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Original Article

Mutual Benefits from Entrepreneurship of Non-business University Graduates for Academia and Founders**Erich Markl¹, Maximilian Lackner^{2*}, Judith Schmid³, Thomas Faast⁴**

University of Applied Sciences Technikum Wien, Austria

Corresponding author:* Lackner M, University of Applied Sciences Technikum Wien, Hoechstaedtplatz 6, 1200 Vienna, Austria, Tel: +43 681 8182 6762, E-mail : maximilian.lackner@technikum-wien.at*Received Date:* 01-30-2019*Accepted Date:* 02-06-2019*Published Date:* 02-11-2019*Copyright:* © 2019 Lackner MAbstract**

There is a trend among universities to teach entrepreneurship and support startup initiatives. In this article, the state-of-the-art in entrepreneurship higher education and university ecosystems of non-business schools is reviewed, and the example of the University of Applied Sciences Technikum Wien, Austria, and one of its startup show cases, Toolsense, is elaborated to understand critical success factors for non-business graduates as founders. The mutual benefits for universities and founders are discussed. In the case of Toolsense and the University of Applied Sciences, narrow band IoT as brought to the University by the startup. Implications on a universities' innovation and portfolio management are highlighted. Concerning startups, the importance of growth financing after initial success is elaborated.

Keywords

Entrepreneurship; Incubator, Startup business; Upstart business; non-business graduates as entrepreneurs; support, innovation management; portfolio management; narrow band IoT; academic entrepreneurial behavior (AEB); tech entrepreneur

Introduction

An entrepreneur, according to Peter Drucker, is a person that searches for change, responds to it and exploits it as an opportunity [1]. He or she perceives an opportunity and creates an organization to pursue it [2]. In addition, an entrepreneur creates changes in existing situations through innovation. Schumpeter calls this phenomenon the creative destruction [3]. The Academy of Management defines the domain entrepreneurship as (a) "the actors, actions, resources, environmental influences and outcomes associated with the emergence of entrepreneurial opportunities and/or new economic activities in multiple organizational contexts, and (b) the characteristics, actions, and challenges of owner-managers and their businesses" [4]. Entrepreneurial activity is regarded as beneficial for the community and entire countries, amongst others, to combat unemployment and to generate jobs and value creation. For instance, the EU 2020 strategy includes entrepreneurship principles in all educational levels to enhance employability [5]. Entrepreneurship and innovation contribute to a nation's well-being and to solving environmental issues [6]. It has been stated that startup/small corporations are "net creators of jobs while the large firm sector is a net shedder of jobs" [7]. Sustainability in entrepreneurship

is also discussed in [6].

A relationship between entrepreneurial activity and young people was found [5], but no correlation between educational investment and the entrepreneurial activity of young people was seen [5]. Entrepreneurship training and exposure at universities were found to encourage graduates to start a business [8], [9].

Although entrepreneurs can succeed in almost all areas of business, and a formal qualification is not an absolute must, university spin offs and startups by highly qualified university graduates bear the potential for high innovation and jobs for other qualified people, so encouraging entrepreneurial activity at the campus can be considered a worthwhile goal. In this paper, the scientific literature on founding graduates from non-business schools, i.e. those with a technical background, is reviewed and compared to activities and a showcase example from the University of Applied Sciences (UAS) Technikum Wien in Vienna, Austria.

University support system for entrepreneurs

In the last years, one could, on a global level, witness a growing interest by universities for entrepreneurial concerns. This not only holds true for typical economic faculties, but also for technically oriented departments and entire universities. Moreover, results show that there is a positive correlation between entrepreneurship education and economic growth [10]. Startup heroes are featured in popular media, and there is extensive news coverage on startups. Funding agencies have special calls and preferred funding rates for startups, and cities, governments and other organisations run business plan competitions, establish incubators or other supporting infrastructure to nurture startups.

Making entrepreneurship, **example:** writing a business plan, part of the curriculum is only one aspect of bringing the topic into universities. Not only students are being addressed, but also faculty members. An entrepreneurial culture is to be created, encouraging startup creation. A generic university support system is shown in **Figure 1**.

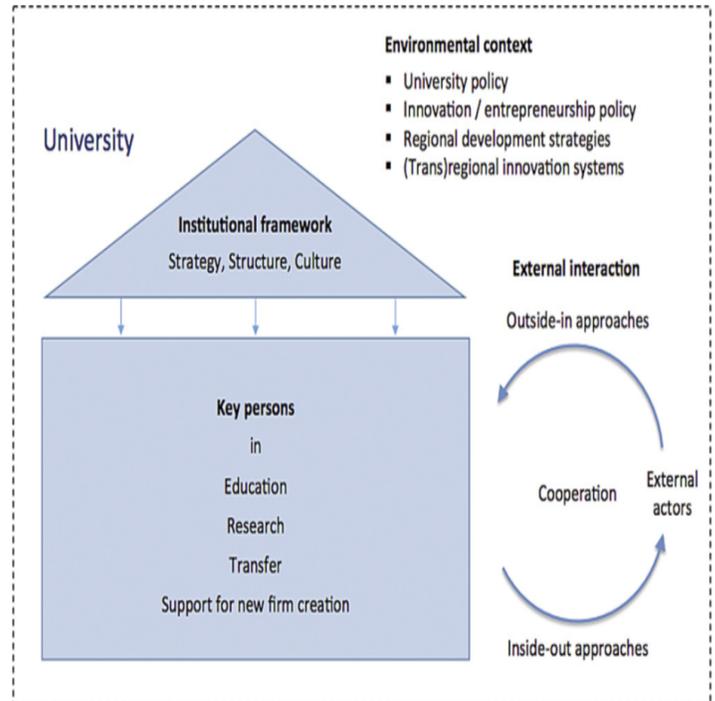


Figure 1: Potential areas of influence on the evolution of university support systems for entrepreneurship. Reproduced with permission from [6].

The figure above shows that reaching out to the community is a vital part of a functioning support system, all driven by an overarching strategy and culture. An important aspect is technology transfer [11]. Student entrepreneurship has been studied at several renowned universities, e.g. at MIT (Massachusetts Institute of Technology), IIT (International Institute of Information Technology (Hyderabad)), and Utrecht University [12], and also at universities in emerging economies [11], [13], [14], [15], [16]. A comparison between entrepreneurial training and (formal) education is given below.

Non-business graduates as entrepreneurs

There is a plethora of popular and scientific literature on the nature of an entrepreneur, studied from different angles, see e.g. [17], [18], [19]. Important personality traits of a successful entrepreneur include achievement motivation, internal locus of control, average risk propensity, proactivity, creativity, independence and tolerance of ambiguity [20]. Concerning academic entrepreneurs, key variables are the type of patents held and the type of research [21].

Table 1: Entrepreneurial training vs. education. Reproduced from [7].

Comparison factor	Training	Education/formal
Focus on activity	On knowledge skills, ability and job performance	On structured development of individual to specified outcomes
Clarity of objectives	Can be specified clearly	Objectives stated in general terms
Time scale	Short term	Specified period
Values which underpin activity	Assumes relative stability, Emphasizes improvement	Emphasis on breakthrough
Nature of learning process	Structured or mechanistic	Structured or mechanistic
Content of activity	Knowledge, skills and attitudes relevant to specific job, basic competences	Imposed and specified curricula
Methods used	Demonstration, practice, feedback	Lectures, guided reading, debate, self-managed learning
Outcomes of process	Skilled performance of tasks which make up a job	External specified outcomes
Learning strategy used	Didactic tutor-centred	Combination of didactic, skill-building and inductive strategies
Nature of process	Outside in, done by others	Largely outside in, done by others
Role of professional trainer	To instruct, demonstrate and guide	Act as an expert, instruct, facilitate and guide to learning resources
Document trainer philosophy	Instrumentalism: transferring knowledge using formal methods and measuring results	Combination of instrumentalism and existentialism
Process of evaluation	Evaluation against specific job performance standards	Evaluation in terms of pass/fail levels
Link with organization mission and strategies	Not necessarily linked to organization's mission and goals	Not necessarily linked to organization's mission and goals

The main indicator of later academic entrepreneurial intention was found to be the attitude towards entrepreneurship, which, in turn, was found to be influenced by creativity, perceived utility, and entrepreneurial experience

[22]. Another study identified personal characteristics, motivations and environmental opportunities [23]. Academic entrepreneurship is reviewed in [24] and [25]. In [26], *academic* entrepreneurial behavior (AEB) was studied. Interestingly, AEB was not necessarily found to be driven by opportunity recognition, but rather by project and funding mechanisms. [26] discerns 4 distinctive categories of AEB: non-entrepreneurial, semi-entrepreneurial, pre-entrepreneurial and entrepreneurial. The same academic was found to possibly exhibit different AEB in relation to different research project(s) and depending on the available support mechanisms (particularly financial ones) [26].

The determinants to start a business by business school graduates was investigated in [27] for Pakistan. The authors could not differentiate entrepreneurs from non-entrepreneurs on the basis of age, gender or entrepreneurial study back ground. However, family background and level of education have an impact on the chances of becoming an entrepreneur. Students in senior classes were found to be more interested in becoming a founder.

Students' majors were found to influence their entrepreneurial intentions [28].

Taking elective entrepreneurship courses by non-business students proved to be an indicator for future startup or business ownership activities [29], and also led to a higher probability that graduated later reached a top management position [29]. The traits which are important for a successful entrepreneur are increasingly valued in the corporate world, too.

Entrepreneurship by non-business students was studied, on the example of the University of Limerick/Ireland, in [7], by the introduction of a special entrepreneurship module for "technical" students.

Startup ecosystems

An ecosystem can be defined as the sum of all the living organisms in an area and the way they affect each other and the environment. Taken to the business world, in an "entrepreneurial ecosystem", different interdependent actors or components interact to create new businesses through startups in a geographic region [30], or, in other words, "Entrepreneurial ecosystems represent a diverse set

of inter-dependent actors within a geographic region that influence the formation and eventual trajectory of the entire group of actors and potentially the economy as a whole. Entrepreneurial ecosystems evolve through a set of interdependent components which interact to generate new venture creation over time.” [31]

An ecosystem can be a larger region, such as “**Silicon Valley**”, or a nucleus around a co-working space or on a campus, where different players and stakeholders gather. A large part of the information on startup ecosystems comes from the non-peer-reviewed literature [30], indicating a need for more systematic and empirical studies [30].

In [32], eight major elements (finance, demography, market, education, human capital, technology, entrepreneur, and support factors) of a startup ecosystem, which directly or indirectly affected startups, were identified.

The University of Applied Sciences Technikum Wien, its startup strategy and its entrepreneurs – showcase example “Toolsense”

The University of Applied Sciences Technikum Wien is Austria’s largest, purely technical university of applied sciences. It was established in 1994. Entrepreneurship has been identified as an important field [33], [34] and intra-entrepreneurial and entrepreneurial aspects are part of several curricula in bachelor and master programs.

Examples of activities to foster entrepreneurship include:

- In study field trips overseas, meetings with entrepreneurs are held.
- In evening sessions, expert talks with entrepreneurs are held
- In information sessions for prospective students, successful entrepreneur graduates are shown as example.
- A series “Start me up” of seminars is offered
- Information on startup activities e.g. on internal white boards and video screens
- Joint R&D projects with startups, starting with bachelor and master theses and leading to larger R&D projects.

In 2018, the UAS Technikum Wien strategy “Entrepreneurship in technology” has been redefined. It is based on the anticipation that in future, students will expect their universities to supply space for joint development of novel solutions, experimentation and independent, entrepreneurial thinking.

Technical degree programs not only have to teach hard technical skills, but knowledge needs to be complemented by innovation and research. It is this “knowledge triangle” that makes a university the preferred choice for applicants.

Selected key points of the “Entrepreneurship in technology” strategy are listed here:

Innovation center

- Maker space (“project kitchen”)
- Offices for startups (currently 15 work spaces)

Startup support

- Mentoring programs
- Startup contests
- Partnering with local incubators

Entrepreneurship in teaching

- Organization of hackathons and datathons
- Hosting meetings of technology communities

Companies

- Knowledge transfer activities

Alumni club

- Reaching out to former students and involving them, e.g. as mentors

Toolsense

Toolsense is a startup company that was taken into the incubator program of Technikum Wien. The company, which was founded by graduates develops technology to determine (“sense”) vibrations in power tools to allow manufacturers to better understand real world use cases of their products, so that they can be further improved. Meanwhile, the company has 9 employees and was able to attract a sizeable investment. **Figure 2** shows Toolsense products. Narrow band IoT is a new cellular technology for providing wide-area coverage for the Internet of Things (IoT) [35]. Toolsense needs this technology, and it was neither used nor taught at the University of Applied Sciences Technikum Wien before. Due to input by Toolsense, the technology is now being investigated and used at the University [36].

In summary, it should be mentioned that Toolsense is a best practice example of cooperation at eye level. For UAS Technikum Wien, that approach is a strategic instrument for its own innovation management. Startups and UAS Technikum Wien bring benefits to each other, it's not a one-way road where the startups are merely recipient of a benefit. With Toolsense the UAS Technikum gets, amongst other aspects, access to their B-to-B customers, investors and partners and they act as an ambassador for the entrepreneurial spirit, here which makes the UAS Technikum Wien attractive for students and companies.

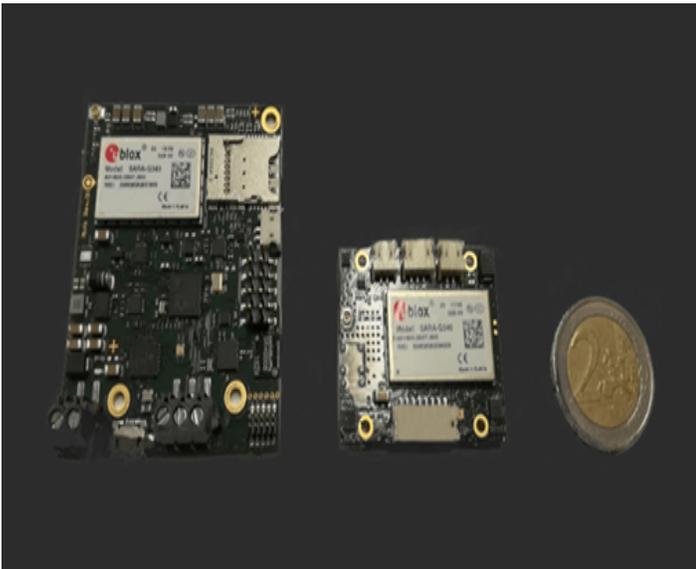


Figure 2 : Hardware to gather field data, with size comparison. For more details, see www.toolsense.io.

Critical success factors for technically oriented campus-born startups and spin offs

Predicting which business plan will “take off” is a difficult task. The story of the FEDEX-founder Fred Smith, whom this Yale professor said, concerning the idea of hub and spoke, that “The concept is interesting and well-formed, but in order to earn better than a ‘C’, the idea must be feasible.” [37], has become textbook folklore. Other startups, the success of which was believed to be a no-brainer, have failed, such as German Cargo Lifter, for instance. What academia can do is identify factors that contribute to success, or that are statistically detrimental. Popular literature is known for its confusion of cause and effect. More often

than none, an aspect of business life is praised one year as holy grail, only to be declared close-to-fatal the next one. The scientific literature has compiled evidence on what can make a startup successful. “Success” per se is already a multidimensional concept and varies from company to company. Consequently, it is necessary to clearly define the term success and to identify success factors based on it [38], [39]. In [40], a clear link between social networks and entrepreneurial success was found based on founders’ social media profiles. Knowledge management [41] and resource based view are becoming more important, too [42]. Every startup should ask itself whether the market should be influenced proactively or whether one only wants to pursue a “follower strategy”. If you decide for the former, then you should act innovatively and customer-oriented, take calculable risks and ask yourself whether you can change the behaviour of competitors and customers with your entrepreneurial spirit [38].

Startup requirements after initial success – overcoming the “valley of death”

“The valley of death” is a term said to be introduced by Bruce Merrifield [43] and coined by Reid Hoffman, the co-founder of LinkedIn [44]. It can be described as a financial/liquidity gap between basic research (the invention) and the commercialization of a product or process (the innovation). The “valley of death”, or synonymously the “valley of tears”, is often encountered as startup is taken to the level of a scalable enterprise [45]. While during the early stage start-ups are busy building up the company and introducing the product(s) or service(s) themselves, the later stage brings new challenges. Assuming that companies always operate in a dynamic environment, it is necessary to adapt the company to changes during this phase. Therefore, the existing business model must be analyzed continuously and innovatively with regard to the market requirements. Based on this, strategies and goals must be derived in order to generate a competitive advantage and secure the survival of the company - without going through - and getting caught in - the “valley of death” [46].

Mutual benefits for academia and founders from an entrepreneurial ecosystem

“Inquissima haec bellorum condicio est: prospera

omnes sibi indicant, aduersa uni imputantur” Tacitus, *Agri-*
cola 27:1 (written ~ 98AD)

The rough translation of this citation is that this is an unfair thing about war: victory is claimed by all, failure to one alone; When a university is deemed successful, e.g. in rankings, graduates are proud to associate with their alma mater. Likewise, when a startup becomes a super-successful enterprise, virtually everyone along the way wants to claim their share of the making.

Not everyone can be studying at Ivy League, and not every startup endeavour becomes an Amazon or Google. Yet, there are very tangible mutual benefits for universities and their graduate entrepreneurs, even if they “only” become SME. It has to be stated that the importance of SME vs. global corporations must not be undervalued. It is SME that provide by far more jobs than large corporations, and any owner-manager in a small SME has to make more complex decisions, with significantly less or no support, than a department manager in a large organization. Coming back to startups and their universities:

Universities are a place for open thought and innovation. It is here that founders can exchange and elaborate ideas with sparring partners who are experts in many fields. On the other hand, universities can learn from their founders, too, on relevant trends in the market place. Both parties can keep one another fit, so to speak.

Conclusion

Universities that offer an environment which supports entrepreneurship activities by its non-business graduates can thereby create benefits for themselves, the startups and their community. The pertinent literature provides reliable evidence that entrepreneurial training and education can improve the rate at which startups are being founded, and also their chances for success. Since entrepreneurial mindset and skills, which can be developed and taught, are increasingly sought by large corporations among their employees, too, curricula should contain core elements for entrepreneurship, and universities should foster spin-offs and startups. From the experience of the University of Applied Sciences Technikum Wien, the following learnings could be

derived:

- Develop a clear entrepreneurship strategy, in our case “Entrepreneurship in Technology”
- Team up with local partners, do not copy what is already in place and working well
- Do not limit yourself to founders amongst “own” graduates, but offer collaboration with external startups, too.
- Work with startups on an equal level: Both sides can benefit from each other. Know and respond to the respective needs for a mutually fruitful and sustainable collaboration and growth

Outlook

The culture of failure is still not well developed in many countries. Unlike the US, where having failed once is regarded as a valuable learning experience, in Central Europe a failed founder is stigmatized for many years. Startup ventures are no surefire thing, they can go wrong for various reasons within and outside the control of the founder(s’ team). Accepting failure as a learning opportunity is a culture that can be created.

Also, a more active involvement of and exchange between faculty and founders can be aimed for, to bring relevant and current topics into the curriculum and, likewise, provide the full body of knowledge to startups.

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