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M05 Commercialization – spin off

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{ } University of
Hradec Králové



**TECHNICAL UNIVERSITY
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DE GRANADA**

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Introduction

One of the most important parts when carrying out transfer tasks consists of determining how can we obtain profit from the product. Obtaining profit is quite important since it allows the creation of new job positions and allows the researchers to carry out more research on their expertise topic or even open new lines of investigation. In order to achieve these economic goals, it is important to know how we can commercialize the resulting products of the research. In addition to making the product profitable, an appropriate marketing campaign allows the researcher to make the product available to the public. This is very important if the results of the research are to be exploited and bring benefits to society. The creation of a spin-off also allows the population to associate the product with a company and makes the consumer-vendor relationship more stable and profitable. Commercialization of research results has become increasingly important for universities worldwide. These can be available to other entities to obtain financial benefits. The goal of commercialization is the practical implementation of the developed research result to meet the requirements of modern markets and the needs of business and industry. As such, the product of this commercialization is the transformation of knowledge and intellectual property into new products, technologies, services, and organizational solutions.

There are many ways to commercialize a research result. The establishment of a spin-off company is one of them. The concept of the spin-off is mostly associated with universities or other research institutions that carry out research and development. Spin-offs are established for the purpose of transferring the results of their research into the market. Although the decision to commercialize such research results through the establishment of a spin-off depends on the capabilities of an individual university or research institution.

Spin-offs are simply businesses (in most cases spin-offs are businesses, though they can have other legal forms) that use the research results of universities for the purpose of their commercialization. However, this mechanism is more often used in cases, where the successful commercialization of a research result is not certain and where it provides a possibility of involving an inventor or researcher in the commercialization process.

Keywords

- Spin off, spin out, start up, commercialization, Death Valley Curve.

Definition of spin-offs

The literature dealing with the issue of spin-offs provides several definitions, each focusing on a different aspect of this concept. Therefore, it is very difficult to find a clear and uniform definition of a spin-off. However, it can be agreed that the term spin-off is not limited only to companies established at universities or research institutions, but also to companies established in the environment of business firms. However, the focus of this chapter is mainly on university spin-offs.

According to the Cambridge dictionary, spin-off is a new business created by separating part of a parent organisation. Merriam-Webster defines spin-off as the distribution by a business to its stockholders of particular assets and especially of stock of another company and also as the new company created by such a distribution.

According to the economic encyclopaedia Euroekonom, spin-offs are organisational units, companies that are created based on the separation of a certain activity or group of people from the primary organisation. A university can also be such a primary organisation. At the same time, however, it is true that the primary organisation generally maintains a dominant influence on the activities of the newly founded organisation. Spin-offs, which are set aside at a university or a research and development organisation of the state sector, are created for the purpose of commercialising the results of research and development.

The Slovak Centre of Scientific and Technical Information (www.cvtisr.sk/en.html?page_id=58) understands spin-off as a business legal entity established for the purpose of using and developing the intellectual property of the university up to the form of a product or service applicable in the market. Intellectual property (mostly the result of research) is provided to the company through a license agreement or sale. The university may or may not own a property share in the spin-off, the company, on the other hand, may agree with the university on the use of its laboratories or the provision of services. The innovators (researchers) of the relevant intellectual property usually also participate in the company's activities.

A spin-off usually refers to a separate company established in order to bring a technology or other invention developed by a parent organisation to the market. A conventional spin-off company can be created through the separation from a parent organisation which contributes with its financial, human and intellectual capital. The mission of such spin-off is mainly to further develop and commercialise the technology created at and assigned by the parent organisation. Together with the relevant intangible asset, the parent organisation also transfers the obligations and risks associated with the commercialisation of the intellectual property to the new legal entity. However, a spin-off can also be a company established, usually by a person external to the parent organisation, with a view of exploiting the intangible asset licensed by the parent organisation.

From these definitions, it follows that a spin-off company is a commercial company founded by a parent organization in order to simplify the commercialization of its research results. In most cases, the organisation establishes a spin-off company together with its employees, Ph.D. students or students who participated in the research, or external researchers who participated as inventors of such research results. A spin-off can also perform various activities depending

on the intellectual property rights made available to it by the parent organization. Most spin-off companies cooperate with the parent organizations from which they were created. The cooperation may have a form of a search for business partners for the purpose of producing a product prototype, or the granting of a license for the production and sale of products in order to resolve the protection of intellectual property unless the necessary protection for the markets to which the products are to be introduced has been ensured. The task of the spin-off company is to ensure business activities associated with the granting of a license and the search for partners who would be interested in it, or even the production and sale of products themselves.

Spin-off vs Spin-out

Generally, there is much confusion about the difference between spin-outs and spin-offs and there exist many opinions about the differences. This confusion is due to the ambiguous use of these terms both in practice and academia.

However, in academic terms, the terms university spin-offs and university spin-outs generally refer to the same thing and are used in the same context. There is a view that it is better to use the term “academic spin-off” where the university retains equity, and “academic spin-out” where the university gets nothing, but this is not a general rule and in most cases there is no clear differentiation between the two terms.

Spin-off vs start-up

One of the first significant differences between a spin-off and a start-up is linked to their origin – the creation of a spin-off takes place within another organisation, which can be a firm, an academic institution or a research institute – in our case it is the university.

Start-ups are also born from innovative business ideas, but, unlike spin-offs, they are not created inside an institution. They tend to exploit a market niche with great potential.

Another key differentiating factor between spin-offs and start-ups is the reason why they have been created. In general, a spin-off tries to exploit a research result discovered in research and development activities (at an academic or a research institution) to for the development of new services and technologies, and seeks new business opportunities.

A start-up, in contrast, is closely linked to the technology sector, and the founders are attempting to launch a totally new and ground-breaking service, technological accessory or application.

All spin-outs are start-ups but not all start-ups are spin-outs.

	Spin-off	Start-up
Origin (Created by)	University	Outside University
Technology/IP	Owned by University	Developed and owned by start-up or licensed to start-up by University
Managed by	University Staff	Outside University

Table 1: Spin-off vs Start-up,
Source: WIPO

The differences that separate spin-offs from start-ups are fairly big, but there is no doubt that both innovation initiatives share the same motivation: to transform an idea to a product or service that addresses a commercial need and one that has an application in society.

Experts in the field of management and economics agree that innovation and the ability to transfer technological innovation not only from the field of science, research and development, but also emerging innovations from practice or innovations that arose from thinking about things “in a different way” towards the business sphere, they represent a key ability that very significantly affects the overall economic growth, GDP growth, employment growth in the area of value-added jobs and an overall increase society’s standard of living. It prevails not only among experts’ agreement also in the fact that the importance of knowledge for economic growth is increasing and that the role of innovation and the ability to use new knowledge and innovation will play an increasingly important role in the future role for the economic development of states and regions. Changes in the requirements of the market represent a natural part of the development of society, technological change justifies estimates that 35% of current working places may be filled by computers in the next 20 years (OECD, 2018). Some jobs will naturally disappear and they will be replaced by new ones. A technological revolution fuelled by efforts to improve people’s lives requires strategic management not only on the system level but also at the level of each individual. The boundary between the work tasks performed is shifting rapidly by people and those left to machines or algorithms. Based on production trends and tracking the growth of the economy will undergo the global labor market with a high probability of several fundamental transformations in the following years. If it will well manage, it can lead to economic growth, the creation of adequate jobs, and to overall quality improvement of life for the whole society. As already mentioned, the increase in the added value of products and services is a necessary transformation to the production sector in which it is possible to produce products, possibly services with high added value. University spin-offs have notably strengthened the link between universities and industry. A number of technology patents and spin-offs based on university research have a significant impact on regional economic and social development.

To further emphasize the importance of university spin-offs is the aim of this chapter in the context of the application of science and research in practice to present a comprehensive overview of what are university spin-offs, why they are important, how they are significant,

and what are key factors in their creation. University spin-offs are not too common, but they are very important for economic development (Lowe, 2002), for the commercialization of university technologies (Etzkowitz, 2003) and contribute to the main mission of the research and university teaching (Jones and Gold, 2001). University spin-offs contribute to the economic development of the locality, to which it belongs. First, they create business opportunities by translating research results into feasible technologies leading to market solutions. Second, they usually perform most of their basic activities locally (e.g. hiring, securing resources, and production) and thus have a significant multiplier effect on local economic activity. Spin-offs often serve as catalysts for the creation of new geographical clusters firms in specific technologies (Lowe, 2002). Spin-offs are one of the rare but significant engines of direct commercialization of university intellectual property. They are a valuable entity because of the benefits they bring universities and society in general; are a source of local and national economic growth with the ability to provide significantly higher revenues to universities than licensing (Bray and Lee, 2000) as a result of equity partnerships between universities and spin-offs. A very important part of the new manufacturing sector would be mainly start-up companies and spin-off companies in the future, which start practically from scratch, and for successful implementation in the market, it is key for them to enter the market often with something new, unique. For this reason, the segment of start-up companies for the development of a healthy economy is desirable and should be supported not only nationally, but also regionally level. The following chapter deals with the theoretical background of the creation of a start-up company and a spin-off company, their definitions, roles, their purpose, and critical points of operation, then legal and administrative aspects.

In the professional literature, we can find many definitions for start-ups and it can be said that recently it is it's a very popular topic. This term appears very often in the media, scientific journals and a number of handbooks, and organized conferences, where the issue of start-ups is very insightful and discussed and at the same time start-ups are supported on the national level, long-term support programs for start-up companies are being prepared. Start-ups are often talked about as a key pillar of the economy in the future. To have a better understanding of the issue, it is necessary to first say what a start-up is, what are its main features and why this particular type of business has great potential to happen from almost zero capital to global business, as it has happened several times in the past. In the Czech environment, we can name, for example, very a successful Kiwi start-up that created a cheap search engine plane ticket. This start-up started with zero, but was based on unique know-how with a scalable product. It bought the American fund, General Atlantic, the price was never disclosed, but according to analysts' estimates, the amount by which General Atlantic paid for the Kiwi start-up, was around almost three billion crowns. Especially for Generation Y, the millennial generation, this one is a way of doing business very interesting and popular in many ways, because it very often allows working with modern digital technology, much of the business takes place online and provides its founders with time flexibility, which they are values that influence this social group the most. Mistakenly, however, start-ups are only associated with a start-up business, because programming applications or setting up an e-shop cannot yet be considered a start-up. The term start-up first appeared in connection with newly built companies in 1976, when this term first appeared used in one of its articles by the American magazine Forbes.

The greater spread of the use of this term occurred in the second the mid-1990s when many were created in the United States as part of the Internet boom. Now we will focus on describing the characteristic features of a start-up.

A start-up is a company founded by an entrepreneur with the aim of finding, effectively developing and validating a scalable business model. The most widespread definition of a start-up is a “newly founded, technologically oriented companies with the potential of fast growth, which brings a completely new idea to the market and which has global ambitions at the same time. It is often typical that the primordial idea is developed only by a small team of mostly enthusiasts, who are willing to invest their resources in the business, namely both financial and mainly time”. Another common feature of start-ups is that they try to stir up business at the lowest possible costs, if possible, often using exchange, and barter trade. A common feature is that start-ups very often face considerable uncertainty and a high failure rate, statistically surviving the first year of business at 80%, the second year at 70% the third year at 60% companies and only approximately 50% of firms survived the fourth year of their business.

The life cycle of start-up companies

Since there is a need to approach this topic holistically, describing and concretizing one model of companies is almost impossible, as each company is a unique entity and the genesis of its origin and development is determined by time and location and many other conditions. Nevertheless, some groups of companies show certain similar characteristics and long-term by examining several hundred companies that are found in the given stage of development, it is possible to trace certain regularities which are then possible to summarize and make of them in an aggregated form conclusions leading to the distinction of individual phases of the life cycle and subsequently focus on the life stages of a start-up. The life cycle model is based on hundreds of companies, which have been screened for innovation potential in recent 10 years.

Early Stage, Pre-seed stage

At this stage, as a rule, a specific legal framework has not yet been established, the working group is based on trust without a clear organizational structure, a group or individual comes up with a new innovative solution that is absent on the market, the authors consider the idea to be very necessary and see it as clear potential. The risk at this stage is too much optimism, and uncritical belief in the uniqueness of the product, but they often have not implemented a detailed search of the state of the art, and no survey is carried out on the market. The author of the idea is willing to realize his idea to invest their finances often without a clear calculation of the point of return. Based on statistics published in this area, it can be assumed that 25% of EU start-ups have one founder. In that phase, the founder, the author of the idea considers a higher level of risk and uncertainty. He constantly continues to work on new ideas for a business, and he gradually creates a team, mostly from friends and acquaintances or like-minded enthusiasts (for example technological, or ecological fans). He uses very often personal funds,

capital mostly provided by friends, partners or family members, he is asking for their investment in his idea. In this phase, the start-up is the most interesting for the so-called business angels, who provide finance to start-ups at the riskiest stage of the project's life, usually by exchange for a share in the company or profit participation. This is often the case for investors who have already completed the exit from their projects and they want to invest the money back into the start-up environment. It is often the motivation, in addition to profit, to return back to the system finances which he had the opportunity to earn business angel himself earlier. Another source of funding at this stage can be various competitions to support start-ups. In the past, it was possible in the Czech Republic, for example for the STAR CUBE competition. It is very good from the fee to finance the next launch of the start-up. Another source of finance can be technology parks and incubators and accelerators. However, this is often not a direct financial support, but services and thus non-financial performance. Start-ups in the seed stage receive valuable mentoring, and legal consultancy, they have the opportunity to join a network of contacts that already has a technology park built not only on the national but especially at the international level. They are often near incubators and organized networking events (for example an event called 120 seconds for innovative companies held by the South Moravian innovation centre, round tables with regional stakeholders B to B events, matchmaking, and others). There are another benefit spaces, in most cases, they are very representative spaces where the future company can present itself to potential customers. The network is also a significant benefit of other start-up companies in one complex of buildings, although they are mostly in different stages of its development, experience sharing works in these organizations very good. It is also a mutual psychological effect, the support of start-ups among themselves. Science and technology parks are often built near universities in the Czech Republic or they are directly part of them, which also brings significant synergistic effects. These services are provided by most in exchange for a share in the company, usually between 5-10%. Alternatively, these services can be financed from the grant of the scheme that the given incubator obtained. At this stage, it is a developed business idea. Further development of the company depends mainly on the level of available financial resources, and precisely because of limited financial resources, this phase is usually very long and development relatively slow compared to the following stages of start-up life cycle. At this stage innovation policy of the given region can play an important role. If the target is a region that usually supports start-up technology companies, in this region usually is a technology park, accelerator or incubator. In these devices, it is possible to verify the functioning idea, and very quickly get feedback from experienced entrepreneurs. But it is also very valuable that it is possible to get the necessary education in the field of company management, marketing and finance. Some incubators and technology centres provide also grant consultancy, however, writing the application for grant is not usually included in the provided support. But the support team in innovation parks and incubators have a very good overview of national and international grant calls. According to statistics published by the Czech Association of Start-ups almost 90% of start-ups join the project in the pre-seed phase. What is important to focus on at this stage: the detailed research of the current state of the art, market research, very realistically considering the tipping point, clearly design organizational structure, management and responsibilities (this is difficult especially for a group of friends who found a start-up and often it seems unnecessary to them).

Seed phase, proof of concept

In this phase of development, the start-up company is usually already legal founded (in the Czech Republic it is usually a s.r.o. form), and the main topic is the introduction of a product, service or technology to the market. The development of technological devices occurred at this stage for prototype production or technology verification. It is formalized description of the innovation. This phase is characterized by teamwork, by developing prototypes, entering the market, looking for support mechanisms such as accelerators, technology parks and incubators, and by finding investors whose capital is needed for further business start-ups. For most start-ups, this is the stage highly uncertain and also where a large number of start-ups fail. In this phase, as a rule, there is the first investment (the so-called seed capital). These are the funds necessary for the start-up company and product launch. Main capital providers at this level are venture capital funds, private investors or groups may also appear. In Europe, these are usually investments from 250,000 up to millions of EUR. The concept of Venture Capital is in the Czech environment more broadly understood as a medium to long-term capital invested in the form of capital entry into the company. For the investment the fund acquires a share in the company's share capital and jointly together with financial resources, he also provides professional assistance to the company (principle of so-called "smart money"). Most valuable for cooperation with the investor is his experience with company development, financial advice, and contacts in the business. The investment itself often may be less important than valuable investor advice and help in creating a business plan, including relevant contacts and active contribution in acquiring new customers. Venture capital is usually allocated to small companies with exceptional growth potential or companies which have grown rapidly and appear poised to continue in expansion. Although it can be risky for investors who invest funds, the potential for above-average returns is attractive. For new companies or businesses that have a limited operating history (up to two years), financing with venture capital is becoming increasingly popular – even essential - as a source for raising capital, especially if they do not have access to capital markets, bank loans or other debt instruments. The main disadvantage is that investors usually acquire capital in the company and therefore have a major say in the management of the company. Another method of financing in this part of the development is crowdfunding. This method of financing is becoming more and more popular and widespread. This is a method of financing in which a greater number of individuals contribute a smaller amount to the target amount. This is what happens on crowdfunding servers (aggregators) that allow you to search for supported projects and invest in them. In practice, we can encounter two types of crowdfunding financing: in the form of a share in the supported company, the right will be in the future share in the profit, or especially for smaller projects is possible to choose a variant in which it is possible to choose a project and based on financial support to receive compensation in the form of a service or product. Crowdfunding platforms include in the world, for example, Kickstarter or Indiegogo, several can also be found in the Czech Republic, such as Fundlift, Peněždroj, Startovač, HitHit, Kick.me and more. It is also possible to use bank financing for the seed phase instruments, banking investments, and loans. Many banks are targeting directly to the financing of start-ups, so it is appropriate to use specialized offers.

Growth phase

In this phase, the company begins to deliver its product or service to the market and seeks rapid growth. At this stage it engages targeted and active marketing. With the development of a start-up it is necessary to set clear company management and corporate culture and leadership. This is often a big problem, because from the group of friends, it is now necessary to create a hierarchical group, to ensure its management, describe very clearly and explicitly the competences and responsibilities of individual team members. A common problem is often the case that from friends who founded a company together and often in the euphoria of the idea they went into business, now they become serious partners in business and different vision from approach to the work and development of the company lead to quarrels that can endanger further development of the start-up. These are soft matters which, however, are absolutely essential for the development of a start-up company and are needed to pay special attention to them. Furthermore, it is important in this the phase to establish a sufficient number of relevant business contacts. Companies at this stage need to finance scaling up production or expansion of service delivery, improve distribution systems or set up a business model. When it is originally start-up company successful, venture capital funds will want to leave it, sell their share and realize profit. An option (mainly abroad) is to enter the stock exchange or acquisition by a much larger company.

The maturity phase, sometimes also referred to as the start-up phase or creation phase

The creation phase occurs when the company sells its products, enters the market and hires its first employees. In this phase, clear and measurable financial indicators are set as well as long-term financial goals. The start-up must mainly focus on development of the scalability of its services or products and the related sustainable development of companies. The company already has a clear picture, each member of the company knows a relatively exactly what s/he will deal with and what will be the content of his work. The company has fully developed, or almost completed business idea, there may be smaller changes, but the main direction of the company is set. The main parts of the business idea are already established in some previous stages. At this stage, the company is most often oriented towards further growth, thanks to which it becomes a company whose activity resembles a classic business, the company already has built structure and is constantly working on further growth. A company ceases to be a start-up as soon as it achieves its vision when investors get back their initial deposit or run out to be absorbed by another company. The goal of start-ups is to grow as quickly as possible into profitable, viable, and stable company that it is no longer a start-up. The most successful start-ups are called "unicorns". This is the designation of start-up companies that have an evaluation of at least 1 billion USD, e.g., Uber or Airbnb. Many entrepreneurs look to mentors to create their own start-up feedback. Mentors guide the founders and mediate entrepreneurial skills and can increase the self-sufficiency of start-up entrepreneurs. Mentoring offers direction to entrepreneurs in order to expand their knowledge about how to keep their wealth related to their status and identity, along with enhancing their skills in real-time.

Reasons for the failure of a start-up

As already mentioned above, the first two phases are the most risky periods for start-ups, sometimes also called the valley of death (Death Valley). Reasons why some of the start-ups fail can of course be many. The company sets up wrong pricing policy, chooses an inappropriate marketing strategy, puts the product on the market at the wrong time or the given product does not have overall demand among customers. Insights analysis mapped the reasons that led to the demise of start-up. The results showed that 42% of start-ups fail, because their services or products are not needed in the market. So there is a complete lack of needs analysis in the first phase. Another important reason for the demise of start-ups are financial difficulties, because it is very difficult to secure financing, especially in the initial phase.

In addition to the very idea of the technology, also the quality of implementation team is important. Some investors report that the quality of the team has almost 70% share in whether they decide to invest in the project, or not. This is confirmed by statistics, which state that the cause of 23% of start-ups fail is not having the right team. Another 18% percent quit because of underrating his business model, and the same percentage failed due to a poor supply of products, and inappropriate marketing. Interesting mistake of start-ups is that they are often very focused on their own business but with no link to the target client. Because they didn't reflect the real needs of their clients, approx. 14% of start-ups ended up. Too many start-ups start with an idea of a product they think people want. Then they spend months, sometimes years perfecting this product without showing this product to a potential customer, and even in a very basic form. When they fail to achieve wide use by customers, it is often because they never talked to potential customers and did not found out if the product was interesting. The percentage of start-ups that operate after 3 years since establishment in individual sectors worldwide is around 44%.

Lean Start-up/spin off

Lean Start-up is a set of principles for creating and designing start-ups with limited resources and huge uncertainty as to whether their businesses will be more flexible and cheaper. Lean Start-up is a new kind of approach to business that is becoming popular around the world and brings a different perspective on building new companies. Eric Ries defines a start-up as an organization aimed to creating something new in the extremely uncertain conditions. This applies to both the individual beginner in the garage and to a group of seasoned professionals. They have one thing in common: they have to uncover uncertainty and look for ways to lead to the sustainable development of the company. It is a methodology for business and product development aimed to shortening cycles of product development and quickly finding out if the proposed is commercial model viable; this is achieved by adopting a combination of experiments based on business hypotheses, ed iterative products and validated learning.

Lean Start-up vs. traditional business model

The Lean Start-up method differs from the traditional business method model by hiring employees. Lean start-ups are hiring workers who are able to learn quickly, adapt with and work while traditional businesses hire workers based on experience and ability. Lean start-ups use other financial reporting metrics; instead of focusing on profit statements, balance sheet

tracking and cash flow statements focus on customer acquisition costs, measurement added value for the customer, etc. The lean method considers experimentation as more valuable than detailed planning. Five years old business plans built on unknowns are considered for wasting time and customer response is paramount here. Instead of long-term business plans, “lean” start-ups business model are based on hypotheses that they quickly test. If customers do not respond as expected, production is quickly adjusted to keep the firm focused on developing and offering products that customers want. Businessmen, who use this method test their hypotheses by that they work closely with potential customers to effectively assessed reactions to product features, pricing, distribution. The Lean Start-up method first identifies the problem that is need to be resolved. Then he develops a product or prototype that entrepreneurs introduce to potential customers for feedback purposes. This method is faster and cheaper than developing the final product for testing and reduces the risk of market failure.

Spin-off introduction

There are several definitions of spin-offs (sometimes also spin-out). Now we describe the spin-off in more details: within a spin-off the parent company distributes the shares of the subsidiary to the shareholders of parent company so that the subsidiary became a separate, independent company. The reason why the parent organization creates a spin-off is its belief that the spin-off will do better on its own than as part of the parent company. There is a form of consideration for the transfer between the parent company and the spin-off (for example, ownership of shares or license agreement). A specific case of spin-offs are high-tech start-ups, which universities produce from master’s students or doctoral students, when the idea turns out to be sufficient interesting and practical to be further developed in academic sphere. The spin-off as a business entity is established in order to commercialize the intellectual property created in a research organization. Linking the company and the university can be variously tight. The definition states that “a spin-off is based on by the fact that the school directly invests its intellectual property in the new emerging enterprise and acquires a stake in it, or invests intellectual property ownership in the business in the form of a license, or a new business is based on personal know-how of university employees, ties to the school are only informal (such companies are rather referred to as start-ups).” It became the cradle of academic spin-off companies in 19th century Germany (Mowery et al, 2001; Shane, 2004). It was it is precisely Germany where the concept of modern universities was born as we perceive them today, and where primordial attempts to establish commercial companies that would benefit from the use of theoretical scientific knowledge in practice were made (Gustin, 1975). One of the first successful business swallows was Professor Johann Pickel, who founded a company engaged in with the production of salts and acetic acid, or Justus von Liebig, who built a company based on his research producing food supplements (Gustin, 1975). They adopted the German concept of organization of university life and universities in the United States of America, which became the main driving force in the development of the business environment in universities in the 20th century (Powers and Mcdougall, 2005). A specific feature that contributed to massive development university business environment, the so-called system was of land grant funding and adoption of The Hatch Act of 18877, standards that forced universities to apply scientific knowledge in practical life. It was the de facto first norm commanding the commercialization of intellectual property (Shane, 2004; Powers and Mcdougall, 2005). The process of establishing

innovative spin-off companies is compared to the western world in the Czech Republic very much slow. Despite the richly subsidized support of a number of European and national programs, the process of establishing academic spin-off companies alludes to the non-existence of some mandatory assumptions. In order for the process to be successful, there is a need for them to exist legally sufficient and strongly protected and at the same time commercially usable research and development results. Within individual research organizations must be a system of internal standards aimed at protection of intellectual property and participation in other legal entities. A professionally established background must be built for technology transfer in the form of specialized offices and an effective system of support for emerging spin-off companies. The formation of academic spin-off companies is supported a whole series of direct and indirect programs in which they take advantage of experience from abroad. The goal of these programs is the creation of conditions for the establishment of spin-off companies in academia and effective commercialization of mental ownership (in the form of patents, licenses, etc.). As part of the project the period 2007–2013 was the activities of innovative business supported by structural funds. Operating program Entrepreneurship and Innovation (OP PI) administered by the Ministry of Commerce and industry (Priority 1 – Entrepreneurship and innovation, e.g., program Incubator) was supposed to help emerging companies in organization, securing financing and establishment in business environment. Directly in this question OP PI followed up on activities of the Operational Program Research and Development for Innovation (OP VVI) under the auspices of the Ministry of Education, Youth and Sports (e.g., Priority 2 – Protection of intellectual property on universities and research institutions), within the framework of which were announced implementation projects aimed at creating conditions and motivational environment necessary for the development of spin-off companies entities in the period before their own establishment and creation. Another example of a program that has a significant impact development of innovative business in the Czech Republic is a program EUREKA, which was established in 1985 (today it brings together 36 countries, the Czech Republic has been a full member since 1995). The goal of the program is European cooperation in the field of applied and industrial research and development and creation of conditions for increase in performance and competitiveness of European industry with a general focus on information technology, biotechnology, medical technology, communication, robotics and automation, new materials and the environment. In recent years, several commercial companies have been established in the Czech Republic that call themselves spin-offs companies of research organizations, i.e., not a true spin-off companies (Enantis a.s., Clever Technologies, s. r. o.), but only four cases of companies with equity participation of the university (AB Pharma, s. r. o.).

The Transfera.cz association represents the interests of the transfer community in the Czech Republic. On the basis of a survey among its members at the beginning of 2020, a total of 42 spin-off companies were created in Czech research organizations, and above all eight public universities. They include both the so-called “true”, i.e., with an ownership share of the institution, as well as the so-called “false” - without the ownership interest of the institution. Especially successful in establishing companies is the Organic Institute of chemistry and biochemistry of the Academy of Sciences of the Czech Republic, which currently owns its stake in three spin-off companies, one of them has headquarters in the USA. The relationship between start-ups and small and medium-sized companies (SMEs) and regional

development are among the controversial topics. The result of a whole series of works that compare the relationship between economic development and SMEs from several countries, was found, as a rule, a slightly above-average share of start-ups and small companies to create new jobs. In general, it is true that small and medium-sized companies are significantly involved in employment. For an indicator of good growth potential, a firm's export capability is often considered. However, the main positive benefit to the employment sector of small and medium-sized start-ups is their great flexibility, the ability to quickly respond to changes in the market and create jobs even in times of economic crises, when layoffs usually occur at large employers and also – last but not least – the ability to innovate and adapt flexibly ideas into the commercial sphere. However, due to their size, these firms are significantly more vulnerable than large firms, which also represents one of the reasons for their regional support politics. No less significant contribution of start-ups and spin-offs is their ability to create and change the business climate region, maintain a competitive environment in the economy, diversify job opportunities in the region and act as a "school" for future generations of great entrepreneurs. It is proven that people who have had their own experience with business are more easily applicable in the labor market, so it can be said that giving people the opportunity to start a business is the best long-term prevention of unemployment. Since investors are always trying to invest into as many promising start-up companies as possible, is increasing interest in finding a clear formula for evaluating potential start-ups. On the one hand, investors have access to a comprehensive analysis of market development, predictive analysis of experts (e.g., analysis of Frost & Sullivan A Growth Strategy) of the given industry or science and research in the given area and can predict developments in the field in which the start-up is trying to succeed in the market. On the other hand, however, we see from practice that it is an important aspect of whether the start-up will transform into a successful company and pass the so-called imaginary valley of death, which are often aspects that are intangible, immeasurable, and which are often referred as soft skills. Based on the professional literature, it can be stated that over the past three decades, there has been a growing body of evidence that point to the value of soft management skills. Well-developed soft skills can mean the difference between the success and failure of a start-up business. Ongoing research argues that if organizations are to survive in today's global information economy, start-ups must master the skills needed to connect and motivate everyone member of the team, maintain relationships and manage and control themselves above each other. Historically, they have been the most important predictors of success in work and companies cognitive or so-called hard skills. Technical competence and cognitive skills refer to traditional skills taught in business and technical-focused schools. Hard skills are usually good defined, visible, and relatively easy to measure. Emphasis on it gradually changed in the 1990s with the discovery of personality dimensions and their relationship to capital development. Researchers in the field behavioral sciences in psychology and economics have begun to suggest that non-cognitive factors or soft skills play a significant role in the workplace, and it has often been shown that determining success is more important than cognitive skills. Researchers have been able to document that soft skills are essential to the implementation of change and transformational purposes, using within the organization or when dealing with suppliers, partners or customers (Holmberg-Wright, 2007). The importance of soft skills was now recognized as more important to the growth and success

of small businesses and start-ups. Unlike technical knowledge and highly specialized knowledge soft management skills are the interpersonal component of leadership and management. These are skills that, however, in mainstream education systems or the workplace are not taught consistently or not completely comprehensively. Yet they are skills that enable companies to get ahead, be successful, and enable the organization and the individual to thrive. Soft skills are skills focused on effectively building interpersonal relationships, team building, cohesion, time management, task delegation, conflict resolution, coping with stress, effective communication with customers, business writing communication, decision making, etc. (Holmberg-Wright, 2006). The definition was subsequently expanded to include resilience, curiosity, risk-taking, adaptability, and creativity or innovation, which are all attributes of a successful start-up. Soft skills are different from technical and professional knowledge, often more a question of attitude and behavior. They are widely defined skills that increase productivity and cognitive or hard skills. Research and books like Emotional Daniel Goleman's Intelligence (1995) argue that in order for organizations (big and small, start-ups) survived today, they have to owners and employees master the so-called soft skills. Currently, numerous studies have been conducted to determine why some start-ups disappear, even though they operate in developing countries with sectors with sufficient market potential and collateral turnover and profit. Interpersonal ones are consistently mentioned here as management issues. The cause of failure is rarely technical or related to ideas. Rather, most of the failure is attributed to interruption of communication between executives and talent, team, and project managers (Hess, 2012). Of the many studies that are processed by innovation around the world, it follows that start-ups very often stumble into business management problems because in many cases they focused on their area of expertise and failed to accommodate the development of managerial skills during rapid growth. It is clear from the above that soft skills are very closely related to the success and overall development of start-ups and the whole start-up scene.

Death Valley

The Death Valley curve describes the period in the life of a start-up in which it has begun operations but has not yet generated revenue. The term, commonly used among venture capitalists (VCs), is derived from the shape of a start-up company's cash flow burn when plotted on a graph. During this period, the company depletes the initial equity capital provided by its shareholders.

Key Takeaways

- The Death Valley curve is an expression used by VCs to describe the critical initial phase of a start-up company.
- During this period, start-up companies must operate without any existing revenue, relying on their initial invested capital.
- Surviving the Death Valley curve means beginning to generate sufficient revenue to become self-sustainable before the initial invested capital runs dry. This is a significant milestone for start-up companies.

Understanding the Death Valley Curve

A start-up company's Death Valley curve is the span of time from the moment it receives its initial capital contribution until it finally begins generating revenue. During this window, it can be difficult for firms to raise additional financing since their business model has not yet been proven. As its name implies, the Death Valley curve is a challenging period for start-up companies marked by a heightened risk of failure. The reason the Death Valley curve is so challenging for start-up companies is that numerous expenses must be borne before a new product or service can begin generating revenue. These include predictable costs, such as renting office space and paying employees, as well as other costs which are harder to predict, such as marketing and research and development (R&D) expenses. Surviving the Death Valley curve marks a significant milestone in the life of a start-up company, signalling to investors that it has survived its start-up phase and stands a better chance of reaching maturity. Generally speaking, the longer the Death Valley curve, the more likely it is that the company will fail prematurely. The shape of the Death Valley curve will vary on a case-by-case basis, depending on factors such as the business plan, the industry niche, and the amount of seed capital invested in the start-up.

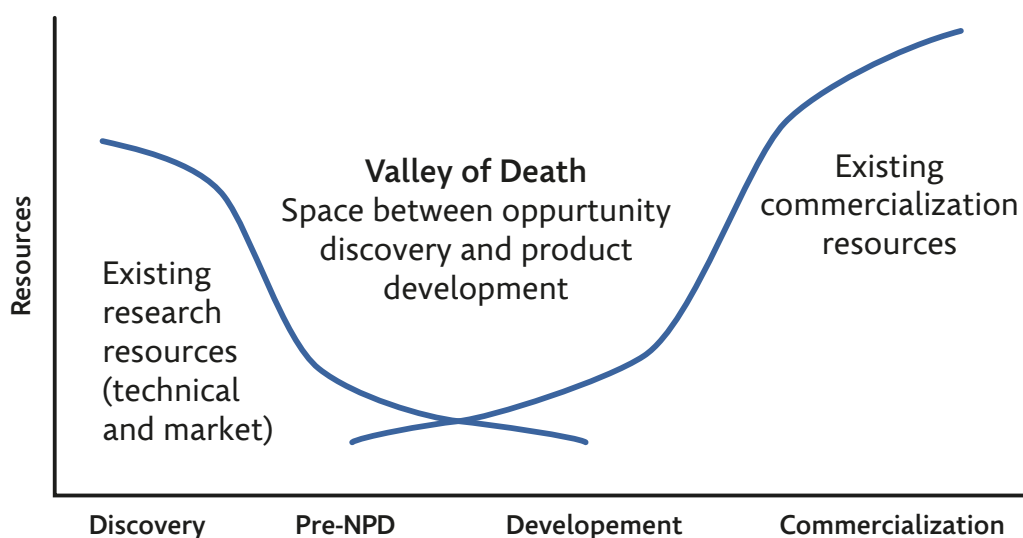


Figure 1: *The Valley of Death* in Markham et al. (2010)

Source: Wiley Online LibraryWeb of Science®Google Scholar

<https://www.investopedia.com/terms/d/death-valley-curve.asp>

Unless a start-up has shrewdly budgeted for this difficult phase and is prepared to carefully monitor its expenses, it will likely struggle with liquidity issues. The longer the Death Valley curve persists, the more difficult it can be for a company to invest in growth initiatives and begin scaling its business.

Spin-out vs spin-in

While a university spin-out will see university staff or students work with business teams to commercialise research, a spin-in is an independent company that chooses to partner with a university as part of its business strategy.

Spin-outs develop from research carried out by staff or students which has the potential for commercial application. The university ecosystem provides ideal conditions to develop and refine this research, to be ready for adoption by industry or consumers.

For existing businesses, teaming up with a university can offer the same opportunities through working collaboratively with leading researchers in a relevant field. This can lead to the development of new technologies and products which can lead to new growth. For reducing risk, the spin-in approach allows access to translational funding, bridging the gap between early-stage technology created through research and its commercialisation.

The spin-in approach provides existing businesses access university intellectual property, know-how, research, technology and facilities to develop a commercial opportunity in return for an equity stake in the company for the university.

The biggest difference between spin-ins and spin-outs is the development and ownership of the initial intellectual property. Rather than a university starting with the ownership of the IP and providing resources before knowing how the business opportunity will turn out, a spin-in allows the university to assess the performance of the company and carry out greater due diligence before collaborating - the university's key focus being to assess a spin-in opportunity from the perspective of its own research and the likely success of the collaboration through the integration of the university's expertise and resources.

Approaches

The creation of a spin-off company by university is one of the suitable ways to commercialise the research results. Parent organisations should always consider the objective behind the spin-off creation, the values between parent organisation and industry, as well as between parent organisation and its researchers as the innovators and creators of research results. The creation of a new spin-off company may often benefit from the structures of universities, such as incubators and science parks.

Following the definition of a spin-off from the beginning of this chapter, for the establishment of a spin-off company the role of researchers or students of parent organisation should be predefined. In order to successfully commercialise the research result by a spin-off company, the cooperation of its inventors, innovators and authors with the spin-off company is essential. In general, researchers and students may hold the following positions in the spin-off company:

- partner/associate - depending on a legal form of spin-off company, researcher and student would be a co-owner of such company by investing financial capital in this spin-off upon its establishment;

- executive manager - this person would act on behalf of the spin-off company and would be authorised to perform certain legal actions;
- employee - researcher and student would have specific rights and obligations based on an employment contract, which could be full-time or part-time or based on a different agreement, which could depend on the performance of work, on work activities, or for example on part-time work of students;
- external expert - researcher and student would perform individual activities according to the agreement based on a specific contract.

Although individual positions within the spin-off company may not be mutually exclusive, it is possible for researchers and students to perform more than one role within such a spin-off company. Universities should support their researchers and students in the creation of businesses, while the process should be as simple as possible in order to fulfil the predefined mission and objectives.

In addition to the involvement of universities, research institutions, researchers and students within the spin-off creation, another legal entity (for example a business partner) can join the spin-off. However, before a spin-off company is established, it must be clear what is the purpose of such spin-off, what activities and research shall be carried out, whether there is already intellectual property that could be invested in the spin-off, or whether the partners, managers and employees have the necessary know-how for the spin-off company to be able to operate independently and conduct research that would be feasible and useful.

Since the goal of a spin-off company is to commercialise the results of research conducted by the universities, it is necessary to acquire such research results from the spin-off company from the parent organisation. Such research result and any intellectual property associated with it could either be assigned to the spin-off company or could be licensed to the spin-off company.

Through assignment, the intellectual property is transferred and becomes the property of the spin-off company and part of its capital. The transfer should be done according to the internal procedures of the company and parent organization, as defined by respective corporate agreements establishing the spin-off company. For a parent organization, it may be beneficial that such parent organization should be granted back a license to the technology assigned to carry on further research activities on it.

In case of licensing, the parent organisation shall retain the full ownership of the intellectual property with the possibility of using it in future (depending on a respective licence agreement).

However, assignment and licensing of intellectual property to the spin-off company differently affect the activity of such spin-off companies. In the case of assignment, any decrease in the value of the intellectual property has a direct repercussion on the spin-off capital and successful commercialization, as well as the existence of such spin-off companies can be at risk. In the case of licensing, if the intellectual property loses value, this may be a reason for renegotiating the licence agreement, but it has no repercussions on the spin-off's existence.

Maintaining a balance between the rights, obligations and expectations between parent organisation, spin-off company and all associated partners is conducive when creating a spin-off company. Technology transfer offices of the parent organisation should act as intermediaries between all the parties.

Indeed, a technology transfer office plays a fundamental role in the construction process of any form of a spin-off company that might be passive or active. A passive role is when only the necessary resources are allocated to assist the process, without the direct involvement of such a technology transfer office. These resources may be in the form of materials, financial capital, or personnel. An active role would occur when a technology transfer office actively participates in writing the business plan and agreements related to the intellectual property, secures or finds initial funding, or assembles the management team.

Advantages

From the university's point of view, the advantages of spin-off creation are several, each with different scope. Although the underlying argument for spin-off creation is to commercially exploit the result of research and apply it in the market in the form of a product, technology, service, or organizational solution, there are other advantages of spin-off creation. A key element in technology transfer between university and industry is closer cooperation between such entities and spin-offs may have a role as a link between the research environment and industry as they are a powerful means of technology transfer between these two sectors.

The advantages of spin-off creation for the university can be directly related to the advantages for its researchers and students. Spin-off company generates the possibility of academic-industry cooperation with researchers and students, which in the end may result in the better application of student graduates in the market. Such cooperation may also have a form of implementation of joint projects, the creation of common technological background between both sectors by pooling the know-how of all associates of the spin-off company and by pooling the common contacts of all associates.

Where the research results may not exactly fit into the mission and objectives of university, spinning off such results would still allow their commercialisation.

A spin-off would also allow the university to participate in European research funded programmes through such spin-off companies as an industrial partner, which would result in obtaining funding not available for pure universities or research institutions.

A spin-off company that is commercializing the research result of the university is also beneficial to the industry. Industry collaboration with academia and participation in the technology transfer process, in general, can accelerate the development of new products, services, technologies, and organizational solutions and their introduction into the market. For businesses, this can mean a competitive advantage in the relevant market.

In the end, spin-off creation and successful commercialisation of underlying innovation increases the reputation of the parent institution and also endows researchers with needed entrepreneurial skills.

Needs Analysis

Since spin-off creation is only one of the possible ways of commercialising the research results, establishment of spin-off companies should be carefully considered. Mission, objectives and general vision of the university plays a significant role in spin-off creation. Motivation of such parent organisation in spin-off creation may reside in commercialising the research results in order to gain significant financial capital, in supporting researchers and students in their entrepreneurial endeavours, in positively affecting the industry in the relevant region as well as in increasing credit of parent organisation in the eyes of all relevant stakeholders.

The creation of a spin-off company is a complex process involving the development of a separate business entity with the subsequent allocation of intellectual property rights, project and risk management, and in certain circumstances, raising of financial capital in order to attract investors. In some cases, where the licensing of intellectual property from the university or research institution is not successful, or where there is no market for the respective research results, the establishment of a spin-off company may be the only way to try to commercialise these research results.

It should be noted that often the researchers and students from the university may lack significant intellectual property management experience, which is likely to undermine the commercial potential of a new product, service, technology or organisational solution. Therefore, business-oriented support for the spin-off company and its relevant stakeholders is crucial to increase the chances to successfully commercialise the results created by the university or research institution's employees and or students.

Before establishing a spin-off company, it is important to prepare a business plan identifying the spin-off goals and the suitable actions to take. Spin-off activities and focus should be consistent with the parent organisation's overall intellectual property strategy and the intellectual property should be properly assigned or licensed as well as managed. Financial support, as well as financial return and exit plan should be carefully prepared. The business plan should include a description of the research result that is going to be commercialised, a description of the spin-off company that is going to be commercialising this result, relevant market analysis and market gap analysis, a description of competition and the differences between the spin-off's end product, services, technology or organisational solution and the market product of the competitors, a description of the marketing strategy, the company's growth, management of the spin-off company as well as realistic financial forecast.

Such a business plan should be preceded by qualitative and accurate description of the research result that is going to be commercialised by the spin-off company. Based on such a description, it should be possible to evaluate its commercial potential and use. Next, similar and substitutable solutions, products or services should be examined to determine whether it could affect the success of the research result's entry into the market.

The university should determine the direction of further implementation of the commercialisation of such research results and the support that it is able to offer to a spin-off company. Spin-offs may be supported in the form of financial capital, personnel, know-how and technical and material infrastructure of the parent company.

However, in order to successfully establish a spin-off company, the university should have a clear and transparent spin-off and intellectual property policy that is formally approved by this institution. Because for a business sector, it is essential to know the conditions under which the university or other research institutions would cooperate. These policies should provide rules and guidelines for the commercial exploitation of intellectual property generated within the institution. Internal policies should define the responsibilities, rights, and obligations of all stakeholders, establish ownership criteria, and ensure that intellectual property created by its employees is utilized in ways most likely to benefit the institution and the public. It is also important to establish basic guidelines for the administration of the intellectual property policy and to define rules for royalty sharing if the commercialization of intellectual property generates income.

A key aspect in creating a spin-off company is the internal policy of the parent organization defining conflicts of interest. Such a conflict occurs when an institution or person has a vested interest which puts into question whether their actions, judgement, or decision-making can be unbiased. Conflicts of interest can also be described as a situation in which a public obligation competes with financial interests. In particular, universities are often concerned that research is not skewed towards the interests of private companies or that the university is not distracted from its core mandate. In technology transfer activities, especially in spin-off activities, there may be specific types of conflicts of interest that need to be addressed, including situations in which a researcher may have a financial interest in any of the university's licensees. To avoid such a situation, policies and procedures should be developed for the disclosure and management of conflicts of interest. This may be critical for the credibility and esteem of the university and its researchers. Such policies also ensure that such activities are conducted in the public interest and not exclusively for personal gain.

Especially with regards to the creation of spin-off companies for the commercialization of research results developed within the university, the internal policies should include, for example, whether the university is entitled to own equity in a company, whether the university can or should participate in the board of directors of a spin-off company and whether researchers are entitled to work in such spin-off company.

Expected Impact and Risks

One of the key impacts of successful commercialisation of research results of university by the created spin-off company is of course implementation and application of such results in the market for the benefit of all stakeholders. This may result in obtaining significant financial capital for the university, for the spin-off company, for researchers and students that are cooperating with the spin-off company. Although there might not be a financial benefit in the first few years, from five years onwards, the benefits can be very large. This shall result

in effective support for the researchers and students in their entrepreneurial endeavours, in positive effect for the industry in the relevant region as well as in increased credit of parent organisation in the eyes of all relevant stakeholders.

However, it should be borne in mind that there are several risks associated with spin-off creation. For example, assignment and licensing intellectual property to the spin-off company differently affect the activity of such spin-off company. In the case of assignment, any decrease in the value of the intellectual property has a direct repercussion on the spin-off capital and a successful commercialisation. This means that the existence of the spin-off company can be at risk.

When the researchers are actively participating in the spin-off activities, they would need to blend business and academic interests, which can inhibit the development of the spin-off company. Less access of a spin-off company to the venture capital, in the beginning, could mean bigger reliance on the parent organization. However, as the financial resources of universities for the spin-off activities are limited, in the end, this could mean that only a few spin-off companies would be supported, and only for a limited period of time. In case of unsuccessful commercialization by the spin-off company, such over-reliance on the parent organization could mean that the parent organization could be reluctant to let the spin-off company fail or forfeit even if there is a very low probability of success. This reluctance could reside in the fact that in the case of little venture capital, such parent organizations can support only a few spin-off companies and would try to support such spin-off companies even when resources could be used much more effectively in other cases. The support of parent organizations would then be unavailable for those spin-off companies that could be created with the greater probability of success.

The risk in the spin-off creation then directly correlates with the risks of the technology transfer in general. This may range from the low financial, material, and immaterial support for spin-off creation by the national strategic actors to the low awareness of the management and the researchers of the university about the benefits of these activities for the further development of both the parent organisation and researchers.

The internal rules of the university in the field of technology transfer directly correlate with the objectives of the university and the attitude of the management towards the spin-off creation. These rules and regulations are of great significance, the problem may arise when these rules are of purely administrative nature and do not regulate all the individual steps in the spin-off creation process.

The risk of a successful spin-off company may also be directly related to the researcher or student himself and to his motivation to participate in the spin-off creation process and spin-off company activities through his research and creation of new knowledge and technologies, creation of new networks with industry and finally to dissemination and commercialization of new findings into the market.

RISK	IMPACT
Assignment of IP to spin-off	If value of IP decreases, it will have a direct impact on the capital of spin-off (decrease of value on balance sheet).
Conflicts of interest – researcher not having sufficient time to commit to spin-off activities	Negative impact on spin-off development that can lead to failure to commercialise.
Lack of early-stage funding	Spin-off will not be able to fund core activities which can result in slower development or in overall failure.
Over-reliance on parent institution (university)	University will be able to support fewer spin-offs due to having to support existing portfolio. This could lead to missing out on opportunity to support more innovative spin-offs.
Lack of support from regional/national governments to support spin-off activities	Low awareness of entrepreneurial opportunities and lack of motivation to commercialise within researcher community - decrease in number of spin-offs.
Administrative burdens of internal university policies	Demotivation of researchers to get involved in commercialisation process.

Table 2: Summary of risks and impacts

Conclusion

Successful spin-off company presents a functioning transfer of knowledge and technology between research organizations and industry with a whole range of benefits both for direct actors and for society in the respective region, state and world according to the nature of the given R&D result. It is not by chance that the world is flourishing in regions supporting innovation and knowledge transfer (e.g., in addition to Israel as the world leader in transfer; North East England - Great Britain; Etelä-Suomi - Finland; Singapore, etc.). In these regions, conditions are created for the emergence of a creating more opportunities from which greatly benefits local universities and research organizations, companies, and ordinary residents.

University spin-offs are seen as an increasingly attractive way of commercialising university intellectual property, boosting innovation and are also being considered to have the potential to bring significant impact on regional economic and social development.

Setting-up a spin-off in academic area is a complex and challenging process often involving lots of different stakeholders with conflicting interests and requiring a supportive national legislative, financial and administrative framework.

The module summarises and draws on the experiences of the three partner universities in spin-off creation and introduces a methodology for spin-off creation. This methodology is not prescriptive and should be adapted into consideration and reflect the legislative, cultural, socio-economic, and other factors of the country in which the university is located.

One of the key pre-requisites of successful spin-off creation is for the university to have a clear, transparent, and easy-to-follow spin-off and intellectual property policy that is formally approved by its institution. Whilst there is a need for clear policies, it is also important that the policies provide a level of flexibility to allow a decision on key aspects such as equity stakes, participation of researchers and IP on a case-by-case basis.

Another important aspect of spin-off creation is to establish a motivational environment that increases the awareness of commercializing research results amongst researchers and also allows researchers to gain essential entrepreneurial skillsets for setting up and participating in spin-offs. Technology transfer offices, university business incubators, science parks, and summer schools are a few of the many support initiatives that universities can use to stimulate academic entrepreneurship and the creation of spin-offs. Also addressing this issue in the university strategy is very important to create a sustainable environment for supporting spin-offs and start-ups in the academic area.

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