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DESIGNING A MODEL FOR BUSINESS TRAINING IN FINNISH BIOTECHNOLOGY COMPANIES

Master's Thesis
in International Business

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1 INTRODUCTION

1.1 Background

> *"As the CEO of British Petroleum has said it, learning is in the heart of the company's ability to adapt to a rapidly changing environment. It is the key to being able to both to identify opportunities that other might not see and to exploit those opportunities." (George & Jones 1999, 174)*

During the last two decades the world economy has gone through a huge transformation process which has occurred in the form of globalization, growing corporate competition and technological diffusion. (Easterby-Smith, Snell & Gherardi 1998, 259.) In addition to diffusion of technology at an increasingly rapid pace, high uncertainty and rapid changes in the environment put pressure on an organization to innovate and learn. (Nieminen 2007, 17.) This is forcing companies to develop new strategies in order to compete and to survive in the constantly changing "new economy". To be able to do this, companies have to learn at individual, group and organizational level, and they are increasingly relying on the knowledge acquired from other firms to facilitate the development of their own capabilities (Lane & Lubatkin 1998, 473). However, companies not only need the knowledge; they also need the skills and competencies to dynamically update and put knowledge into practice. This results in the need for organizations to learn continuously and to look for continuous improvement in their actions through the acquired knowledge (Baets 1998, 181). Developing new competencies through external knowledge acquisition is especially important when the number of technologies the company has to cope with is high, or a specific area of expertise is not familiar enough (or when the resources are otherwise restricted). It is often possible to accelerate the product development process through acquisition of external knowledge, which complements the existing pool of knowledge (Nieminen 2007, 15).

The need for knowledge transfer and organizational learning has been realized in the Finnish biotechnology industry. This industry holds a huge potential; in year 2001 the value added[1] of the Finnish biotechnology sector was about EUR 500 million. Despite

[1] As a management technique, companies seek to provide additional value-added in their products as a way of distinguishing them from competitors; value-added in this sense is a means of avoiding commoditization and maintaining profit margins (Investor Glossary 2008).

this, the relative value added has remained low, because the biotechnology companies use plenty of funding for purchasing services and goods outside the firm. (Hermans & Kulvik 2006, 8-9.) This outsourcing aims at fulfilling the needs of biotechnology companies which cannot be fulfilled with the human resources companies possess.

According to Hine and Kapeleris (2006, 19) biotechnology involves the use of living organisms or parts of living organisms through biological processing to develop new products or provide new methods of production. Grace (1997, 2) defines biotechnology simply as the commercialization of cell biology and describes it as an umbrella that covers various techniques for using the properties of living things to make products or provide services. *"Biotechnology can be also defined as the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services."* This is the definition of Organization for Economic Cooperation and Development (OECD 2005) and it is the one used in this research. This definition was chosen because it emphasis both, the science part of biotechnology as well as the commercial part of it.

Most new biotechnology firms[2] are spinouts, spin-offs[3], or developed from research projects and programmes, based largely around the intellectual property they possess (Hine & Kapeleris 2006, 197). As the biotechnology industry is knowledge-intensive in character and depends on human capital as the engine on innovation, it is crucial to ensure that the key persons are highly-skilled and able to lead the company. (Tahvanainen & Hermans 2005, 74; Hermans & Kulvik 2006, 11; Hermans, Kulvik & Tahvanainen 2006, 22.) However, management talent is scarce and is often the weakest pillar in most biotechnology companies. The skills required of the biotechnology executives are myriad and the path from an R&D driven to a market-driven culture requires a complex repertoire of knowledge, skills and talents. (Meyers & Hurley 2008, 2.)

University-trained biotechnology graduates generally possess a solid knowledge base but often lack real-world business acumen and are not entrepreneurially inclined, preferring instead to pursue careers focused on science. As such, the average biotechnology science graduate is generally not suitable or capable of operating in the commercialization environment between research and the market which is the focus of the start-ups and established companies. (Collet & Wyatt 2005, 409.) The bioentrepreneur is often said to be a scientist/researcher-turned-entrepreneur who

[2] In this research, biotechnology firm is defined as a company which either develops biotechnology processes (a biotechnology research company) or applies the biotechnology processes in their production (a biotechnology using company). Though, an individual company can belong simultaneously to both categories. (cf. Hermans, Kulvik & Ylä-Anttila 2005b, 135.)

[3] In this study spin-offs are considered to be firms founded or at least co-founded by the originator of the academic research a particular firm is commercializing (cf. Tahvanainen 2004, 455).

wishes to see their research success put into practice through commercialization (Kermani & Bonacossa 2003, 160; Hine & Kapeleris 2006, 25), though they do not always have the competencies to positively affect the commercialization process. According to Meyers and Hurley (2008, 3) the lack of such competencies is an international problem. To overcome this problem, the Finnish biotechnology companies should pay special attention to organizational and individual learning e.g. through corporate training. In this research, corporate training is defined as a well thought set of activities aimed to facilitate learning of knowledge, attitude and skills among people in the organization to improve their current job performance and contribute to the achievement of organizational goals. (cf. Edralin 2004.)

1.2 Research purpose and sub objectives

Lately most Finnish biotechnology industry related research carried out has focused on the special features of the industry; such as innovativeness, lack of venture capital or growth potential (cf. Hermans, Kulvik & Tahvanainen 2005a; Brännback, Jalkanen, Kurkela & Soppi 2005). The actual training needs of the industry have been recently researched in Turku School of Economics in cooperation with SLP Innovations Ltd[4]. Training models have been investigated e.g. by Allen (1994) and by Jacobson, Rubin and Coleman Selden (2002), but these researches did not link to the biotechnology industry. Allen (1994, 16) introduced a three phase diverse training model which is based on the corporate needs profile and individual needs profile. Jacobson et al. (2002, 496) have developed a comprehensive model, which makes a distinction between organizational training context and external training context. Thus, there still exists a research gap as no research has been conducted in order to find out what kind of business training model would satisfy the current training needs of Finnish biotechnology companies. This research aims at closing the existing research gap and introducing a training model suitable for business training[5] in the Finnish biotechnology companies.

The research purpose of this master's thesis is to design a model for business training to be used in the Finnish biotechnology companies. The sub-objectives of the research are

- *to describe what kind of business training the Finnish biotechnology companies need*

[4] SLP Innovations is a Finnish consultancy company offering services to businesses and organizations involved in the biotechnology industry. See www.slpinnovations.com.

[5] In this research, business training is considered as corporate training which aims at development of the business competencies introduced by Näsi and Neilimo (2006).

- *to analyze how the training needs of individuals as well as organization's needs can be taken into account in business training*

In this research, training is defined as the collection of structured (e.g. off-the-job courses) and unstructured (e.g. on-the-job, day-to-day problem solving) initiatives which seek to instill a greater awareness and understanding of work practices while providing the scope for development and growth (Antonacopoulou 2001, 329). The training model to be developed is a model suitable for intensive, short-term training which aims at development of business competencies. According to Näsi and Neilimo (2006, 64) business competencies are such as marketing, financial accounting, production management, technology management, logistics, organization, leadership and human resource management and knowledge management competencies. This is further illustrated in figure 1.

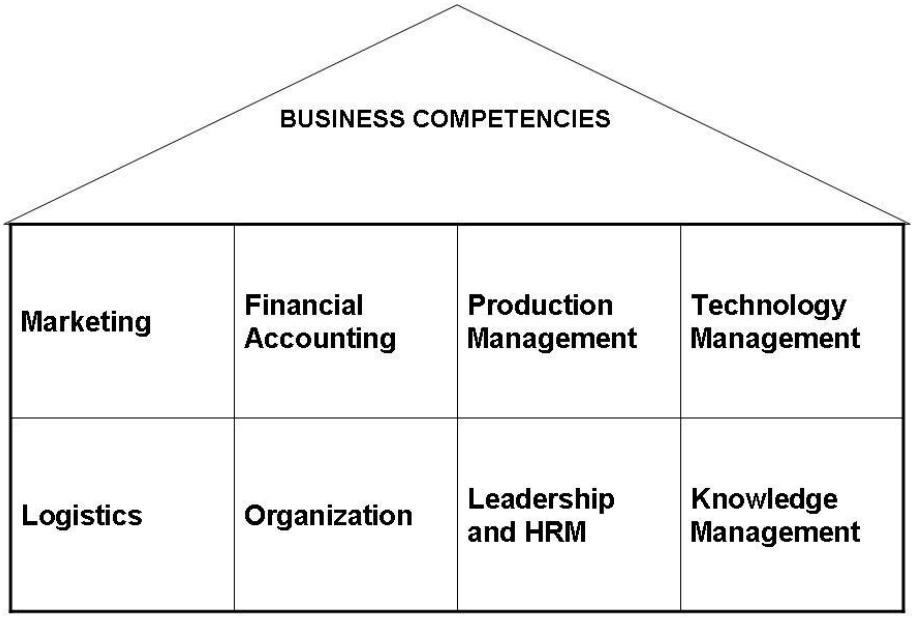

Figure 1 – House of business competencies (Näsi & Neilimo 2004, 64)

This research focuses on the biotechnology companies which already have an existing product or service. Due to the special nature of the biotechnology industry, it is important to make a distinction between the companies which are still at the product development phase and those who already have a product or a service to be commercialized. The product development phase in biotechnology sector may take as long as 10-15 years and the training needs of this type of companies are more concentrated on the technical issues as well as intellectual property rights than on business competencies (cf. Brännback et al. 2005; Hine & Kapeleris 2006).

Since this thesis aims at development of a training model for business training in biotechnology companies, it is important to study the biotechnology industry itself as well as the features of the Finnish biotechnology companies. After this is done, the problems and the training needs of the Finnish biotechnology industry will be described. This will be then reflected to the organizational learning and three learning theories to come up with a first version of a training model that would take into account both the individuals and the organization in terms of learning. It is important to notice, that learning can be claimed to have three levels; individual learning, organizational learning and learning of algorithms, i.e. systematic learning. (Baets 1998, 62.) However, systematic learning is not in the focus of this study and, thus, only individual learning and organizational learning are discussed in this research. Finally, after formation of the training model, expert interviews are carried out in order to find out how the model could be improved and then, the last version of the model is built.

2 TRAINING IN FINNISH BIOTECHNOLOGY COMPANIES

2.1 Short introduction to biotechnology industry

Biotechnology industry is a science-led industry, which covers a diverse range of fields, including medicine, therapeutics, agriculture, food processing and environmental maintenance. (Hine & Kapeleris 2006, 19.) According to Renko (2006, 27) biotechnology is a business developed out of the research laboratories of universities. In discussing the biotechnology field, the focus is usually on the six dominant, interdependent categories; pharmaceuticals, medicine, agriculture, biomaterials, computing and military applications (Renko 2006, 27). During the past few decades, healthcare technology has been considered as the main application area of biotechnology, but the applications of plant and process biotechnology are gaining importance. (Simon & Kotler 2003, 93; Hermans & Kulvik 2006, 5.) Irrespective of the application area, the technological interests and market potential are global. (Hermans & Kulvik 2006, 5; Ahn & Meeks 2008, 21.) Biotechnology is also seen as a major pillar of economic growth and a critical sector to national economies. (Collet & Wyatt 2005, 409; Hine & Kapeleris 2006, 22; Ireland, Cormick & Hine 2007, 86.) It is virtually certain that biotechnology, with its multiple applications and challenges, will develop further and increase in importance (Solem & Gaivoronskaia 2005, 8). However, Hermans et al. (2005b, 143) have argued that the biotechnology industry in Finland will not become one of the main pillars of the Finnish economy at least for a decade.

Table 1 summarizes the key features of biotechnology industry and illustrates how the industry differs from information technology industry. The nature of biotechnology industry differs from many other industries as many biotechnology and life science companies develop science-based products. (Renko 2006, 27.) Due to the nature of the products which biotechnology companies develop (excluding services) the product development times are very long, sometimes even as long as ten to twenty years. This long product development process has made the industry very capital-intensive and highly-regulated and capital needs to be raised continuously. (Nilsson 2001, 94; Kermani & Bonacossa 2003, 156; Hine & Kapeleris 2006, 20.) Information Technology industry is used as an example here because it is considered as highly knowledge-intensive as biotechnology industry. (Hine & Kapeleris 2006, 20.)

Table 1 - A comparison of key features of biotechnology industry and information technology industry (Hine & Kapeleris 2006, 26-27)

Feature	Biotechnology	Information Technology
Product life cycles	Medium to Long	Very Short
Technological requirements	In new product development, extensive skills set and technical knowledge are required.	Most IT skills are learnt by doing.
Resource requirements	Very capital-intensive industry with extensive sunk costs.	Limited to labour costs, hardware, software and overheads.
Capital raising	Very capital-intensive industry with extensive sunk costs.	Most start-ups proceed to initial product launch without backing.
Extent of R&D	A long, intensive, trial process including animal, chemical and human testing.	R&D on individual products is not extensive but many products can be concurrently developed.
Product development and product launch	Due to ethical and regulatory issues product development must be completed prior to launch.	Product development continues well after the product is launched.
Intellectual property	Patents most prevalent. IP control is essential to the success of most companies and also a substantial financial burden.	Few patents, some trademarks, design copyright most prevalent. Intellectual property control hard to maintain.

Biotechnology industry is very research intensive, and it requires extensive skill sets and technical knowledge. Majority of the drug developing companies are required to do a plenty of clinical trials, both animal and human, and this requires ethical consciousness. (Hine & Kapeleris 2006, 20.) The innovation process in biotechnology is often complex, because basic research and product development, as well as manufacturing, distribution and marketing of a commercial product can include several sector players (Renko, Carsrud, Brännback & Jalkanen 2005, 254). Due to the nature of biotechnology products, intellectual property protection is an essential element of success for most biotechnology companies. Biotechnology companies are also required

to establish strong linkages and strategic alliances with universities, institutions and other biotechnology companies. (Hine & Kapeleris 2006, 20.)

The most well-known biotechnology companies are located in the USA and in Europe, but there are significant companies emerging in Canada, Australia, and New Zealand and throughout Asia (Kermani & Bonacossa 2003, 154). At the moment, the European biotechnology industry is substantially smaller than its US counterpart in most measures (Bains 2006, 274). Most of the biotechnology companies are small in size and limited when it comes to finances, and this has had an impact on the output of the industry e.g. in terms of new drugs. (Kermani & Bonacossa 2003, 156.)

Biotechnology organizations evolve rapidly. It is a truism to state that all sustainable companies require the golden triangle; finance, intellectual property and management (Collingham 2004, 320). Investments are crucial to the growth and continuity of the industry, because biotechnology industry is characterized by high-cost research and development, limited commercialization, and rapid change brought about by constant technological developments and scientific advances. (Hine & Kapeleris 2006, 22.) It has now been accepted that businesses need different skills and experience at different times in their organizational development (Collingham 2004, 320).

2.2 Special features of Finnish biotechnology companies

Finnish biotechnology industry is one of the most promising high technology sectors in Finland and it has the potential to develop to be one of the top industries in the world. (cf. Brännback et al. 2005) Though, for the industry to fulfill its potential, companies still need to focus on the bases for competition, innovation, branding and global reach. (Simon & Kotler 2003, 5.) The structure of Finnish biotechnology sector is similar to that of European biotechnology. The pharmaceutical industry represents the leading sector, while the agro-food sector and the forest industry are lacking behind (Schienstock & Tulkki 2001, 119). At the moment, Finnish companies constitute almost 7 percent of the entire number of biotechnology companies in the EU (Hermans et al. 2005a, 1). Currently there are around 200 biotech firms in Finland and most of them are small and medium-sized businesses[6]; which are owned and managed by the same person (Hermans & Kulvik 2004, 283). Due to this, Finnish biotechnology companies are limited in their size and ability to exploit their market potential (Hermans & Kulvik 2004, 283).

[6] Small and medium-sized enterprises in this paper are defined according to the definition of European Commission excluding firms with over 250 employees and match additionally at least one of the following criteria: a) annual turnover over 50 million EUR or b) balance sheet total over 43 million EUR. (European Commission 2007)

The basic structure of Finnish biotechnology companies differs a lot from the structure of companies in traditional industries, such as forestry. A typical Finnish biotechnology company has around 10 employees of whom 50% holds a doctoral degree. Usually the company's chief executive officer has around 10 years of experience in business and only some of the company's personnel have marketing experience (Hermans et al. 2006, 23). According to Brännback et al. (2005, 40) 70 percent of the Finnish bio companies are run by a person with a Ph.D. degree and with less than 5 years of business experience. Biotechnology is a science-based sector where management of know-how is given more emphasis than in many other sectors. The total number of personnel and number of employees with doctorate depicts the company's internal critical mass. The business experience of the CEO in years measures the business knowledge of the management while the educational level of the CEO signifies formal or practical competence. (Hermans 2004, 9.)

The number of personnel in small and medium-sized life science companies is relatively high compared to other Finnish SMEs as whole, but their sales revenues are lower than average of SMEs in other industries. Almost 30 per cent of the bio-pharmaceutical companies employ over 20 persons while the corresponding share for all SMEs is 15 percent. Despite the fairly high number of employees, turnover of biotechnology companies is low in comparison to SMEs in other industries. (Hermans 2004, 2.) The majority of Finnish biotechnology firms is young, and still in the early stage of profitable economic activities. Their turn-over, profits and exports are for younger firms in particular, still low. Profits are even negative, while their growth expectations are high. (Hermans & Luukkonen 2002, 27.)

According to Hermans and Kauranen (2005, 2) most of the Finnish biotech companies have started as a result of academic research-based spin-offs and possess great scientific knowledge. Despite this, the Finnish academic spin-offs are constrained in several ways; they are lacking a clear market-oriented focus, commercial knowledge and the proper knowledge to direct the business towards the markets. (Hermans et al. 2005a, 4.) The companies are very technology-focused and many companies are even lacking an existing business plan. Co-operation activities are relatively poorly organized; firms rely heavily on lead-time to protect their innovations, and do not utilize alternative business modes, such as offering services or acquiring product licenses to generate initial revenue that would make them less dependent on financial markets from the beginning of operations. (Hermans et al. 2005a, 4.) Tahvanainen (2004, 472) stated that Finnish entrepreneurial academic spin-offs are at a relative disadvantage when compared to other types of biotechnology SMEs. Hit more often by financial difficulties at start-up, being unable to attract skilled people, and, most unfortunately, lacking the vital strategic sense and skills for transforming research into a thriving business through

cooperation and market oriented approach, academic spin-offs are facing major impediments to successful growth (Tahvanainen 2004, 472).

In the Finnish biotechnology industry, large investments have been made in R&D activities to commercialize inventions or sell intellectual property rights. (Hermans & Kauranen 2005, 174.) Due to the limitations, both in human resources as well in finance, the commercialization of biotechnology inventions in Finland has not succeeded as well as expected. (SLP Innovations 2006.) Only a few of the anticipated potential innovations have been successfully developed, and even fewer of them commercialized (Hermans & Kauranen 2005, 174.) This is a serious drawback, as commercialization of research is essential to the development of local biotechnology companies. (Collet & Wyatt 2005, 409.) However, these problems are not unique; e.g. the problems in Swedish biotechnology industry are very similar to these ones (cf. Nilsson 2001).

It could be thought that the lacking business expertise as well as venture capital could be recruited from outside of the industry and country as it is done in many other European countries. However, Finland is faced with a different kind of problem as it does not have a long history in any branch of the industry. A large pool of skilled individuals with relevant background from which to recruit is simply missing in Finland. (Hermans et al. 2005a, 5.) In the research of Hermans et al. (2005a), the relevant background refers to individual with both, scientific and business background. In general, high basic education of Finns and a long tradition of international training of researchers in the life science form a solid platform for a successful biotechnology industry development. (Brännback et al. 2005, 39.) Because of the technical and scientific understanding required to operate in the industry, entrepreneurs have not been attracted in large numbers from other industries. (Hine & Kapeleris 2006, 28.) However, technical skills alone will not offer sustainable competitiveness, as exploiting opportunities relies heavily on traditional entrepreneurial skills. So the question remains. How does the bioentrepreneur or the entrepreneurial biotechnology company build this knowledge base of business strategic skills? Largely it has been through experiential learning rather than the codified knowledge developed through university courses, although the trend toward biotechnology PhD, augmenting their qualifications with an MBA is becoming apparent. (Hine & Kapeleris 2006, 31.)

At the moment, Finnish infrastructure is still weak to support birth and fast growth of new life science companies, preventing recycling of human resources, and utilization and spreading of business skills. (Brännback et al. 2005, 3.) However, the problem of finding adequately skilled personnel does not concern business expertise only. Entrepreneurial academic spin-offs are hard pressed with finding personnel for research activities as well. (Tahvanainen 2004, 468.) According to Hermans and Kulvik (2006, 5) the key question for the success of the Finnish biotechnology industry is to be able to

take advantage of the domestic strengths, acknowledge the limited resources and yet realize the global view of biotechnology. Because the human capital of a particular biotechnology company is limited to that provided by the people employed and committed to the company, a possible lack of abilities, experience, and skills needed must be compensated for by accessing external sources. (Hermans & Tahvanainen 2006, 122.) One way to overcome these human resource-related obstacles in the biotech firms' growth is to provide corporate training, with a special focus in bio-business. The content of the training should be able to bridge the gap between science and business, since most of the managers and entrepreneurs have a degree in science and they are only lacking the necessary business knowledge.

The role of training is seen central to enhancing the future commercialization and internationalization of biotechnology innovations. According to Hussi, Hermans, Kulvik and Tahvanainen (2006, 69) business schools would be a good source for more business-oriented managers in the field and researchers should be educated to understand better the management and business issues. A training programme offering experiences on international markets and hand-on experience of commercialization is seen beneficiary from the industry point of view as well (Hussi et al. 2006, 69). However, as many managers and staff members of biotechnology companies do not have the time needed to participate to these time-consuming university training programmes, effective substitutes to consider are short-term corporate training modules.

2.3 Current training needs of the Finnish biotechnology companies

Due to the limited size and human resources, many Finnish biotechnology companies are lacking some important skills needed to be able to commercialize their latest innovations and to internationalize (cf. Brännback et al. 2005). To figure out solutions for this problem, SLP Innovations Ltd and Turku School of Economics have carried out a research called "Training needs of Finnish biotechnology industry". The research was carried out through depth interviews and an online survey. The target population of the research included the Finnish biotechnology companies as well as some academic researchers who are strongly linked to the industry. The research was carried out during the summer 2006, and it involved both academics and company representatives. (SLP Innovations 2006.)

The survey brought up similar kind of issues, as most of the industry representatives have been able to identify for some time now. Brännback et al. (2005, 18) have stated the three less developed areas in life science companies in Finland are lack of business skills, lack of international growth and shortage of capital. Especially severe the lack of business skills is at the seed stage of the companies. (Brännback et al. 2005, 18.) The

survey carried out by SLP Innovations and Turku School of Economics showed that there is a need for business training in the industry, even though the corporate training is not yet a very well –known and accepted form of knowledge transfer in the industry. (SLP Innovations 2006.) A training deficit can be said to exist owing part to a failure of education and training market and partly to a failure of demand from SMEs which lack the personnel planning capability required to define and source specialist training services they require (Penn, Ang'wa, Foster, Heydon & Richardson 1998, 128, 129).

The respondents of the survey expressed their interest towards development of the following skills and competencies: bio-entrepreneurship, management, networking, commercialization and marketing. (SLP Innovations 2006) According to Renko et al. (2005, 252) marketing and general management skills are often significant areas of weaknesses within small high technology firms. These skills and competencies were considered crucial from the company's growth point of view. (SLP Innovations 2006.) This kind of skills can be acquired through formal training to some extent and improved through practice, and are, thus, important to possess before starting a firm. (Brännback et al. 2005, 40.)

A short summary of the basic business competencies which the survey respondents felt that need the most development is presented in table 2. This summary correlates strongly with Näsi and Neilimo's House of business competencies presented in chapter 1.2. Näsi and Neilimo emphasize basic business competencies, such as marketing and management competencies and these are similar kind of competencies as the respondents of the "Training needs of Finnish biotechnology industry" –survey brought up. However, in Näsi and Neilimo's model there are blocks for knowledge and technology management and logistics, while the survey in question revealed lacks in innovation and project management and in internationalization competencies.

Table 2 - Basic business competencies needing development in Finnish biotechnology companies

Basic business competencies	Example
Marketing Competencies	How to market new products and services?
Management and Leadership Competencies	How to run a company with very limited resources? What is a good and competent leader/manager like?
Entrepreneurship Competencies	How to run the everyday operations of a SME (biotechnology company)?
Innovation Management Competencies	How to create an innovative organization? How to maintain the innovativeness? How to turn good ideas as successful innovations?
Project Management Competencies	How to run a project (both in nationally and internationally)?
Financial Competencies	How and where to raise capital for the company?
Internationalization Competencies	How to internationalize? How to find the right contacts, customers, suppliers etc. abroad?

Besides the "basic business competencies", respondents also brought up their interest towards some other business related skills, which are here referred as specific business skills. The respondents saw as very important to have, or learn, such skills as networking skills, problem solving skills and communication and presentation skills. (SLP Innovations 2006.) According to Brännback et al. (2005, 49) these are skills which apply to the focal firm, industry and even specific technology. These skills can be acquired either by training or by hiring people possessing them. (Brännback et al. 2005, 40.) A short list and examples of these skills are provided in table 3.

Table 3 - Specific business skills needing development in Finnish biotechnology companies

Other Business related competencies	Examples
Networking Skills	How to find new partners, financiers, customers etc.? How to create a relationship with them? What are networking events like?
Problem Solving Skills	How to "solve problems", especially under pressure?
Communication and Presentation Skills	How to introduce the company/products to possible customers, partners etc.? How to make a good first impression? How to communicate effectively?

There is a growing trend in the interest towards business training in the industry. Though, most of the respondents have not participated on training offered to them in the past. 40% of the respondents stated that they have not participated in training because of lack of time, and 28% said that the lack of money prohibited them to participate. Some respondents also said that there was not suitable training available. (SLP Innovations 2006.) Many respondents feel that the use of information technology and multimedia solutions could help to overcome the limited time resources. As time is one of the scare resources in the industry today, respondents appreciated a possibility for distance learning that is not bound to any certain time or venue (SLP Innovations 2006). The respondents felt that the most suitable training method for their needs would be a combination of traditional training methods, such as lectures and workshops, and IT methods, such as video-lectures and online conversation possibility with the trainer and other participants. (Paakkonen 2006.)

There is a need for training programmes that are flexible enough to accommodate individual needs' rather than insisting that individuals try to accommodate an inflexible existing system. (Allen 1994, 16.) After all, in industry and training situations where clearly defined goals have been lacking previously a movement towards competence-based training will be a definite advantage. (Cornford & Athanasou 1995, 12.) Training that is individually relevant and appropriate is likely to be more cost effective and produce a more effective transfer of training material back to workplace. (Mulholland et al. 2000, 11, 20.) Though, as all the corporate training aims at organizational learning as well, the needs of the organizations should not be completely forgotten. The concept of

organizational learning will be discussed in chapter 3 after a traditional approach to training has been introduced.

3 FROM TRAINING TO LEARNING

3.1 Traditional approach to training

In today's ever-changing business climate, as organizations seek ways to remain competitive, they have significantly increased their efforts to develop the knowledge, skills and capabilities of each employee to maximize their organizational impact (Murray & Efendioglu 2007, 372). Due to this, organizations are increasingly spending even more money annually on corporate training with the belief that it will give them a competitive edge in the local and global markets. (Edralin 2004.) According to Edralin (2004) corporate training is already a well known concept in the world, and it is becoming more and more important in the Finnish biotechnology sector as well. There is a growing acceptance that people are indeed the most important asset of the company and investing in staff through helping them learn new skills will bring benefits to the company in the long term. (Tennant, Boonkrong & Roberts 2002, 230; Sloman 2005, 348.) However, it has been noted that the expertise of each these individuals is usually limited both in quality and scope. (Baets 1998, 185.)

As Mulholland, Domingue, Zdharal & Hatala (2000, 9) have stated, traditional approaches to training employed by the biotechnology industry involve identifying or predicting the skills gap between the company they need to be and the current competencies of their staff. The gap is often bridged by conventional training methods that extend the staff competencies to meet company requirements. (Mulholland, Domingue, Zdharal & Hatala 2000, 9.) However, these traditional approaches to training are considered to have certain shortcomings. For example, the training has been shown to be ineffective, i.e. most of the things learned were not transferred to the everyday work. (Mulholland et al. 2000, 9) According to the research of Mulholland et al. (2000, 9) this is because the training mostly takes place outside the normal context of the work and therefore the knowledge attained is seen difficult to transfer. This is one of the problems of the biotechnology training as well; the training available in the industry is seen too theoretical and irrelevant to everyday work. (Paakkonen 2006.)

According to Brown and Duguid (1996, 68) training is viewed as the transmission of explicit, abstract knowledge from the head of someone who knows, to the head of someone who does not know in surroundings that specifically exclude the complexities of practice and the communities of practitioners. Traditional approaches to training concentrate on providing theoretical knowledge which is vital but training often fails to support the worker in translating what they have learned into practical knowledge.

There is a clear contrast between having theoretical knowledge about a subject and knowing how to put that knowledge into practice. (Mulholland et al. 2000, 10.)

Currently, most of the corporate training offered to Finnish biotechnology companies, is tailor-made to meet the organizational needs of the company. As the training is tailored to the company's needs, it should provide something new to every participant. However, this tailor-made training is planned and implemented based on the needs of the organization, and does not take into account the needs of individuals, and ensure that every participant really learns something. After all, even if organizational learning takes place, it does not ensure that individuals learn. As Allen (1994, 16) states, what is needed is a training model that starts with, and accommodates as far as possible the diverse human needs present in every organization. To improve the learning outcomes of the participants at individual level, more training based on individuals needs and individual learning styles should be provided. Even when learning takes place at the individual level, also the organizations are considered to learn. Thus, the concept of organizational learning is introduced in the following subchapter.

3.2 Organizational learning

Organizational learning as well as inter-organizational learning have become very popular research areas during last decades due to the fact that need of learning and the need for knowledge management has been recognized (cf. Gupta, Sharma & Hsu 2003). Organizational learning is nowadays also a significant element of organizational change and development literature and is at the heart of continuous improvement (Brown 1998, 100; Lu & Tsai 2003, 281). King (2006, 1, 6) has stated that organizational learning is one of the oldest and still least-understood elements of an organization's knowledge capability.

Fiol and Lyles (1985, 803) define organizational learning as the process of improving actions through better knowledge and understanding. According to Huber (1991, 89, 90) organizational learning can be considered as the development of new knowledge and insights that have the potential to influence behavior. Organizational learning occurs when workers act as learning agents for the organization, responding to the changes from the internal and external environments by detecting and correcting errors and embedding the results of their inquiries in private images and shared maps of organization (Brown 1998, 100; Lu & Tsai 2003, 281). However, organizational learning, like individual learning, does not necessarily imply change, particularly observable change. An organization can, for example, learn something in order not to change (Cook & Yanow 1996, 439).

Argyris and Schön (1996, 3) have stated that an organization is said to learn when it acquires information (knowledge, understanding, know-how, techniques or practices) of any kind and by whatever means. Learning may take place within the organization due to internal information exchanges, participative policy making and a learning approach to strategy formulation. Internal information exchange and participative policy making leads to learning, as they enable members of the organizations to share their knowledge and values (Baets 1998, 43). All organizations learn, for good or ill, whenever they add to their store of information, and there is no stricture on how the addition may occur. (Argyris & Schön 1996, 3.)

Figure 2 introduces the general model of organization learning of Snyder and Cummings (1998). It consists of three square-like shapes which describe organization learning processes, organization knowledge and organization performance outcomes. These elements are interrelated through number of feedback loops indicated as arrows in figure 2. (Snyder & Cummings 1998, 877.) Successful learning occurs when organizations complete all four organization learning processes introduced in figure 2. According to Snyder and Cummings (1998, 876) organizations discover errors or dissonance between their desired state and their current state; diagnose the causes of this gap and invent appropriate solutions to alleviate it: produce solutions through organizational actions and document the results; draw conclusions about the effects of the solutions and generalize the learning to relevant situations (Snyder & Cummings 1998, 876.) This is illustrated in the most left-hand side box in the figure 2. In the figure, the box “organization knowledge” consists of three elements; skills, cognitions and systems. Figure 2 also proposes that organizational learning processes affect organization performance through their influence on organization knowledge (Snyder & Cummings 1998, 876). Although these processes are presented as sequential, they interact and overlap considerably in practice (Snyder & Cummings 1998, 876).

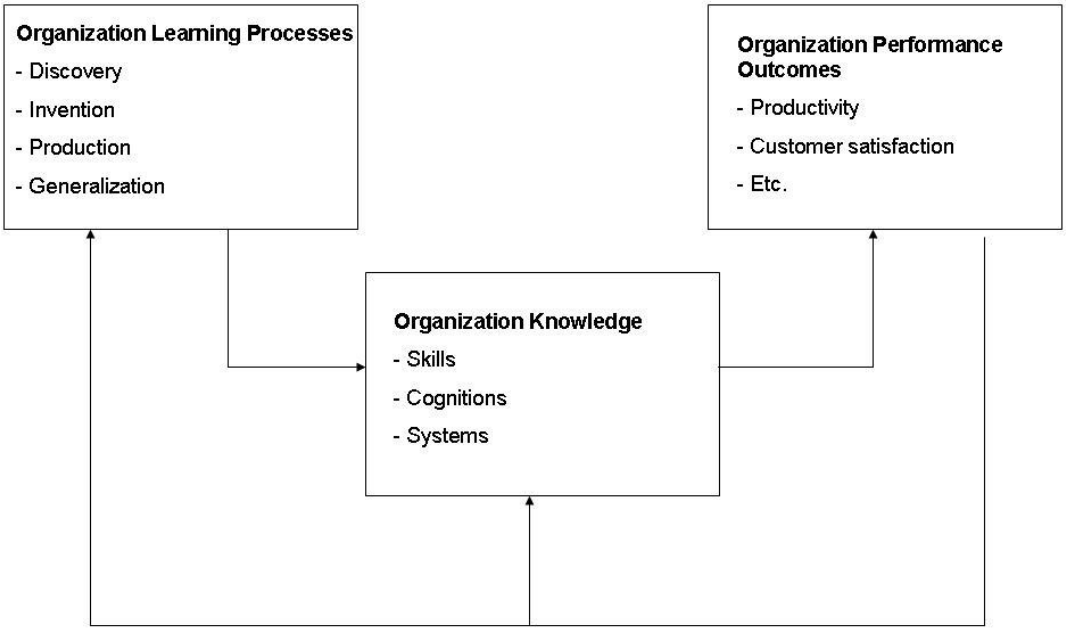

Figure 2 – General model of organization learning (modified from Snyder & Cummings 1998, 876)

As Huber (1991, 89) has stated, an organization learns if any of its units acquires knowledge that is recognized as potentially useful to the organization. However, it has to be noted that the organizational learning cannot be simply counted as the sum of the each member's learning (Fiol & Lyles 1985, 804). Thus, it is important to notice, that individuals do learn in organizations, but this learning may or may not contribute to organization learning. According to Snyder and Cummings (1998, 875) learning is organizational to the extent that: a) it is done to achieve organization purposes; b) it is shared or distributed among members of the organization; and c) learning outcomes are embedded in the organizations' systems, structures and culture. To the extent that these criteria are met, organization-level learning is distinct from individual-level learning (Snyder & Cummings 1998, 875).

An organization cannot create knowledge on it own without the initiative of the individual and the interaction that takes place within a group of people. (Lu & Tsai 2003, 282.) According to Huber (1991, 90) more organizational learning occurs when more of the organization's components obtain this knowledge and recognize it as potentially useful. It is crucial to bear in mind, that all learning takes place inside individual human heads; an organization learns only in two ways: a) by the learning of its members, or b) by ingesting new members, who have knowledge the organization

did not previously have (Simon 1996, 176). Individual learning in organizations is viewed as a social, not solitary, phenomenon and it is dependent on what is already known to other members of the organization. (Simon 1996, 176.)

The need for organizational learning usually arises from the mismatch between intensions and outcomes of activities and involves knowledge management and knowledge transfer (King 2006, 7). The processes that organizations use for organizational learning are diverse – corporate training, the employment of organizational development techniques, change management, case management, employee empowerment, and continuous improvement of techniques and programs (King 2006, 7). The emphasis of this thesis is on organizational learning which takes place in the form of corporate training.

Two basic types of organizational learning are often distinguished: single-loop learning, which involves minor adjustments, replacements or refinements of response and double-loop learning, which implies important changes in values and assumptions, making completely new responses possible (Brown 1998, 100). Single-loop learning is the detection and correction of errors that does not require changing the values that govern the existing theory-in-use. (Argyris 2004, 10.) *Single-loop learning involves learning from the consequences of previous behaviour* (Hatch 1997, 371). As Hatch has stated it, in this model learning results from feedback generated by a process of observing the consequences of action and using this knowledge to adjust subsequent action in order to avoid similar mistakes in the future and develop successful patterns of behavior. For example the use of budgets, can be considered as an organizational practice designed to formalize single-loop learning (Hatch 1997, 371).

Double-loop learning is the detection and correction of errors where the correction requires changes not only in action strategies but also in the values that govern the theory-in-use (Argyris 2004, 10). Double-loop learning requires that the system question its own underlying assumptions and values and risk fundamentally changing terms of its own organizing. *Double-loop learning is increasingly being seen as taking place, or needing to take place, throughout organizations as they hire professionals and skilled technicians to help them adapt to the increasing rates of change they perceive as necessary to their survival* (Hatch 1997, 371, 372). The trouble with double-loop learning is that it can be painful and distressing as long held beliefs may be found to be dysfunctional or outmoded (Hebel 2007, 502). The process of single-loop learning and double-loop learning is illustrated in figure 3.

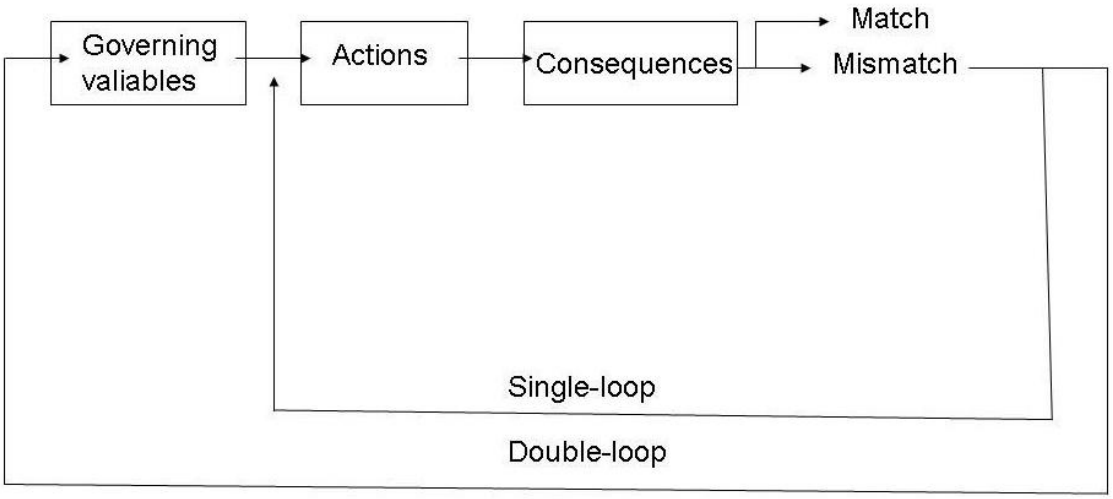

Figure 3 - Single-loop and douple-loop learning (Argyris 2005, 68)

The barriers to organizational learning are rooted to the organizational factors, and located at the individual and collective levels. (Adams, Day & Dogherty 1998, 417; Brown 1998, 101.) At the individual level, cognitive limitations are highly significant. At a collective level the influences of politics and culture are, perhaps, the most important potential inhibitors of organizational learning. (Brown 1998, 101.) Thus, the central challenge for organizations today is to how to leverage learning consistently, quickly, and effectively and how to leverage it into performance. (Baets 1998, 181; Brinkerhoff 2006, 304.)

3.3 Learning as a change in behavior

Behaviorism focuses on the objective and observable components of human behavior-that is, the stimulus and response events (Lefrancois 1972, 81). According to Boghossian (2006, 716) in the traditional behaviorist model, learners undergo some form of conditioning. Ultimately, the goal of conditioning is to produce a behavioral result. In an academic venue, changing behavior is more difficult to measure than in other contexts, like a gym class, where there are observable physical behaviors that result from physical stimuli. In an academic context, behaviorists substitute verbal behavior (e.g. responding appropriately to a question) for physical behavior. The behaviorist would interpret, for example, a student's correct answer to a question as a sign of successful conditioning, and then continue to reinforce correct responses behaviorally by assigning good grades. Often, the form of conditioning used to achieve desirable verbal behavior is a lecture-based pedagogy. (Boghossian 2006, 716.) It is

important to notice, that there are several different varieties of behaviorism (cf. O'Donohue & Kitchener 1999; Rashotte & Amsel 1999) and this research describes the general features of behaviorism, and leans mostly towards of Skinnerian behaviorism.

The Dog-Salivation-experiment[7], carried out by the Russian scientist Ivan Pavlov is a good example of behaviorism. Frederic Skinner carried out a similar type of experiment, but instead of dogs Skinner did his experiments with pigeons and created so called "Skinner's Box", which is a very well known example of behaviorist learning experiment. (Iacovou 2006, 36.) Both of these experiments place learning in an action-reaction framework, where actions are always followed by reactions. The important aspect of behavioral learning theory is that the individual learner is viewed as adapting to the environment and learning is seen largely as a passive process, in which there is no explicit treatment of interest in mental process. The learner merely responds to the "demands" of the environment and knowledge is viewed as given and absolute. (CSCL 2007.) In the behaviorist point of view, there is no subjective element to learning; either in determining what to study or in how information is interpreted, used, or understood. (Boghossian 2006, 716.) Many critics argue that behavioral learning theory is too one-dimensional approach to learning as behavioral theories do not account for free will and internal influences such as moods, thoughts and feelings. Behaviorism does not account for other types of learning, especially learning that occurs without the use of reinforcements or punishments. People and animals are able to adapt their behavior when new information is introduced, even if a previous behavior pattern has been established through reinforcement. (Iacovou 2006, 37.)

For education and training, this learning theory has had unfortunate consequences. It has tended to focus attention on students' and participants' performance rather than on the reasons that prompt them to respond or act in a particular way. Reinforcement fosters the repetition of what gets reinforced, regardless of the acting subject's understanding of the problem that was posed, and of the inherent logic that distinguishes solutions from inadequate responses. Thus, training may modify behavioral responses, but it leaves the responding subject's comprehension to fortunate accidents. (Von Glasersfeld 1995, 4.) Behaviorism is diametrically opposed to constructivism. Unlike constructivists, behaviorists believe that knowledge does not depend upon introspection, and they completely reject discussion about internal mental states. Rather, behaviorism's focus is on the external observation of lawful relations between and among outwardly observable stimuli and the responses that follow (Boghossian 2006, 715). Behaviorism dominated educational landscape 20 year ago

[7] Pavlov carried out an experiment where a bell rang every time when a group of dogs were offered food. In the end the dogs started to connect the sound of bell with food and they started to salivate every time the bell rang, even though there were not offered any food. (Iacovou 2006, 36.)

while the foremost learning theory today is constructivism (Boghossian 2006, 713). In the following subchapter, the constructivist learning theory is introduced.

3.4 Learning as a change in understanding

Constructivism is a philosophical view on how people come to understand or know. (Savery & Duffy 2001.) Constructivist learning theory is about the process of learning and helping people to discover their truths, instead of helping people to arrive at their truth. (Boghossian 2006, 719.) Constructivist learning theory emphasis that what is understand is a function of the content, the context, the activity of the learner, and, perhaps most importantly, the goals of learner. (Savery & Duffy 2001.) This is a theory of cognition and concerns, not what might "exist", but only what can rationally be known (Von Glasersfeld 2004, 220).

Rather than seeing the learner as a passive absorber of information, a constructivist perspective views the learner as actively engaged in constructing meaning, bringing his or her prior knowledge to bear on new situations, and, if purposes are worthwhile, adapting those knowledge structures (Driver 1995, 399). Constructing knowledge means that students are active participants in a learning process by seeking to find meaning in their experiences (Boghossian 2006, 713). Understandings cannot be shared but the degree to which our individual understandings are compatible can be tested. When a learner is in a learning environment, there's always a stimulus or goal for learning, so the learner has a purpose for being in this environment. It is important to notice that this goal plays a central role when it is considered what is really learned. The goal set is not only a stimulus for learning, but it is the primary factor in determining what the learner attends to do, what prior experience the learner brings to bear in constructing an understanding and, basically, what understanding is eventually constructed. (Savery and Duffy 2001.)

The social environment is critical to the development of individual understandings as well as to the development of the set of propositions called knowledge. As Von Glasersfeld (1995, 14) has noted, other people are the greatest source of alternative views to challenge our current views and hence to serve as the source of puzzlement that stimulates new learning. From the constructivist perspective, learning is not a stimulus-response phenomenon. It requires self-regulation and the building of conceptual structures through reflection and abstraction. Problems are not solved by the retrieval of rote-learned "right" answers. To solve a problem intelligently, one must first see it as one's own problem. That is, one must see it as an obstacle that obstructs one's progress toward a goal. (Von Glasersfeld 1995, 14.)

According to Boghossian (2006, 715) constructivism replaced the teacher as the center of knowledge (“objective”) with the learner (“subjective”). Independent of the teacher, each learner’s subjective experiences now have a special and unique meaning. It is both the student’s learning experience and her perceptions of those experiences that have educational value (Boghossian 2006, 715). From a constructive point of view, teachers and trainers need to de-center their roles as the source of knowledge by consciously refraining from giving only right-wrong answers, and acting as facilitators. Teachers need to ask questions such as: "Why? What do you mean?" and "How do you know that is true?" to challenge the students' reasoning and to help them consider each step they take in their inquiry. By asking such questions, facilitators also model critical thinking, with the purpose of stepping back and letting students begin to ask themselves and their peers those same types of questions (Abdullah 1998). Besides helping the participants to learn, asking questions can also guide trainers in their work. (Pedrosa de Jesus, Albergaria Almeida, Teixeira-Dias & Watts 2006, 98.) As facilitators, teachers also design problems and provide critical resources needed for the inquiry process. (Abdullah 1998.) Constructivism challenges the traditional view of the individual mind as a device for reflecting the character and conditions of an independent world. It questions the view of knowledge as something “build up” within the mind through dispassionate observation. (Gergen 1995, 27.)

In practice, it is very crucial that the learning process has a purpose and the learner feels connected to the task given. (Hein 1991; Driver 1995, 399.) The goals of the learner should be consistent with the instructional goals. In the end, this will determine what is really learned. The learner should be placed in a learning environment in which the learner faces the same kind of cognitive demands, such as thinking, as he would face in the environment he is prepared for, but the learner should also be supported to work in a complex environment instead of simplifying the task and the environment. (Hein 1991.) It is also important that the learner feels that he has an ownership of the learning process as well as with the problem itself. Most of the time the instructors tell the learners what they should study and learn in order to solve certain problems. The problems should be more like examples which are used to challenge the learner’s thinking without trying to dictate his thinking. (Driver 1995, 393.) The goal is to encourage the learner to become an effective worker and thinker by challenging his thinking while the teacher acts as coach and consultant. This learning theory fits well to corporate training purposes, as the participants can be challenged to solve their work-related problems or case studies during the training.

Human beings find it easy to use case studies in handling uncertain situations in a complex and dynamic environment. In the case of organizations, managers are often interested to learn how other companies approach certain problems (Baets 1998, 180). There is danger of case studies or other exercises being used simply to occupy class

time. However, just as for any other learning activity, cases should only be used to secure valid and explicit learning outcomes. Also they need to be the most time effective way of achieving such outcomes. Sometimes when the case method would be appropriate a suitable case may simply not be available (Rees & Porter 2002, 5).

The quality of one's learning results can be tested best in an environment where the learner is encouraged to compare his views and opinions with someone who has an alternative view, such as a participant from some other company or someone from a different unit of the company. The formation of collaborative learning groups is a very good strategy to test this. The teachers should model reflective thinking throughout the learning process and support the learners in reflecting on the strategies for learning as well as what was learned. (Abdullah 1998.)

3.5 The role of experience in learning

According to David Kolb (1984, 38) learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from combination of grasping and transforming experience (Kolb 1984, 41). This definition emphasizes the process of adaptation and learning as opposed to content or outcomes. It also emphasizes the fact that knowledge is a transformation process, which is continuously created and recreated, and not an independent entity to be acquired or transmitted. (Kolb 1984, 38.) According to this definition, individual learning takes place in a cycle of four steps: first an experience is made; secondly observations and reflections on that experience are created; thirdly, abstract concepts and generalizations are formed based on these reflections; and finally these ideas on the new situation are tested which in turn gives new experiences. (Baets 1998, 57.)

Kolb's experiential learning theory offers a method by which an individual's skills and his job requirements can be assessed in the same language. In other words, commensurability can be measured (Sims 1983, 501). Going beyond the cognitive style, the experiential learning theory provided a more differentiated framework with which one can view person and environment (i.e. job) in commensurate terms (Sims 1983, 502). According to Sims (1983, 502) the basis for this view is that learning, adaptation, and problem solving processes are similar and that all jobs involve each of these processes. Kolb's experiential learning theory offers the foundation for an approach to education and learning as a lifelong process that is soundly based in intellectual traditions of social psychology, philosophy, and cognitive psychology. This learning theory pursues a framework for examining and strengthening the critical linkages among education, work and personal development. It offers a system of competencies for describing job demands and corresponding educational objectives and emphasizes

the critical linkages that can be developed between the class room and the “real world” with experiential learning methods (Kolb 1984, 4). This is illustrated in figure 4.

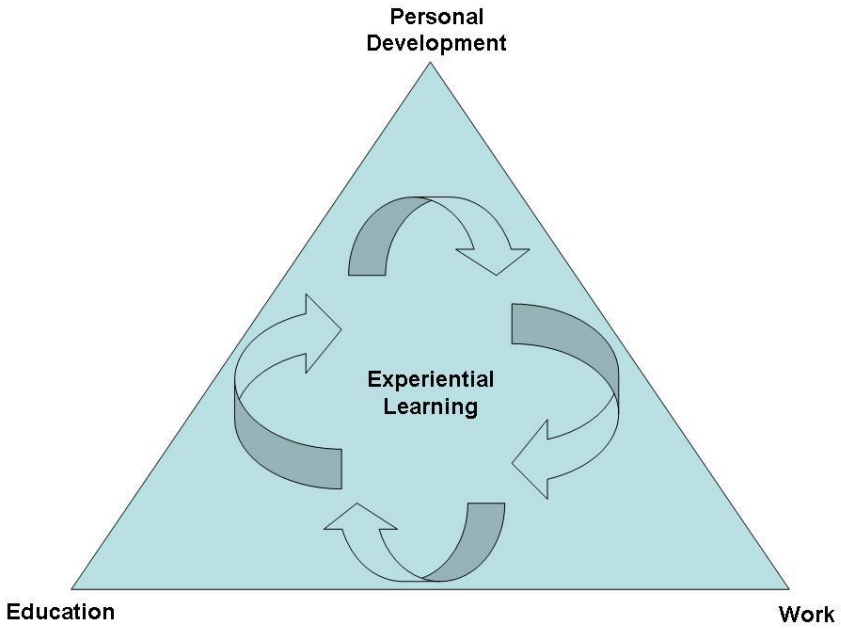

Figure 4 - Experiential learning as a process linking education, work and personal development (Kolb 1984, 4)

The experiential learning theory conceptualizes the learning process in such a way that differences in learner styles and corresponding learning environments can be identified (Sims 1983, 502). The theory by Kolb presents two models of transforming experience; reflective observation (sample word, *watching*) and active experimentation (*doing*) and two related models of grasping experience; concrete experience (*feeling*) and abstract conceptualization (*thinking*). (Sims 1983, 503; Kolb 1984, 68.) That is, learners must be able to involve themselves fully, openly and without bias in new experiences (Concrete Experience). They must be able to reflect on and observe their experiences from many perspectives (Reflective Observation). The learners must be able to create concepts that integrate their observations into logically sound theories (Abstract Conceptualization), and they must be able to use these theories to make decisions and solve problems (Active Experimentation). (Sims 1983, 503; Kolb 1984, 30.) Table 4 summarizes the key features of the four learning modes introduced in the previous paragraphs.

According to Kolb (1984, 30), learners, if they are to be effective, need all these four different kind of modes. These four learning modes together form a four-stage learning cycle which is the basis for most experiential learning theories. (Kolb, Boyatzis & Mainemelis 1999.) The four-stage learning cycle offers a way to understand individual

people's different learning styles and an explanation of a cycle of experiential learning that applies to us all. (Kolb et al. 1999.)

Table 4 - Key features of the learning modes (Kolb 1984, 68-69)

Learning mode	Key features	Example
Concrete Experience (CE)	Emphasizes feeling as opposed to thinking: a concern with the uniqueness and complexity of present reality as opposed to theories and generalizations.	People with this orientation enjoy and are good at relating to others. They are often good intuitive decision makers and function well in unstructured situations.
Reflective Observation (RO)	Focus on understanding the meaning of ideas and situations by carefully observing and impartially describing them	People with this orientation enjoy intuiting the meaning of situations and ideas and are good at seeing their implications and appreciate different points of view.
Abstract Conceptualization (AC)	Focuses on using logic, ideas and concepts. Emphasizes thinking as opposed to feeling.	A person with this orientation enjoys and is good at systematic planning, manipulation of abstract symbols and quantitative analysis.
Active Experimentation (AE)	Focuses on actively influencing people and changing situations. Emphasizes practical applications as opposed to reflective understanding.	People with this orientation enjoy and are good at getting things accomplished They are willing to take some risk in order to achieve their objectives.

In 1971 Kolb developed Learning Style Inventory to assess individual orientations toward learning and differentiate four basic learning styles: accommodating, assimilating, converging and diverging. (Kolb 1984, 67; Kolb et al. 1999.) According to Kolb (1984, 67-68), learning styles are categories developed by educational researchers to classify learners based on their customary approach to perceiving and processing information. Each of the below mentioned learning styles is a combination of two different learning modes mentioned; concrete experience, active experimentation, abstract conceptualization and reflective observation. The four basic learning styles have the following features: (Kolb 1984, 77; Kolb et al. 1999.)

- Accommodating (i.e. doing and feeling): Persons with accommodating learning style like new challenges and experience and like working in teams. The greatest strength of this orientation lies in doing things, in carrying out plans and tasks and getting involved in new experiences.
- Assimilating (i.e. watching and thinking): People having assimilating learning style like exploring analytical models, reading and attending lectures. For these people ideas and concepts are more important than people. The greatest strength of this orientation lies in inductive reasoning and the ability to create theoretical models.
- Converging (i.e. doing and thinking): Persons with converging learning style are best at finding practical use for different kind of ideas and theories. The greatest strength of this approach lies in problem solving, decision making, and the practical application of ideas.
- Diverging (i.e. feeling and watching): People with this learning style prefer to watch rather than do and have a tendency to gather information and use their imagination to solve problems. The greatest strength of this orientation lies in imaginative ability and awareness of meaning and values.

Table 5 provides a summary of the learning styles and related learning modes, and descriptions of these.

Table 5 - Description of learning styles and related learning modes

Learning style	Dominant/Preferred learning modes	Description
Accommodating	Concrete Experience (CE) and Active Experimentation (AE)	People with this learning style have the ability to learn from primarily "hand-on" experience.
Assimilating	Abstract Conceptualization (AC) and Reflective observation (RO)	People with this learning style are best at understanding a wide range of information and putting into concise, logical form.
Converging	Abstract Conceptualization (AC) and Active Experimentation (AE)	People with this learning style learn best at finding practical uses for ideas and theories.
Diverging	Concrete Experience (CE) and Reflective Observation (RO)	People with this learning style are best at viewing concrete situations from many points of view.

Understanding one's preferred learning abilities has two benefits. It helps to understand the areas of weakness, giving the opportunity to work on becoming more proficient in the other modes or it helps to realize the strengths, which might be useful in certain social situations, such as deciding on a career. The use of the Learning Style Inventory as well has two benefits; it helps to understand the learners' learning styles and allows the teachers to cover materials in a way that fits best to the diversity of the classroom.

3.6 Synthesis of the learning theories

The theoretical framework of this thesis is based on business competencies, the concept of organizational learning and three different learning theories, i.e. behavioral,

constructivist and experiential theory of learning. These theories were chosen as they bring up the importance of learning at organizational level and reflect the fact that individuals learn in different ways. The three learning theories reviewed in chapters 3.3, 3.4 and 3.5., are assumed to directly affect the structure, content and implementation of training.

From the behaviorist approach, one can see the importance of a lecturer-focused component of learning. This is necessary to give learners relevant conceptual knowledge which could be achieved through lectures and/or seminars. The important aspect of behavioral learning theory is that the individual learner is viewed as adapting to the environment and learning is seen largely as a passive process in where there is no explicit treatment of interest in mental process. The learner merely responds to the "demands" of the environment and knowledge is viewed as given and absolute. (CSCL 2007.) In a behaviourist paradigm, the student is engaged in the educational process only in that she displays the appropriate verbal behavior (e.g. checking the correct box on a multiple choice test). There is subjective element to learning—neither in determining what to study nor in how information is interpreted, used, or understood (Boghossian 2006, 722).

The behaviorist school supports strongly the view of giving the information through lectures. In corporate training, the emphasis is placed on the teacher-centered approach and the role of the trainers and lecturers is the central one. In the implementation of the training models, the most emphasis is on the contact lectures and written exams, instead of encouraging the participants to study independently outside the lecture rooms or participate in the practical projects. Systematic training design, training objectives, programmed learning, computer-based training and competencies are all grounded in behaviorist learning theory (Iacovou 2006, 37).

From a constructivist view, on the other hand, learning is the process of constructing knowledge - not merely obtaining it - in social environments. The theory of situated learning consistent with this view asserts that what persons come to know and understand are fundamentally a product of the learning situation and the nature of the learning activity. Learning tasks should thus, as far as possible, be embedded in the target context and require the kind of thinking that would be done in real life. (Abdullah 1998.) In a corporate training the constructivist approach means an emphasis on independent studies and problem-solving.

Where behaviorism views learning as an active process of acquiring knowledge, constructivism views learning as an active process of constructing knowledge. Experiential learning theory emphasizes the practical component of learning. Praxis means that theories are not studied in some kind of artificial isolation, but that ideas, skills, and insights learned in a classroom are tested and experienced in real life. Essential to praxis is the opportunity to reflect on experience, so that formal study is in

formed by some appreciation of reality. (Kelly 1997.) One of the problems with experiential learning is that experiences by their nature are limited. Most bioentrepreneurs commence this stage of their career late, having been successful in their scientific field first and after having completed their initial PhD. Their range of business expertise is often limited to one or two companies. This limited access to distributive knowledge can be problematic to building an entrepreneurial knowledge base not only in individual biotechnology companies, but for the industry as a whole. (Hine & Kapeleris 2006, 32.) In a corporate training this means a possibility to learn by doing, e.g. through projects and internships and to be able to establish the connection between theory and practice.

According to Saru (2007, 48) learning should be seen as a future-oriented, ongoing development process with different options for different economic situations. However, it is important to notice that, learning is something each person does, not something that is done to them and if a good learning or training programme is in place it can help the individual to realize their potential and benefit both the individual and the organization (Sloman 2005, 348). Thus, also organizational learning is at the focus of this research. According to Lopez, Péon and Ordás (2005, 228) organizational learning can be defined as a dynamic process of creation, acquisition and integration of knowledge aimed at the development of resources and capabilities that contribute to better organizational performance. From the corporate training point of view, this means analyzing the organizational needs and implementing a training which enables organizations to acquire knowledge from external sources, i.e. outside the company.

4 LITERATURE-BASED MODEL FOR BUSINESS TRAINING IN FINNISH BIOTECHNOLOGY COMPANIES

In the past no special emphasis has been placed on corporate training in the Finnish biotechnology companies. Now, when Finnish biotechnology companies are facing difficulties when trying to commercialize their inventions, the importance of business competencies together with technical skills has been understood. As the industry structure is more technology-focused than business-oriented, the help for the problems in the industry could be provided in the form of corporate training. According to Valle, Martin, Romero and Dolan (2000, 283) training is nowadays understood to be one of the most significant processes in the human resource management function in the organization. It plays a critical role in maintaining and developing the capabilities of both individual employees and the organization as a whole; and in contributing to the vital process of organizational change as well (Valle et al. 2000, 283).

Based on the already existing training models, training program measurement model of Tennant, Boonkrong and Roberts (2002)[8], the Finnish biotechnology industry's training needs survey, organizational learning concept and three different learning theories, a 4-step training model is introduced. This 4-step training model is created based on the needs of Finnish biotechnology industry and it is especially designed to be used in business training. The focus is in the bio-business training, as business skills are seen inadequate in the Finnish companies in their commercialization and internationalization process, and their aims to attract financiers and venture capitalist (cf. Brännback et al. 2005; SLP Innovations 2006). Business skills are also skills which can be taught to some extent in a short-time period, and are also applicable the everyday work of the participants of the trainings. This new model aims at bringing together the best features of the existing models and the industry training needs. The 4-step training model for business training in the Finnish biotechnology companies is presented in figure 5.

[8] Tennant et. al (2002) have developed a training programme measurement model, which can be used as a framework to enable organizations to measure the effectiveness of their training programme for production operators.

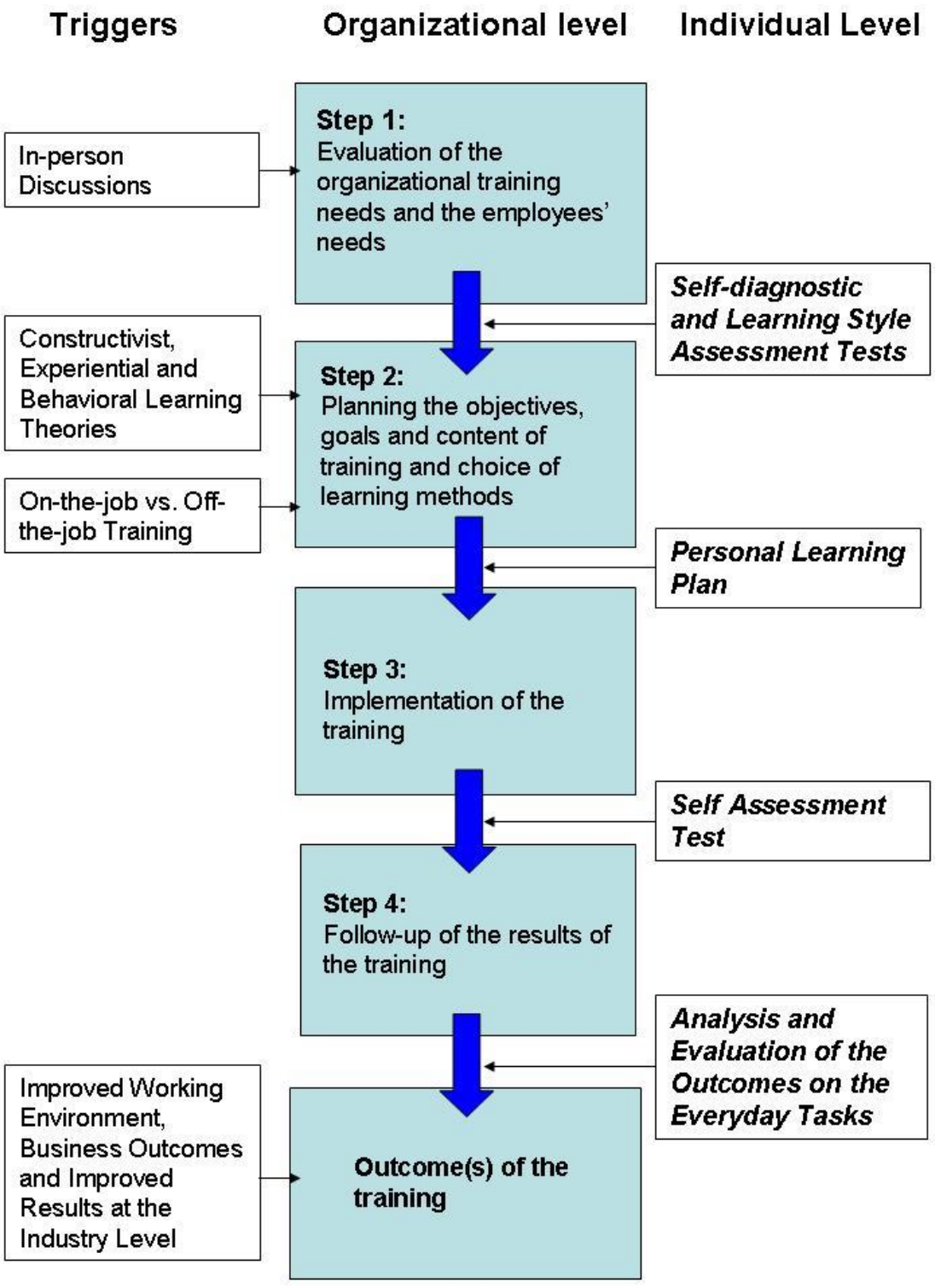

Figure 5 - Preliminary training model for business training in the Finnish biotechnology companies

The diversity of employees' training needs means that an organization has to carefully plan its training structure to train employees at the appropriate level according to both individual and programmatic needs, which require a more holistic understanding of how employees fit into the larger organizational structure and how an employee contributes to the accomplishment of the organization's mission. (Jacobson et al. 2002, 494.) The extent to which organizations react to change is also a critical element in the learning process for individuals and for organizations (Penn et al. 1998, 129). Matching employees to training levels actually results in the separation of the organizational training structure into two training sub-structures: one that focuses on the training of managers and the other one that focuses on the more general training.

Majority of organizational training which is carried out today is based on a traditional, mechanistic approach to adult learning (Anderson 1994, 23) and thus fails to meet the needs of the participants. In the traditional training model, the locus of control of the training programs rests with the organization (Allen 1994, 17). The model introduced in more details in the following paragraphs emphasizes also the role of individuals in the training process; not just as learners but also individuals who have the possibility to affect to the planning of the training. However, it is important to notice that all training and development activities are a means for achieving improved organizational performance and thus driving up shareholder value. They should not be pursued merely for their own sakes. (Terry 1999, 26.)

The first step of the model is the *evaluation of the organizational training needs and the employees' needs*. This training needs analysis means the process of gathering, assessing and analyzing data to determine that training needs. (Reed & Vakola 2006, 393-394.) This step involves determination of current knowledge, competencies and skills of the workforce as well as the exact training needs. The formed profile will describe such individual characteristics as the skills, abilities, knowledge and personality traits necessary for individuals to personally get ahead in, and make a contribution to the organization (Allen 1994, 16). A useful tool for this purpose are personal, task and organizational level analysis, which can e.g. take the form of in-person discussions with the company management. (Edralin 2004.)

Before proceeding to step two, the learners are asked to complete *a learning style assessment and self-diagnostics tests*. In this research, learning style is defined as the way each learner begins to concentrate on, process and retain new and difficult information (Boström & Lassen 2006, 181)[9]. It is claimed, that the learning style can be affected by for example perceived capabilities and preferences and it closely relates to learning activity and learning strategy (cf. Berings & Poell & Simons 2005). However,

[9] Original Source: Dunn, R. – Dunn, K. – Perrin, J. (1994) *Teaching Young Children through Their Individual Learning Style.* Allyn & Bacon: United States of America.

these concepts are not in the focus of this research and thus are not dealt with in this research.

An evaluation of these tests will provide *an individual needs profile* (Allen 1994, 16). In general terms, ability of self assessment involves a high level of self-awareness and the ability to monitor one's own learning and performance. (Cassidy 2006, 170.) The corporate needs profile and individual needs profile together will provide the planner of the training an overall picture of the types of training modules needed. The outcome of the whole process is an individually designed training plan for each employee, but each of these individual plans will be pointed towards the goal closely resembling the original mission-oriented corporate profile (Allen 1994, 16).

The second step of the training model is *planning the objectives and content of training and finding the most suitable training methods*. This step involves planning of the entire training program. It starts with the identification of goals and objectives that should be achieved. The topics and contents to be covered and the appropriate training methods for training are determined (Edralin 2004). Also this step could involve some contributions from the company's management, in the form of content planning. Based on the literature review, it could be said that the training method chosen should mostly rely on the constructivist learning theory and experiential learning theory. These two theories emphasis the link between theory and real-life, and recognize the importance of learning by doing.

Training methods, where the choice is made from, can be categorized as on-the-job or off-the-job. On-the-job training method is mostly adopted when the learner is developing his skills in the work-related environment. For this training method it is crucial that the learner really uses the same machinery and materials during the training, than he uses at his work. (Tennant et al. 2002, 232.) On-the-job training is an effective method, as the learners have the opportunity to apply what they learn to their everyday work throughout the training, instead of sitting in the classroom and forgetting what they have learned when returning to work. (Tennant et al. 2002, 232.[10]) However, previous research has indicated that there are real problems of transfer of theory and skills learned in the class workshop to equipment in the workplace which often differs significantly from that in service in the class setting (Cornford & Athanasou 1995, 14.)

Off-the-job training provides opportunities to widen the boundaries of teaching and it can be used as an initial step on the way to on-the-job training. (Tennant et al. 2002, 232.) Off-the-job training methods can include seminars, workshops, tutorials, computer-assisted training, coaching and mentoring sessions and self-study methods. (Longenecker 2007, 364.) In the current learning environment this instructor-led training in a classroom is still the way that most employees are likely to do their

[10] Original source: Coles, M. (2000) Virtual universities are just the job. *The Sunday Times*, 21 May.

learning. (Baldwin-Evans 2007, 302.) From the industry point of view, the most suitable training method for the bio-business training is a combination of on-the-job and off-the-job methods, such as a combination of lectures, practical projects and online learning. Though, it is important to bear in mind, that the success of online learning depends on a three-way partnership between the company, the learner and the supplier, and no party alone can control it. Online learning has the potential to promote the shift from teaching to learning, but its adoption is a change process and to be successful it needs to be built on a learning culture on all players. (Mitchell & Honore 2007, 148.)

After all, most effective learning is that which is not context free but occurs within a specific, natural workplace where there are clearly visible models of application involving theory, skills and attitudes. (Conford & Athanasou 1995, 14.) As time is a scarce resource, it is crucial to find methods that are time-efficient, but provide a proper contact between the participant and the trainer, as well as between the participants. Good methods to overcome this problem are e.g. online learning communities, video conferences and intensive seminars. In these communities or through them, the participants can follow video-lectures, chat online with the trainer and other participants, return their assignments and look for additional material on the topic.

Before moving to the actual implementation of the training, the participants are asked to do *a personal learning plan*. The aim of this learning plan is to make the participants to think about the outcomes they expect from the training and get them committed to the training process. This plan also helps the participants to identify the skills and competencies they could develop during the training process.

The step three in the training model is *the implementation of the training*. This step involves the actual training implemented through a chosen method or methods. In the implementation phase several practicalities such as venue, equipment and budget needs to be consider as well. (Edralin 2004.) The exact duration of training will depend on the training needs and the level of prior knowledge of each participant. Training can take from few hours to a few days, or even few months to complete depending on the participant's familiarity with the subject and how much he or she uses the case exercises and reference materials. After the training has taken place the learning outcomes of the participants are evaluated. This evaluation can take the form of self-assessment test, which enables the participants to evaluate what they have learned during the training and how their behavior could change after this training.

The fourth step of the training model is *the follow-up of the results of the training*, and this step can take several months, as the long-term implications of the training cannot be seen right away. As Murray and Efendioglu (2007, 373) have stated it, in spite of the best efforts of organizations and the professional trainers associations, it is very difficult to evaluate the true impact of the training. Due to these difficulties, it is crucial to do some follow-up at the organizational level after the training. This follow-

up can take the form of in-person discussions as well as evaluation of the business performance of the company in a longer time period. Evaluation can be performed over a period of time at four levels:

- the quality of the execution of the training,
- the quantity and quality of learning,
- the level of transfer of the training to the work place and
- the effect of the training on the business or specific areas of the business (Terry 1999, 25).

Usually, the outcomes and impact of the training is measured in the development of job related knowledge. Personal benefits, such as an increase in confidence, are either overlooked or forgotten. (Baldwin-Evans 2007, 303.) Brinkerhoff (2006, 302) defines the impact of training as *employees using new skills learned in training in on-the-job behaviors' that lead to worthwhile business results such as increased sales, reduced costs, or increased retention of key staff.*

According to Tennant et al. (2002, 234), in order to be effective, training must have specific objectives and outcomes, which directly lead to business benefits and produce hidden assets. From the learner's point of view, the key issue which inhibits the effectiveness of training is that people often return the same inadequate workplace environment. This leads to trainers feeling frustrated that they have not been able to apply their learning, and the company believing that the training program was not effective. (Tennant et al. 2002, 324.) The follow-up also helps the company to map their future training needs, as the training process should be an ongoing process.

As stated in the previous paragraphs, this model is purely based on literature and the previous research carried out. In order to find out if the model really is suitable for short-term business training in the Finnish biotechnology industry, it needs to be tested or commented by industry experts. This "testing" is carried out by industry experts' interviews, and this data collection process described in more detail in chapter 5. The comments of the industry experts and further improvements in the model are provided in chapters 6 and 7.

5 METHODOLOGY

5.1 Research Approach

The research approach chosen for the purposes of this research was constructive research approach. The constructive research approach is a research procedure for producing constructions, intended to solve problems faced in the real world and, by that means, to make a contribution to the theory of the discipline in which it is applied (Kasanen, Lukka & Siitonen 1993, 244; Lukka 2003, 83; Lukka 2006, 112). The constructions which are in the core of the constructive approach can be almost whatever type, ranging from simple models in merely technical terms to complex management systems designs covering both technical and socio-technical elements to manifestations of new ways of approaching and doing things in an organization (Lukka 2000, 115). All human artefacts – such as models, diagrams, plans, organization structures, commercial products, and information system designs – are constructions. By developing a construction, something that differs profoundly from anything, which existed before, is created: novel constructions bring forth, by definition, new reality. (Kasanen et al. 1993, 243-244, 245; Lukka 2003, 84.) In this research, the purpose was to develop a model for business training of Finnish biotechnology companies, i.e. construct something that has not existed before.

The characteristic features of the constructive method introduced by Kasanen et al. (1993, 258) are following:

- It is a step by step procedure, so that the nature of the steps is specified in the framework system, within which the method is applied.
- The possibility exists to check every step, or every phase in the construction.
- The procedure as a whole serves some definite purposes. Thus building constructions is a goal-directed activity.

According to Lukka (2000, 114), the core features of the constructive research approach require that it focuses on the real-world problems which are felt relevant to be solved in practice. The research produces an innovative construction meant to solve the initial real-world problem, and includes an attempt for implementing the developed construction. This should be done to test the practical applicability of the construct. The constructive research approach implies a very close involvement and co-operation between researcher and practitioners in a team-like manner, in which experiential learning is expected to take place. (Lukka 2000, 114.) Experiential learning is in the center of this research as well, and thus, the constructive research approach suit extremely well for the purposes of this research. It is important to remember, that

constructive research approach is explicitly linked to prior theoretical knowledge and pays particular attention to reflecting the empirical findings back to theory. (Lukka 2000, 114.) The core features of the constructive research approach are illustrated in figure 6.

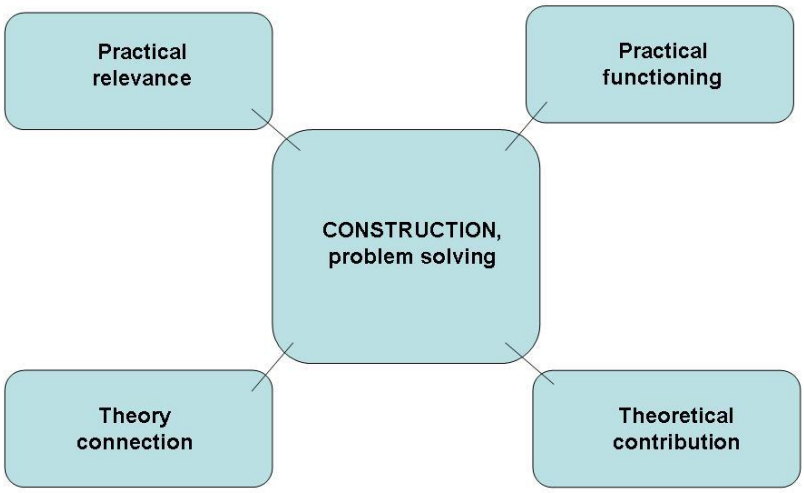

Figure 6 - Elements of constructive research (Kasanen et al. 1993, 246)

Constructive research process can be characterized by dividing the research process into steps. The order of the steps may vary from case to case. The steps are (Kasanen et al. 1993, 246; Lukka 2000, 116-120):

1. To find a practically relevant problem which also has research potential.
2. To examine the potential for long-term research cooperation with the target organization(s).
3. To obtain comprehensive understanding of the topic area both practically and theoretically.
4. To innovate a solution idea and develop a problem solving construction, which also has potential for theoretical contribution.
5. To demonstrate that the solution works.
6. To examine the scope of applicability of the solution.
7. To reflect the findings to prior literature.

As explained in the chapter 1, the nature of this research is very practical-oriented. The aim is to create a training model, which could be used to develop and improve the business competencies of the Finnish biotechnology companies. This area has not been researched thoroughly yet, and due to this, this research can be claimed to have a practically relevant problem, which also has research potential. According to Lukka (2000, 116), the step two is the key step towards close cooperation between the

researcher and the key members of the target organization. It ensures that the research carried out is in the best interest of both parties. However, in this research no particular organization was involved and due to this, the researcher could not get the chance for long-term cooperation with them.

Steps 3, 4 and 5 are related most of all to ensure internal validity, while the sixth step brings forward the need for deal with external validity (Labro & Tuomela 2003, 415). Step three involves obtaining through understanding of the topic. In this particular research, this was done by reviewing literature and previous researches related to biotechnology, business training, business competencies, learning theories and organizational training. After third step, a problem solving construction should be developed. In this research, this meant creating the kind of training model which has not existed before. Step five is the implementation and testing of the created construction. However, due to the limited resources the construction in question, i.e. the training model was not implemented and tested in practice, but its applicability was "verified" through industry expert interviews. In this research, the steps five and six overlapped strongly, as the examination of the applicability took place in the course of the interviews. It was examined if the model in question could be used in other industries than biotechnology industry or if it could be used for some other kind of training. The final step of the constructive research process involves establishing the links between the construction created and prior literature. That training model created was reflected in prior literature and this process is discussed more in details in chapters 4 and 6. The strongest links were established between the model and theory in organizational learning and constructive, behaviorist and experiential learning theories.

These seven steps are also part of three aggregate phases; the preparatory phase, the fieldwork phase and the theorizing phase. (Labro & Tuomela 2003, 416.) Figure 7 illustrates the three phases and seven steps of constructive research process.

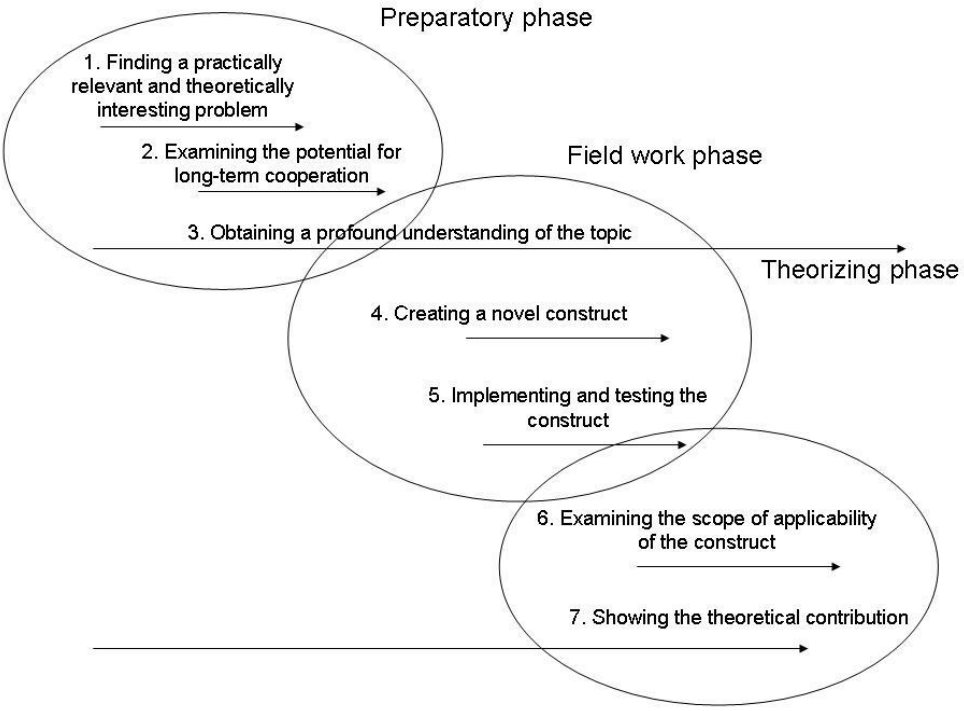

Figure 7 - The phases and steps of constructive research process (Labro & Tuomela 2003, 416)

In the figure 7, most steps overlap partly with each other. For example, the third step "obtaining a profound understanding of the topic", continues throughout the research process. (Labro & Tuomela 2003, 415.) Similarly, the seventh step has been extended to cover the entire research process. This is to say that the theoretical linkages should be considered throughout the research process in order to make the project meaningful to the research community, even though the exact theoretical contribution can be elaborated only in the final part of the research process (Labro & Tuomela 2003, 416).
According to Kasanen et al. (1993, 255) constructive research may be either qualitative or quantitative or both by its nature. For the purposes of this research qualitative research method was chosen, and the data was collected through interviews. Research methods refer to the systematic, focused and orderly collection of data for the purpose of obtaining information from it, to answer the research problems or questions. These methods are different from the techniques of data collection. (Ghauri, Grønhaug & Kristianslund 1995, 83.) Quantitative research methods were also considered, but they were declined because they focus more on providing "an outsider view" than qualitative research methods do. However, qualitative and quantitative methods can be combined and used in the same study. (Ghauri et al. 1995, 84.)

According to Malhotra and Birks (2007, 152) qualitative research can be defined as an unstructured, primarily exploratory design based on small samples, intended to

provide insight and understanding. Qualitative research is a mixture of the rational, explorative and intuitive, where the skills and experiences of the researcher play an important role in the analysis of data. Qualitative research is often focused on social process and not on social structures, which is often the case in quantitative research (Ghauri et al. 1995, 84). Typical examples requiring qualitative research are research problems focusing on uncovering a person's experience or behavior, or trying to uncover and understand a phenomenon about which very little is known (Ghauri et al. 1995, 85), like is the case in this research. Qualitative methodology and case studies provide powerful tools for research in management and business subjects. However, qualitative methods can be used only to a limited degree. (Gummesson 2000, 1.)

5.2 Interviewing as a data collection method

The data collection technique used in this research was interviews. According to Frey and Oishi (1995, 2) interviewing is a key data-collection tool for conducting surveys. A data-collection tool is a structured method of obtaining information about selected characteristics, or variables, in a target population. Depending on the topic of the survey, the variables may include specific knowledge, attitudes and behaviors prevalent among the members of population. (Frey & Oishi 1995, 2.) Interviews can be used at any stage of the research process and due to this, interviewing is a very flexible research tool. (Brewerton & Millward 2001, 69.) In this particular research, the semi-structured interviews were carried out during spring 2008, after the first draft of the training model had been developed. Questionnaires were also considered as an alternative data collection tool, but they were declined as they would not necessarily provide same kind of in-depth knowledge of the topic as interviews do. According to Stone (1978, 67) the major difference between data collection via the questionnaire and the interview is that in the case of the former technique the respondent reads the questions and records his responses to the questions, while in the case of the latter method the interviewer both presents the questions to the subject and records the elicited responses and thus they can be considered as alternative data collection tools. Table 6 summarizes the advantages and disadvantages of personal interview.

Table 6 - Summary of the advantages and disadvantages of a personal interview (Modified from Zigmund 1994, 215; Brewerton & Millward 2001, 73; Webb 2002, 72-73)

Personal interview	
Advantages	**Disadvantages**
Allows open-ended questions	Requires a skilled and cautious interviewer
The face-to-face situation between the two parties allows the interviewer to do much to reduce respondent anxiety and allay potential embarrassment	Time-consuming
Interviewers can ask, within narrow limits, for a respondent's answer to be made more clear in the case of ambiguous answers	Costly
Speed of data collection is moderate to fast	Anonymity of the respondents cannot be obtained
As the interview will be in a face-to-face situation, pictures, signs or objects may be used to refresh a respondent's memory or demonstrate some action and thus greater effectiveness can be obtained	Some samples, especially those which are geographically disparate or isolated, may be more accessible via other methods

Due to the availability of the interviewer, interviewing allows open-ended questions and the interviewer can ensure that the complex instructions or sequences can be adhered to (Brewerton & Millward 2001, 74.) unlike when colleting data via questionnaires. This was the case in the course of this research as well. Some of the industry experts interviewed were provided some additional information and instructions, in order to ensure that they understood the questions as the interviewer meant them. The advantage of interviews as a data collection method is that it is possible to obtain a more accurate and clear picture of a respondent's position and behaviour. This is because respondents are free to answer according to their own thinking, as they are not constrained with few answer alternatives. This is also true in the case of complicated and sensitive issues, where the interviewer can ask for further elaboration of answers and attitudes (Zigmund 1994, 196; Ghauri et al. 1995, 65) and reduce the anxiety and allay potential embarrassment of the respondent (Webb 2002, 72). If a respondent's answer is brief or unclear, the interviewer may probe for a clearer or more comprehensive explanation (Zigmund 1994, 196). However, this can only take

place within narrow limits. Some of the answers received during the industry experts' interviews were a bit difficult to understand, and thus, the respondents were asked to clarify their answers. If the questionnaire would have been chosen as the data collection method, this would not been possible to do. As the interviewees will be in face-to-face situation, they can be shown pictures, signs and objects to either refresh the interviewees' memory or in order to demonstrate some action (Webb 2002, 72) and thus greater effectiveness can be obtained.

One disadvantage related to the interview method is that a skilled and cautious interviewer is demanded. The interviewer should have a complete understanding of the research problem, research purpose and what information is looked for. (Ghauri et al. 1995, 65.) The know-how and skills of the interviewer are thus the utmost importance (Ghauri et al. 1995, 65-66). Due to volume of data analysis, and to length of time needed to introduce, establish rapport, probe, debrief on completion, this method is very time consuming. (Brewerton & Millward 2001, 74.) The cost per completed interview is high, especially compared with mail or e-questionnaire survey methods. (Brewerton & Millward 2001, 74.) When conducting personal interviews, the respondents are not anonymous and they may be reluctant to provide confidential information to another person. (Zigmund 1994, 199.) Some samples, especially those which are geographically disparate or isolated, may be more accessible via other methods, and the costs of the research can be diminished. (Zigmund 1994, 215; Brewerton & Millward 2001, 73; Webb 2002, 72-73.)

In simple terms, interviewing provides a way of generating empirical data about the social world by asking people to talk about their lives. In this respect, interviews can be considered as a special form of conversation. (Holstein & Gubrium 2004, 140-141.) However, in the process of conducting qualitative interviews, the interviewer may encounter the "on and off the record" situation, meaning that the interviewees continue to speak after the recorded has been turned off. (Warren 2002, 92.) If this is the case, it might affect to the reliability and validity of the research. "Off the record" –situation seems to occur for two reasons, a) the interviewee wants to talk about his own concerns; and b) the interviewee does not want to talk "on the record" about issues that might be dangerous or personally damaging. (Warren 2002, 92.) However, in the course of the industry experts' interview carried out, no "off the record" -situation occurred. According to Brewerton and Millward (2001, 69) interviews could also be combined with other approaches in a multi-method design which may incorporate, for example, questionnaire measures or observation. However, the in this research no need for the use of several methods occurred and the use of other methods than personal interviews was declined.

5.2.1 Semi-structured interviews

No consideration of interviewing would be complete without some acknowledgement of the major interview structures (Berg 2004, 78). These structures are sometimes referred to as "the family of qualitative interviews". (Rubin & Rubin 1995, 5.) Some sources mention only two interview structures – namely, formal and informal (cf. Hirsjärvi & Hurme 1995) or structured and unstructured, and some other refer to three different structures (cf. Saunders et al. 2000; Hesse-Biber & Leavy 2006, Silverman 2006). However, at least three major categories can be identified: the standardized (formal or structured) interview, the unstandardized (informal, nondirective or unstructured) interview and the semistandardized (guided-semistructured, semi-structured or focused) interview. The major difference between these different interview structures is their degree of rigidity with regard to presentational structure (Berg 2004, 78). For the purposes of this research, semi-structured interviews were used because they give certain flexibility to the interviewer, but the pre-prepared questions also ensure that the interviewees are asked the same "basic" questions. However, the actual interview process of this research is described more in detail in subchapter 5.2.2., where the industry expert interviews are discussed.

Structured interviews use questionnaires based on a predetermined and standardized or identical set of questions. By comparison, semi-structured and unstructured interviews are non-standardized (Saunders et al. 2000, 243). Semi-structured interviews involve the implementation of a number of predetermined questions and special topics. These questions are typically asked of each interviewee in a systematic and consistent order, but the interviewers are allowed freedom to digress; that is, the interviewers are permitted to probe far beyond the answers to their prepared standardized questions (Berg 2004, 81). Unstructured interviews are informal. There is no predetermined list of questions to work through the situation, although the researcher should have a clear idea about the aspects to be researched. (Saunders et al. 2000, 244.) Unstructured and open-ended questions allow the interviewee to elaborate upon responses. (Salkind 2006, 187.) Semi-structured interviews are used in qualitative research in order to conduct exploratory discussions not only to reveal and understand the "what" and the " how" but also to place more emphasis on exploring the "why" (Saunders et al. 2000, 244). The interviews conducted for this research were very informal and semi-structured in order to give the interviewees a chance to express their opinions freely and allow the free flow of conversation. Though, set of the questions was prepared in advance and this ensured that the interviewees were asked the same "basic" questions. The interview questions were prepared by the researcher and they were commented by the supervisors of this research work. The questions prepared involved questions related to the background of the interviewee, questions about their experiences of training and questions derived

from the literature and the model constructed. For the list of interview questions, see Appendix 1. The questions listed in Appendix 1 are in English; however, all four interviews were conducted in Finnish.

Semi-structured interview carries with it the advantage of both approaches as well as disadvantages. (Brewerton & Millward 2001, 70.) These advantages are such as easiness to analyze, quantify and compare, thus allowing interviewees, to explain their responses and to provide more in-depth information when necessary. Semi-structured interviews incorporate also some disadvantages, such as the temptation to spend too long on peripheral subjects, the danger of losing control to the interviewee, and the reduction in reliability when using non-standardized approaches to interview each respondent. (Brewerton & Millward 2001, 70.)

5.2.2 Selection of interviews

Qualitative interviews with industry experts, i.e. individuals knowledgeable about the firm and the industry, can help in diagnosing the nature of the market and research problem (Malhotra & Birks 2007, 44.). In qualitative interview studies, respondents may be chosen based on a priori research design, theoretical sampling, or "snowball" or convenience design or particular respondents may be sought out to act as key informants (Warren 2002, 87).[11] These experts may be found both inside and outside the firm. Typically, like in this research as well, expert information is obtained by semi-structured or unstructured personal interviews, without any formal question setting. (Malhotra & Birks 2007, 44.) As Patton (1990, 278) has stated, qualitative interviewing begins with the assumption that the perspective of others is meaningful, knowable, and able to be made explicit.

The number of interviews needed to explore a given research question depends on the nature of that question and the kind or type of the knowledge interviewer seeks (Johnson 2002, 113). For the purposes this research, four industry expert interviews were carried out. The experts were chosen because of their background and experience in the Finnish biotechnology industry. The first person interviewed was a former CEO and owner of a Finnish biotechnology company. He had given training and lectures for biotechnology companies e.g. in marketing research and commercialization for several years. Altogether, the interviewee has 10 years experience in the industry, and he is currently working in a global pharmaceutical company. Interviewee's background as a

[11] Original source: Holstein, J.A. – Gubrium, J.F. (1995) *The Active Interview.* Sage Publications: United States of America and Spradley, J.P. (1979) *The Ethnographic Interview.* Holt, Rinehart & Winston: United States of America.

lecturer and trainer made him valuable from the research point of view. The second person interviewed was a former CEO of a Finnish biotechnology company, and a current owner of this SME. He is currently in a position of improving cooperation between Finnish (biotechnology) companies and the educational sector. He was chosen to be interviewed because of his long experience in the industry and in various companies. He has also participated in several different kinds of trainings related to both, business competencies and technical skills. The third person interviewed was a consultant, who has worked also in the educational sector. For last 5 years she has worked in a company which provides language and business competence related trainings for companies and organizations. However, their focus group is all SMEs, not only biotechnology companies. Thus, her experience as a trainer and consultant made her interesting from the research point of view. The fourth person chosen to be interviewed was a researcher, who has done biotechnology industry related research and given lectures to and about Finnish biotechnology companies. For the purposes of this research, he was able to contribute some current knowledge and analysis of the current stake of the industry.

In the beginning of the interview process it was not clear how many interviews should be conducted in order to reach saturation. According to Hirsjärvi, Remes and Sajavaara (2004, 171) saturation has been reached, when same things keep repeating in the interviews. In this research, same things started to repeat after two interviews, but the third and fourth interview was conducted in order to reach the "full" saturation. The interviews were conducted during spring 2008, more precisely on 8th of February, 21st of February, 11th of March and 4th of April and the duration of the interviews varied between 43 and 52 minutes. In the beginning of the interview process, the interviewees were explained the purpose of the research. They were also told that the interviews will be recorded and notes will be taken. However, the issue of confidentiality was emphasized. The interviewees were also explained some key concepts related to the interview questions in order to make sure that they understood these concepts same way than the interviewer did. The actual interview questions asked related to the background of the interviewee and their experience in the industry. The interviewees were also asked to evaluate the current state of the Finnish biotechnology industry and the major advantages and drawbacks of the industry. The training needs of the biotechnology companies were discussed during the interviews and the companies' eagerness to participate training was evaluated. After all these introductory questions, the actual focus of this research, the business training model was discussed. The interviewees were not provided a picture of the model, but they were asked to construct a model which would be suitable for the business training of Finnish biotechnology companies. The interviewees were also provided a chance add their own opinions and comments

after the questions prepared in advance were dealt with. Table 7 summarizes the information of the industry experts' interviews carried out.

Table 7 - Summary of the industry expert interviews

	Interviewee A	**Interviewee B**	**Interviewee C**	**Interviewee D**
Sex	Male	Male	Female	Male
Occupation /Position	PhD, consultant	PhD, director	Master of Science, consultant, trainer	PhD, researcher, lecturer
Industry experience	Interviewee is a former CEO and owner of Finnish biotechnology company (consultancy service provider) and given training and lectures in e.g. marketing research and commercialization. Experience in the industry 10 years. Currently he is working in a global pharmaceutical company.	Interviewee is a former CEO of a Finnish biotechnology company and is currently in a position of improving cooperation between Finnish (biotechnology) companies and the educational sector.	Interviewee has worked several years as a business consultant and organized trainings for biotechnology companies. These trainings have focused on both, technical and business skills.	Interviewee has done research about the biotechnology industry and both given lectures to and about biotechnology companies for a decade.
Date of the interview	February 2008	February 2008	March 2008	April 2008
Duration of the interview	45 min	48 min	52 min	43 min

Due to the delicate nature of the industry, and in order to maintain the anonymity of the interviewees, the industry experts interviewed are referred as Interviewee A, B, C and D in the following paragraphs and chapters. All the interviews were recorded with

an electronic recorder in order to avoid a lost of important information. According to Seidman (2006, 114) tape-recording offers several benefits. By preserving the words of the participants, researchers have their original data. If something is not clear in a transcript, the researcher can return to the source and check for accuracy. (Seidman 2006, 114.) Interviewers can also use tapes to study their interviewing techniques and improve upon them (Seidman 2006, 114). In addition to recording, notes were taken in the course of every interview. Taking notes about what is said facilitates later analysis, including locating important quotations from the tape itself (Patton 1990, 349).

5.3 Data Analysis

According to Ghauri et al. (1995, 95) data which cannot be statistically analyzed and are difficult to measure in numbers are often called qualitative; such as strong, weak, difficult and easy. One main problem of analyzing qualitative data is that, on one hand the number of observations is so low and, on the other hand, the information on the case(s) is so in-depth that it is very easy for the researcher to be drawn into the sheer volume of cases. With qualitative methods the analysis is also difficult because data collection and analysis are often done simultaneously, and sometimes the research problem is even formulated or reformulated at the same time. (Ghauri et al. 1995, 95-96.) The problem in qualitative data analysis is that there are no formulas for determining significance, and no straightforward tests for reliability and validity. (Patton 1990, 372.)

When analyzing interview data, there are two means to choose from; interview analysis and cross-interview analysis. For this research, interview analysis was chosen. It means writing a separate transcript of each of the interviews and analyzing them. (Patton 1990, 376.) After the interviews, the recorded tapes were transcript. The transcription of recorded interviews as a method for making data available in textual form for subsequent coding and analysis is widespread in qualitative research (Poland 2002, 629). Although inevitably the researcher's consciousness will play a major role in the interpretation of interview data, that consciousness must interact with the words of the participant recorded as fully and accurately as possible (Seidman 2006, 114).

According to Miles and Huberman (1984, 21) interview data analysis consists of three different flows of activity: data reduction, data display and conclusion drawing/verification. Data collection, the process of data analysis and the links between these processes are illustrated in figure 8.

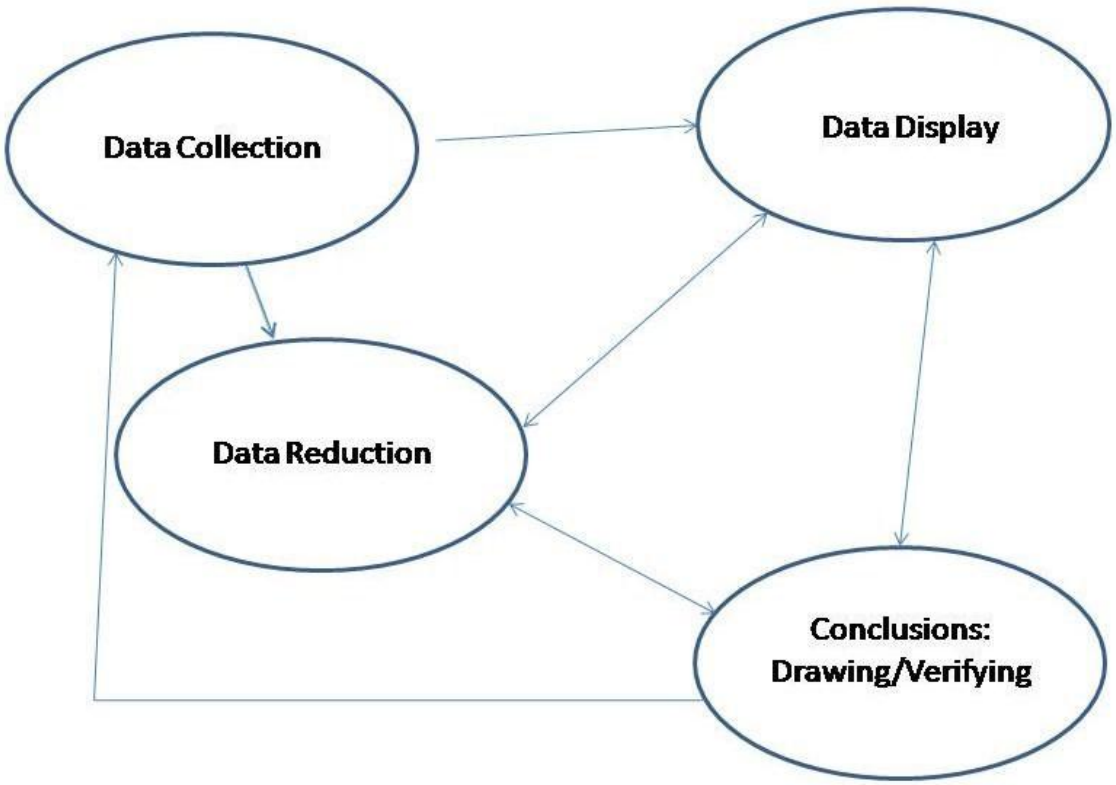

Figure 8 – Components of data analysis: Interactive model (Miles & Huberman 1984, 23)

Data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the "raw" data that appear in transcripts (Miles & Huberman 1984, 21). Reducing the data involves a process of coding data, which means breaking down the data into discrete pieces and attaching a reference to those pieces of data (Miles & Huberman 1984, 21; Malhotra & Birks 2007, 240). Coding is the process of bringing together participant's responses into categories that brings together similar ideas, concepts, themes or steps and stages in process (Malhotra & Birks 2007, 240). In practice, coding can be thought as a range of approaches that aid the organization, retrieval, and interpretation of data (Coffey & Atkinson 1996, 27). Miles and Huberman (1994, 56, 57) consider coding as a process that enables the researcher to identify meaningful data and prepare for interpreting and drawing conclusions. To some extent, coding can be even thought as data simplification or reduction. (Coffey & Atkinson 1996, 28.) In the course of this research, the coding was done with the help of "Find" – function of Word processing –computer program. The transcripts were analyzed and the common "key words" were located in the transcripts with the help of "Find"- function. The list of these key words is provided in the Appendix 2.

Data reduction is a form of analysis that sharpens, sorts, focuses, discards, and organizes data in such a way that "final" conclusions can be drawn and verified (Miles

& Huberman 1984, 21). The process of working with excerpts from participants' interviews, seeking connections among them, explaining those connections, and building interpretative categories is demanding and involves risks (Seidman 2006, 127). The danger is that the researcher will try to force the excerpts into categories, and the categories into themes that he has in mind rather than let them develop from the experience of the participants as represented in the interviews (Seidman 2006, 127-128). In this research process, data reduction took place at the same time with coding. The data collected was divided into pieces so that connections and contradictions among the interviews were found.

Data display, the second subprocess, describes the ways in which reduced data are displayed in diagrammatic, pictorial or visual forms in order to show what those data imply (Coffey & Atkinson 1996, 7). Miles and Huberman (1984, 21) define data display as an organized assembly of information that permits conclusion drawing and action taking. Data display can take various forms, such as matrices, graphs, networks, charts or narrative text. All these are designed to assemble organized information in an immediately accessible, compact form, so that justified conclusions can be drawn (Miles & Huberman 1984, 21-22). Data display also allows a "public" view of how the researcher has made connections between the different data "chunks" (Malhotra & Birks 2007, 244). For the various forms of data display a table was chosen. The data collected was organized in a table, which helped the research to go through the final step of the data analysis process.

The final step of the data analysis process is the conclusion drawing and verification. In short, the meanings emerging from the data have to be tested for their plausibility, their sturdiness, their "confirmability" – that is, their validity (Miles & Huberman 1984, 22). The data collected through industry expert interviews was compared to the model and data collected from literature and previous research. Both, similarities and differences were found, and due to these model constructed was developed even further. The evaluation of the research and the results of this research are discussed in subchapter 5.4 and in chapter 6.

5.4 Evaluation of the research

Interviewing, as with all research methods, is also open to a number of biases and shortcomings, the most critical of which is the difficulty of achieving reliable and valid results (Brewerton & Millward 2001, 69). There is an asymmetrical relationship between reliability and validity; a valid measurement is always reliable, but a reliable measurement may not be valid. A research design should always aim for both validity and reliability, but, in absolute terms, this is not always possible. (Webb 2002, 148.)

In the following subchapters the concepts of reliability and validity of the research are discussed more in details and the reliability and validity of this research are evaluated. In semi-structured interviews, bias are handled by careful design of the technique itself: bias arising form the sequence in which the subject matter is addressed, from any inadvertent omission of questions, from unrepresentative sampling and from an uncontrolled over- or under-representation of subgroups among the respondents. (Ghauri et al. 1995, 65.) As Miles and Huberman (1984, 46) and Patton (1990, 279) have stated, in qualitative research the quality of the information obtained during an interview is largely dependent on the interviewer.

5.4.1 Reliability

According to Webb (2002, 148) reliability is the extent to which a scale or measurement delivers consistent results. Reliability is the extent to which a measurement procedure yields the same answer however and whenever it is carried out. (Kirk & Miller 1985, 19; Silverman 2006, 282.) Reliable measurement instruments are free of random (non-systematic) errors (Webb 2002, 150). Reliability occurs when a test measures the same thing more than once and results in the same outcomes (Salkind 2006, 106). Reliable instruments are robust; they work well at different times under different conditions (Emory 1985, 98). Any method that involves a lone researcher in a situation that cannot be repeated, such as participation observation, is always in danger of being thought unreliable (McNeill and Chapman 2005, 9).

The reliability of the interview schedules is a central question in research methods textbooks. According to these books, it is very important that each respondent understands the questions in the same way and that answers can be coded without the possibility of uncertainty (Silverman 2006, 286). This is achieved through a number of means, including (Silverman 2006, 286):

- Thorough pre-testing of interview schedules
- Thorough training of interviewers
- As much use as possible of fixed-choice answers
- Inter-rater reliability checks on the coding of answers to open-ended questions.

The reliability of this research was increased mainly via the reliability of interview schedules. Before the interviews, the respondents were explained the purpose of this research as well as the interview procedure. They were notified about the recorders and about the notes taken. The respondents were also asked whether their names can be revealed when the final report is published. Like stated in the subchapter 5.2, few of the interviewees preferred to stay anonymous, and due to this, the interviewees are called as A, B, C and D. However, this should not affect to the reliability of this research,

because it is most likely that the same or similar kind of answers could be collected from any Finnish biotechnology experts who have similar kind of background as the interviewees A, B, C and D does. This anonymity to some extent even increases the reliability, as the interviewees felt more confident commenting things anonymously. From the interviewees point of view anonymity is a positive issue, but it is not always from the research point of view, as the interviewees cannot be traced. As described in the previous subchapters, the interviews conducted were semi-structured interviews. The questions were prepared in advance, and the order, wording and the necessity of the questions were evaluated by the supervisors of this research work. All the respondents were asked the same standardized questions in order to increase reliability and in addition, some other questions which arose during the discussion. However, the order how the questions were asked varied a bit when interviewing interviewees C and D.

At the basic level, when people's activities are tape-recorded and transcribed, the reliability of the interpretation of transcripts may be gravely weakened by a failure to transcribe apparently trivial, but often critical, pauses and overlaps (Silverman 2006, 287). According to Silverman (2006, 288-289) reliability can be addressed by using standardized methods to write fieldnotes and prepare transcripts. In the case of interview and textual studies, reliability can be improved by comparing the analysis of the same data by several researchers. The credibility of qualitative research studies resets not just on the reliability of their data and methods, but also on the validity of their findings (Silverman 2006, 289). The data collected was transcribed and analyzed only by the researcher. However, all the data was transcribed with the same method and all the notes were taken on a same way, as there was only one person doing this. This increases the reliability of the research, even though the data was not analyzed by several researchers.

5.4.2 Validity

Webb (2002, 148) defines validity as the extent to which a scale of measurement is capable of measuring what it is supposed to be measuring. According to Kirk and Miller (1985, 19) validity is the extent to which it gives the correct answer. Validity refers to the results of the test, not to the test itself (Salkind 2006, 113). However, most of the indicators of validity do not fit qualitative research. Instead, researchers judge the creditability of qualitative work by its transparency, consistency-coherence and communicability (Rubin & Rubin 1995, 85). According to Rubin and Rubin (1995, 92) in order to gain creditability the interviewees should be chosen carefully and it should be ensured that they are knowledgeable, will speak openly and have firsthand experience. For the purposes of this research, four interviewees were chosen. They all

had a several years of experience in the biotechnology industry and different kind of experiences on the training sector (for more detailed description of the interviewees, see chapter 5.2). Thus, it can be claimed that in the choice of interviewees the credibility was obtained.

Kirk and Miller (1985, 22) refer to transparency as “apparent validity” and it implies, that the reader of a qualitative research report is able to see the basic processes of data collection (Rubin & Rubin 1995, 85). A transparent report allows the reader to assess the intellectual strengths and weaknesses, the biases, and the conscientiousness of the interviewer (Rubin & Rubin 1995, 85). In the course of this research, the transparency has been tried to achieve through thorough reporting of the data collection process (see chapter 5.2) and maintaining the recordings of what was said during the industry experts’ interviews. In order to able easy access to the data collected, it has been saved in the form of transcripts. The transcripts include also comments of the researcher, in order to make a distinction between concepts and phrases which were introduced by the researcher and the concepts and phrases which were introduced by the interviewee.

Consistency means that the researcher presents a credible final report, which should show that he has checked out all the ideas and responses that appeared to be inconsistent. In qualitative research the goal is not to eliminate inconsistencies, but to make sure that it is understood why they occur (Rubin & Rubin 1995, 87). Inconsistency may occur in themes, individuals and across cases. (Rubin & Rubin 1995, 87, 88, 90.) In this research, the inconsistency occurred in themes. When interviewing the industry experts, some of them saw different issues as the key issues in training. For example, Interviewees A and C saw the use of learning style assessment and self-diagnostic tests necessary part of the training process, but Interviewee D disagreed with this statement. This disagreement is stated in the research report, even though it did not have effect on the final result, i.e. the training model. The justifications for the Interviewee D’s opinion were also carefully considered, as they were based on his experiences.

Communicability means that the researcher should portrait the research arena so that it feels real to the participants and to readers of research report (Rubin & Rubin 1995, 91). When conducting the industry experts’ interviews, a short introductory speech was given to all interviewees. They were explained the purpose of the research, as well as their role in the research. The interviewees were encouraged to talk about their firsthand experiences instead of experiences of others in order to increase validity of the results. According to McNeill and Chapman (2005, 62) where the interview is held may also affect the validity of the replies. All the interviews for this research were conducted in the locations chosen by the respondents. All of them wanted to meet at their work place, and thus, the interviews were conducted in an environment well-known by the interviewees.

According to Kirk and Miller (1985, 21) no experiment can be perfectly controlled, and no measuring instrument can be perfectly calibrated. All measurement, therefore, is open to some degree of suspects. Kirk and Miller (1985, 21,42) have pointed out, that in conducting and assessing qualitative research, the primary emphasis should usually be laid on validity rather than reliability. In simple terms, this implies that qualitative research is well developed in terms of validity, but underdeveloped in terms of reliability (Peräkylä 2004, 299). This research approach chosen for this research was the constructive research approach, because the purpose was to develop a model, i.e. construct something new. According to Kasanen et al. (1993, 258) the main condition for validity for constructions is clearly that they work (i.e. solve the problems in question). In the case of this research, it can be claimed that the model constructed works and solves the problem it should solve. This claim is based on the literature review, and industry experts' interviews. However, the model should be tested for several times in practice, before it could be claimed to work watertight.

6 BUSINESS TRAINING IN FINNISH BIOTECHNOLOGY COMPANIES

6.1 Determinants of training needed in Finnish biotechnology companies

After the industry experts interviews were carried out, it become evident that the importance of business training has been recognized in the Finnish biotechnology industry. As such, the training needs of the Finnish biotechnology companies can be defined through three determinants; duration, content and finance. Finance is a different type of determinant than duration and content, but is an important factor to consider, as the lack of finance seems to overcome the two other determinants and their benefits. It is known, that companies are not yet willing to invest financial and human resources to the training sessions, as the benefits of them are not evitable and well-known. (Interviewee A 2008.)

> *"It is seen as a lost in terms of business, if staff members are committed to a training for a long time and due to this, they are unable to perform all their daily duties."* (Interviewee A 2008.)

Thus, it is evident, that the training offered to biotechnology companies should not last more than couple of days at the time. (Interviewee A 2008.) A longer period of time would require too many commitments. However, *"Currently there is a limited amount of short-term training available"* (Interviewee C 2008). As training which requires long-term commitment is not an attractive option for Finnish biotechnology companies, they should be offered more short-term training. However, it is important to remember, that even though many business competencies can be learned through short-term training, the full exploitation of them requires a longer period of time and lot of practice.

The second determinant to consider is the content of the training. The industry experts interviewed specified some skills and competencies, which in their opinion need development in Finnish biotechnology companies. According to interviewee D (2008) the marketing competencies, financial competencies, internationalization competencies and networking skills of Finnish biotechnology companies should be improved. Interviewee A (2008) supported this view, however he also pointed out the importance of the knowledge about international markets and communication and presentation skills. Besides marketing competencies and networking skills, Interviewee B (2008)

emphasized also the importance of problem solving and communication and presentation skills.

> *"The representatives of Finnish biotechnology companies do not always know how to communicate effectively, and more importantly, how to make a good first impression. Among thousands of international biotechnology companies, the first impression is crucial" (Interviewee B 2008).*

Interviewee C did not bring up marketing and networking skills like all the other interviewees did. Instead, she listed management and leadership competencies, entrepreneurship competencies, internationalization competencies and knowledge related to intellectual property rights as areas to be developed. (Interviewee C 2008.) The skills and competences listed by the interviewed industry experts very similar to those brought up by the survey "Training needs of Finnish biotechnology companies", which was carried out in 2006. However, this survey also showed that there are development needs in innovation management and project management competencies, but the industry experts interviewed did not mentioned these issues. Table 8 summarizes the skills and competencies which the industry experts felt that need development. This summary is very similar to tables 2 and 3, which introduced the results of the "Training needs of Finnish biotechnology industry" –survey.

Table 8 – Industry experts' evaluation of the competencies needing development in Finnish biotechnology companies

Interviewee A	**Interviewee B**	**Interviewee C**	**Interviewee D**
-Marketing competencies -Financial competencies -Internationalization competencies and knowledge about foreign markets -Networking skills -Communication and presentation skills	- Marketing competencies - Networking skills - Problem solving skills -Communication and presentation skills	-Management and leadership competencies -Entrepreneurship competencies -Internationalization competencies - Knowledge related to intellectual property rights	-Marketing competencies -Financial competencies -Internationalization competencies - Networking skills

Training in an industry is the formal procedure which a company uses to facilitate employees' learning so that their resultant behavior contributes to the attainment of the company's goals and objectives (McGhee & Thayer 1961, 3). Thus, the Finnish biotechnology companies should be offered more business training, which helps the companies to move towards their goals and objectives. In some companies the key personnel do not even possess adequate skills to run the company's daily operations, and for them, the first step would be participating in training which offers them basic business competencies. According to interviewee D (2008) majority of the Finnish biotechnology companies are small and they possess limited resources.

> *"When a company [SME] like this hires a person or two, they are more likely to bring in scientific and technical know-how than business know-how. This is understandable, as no business man can participate in the product development. However, persons hired for their scientific experience and background are usually not experienced in marketing and selling a product and they need training for activities like these"* (Interviewee A 2008).

When talking about the training targeted to biotechnology companies, it is not enough just to think about the content and the duration of training, but it is also important to consider the issue of funding. (Interviewee B 2008). According to Williams (2005, 240), most biotechnology companies are short of money, chronically, and this limits their enthusiasm to participate in a corporate training. Investment in training and development is only truly effective if it realizes benefits to the business in terms of skills and service improvements, staff retention and motivation, business improvements, increased turnover and cost reductions (Morley 2002, 9). Thus, Finnish biotechnology companies should be encouraged to do this investment. According to Interviewee A (2008)

> *"Private companies are not that much appreciated as the suppliers of the training as they charge for their services. The financial support from the state/state led organizations has some how ruined the markets, as the customers are not willing to pay for the training"*.

As pointed out by Interviewee A, the problem is just not the issue that the companies would not have the money to invest. Currently the state and state-led organizations are offering training for free, and, due to this companies expect to get training for free.

6.2 Individuals' and organizational training needs and their effect on business training process

When designing business training for biotechnology companies, more particularly for the Finnish biotechnology companies, it is important to consider both, individuals' as well as organizational training needs. This view was also supported by Interviewees B and C.

> *"Individuals are the key persons in the company. If their needs are ignored, it is likely that the whole training process fails. There is no point training individuals performing different duties on a same way"* (Interviewee B 2008).

> *"There should be found a way to train individuals to meet the organizational needs. After all, no organization can learn if the persons in the organizations do not learn"* (Interviewee C 2008).

However, no learning can take place unless the needs and objectives of individuals and organizations are carefully evaluated. For the purposes of this evaluation process, several tests and assessment tools can be used. These tools include such as self-diagnostic and learning style assessment tests, personal learning plan, self-assessment test and evaluation of the outcomes of training. Self-diagnostic and learning style assessment tests and personal learning plan are completed before the training starts. The latter one is mostly for the use of the person himself, but the two first ones affect the content and the mode of the training. Most of tests listed concentrate on the individual point of view, but to some extent the organizational needs are always based on the individual needs. As Interviewee B (2008) stated:

> *"When you evaluate the individual needs, you can see quite well what is going on in the company. If an individual is having troubles to perform her daily duties, does not it mean that the company is also missing these skills?"*

Interviewee C instead disagreed with this view. According to her, more emphasis should be placed on the organizational needs and after they have been evaluated, the individual needs can be, if necessary, taken into account. (Interviewee C 2008.)

> *"Most often the management of the company knows what the company needs. The key for a successful performance is the whole organization, not just one person in it"* (Interviewee C 2008).

When a trainer is taking look at the self-diagnostics tests and learning style assessment, he will base his evaluation on different learning theories, and theory about learning styles. These different theories help the trainer to design the most suitable training modes for the participants, and thus, to ensure the best possible learning results. The most suitable theories to be used for the evaluation are theory of organizational learning, behaviorist learning theory, constructivist learning theory and experiential learning theory.

Behaviorist learning theory sees learning as a passive process, where the knowledge given by the lecturers or teachers is viewed as absolute. This view supports giving the information through lectures, and the role of lecturers and trainers is central one. When implementing business training, behaviorists prefer having plenty of lectures and exams rather than independent studies or project works. *In the training model formed, this theory is most strongly present in the form of introductory lecture, which aims at ensuring that all the participants understand the key concepts in a similar way.* Even though the actual learning theories were not discussed during the industry experts' interviews, the use of lectures, such as an introductory lecture, was supported by the interviewees. Interviewee A (2008) pointed out that

> *"Participants feel more connected to the task given if they meet the instructor face-to-face and are able to ask questions related to their own case [work]."*

This view is also supported by Interviewee A (2008), as he stated that an introductory lecture also ensures that all the participants are having similar kind of basic knowledge about the key concepts used in the course of the training.

Constructivist learning theory views learning as a process of constructing knowledge in social environments. This theory supports the use of independent studies and emphasizes problem-solving skills. According to Interviewee C (2008)

> *"The biotechnology company representatives appreciate if they can solve problems related to their own cases and the problems they face in their everyday activities."*

Constructive learning theory views learners actively engaged in the learning process, instead of passive absorbers of information. This view sees learners in the center of learning process instead of trainers. However, it is also important to notice the central role of goals and objectives in this learning theory. The objectives are not only stimulus for learning, but they also determine what learners attend do, what kind of experiences learners bring in when constructing an understanding and what understanding is

constructed. *When considering corporate training, constructive learning theory is most strongly present in the form of case studies and according to this theory; learners should feel strongly connected to the tasks given in order to ensure learning.*

Experiential learning theory, instead, emphasizes the practicality of learning. It means that theories studied and the ideas brought up by them are tested in real life. In the corporate training this means providing introductory lectures where key concepts and theories are introduced and then providing the chance to test these in practice. Establishing a link between the own experiences and theory can be done e.g. through project works. Interviewee A (2008) emphasized the importance of experience in the training process:

> *"Companies appreciate if they can share and compare experiences, as most of them [Finnish biotechnology companies] are facing similar kind of problems."*

However, the problem with experiential learning is that experiences are limited by their nature. This means that majority of persons working in Finnish biotechnology companies, have little or no experience on the industry. Thus reflecting the theory in personal experience or cases is very demanding. These problems were also recognized by Interviewee D (2008):

> *"Finnish biotechnology companies could benefit from sharing experiences, both at individual and organizational level. However, there are usually just one or two individuals in an area, who have some experience, especially about international markets. And, often they do not want to share their experiences as they do not get anything in return."*

Organizational learning as such is a process of acquiring information, which can and does affect the performance of the company. An organization learns when the individuals in the organization learn. However, organizational learning cannot be counted as the sum of the individuals' learning. The role of organizational learning is most visible in the beginning when planning the training process, and in the end, when the results of the training are evaluated. As the organization itself cannot make any self evaluation, the input from management is crucial when evaluating the organizational needs.

> *"A good way to evaluate how the organization members could be trained, is to discuss with the management. They should know the*

> *problem areas of the company and can see the big picture"* (Interviewee C 2008).

This type of discussions would not necessarily work in the big pharma companies as the distance between company's management and every day operations is huge, but it is suitable for majority of Finnish biotechnology companies. Like stated in the chapter 2, many of the Finnish biotechnology companies are owned and managed by the same person and thus, they have an extensive knowledge of the problem areas of the company. However, it is not enough just to take individuals' and organizational needs and learning preferences into account before, during and after the training. What has been learned should be transferred from one level to another and become as a part of the daily routines. As Interviewee A (2008) stated

> *"When a training is created, it should aim at development of the organization through individuals. However, in most cases the organization does not develop as much as it could because the things individuals have learned are not transferred to the use of the organizations."*

After all, the aim of the training is to improve both, the individual and organizational performance, and this does not happen, if the new knowledge is embedded in the heads of few individuals.

6.3 Business training model for Finnish biotechnology companies

In order to help Finnish biotechnology companies to develop their business competencies, a four-step training model for business training was constructed. The model, as a figure, is divided into three columns; organizational level, individual level and the factors affecting these two levels, i.e. triggers. This model has four main steps; namely diagnosis of the organizational training needs and the employees' needs, planning the objectives and content of training and finding the most suitable training methods, implementation of the training and the follow-up of the results of the training. In the figure, these steps are illustrated in the column "organizational level". The model also includes so called "mid-steps" which are the steps affecting the individuals the most. These mid-steps include learning style assessment and self-diagnostics tests, personal learning plan, self assessment test, analysis and evaluation of the training outcomes on everyday tasks and long-term follow-up of the outcomes of the training. The training model for business training in Finnish biotechnology companies is

illustrated in figure 9 and described more in detail in the following paragraphs. This model is very similar to the model introduced in chapter 4; however, some modifications based on the industry experts' interviews have been made.

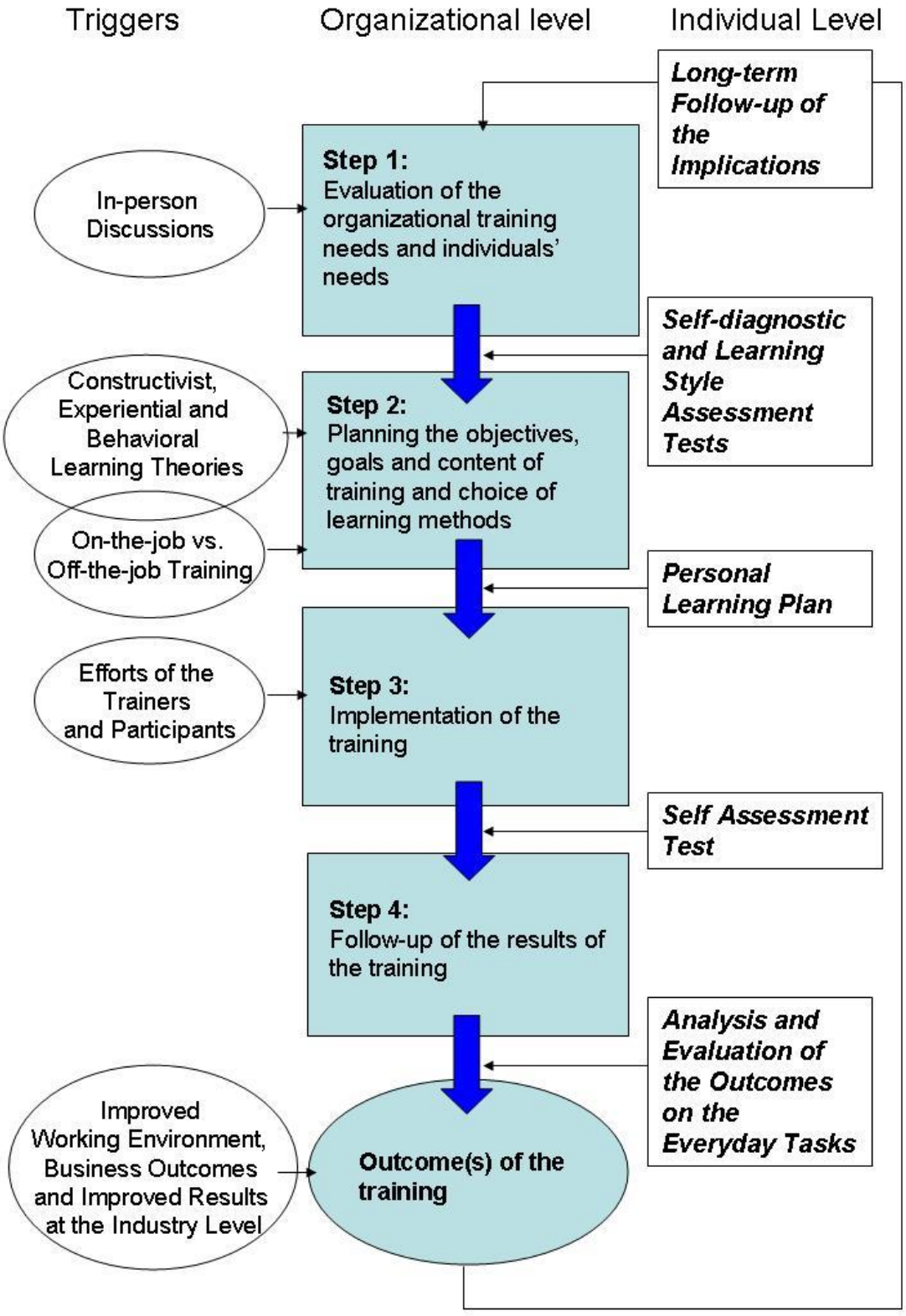

Figure 9 – A business training model for Finnish biotechnology companies

The first step of the model is *the diagnosis of the organizational training needs and the individuals' needs.* According to Leat and Lovell (1997, 143), the diagnosis of training needs is a process of information gathering and analysis, that is, diagnosing. This step involves *evaluation* of current knowledge, competencies and skills of the workforce as well as the exact training needs. All the interviewees agreed that it is extremely important to evaluate the needs of the participants in advance. According to Interviewee C (2008):

> *"Finnish biotechnology companies do not always know which competencies they are missing. Sometimes they need a little push to a right direction. When considering training, this push can take e.g. the form of interviews."*

Interviewee C's opinion was supported by Interviewee D (2008):

> *"Individuals in biotech companies need versatile skills in their everyday tasks. However, often employees assume that they have all the needed skills and competencies. Very few of them actually recognize the fact, that also a scientist should have some business competencies."*

Also interviewees A and B found the evaluation of individual's and organizational needs as an important step. According to Interviewee B (2008)

> *"No tailor-made training can be conducted without a thorough analysis of the company's needs. If this is not done, the training will be too general and does not really benefit the participants."*

As presented in chapter four, the analysis of the organizational training need can be evaluated e.g. through discussions with the company management and the individual needs can be evaluated through in-person discussions. However, it is important to note, that this first step is a very time-consuming, but still very important. According to Swezey and Salas (1994, 316) designing a competence-based training offers the advantage of presenting and providing opportunities to practice the actual competence involved in performing tasks and activities required for successful performance.

Before proceeding to step 2, the learners are asked to do *learning style assessment and self-diagnostics tests.* Learning style can be considered as the tendency to learn in a particular way stemming from a mixture of preferences and perceived capabilities (Berings et al. 2005, 379). After the test have been completed, an individual needs profile is formed. (Individual needs profile is discussed more in details in chapter 4.)

Interviewees A (2008) and C (2008) supported the use of learning style assessment and self-diagnostic tests. According to Interviewee C (2008)

> *"Testing the participants in advance gives a good idea of their current level of competencies, and helps the trainer to choose the most suitable training methods."*

However, interviewee D saw this stage a bit too heavy for small biotechnology companies, as according to him (2008),

> *"These companies do not have the time to complete plenty of tests before, after and during the training. They just want to get to the point."*

The learning style assessment tests and self-diagnostics tests can be done e.g. online, and as they offer such a great advantages, this "mid-step" was preserved in the model. According to Buch and Bartley (2002, 5) the need for both, teachers and trainers, to take learning styles into account is greater today than ever before, due to the increasing use of technology-aided instructions. Training must be also contextualized to be firm's specific needs and be applied to the firm's existing projects within the training programme itself, not afterwards. The contextualization can also enhance internal diffusion as it is applied to the firm's tasks directly and does not require conversion from generic to specific skills (Hine & Kapeleris 2006, 99). According to Morley (2002, 12) effective training frameworks have to be driven primarily by business needs and support an organization in adapting to the future needs of its market place, by ensuring that its people undergo essential skills development designed to impact upon performance.

The second step of the training model involves *planning the objectives and content of training and finding the most suitable training methods* to achieve the set objectives. The actual content of the training is usually planned by the training provider and it is not dealt in this research, but it has been researched previously for example by Meyers and Hurley (2008). According to interviewee A (2008), the contribution of the company's management is crucial at this stage:

> *"Company's management need to be closely involved in the planning process, as they are the ones knowing the current status of the company. It is not enough to just evaluate the employees' current level of knowledge, but it is also important to consider the state of the company."*

However, the importance of managerial contribution to this step has not been emphasized in the literature as it was emphasized in the interviews of industry experts. This is likely because usually the content is planned by the trainer or the supplier of the training. In this model the planning of the content is closely linked to the defining the objectives of the training, and thus, some company representatives need to be involved.

Like discussed in chapter four, the training method chosen should based on the behaviorist, constructivist and experiential learning theory. In practice this means implementing a training which consists of lectures, case studies and possibilities to link the theory to their own experiences and problem areas. Some of the material, and to some extent some lectures even, could be offered online. According to Buch and Bartley (2002, 9) corporate training is following the trend toward non-traditional formats of education, such as online courses, and the use of classroom-based instruction is expected to decline. Online teaching replicates and enhances established face-to-face teaching and training practice, by getting beyond traditional geographical, cultural and technological barriers (Noonan 2007, 10). Thus, participants in different locations can be trained at the same time. The use of new technologies in the corporate training was emphasized by Interviewee D.

> *"It is always problematic to get all the participants under the same roof. If you can arrange virtual courses, I'm sure that companies are more interested. However, this decreases the amount of face-to-face contacts, and limits the possibilities to get immediate feedback"* (Interviewee D 2008).

It is important to notice, that the process of learning and developing can take many forms- attending a training course is only one of these, and there is a wide range of other options to choose from, such as learning by doing and learning from past experiences. When selecting an appropriate method, a number of factors must be considered, the most important of which is the desired outcome, linked closely with the budget available, time considerations and learning styles. (Clifford & Thorpe 2007, 271.)

When designing a training based on the training model introduced in figure 9, the choice of training method is made between on-the-job and off-the-job training methods. On-the-job learning styles can be defined as the tendency to use a particular combination of implicit and explicit learning activities that a person can and likes to perform on the job. (Berings et al. 2005, 377.) When training the staff of Finnish biotechnology companies, on-the-job methods could be recommended as they enable the participants to apply the learning outcomes directly to their work. However, it is important to notice learning at the work place usually takes place during work process rather than during processes intended for learning. People rarely, however, perceive or

conceive these processes as learning opportunities (Berings et al. 2008, 420). Interviewee A (2008) pointed out that

> *"The training methods chosen needs to be connected closely to the everyday work, as these people [scientists] rarely are able to focus all their efforts of studying business theories in a lecture room."*

Before the third step of the model, the participants of the training are asked to do *a personal learning plan*. According to interviewee B (2008) this plan helps to the participants see the connection between the objectives of the training, personal objectives and their everyday work. "*This plan also makes the participants more connected to the training process"* (Interviewee D 2008).

The third step of the training model is the actual *implementation of the training.* The implementation of the training requires a lot of planning, not just related to content, but also concerning the practical arrangements. However, they are not in the focus of this research. When implementing the training, an introductory lecture for all the participants would be necessary.

> *"During the introductory lecture, it could be checked that all the participants understand the key concepts similarly and are equally committed to the training process"* (Interviewee A 2008).

> *"Some lecturers in the beginning of a training is always a good idea; people meet each other and get familiar with the topic. But, it should be remembered, that no one [none of the participants] wants to spent several days on a lecture room without a connection to the real-life"* (Interviewee D 2008).

Step 3 is strongly influenced by the efforts of the trainer and the participants.

> *"If the trainer fails to meet the needs of the participants and is not able to provide what was agreed and promised, the whole process may fail"* (Interviewee C 2008).

In the original training model (cf. figure 5), this step did involve the efforts of the trainer(s) and the participants as they were not emphasized in the literature. However, after the industry experts' interviews this trigger was added.

After the training session, or sessions, the participants are asked to complete a self-assessment test. This test helps both, the participants as well as the trainers see the

connections between the objectives of the training and what was actually learned. However, the self-assessment test is based on the feelings of the participants right after the training, and does not necessarily tell "the whole truth" about the outcomes of the training. According to Interviewee D (2008)

> *"The self-assessment test is useful, but more emphasis should be put on the evaluation actual outcomes of the training. And these outcomes cannot be evaluated just after the training; it takes some time"*.

The fourth step of the model is *the follow-up of the results of the training*. The importance of the follow-up has been also recognized by researchers (cf. Brinkerhoff 2006). The focus needs to be shift from evaluation of "training" to an evaluation of how effectively the organization uses the training. (Brinkerhoff 2006, 305.)

> *"Some follow-up is done usually right after the training, but there exist a need for follow-up procedure which would consider the implications of the training after 6 months or even after few years"* (Interviewee A 2008).

> *"In reality the follow-up, especially long-term follow-up, seems to be missing"* (Interviewees A, B &D 2008).

The evaluation can take such forms as in-person discussions, evaluation forms or even just observation of the daily routines. The outcomes on the organization can be observed also through sales figures, changes in finance attracted by the company or number of partnerships. According to Brinkerhoff (2006, 307) learning enables performance and performance enables learning. Evaluation of training is a powerful tool for organizational learning and capability building. It is not only consistent with the concept of shared ownership: it is a method for achieving and strengthening the partnership of learning and development professionals with the other key players in the performance and business improvement process. (Brinkerhoff 2006, 307.) The importance of the evaluation is also strongly linked to the training process as such. According to Interviewees B and D (2008)

> *"Training should not be only a one session or one course; it should be a process which involves the participants in a life-long learning and development process."*

Training as such cannot be assumed to produce learning, nor is learning always an integral part of training, partly because even when training may result in some learning, the organization may not provide the necessary infrastructure to support such learning after the training has been completed (Antonacopoulou 2001, 331). The best result that training can ever accomplish is an increase in capability, which is the ability to perform. And, the value from the training comes when capability is transformed into improved job performance. (Brinkerhoff 2006, 303.)

7 CONCLUSIONS

7.1 Theoretical contributions

Just like in any industry, the training needs of Finnish biotechnology companies are unique. Majority of the Finnish biotechnology companies are SMEs and they possess a very limited human resource-base. Their scientific knowledge is at very high level, but majority of the companies have hardly any business competencies. *Based on the literature and the interviews conducted for the purposes of this research it can be said that the Finnish biotechnology companies need to develop the following skills and competencies: marketing competencies, management and leadership competencies, entrepreneurship competencies, innovation management competencies, financial competencies, internationalization competencies, networking skills, problem solving skills and communication and presentation skills.* Majority of these are basic business skills, which are needed to run the everyday operations of a company. However, networking skills are skills which are especially necessary in the biotechnology industry. As the product development times in the industry are long, companies need to obtain constant funding to carry out this time-consuming process. Usually the venture capitalists are attracted through networking events, and this requires high-level of networking skills.

As time is a scarce resource, the training designed for the biotechnology companies should be short-term training. At the moment, it seems that the Finnish biotechnology companies do not have the resources and financing to commit in the long-term training, and due to the limited human resources, one person cannot be "absent" from work for a long time. Due to these constrains, it is important to offer short-term training, which includes plenty of online material. This enables the persons to participate training during and after their daily routines, and does not require time-consuming traveling to the location of the training. However, it is important to maintain the face-to-face contacts, and thus, not all the training can take place online. *As finance is a scarce resource as well, the training offered to the Finnish biotechnology companies should not be too expensive.* If the amount of contact lectures is at minimum level, and no specific location need to be rented for the training session, the costs of the training can be kept at descent level. Thus, this kind of training will attract more Finnish biotechnology companies.

When designing a corporate training, both individuals' and organizational needs should be taken into account. In the course of this research, the individual point of view was investigated through three different learning theories; behaviorist, constructivist

and experiential learning theories. Besides these, the importance of organizational learning was taken into account. An organization may learn without a particular individual, but it cannot learn independently of all individuals (Nieminen 2007, 40). Thus, individuals are a necessary condition for organizational learning. When an organization learns, the learning may take place only through few individuals. This is why a training model taking into account both, the organization and individuals, needed to be developed.

The business training model created consists of three different columns, namely triggers, organizational level and individual level. Inside the triggers column are issues which should be considered during specific steps. There are issues such as in-person discussions, learning theories, on-the-job and off-the-job training, efforts of the trainers and participants, and improved working environment. These issues as such are not at the same "level" but they are all important parts to be considered before, during and after the training process. The importance of them is also supported by the literature and the industry experts' interviews carried out. The middle column of the model is "organizational level" which is formed of four different steps and the outcomes of the training. The steps are namely evaluation of the organizational training needs and individuals' needs, planning the objectives, goals and content of training and choice of learning methods, implementation of the training and follow-up of the results of the training. The existence of these steps is based on both, literature and the interviews conducted. However, in the past no model has included all of them to same extent as the model created does. The third column of the model is the individual level. Individual level is formed of all the activities which require individual input, and affect most strongly to the individual performance. *In the business training model developed, the organizational learning is considered especially during the steps one, two and four. Step four is especially crucial from the both individual and organizational learning point of view, as this step involves the evaluation of the learning outcomes. When taking a look at the figure 9, it can be seen that the individual point of view is most strongly present at the right hand side of the model, i.e. in the individual level column.* In addition to the three columns, the figure includes a continuum, which in the model is called as "long-term follow-up of the implications". This continuum leads from the last step of the model to back to the first step, thus making the whole process a continuum. *The aim of the continuum is to strength the impression, that training as such is not a separate event, but it should be an on-going process.*

7.2 Managerial implications

The training model developed in the course of this research is designed especially for the needs of the Finnish biotechnology companies. The model is designed for the development of business competencies. However, the emphasis of the training model is on the training process itself, not on the content of the training. Thus, the model could be used for development of some other types of skills and competencies as well. Suitable competencies to be developed on training session based on the model are competencies which can be developed in a short time and does not require high number of contact hours. It is important to notice that this model is not necessarily suitable for a long-term training process, as it is designed to include a low number of contact lectures, and lot of independent work. Long-term trainings, however, usually require higher number of face-to-face contacts in order to maintain the participants' motivation and interest and offer them a possibility to interact regularly with other participants. Due to these reasons, the model created is not suitable for the development of skills which require a long-term training process. These are skills like language skills and some technical skills.

The training model constructed is meant for small- and medium-sized biotechnology companies. However, there's no reason why this model could not be used in the bigger companies as well. It is likely that the model would require some modifications, but as such it should work well both, in big and in small companies. More important factor to consider is actually the number of participants, than the size of the company. As the training model is used on personal basis, i.e. each of the individuals is involved in the planning process; the work of the load of the trainer may become quite heavy if high number of participants is involved. After all, it is the trainer who evaluates e.g. the self-diagnostic tests. The model is designed for biotechnology companies, but is should work well in any other industry as well. The training model could be used e.g. to help small handicraft companies to improve their business competencies. The emphasis of the training model was on Finnish biotechnology companies, but it could be well exported to other countries as well. For example, Swedish biotechnology companies are facing very similar problems than Finnish ones, so the model created might be useful in Sweden as well. The model does not include any cultural or language elements, and thus there is no direct barriers of the export of the model.

In order the model to be useful, it is necessary to increase the consciousness about training and the importance of it. At the moment, many Finnish biotechnology companies do not participate any training sessions appealing to the lack of time. However, they should be addressed that the time spend in training session(s), can offer several advantages, for example in the form of developed business performance. The companies should be also made aware of the fact that not all the training can be for free.

At the moment many of the training sessions offered are supported by the state or offered by the state-led organizations and thus, these sessions are free for participants. However, these sessions are not usually tailor-made to the specific organizational and individual needs and due to this, the outcomes of the training are very limited.

7.3 Limitations and suggestions for further research

In the future it would be worthwhile to investigate the training model constructed in practice. In the course of this research, the model was only "tested" based on the industry experts' opinions and due to the time limitations, no real training based on the model was implemented. However, this is not be an easy thing to do. The implementation of training requires a close cooperation with a company either offering training services, or a company interested to participate training. Even if this kind of cooperation would be achieved, all the parties involved should agree to "participate" the research, i.e. testing of the training model in real-life.

The training model created should be also evaluated in the context of other industries and other types of training. It would be worthwhile investigating, if the same model could be used in other industries where majority of companies are SMEs, or even in industries, which are dominated by larger companies. The actual content of the training was not investigated in this research, and thus, it might be worthwhile researching what kind of content or which specific competencies can be learned via this training model. So far the model is only planned for business training, but a more specific description of the content would be necessary.

The research conducted had also some limitations. The number of industry experts' interviews was low, as just four of them were carried out. Even though saturation was reached, higher number of interviews could have provided even more in-depth information about the Finnish biotechnology companies and the training in the industry. If more interviews would have been carried out, maybe there could have been found some differences in the training needs of biotechnology companies operating in different areas of the industry, such as red or green biotechnology. All the data collected was analyzed by one person, i.e. the researcher, and this may have caused some fallacies in the results. The theoretical base of this research is based on three learning theories and theory of organizational learning. However, the model might have been affected if more learning theories would have been involved. For example, the behaviorist learning theory described here leans most strongly towards Skinnerian behaviorism, but if different tendency would have been chosen, it might have slightly affected the model constructed.

8 SUMMARY

Biotechnology is an important and growing sector in the Finnish economy. As such, the biotechnology industry is one of the most promising high technology branches. The Finnish biotechnology companies possess high level know-how in life sciences and this, together with growing expenditure in research, offers a solid base for the development of the industry. Despite the high level of technical know-how, majority of Finnish biotechnology companies are lacking vital business competencies which would enable the real success of the companies, or even the commercialization of their ideas. Some of the companies are also facing the problem of limited human resource base, as they are often owned and managed by the same person. To be able to fulfill the gap between scientific knowledge and business knowledge in the biotechnology companies, more business-oriented corporate training should be offered. In order to be able to provide the kind of training that really benefits the companies, i.e. in this case the companies in Finnish biotechnology industry, a special training model for business training should be created. Thus, the purpose of this research was to design a business training model for Finnish biotechnology companies. This purpose was approached through two sub-objectives:

- to describe what kind of business training the Finnish biotechnology companies need and
- to analyze how the training needs of individuals as well as the needs of organizations can be taken into account in business training.

The emphasis of this research was on small- and medium-sized biotechnology companies, which already have an existing product or service. This limitation was made because the biotechnology companies at beginning of the product development phase are having different training needs than the ones having a product or service to be commercialized, marketed and sold.

Due to the nature of the biotechnology industry and the features of it, the training offered for Finnish biotechnology companies should be short-term, cheap and targeted to meet both, individuals' and organizational training needs. Short-term training is an attractive option to the Finnish biotechnology companies, as they do not require huge human resource and financial investments. The actual content of the training should deal with one of the following areas; marketing, management and leadership, entrepreneurship, innovation management, finance, internationalization, networking, problem solving or communication and presentations.

In order to fulfill the research purpose, a four-step training model for business training was constructed. This model is based on the theories introduced in chapter 3, namely organizational learning theory, behaviorist learning theory, constructive learning theory and experiential learning theory. Thus this model is also affected by theory on

business competencies, academic literature and previous research carried out. The verification of the model was done through industry experts' interviews, as due to the time constrains no training based on the model could not be implemented. (The model for business training is further illustrated in figure 9) Four, semi-structured industry experts' interviews were carried out, in order to find out what kind of training model would suit for the needs of Finnish biotechnology companies. The interviewees were chosen based on their background and their experience in the industry. The interviewees were asked 12 pre-prepared questions, and in addition some questions, which were brought up in the course of the interviews.

The training model constructed is formed of three columns; triggers, organizational level and individual level. The triggers column includes a variety of issues which need to be considered during the training process. These are issues such as the choice between on-the-job and off-the-job training methods. The organizational level –column consists of four different steps of training process. The first step is the evaluation of organizational training needs and individuals' needs, second one is the planning of the content and the objectives of the training, followed by the actual implementation of the training and the fourth step is the evaluation of the outcomes of the training. The individual level –column includes variety of tests and evaluation tools used e.g. for the evaluation of the individual training needs, the current level of knowledge and evaluation of the results of the training. The advantages gained by organizations can be usually evaluated through improved profit or sales, but the analysis of the individuals' learning outcomes requires more in-depth analysis. However, the outcomes of the training cannot be evaluated just right after the training. A constant follow-up of the outcomes is needed, as training should be considered as a constantly on-going process instead of one time event.

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APPENDICES

Appendix 1: List of interview questions for the industry experts' interviews

1. **Company and position**

2. **Background (education, Industry Experience / number of years in the industry, previous position, areas of expertise)**

3. **In your opinion, what makes Finnish biotechnology industry internationally competitive?**

4. **In your opinion, what are the major advantages and disadvantages/ drawbacks of the industry?**

5. **How to overcome these disadvantages/drawbacks?**

6. **In your opinion, what kind of training is needed in the Finnish biotechnology companies? (Area, length etc.)**

7. **To what extent there is a need for business training in the companies? Are there any specific areas Finnish biotech companies need to improve their skills? (Marketing, IPR, commercialization, communication skills, etc.)**
    a. **To what extent these skills can be taught to scientists / engineers etc.?**
    b. **Which one of these skills can be/should be taught to individuals and which one of these should be taught to organizations?**

8. **Is there enough training available to fulfill these needs?**

   - If yes, are companies willing to pay for and participate in this kind of training?

9. **What kind of training your company offers / has participated?**

10. **Are/Were these trainings tailor-made or "group trainings**
    a. **How long they last/lasted?**
    b. **How are/were the participants chosen?**
    c. **Is/was the content of the training based on the organization's needs or individual's needs?**
    d. **How is/was it ensured that the participants actually learn/learned and are/were able to apply the things they learn to their every day work?**

11. **What do you think, how an effective business training module/course should be constructed? (how many "steps", forms of learning, trainer, learning methods, contact before, during and after the course..)**

    - Do you think that this kind of "model/idea" works for both, short-term and long-term training as well for SME's and bigpharma companies?

12. **Any comments / something to add?**

Appendix 2: Key words of interview transcripts

- training
- learning
- organizational learning
- individual
- employee
- competence
- business competence
- skill / skills
- short-term
- long-term
- introduction
- finance / financing
- trainer / instructor
- participant
- tailor-made
- evaluation
- follow-up
- test
- lecture
- technology
- online / virtual