneurship education can be accomplished in many different ways depending on both the operational context and the university ambitions (i.e. if their primary focus is learning or being an assistant in the business generation process). The operational context is related to both the internal university support as well as the entrepreneurial environment in the region. Any university planning to set up an initiative following the business generation logic must tune their ambitions according to the opportunities and boundaries in their regional context. Such action-oriented initiatives rely on external resources and a well-developed network toward a regional business community for developing ideas, access to mentors, funding, etc. It seems, however, possible to acquire considerable external resources both from public and private sources.

Although it has been questioned whether it is possible to educate entrepreneurs, the cases in this study show that teaching entrepreneurship can be very successful for example measured by the number of companies started by the participants. All universities in this study have initiatives where the generation of new businesses is either a direct goal or an important part of the entrepreneurship education. The participants are, however, likely to be recruited among people initially motivated to become entrepreneurs, so a high start-up rate could be expected independent of the education programme. It could also be asked whether individuals with a strong entrepreneurial orientation will participate in entrepreneurship education programmes, or if they see this as a waste of time and rather prefer to start their own business right away. Nevertheless, these individuals may not be the target group for programmes aiming to increase the number of entrepreneurs, as they probably will start their own business anyway.

To address the long-term effect of the different approaches to entrepreneurship education would be important for future studies. Assessing the effect of entrepreneurship education programmes on individuals (e.g. entrepreneurial intentions or track record), or venture creation and survival, is important but challenging. Such studies should address variables such as; the amount of resources utilised, the degree of student involvement (including team composition), the potential scope and impact of the business idea, and the regional context of operation. Entrepreneurship education involves many ambiguities as the aim is to stimulate the process of developing idiosyncratic new ventures. Hence, qualitative longitudinal studies might be an important tool to add new understanding to this phenomenon.

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