Professional MBA
Entrepreneurship & Innovation

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Do we have an opportunity window for economic execution of the development in medical image distribution technology? A theoretical feasibility study.

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by
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Vienna, 24.07.2013

Affidavit

I, **BORNY ROBERT**, hereby declare

1. that I am the sole author of the present Master's Thesis, "DO WE HAVE AN OPPORTUNITY WINDOW FOR ECONOMIC EXECUTION OF THE DEVELOPMENT IN MEDICAL IMAGE DISTRIBUTION TECHNOLOGY? A THORETICAL FEASBILITY STUDY", 80 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 24.07.2013

Signature

Preface

"A creative idea is just an idea until something is done with it. You must do something or you are not creative"

Glen Hoffherr

This Thesis is more than a scientific work – it is a journey, which started on the 15.05.2011 with a spontaneous idea on the way home from a wedding trip. Yet, the destination is unknown and it is still going on. It evolved in far more than I ever expected and changed my life in a fascinating way.

I want to express my deep gratitude to Univ. Prof. Dr. Sabine T. Köszegi, Mag. Nicole Thurn, Ramtin Ghasemipour-Yazdi and Annemarie Hartlieb for the scholarship, which gave me the opportunity to attend this MBA education programme. Furthermore, I appreciatively acknowledge my thesis supervisor Univ. Prof. Dr. Marc Gruber for his support and for agreeing to evaluate this thesis. I am sincerely thankful to my parents for their encouragement and financial support. Finally, I want to thank my wonderful wife, for her patience, support an endless love.

I dedicate this thesis to my child, which will be born next year.

Abstract

In this thesis a possibility to outsource the reporting service of radiological institutes on demand was evaluated. The institutes can focus on the examinations, minimize the managerial efforts, eliminate all human resource capacity problems and use our service in cases of medical uncertainty as well. The outsourced radiologist can focus on a subspecialisation. Therefore, faster reading times and a more detailed diagnosis are possible. The patients profit from superior healthcare and the insurance companies from not performed repetitive examinations.

To simulate the economical outcome an excel simulation with different adjustable variables was created. The simulation was performed in accordance to the scenario technique, with best, most probable and worst scenario analysis. For this basic case a Market Value Added (MVA) between SFR 4338330.20 and SFR 2380994.18 was shown. The Internal Rate of Return (IRR) was between 694% (best scenario) and 444% (worst scenario). In the second simulation the selling price was reduced to a level of 30% below the competition. In this case the IRR decreased to 350% (best scenario) and 220% (worst scenario). In the last simulation the exchange rate of Euro & Swiss Franc was varied to simulate the project stability on external impact. Thereby, the IRR decreased to 426% (best scenario) and 269% (worst scenario).

With this thesis it was shown that from the economical point of view it is profitable to create a company providing outsourcing service to radiological institutes. However, this area is under governmental regulation and legal barriers hinder the creation of the company.

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List of abbreviations

AG	Aktiengesellschaft (Joint-Stock-Company)
AT	Austria
BFS	Bundesamt für Statistik (Federal Statistical Office)
CH	Switzerland
CHF	Swiss Frank
CT	Computed tomography
CV	Company value
D	Debt
E	Equity
EBIT	Earnings before interest and taxes
ESR	European Society of Radiology
EU	European Union
EUR	Euro
EVA	Economic value added
GB	Gigabyte
HSLU	Hochschule Luzern (Lucerne University of Applied Sciences and Arts)
IDV	Individualism
IPMA	International Project Management Austria
IRR	Internal rate of return
IT	Information technology
LTO	Long term orientation
MAS	Masculinity
MBA	Master of Business Administration
Mbit	Meagbit
MRI	Magnetic resonance imaging
MVA	Market value added
NPV	Net present value
NOPLAT	Net operating profit less adjusted taxes
PACS	Picture archiving and communication system
PDI	Power distance

r(debt)	Cost of debt capital
r(equity)	Cost of equity capital
rf	Risk free rate
rm	Expected market return
ROIC	Return on invested capital
Sec	Second
SHV	Shareholders value
SNB	Swiss National Bank
SSR/SGR	Swiss Society of Radiology
UAI	Uncertainty avoidance
UK	United Kingdom
UEMS	Unio of European Medical Specialist
US	United States
USA	United States of America
V	Total firma value
WACC	Weighted average cost of capital
WBS	Work breakdown structure

1 Introduction

1.1 Problem formulation

Worldwide the medical market is characterized by legal restrictions and barriers in order to protect the patients and the national healthcare system. Although the concept of teleradiology was already introduced in the 90ties for US military use [1], not all countries opened their healthcare markets to this innovation. This results in differences between the national markets. The teleradiology in the USA is an established part of radiological healthcare. In 2003 already 67% of all radiological practices were using teleradiological services [2], and nowadays more than 500 providers exist. However, this market shows now, first signs of maturity, the prices have already decreased and a first wave of consolidation has started [2]. On the other hand only a few countries in Europe have introduced this service, despite the "Online healthcare action plan" of the Council of the European Union. UK, France, Sweden, Poland and France allowed the teleradiological service and Germany limited it to nightshifts and weekends. Despite all the restrictions the market size in the EU was $184.1 million in 2010, with more than 50 percent of revenues coming from the United Kingdom and Germany. [3]

However, due to organizational barriers the European market is still economically undeveloped. This thesis will evaluate if it is possible to create a teleradiological company, which would operate on the European market. Due to language similarity and already present first movers the evaluation will focus on a cross-border business model between Switzerland and Austria.

1.2 Objectives of the master thesis

a) Evaluation of the international status quo of the literature in the field of medical image distribution
b) Performing a deep market analysis, including existing competitors and potential customers

c) Creation of an start-up project using tools from the IPMA methodology
d) Developing a market entry and penetration strategy
e) Evaluation the opportunities in CH and the legal framework for medical service companies
f) Creation of an excel simulation of the business case with three scenarios.

1.3 Elevator pitch

The text serves as an elevator pitch, and was fitted to approximately 60 seconds, which are usually given to participants in elevator pitch competitions for oral presentations:

A patient entering a radiological institute expects to be examined and to get a written report within the next days. This process sounds simple but in reality huge managerial efforts have to be taken and no outsourcing is possible. Hardly anyone knows that a radiological institute needs up to 20 radiologists per MRI/CT scanner to guarantee this service.

Telebrain creates a possibility to outsource the reporting service on demand. The already performed examination is forwarded through the internet to our radiologist outside of the institute. This radiologist describes the case and simply returns a written report. The institutes can focus on the examinations, minimize the managerial efforts, eliminate all human resource capacity problems and use our service in cases of medical uncertainty as well.

The first target are the operators of all 460 MRI and CT scanners in Switzerland, creating together nearly 1.300.000 examinations per year. A process innovation enables a price range which is comparable to the current expanses for reporting in a conventional institute and is charged on a per case basis. With a 150.000 CHF investment, Telebrain can be cash-flow positive already in 6 months and we estimate a 4-7 fold investment return after 3 years.

We are Telebrain - outsource your worries to us.

2 Literature review

The teleradiology evolved on the basis of the following facts: "(I) the transition from analog to digital imaging, (II) decreasing number of radiologists and their increasing workload and, (III) the need of access to subspecialty expertise" [4]. In 2003 the radiologist performed 34 percent more procedures than in 1992 and in 2007 seven percent more than in 2003 [5]. In this survey more than 80 percent of radiologists said that they have not enough time to access each scan, read it and to deliver results [6]. An analysis of the Royal collage showed that the current workload is at the point, where it threatens the quality of healthcare [7] Teleradiology could help to get rid of this situation and bring benefits to the healthcare providers, radiologist and patients. "However, Teleradiology is like a two-edged sword that requires careful consideration and balancing, needing uniform standards to guide quality care while ensuring patient safety" [8]. It has been already experienced, that healthcare providers are unwilling to accept new innovations, especially when new actors in the process have to be involved [9, 10]. This phenomena is amplified by the enormous complexity of teleradiological processes [11] as well as by legal uncertainty [12] and results in a cautious acceptance of this new service. The major opportunities of teleradiological service are: "Access to subspecialty, accelerated turnaround times, anytime/anywhere access, improved workflow" [4] and a nightshift service from other time zones. The major drawbacks are: "distancing the radiologists from the patients, transfer of images may result in less than optimal quality, and the potential evolution to a commodity service" [8]. Despite these facts, teleradiology is one of the most evolved areas of telemedicine [13] and was the most rapidly growing imaging service in the USA between 1999 and 2004 [14]. The European Union showed already some engagement to create a legal framework and to develop an innovative market with the opportunity of a global service leadership. On the European level in 2009 a directive on cross-border healthcare has been accepted [15]. "An directive is a

guideline, that should be, in one way or the other, incorporated in national law of the member states – though it does not dictate the exact rules that should be adopted" [12]. This directive regulates in a wide range the aspects of patients, who visit doctors in other EU member states than their own [16]. One of the most important parts is the Art. 5 regulating the responsibilities of authorities of the member state of treatment. "The member state of treatment shall be responsible for the organization and the delivery of healthcare (a) when healthcare is provided in an a member state other than that where the patient is an insured person, such healthcare is provided in accordance with the legislation of the member state of treatment (b) healthcare referred to point a is provided in accordance to standards and guidelines on quality defined by the member state of treatment (c) healthcare providers provide all relevant information to enable patients to make an informed choice" [15]. This directive is similar to the joint position paper on teleradiology published by the UEMS radiology section [17] and the ESR [18]. "However, it should be understood that a major driver for the European Commission is economic in nature: It considers telemedicine as a solution to contain the rising cost of healthcare" [12]. In 2007, the SGR SSR teleradiology white paper was published in Switzerland [19]. This paper covers most of the teleradiological aspects and is similar to the EU directive, but lacks in the cross boarder view, which is still an unregulated area. An important part of the medical legislation is the conflict regulation. Usually, a patient has a direct treatment agreement with the healthcare provider. In case of conflict he can sue his local provider. In case of teleradiology, the patient would sue the local healthcare provider and the local healthcare provider would sue the teleradiological service company. It should be considered that: "Whenever the teleradiology provider is based in a country outside of the EU, EU law does not apply. It is then not evident from the outset which country´s law apply and where conflicts should be settled, unless this has been contractually agreed or there are bilateral agreements in place between the two countries" [12].

3 Empirical part

3.1 Project management

3.1.1 Project objectives

"Projects can be seen as goal-oriented organisations. In the course of the project, objectives have to be achieved with regard to content, schedule and budget. The project objectives should clarify the meaning of the project and define or describe the desired results at the end of the project. A holistic project view ensures the consideration of all objective perspectives. Objectives can be broken down into main objectives (targets) and additional objectives" [20].

Main objectives:

Till 01.06.2013 I am an owner of a Teleradiology company in Switzerland
Till 01.04.2013 I have found investors for my company
Till 01.04.2013 I have the first customer for the initial trial phase
Till 01.04.2013 I have five certified radiologists for the Swiss market

Additional objectives:

Till 01.01.2013 I have finished my project management certification
Till 01.01.2013 I have finished the post graduate management course
Till 01.03.2014 I have finished my MBA

Non-objectives:

An own teleradiological software has been developed
I have lost contact to the medical university
The competition has noticed the project before I entered the market
A joint Venture with another company has been established
An investors controls more than 30% of the company
I am liable for the content of the diagnostic reports

3.1.2 Objects of consideration plan

"The objects of consideration plan is a method that structures the material and immaterial objects of consideration (e.g. results, interim results) to be considered and created in a project into their components. The objects of consideration of project management are not part of the objects of consideration plan. The objects of consideration plan display the individual objects of consideration and their interrelationships in a hierarchical structure, either graphically or in a table. The objects of consideration plan provide orientation or assistance when creating the work breakdown structure" [20].

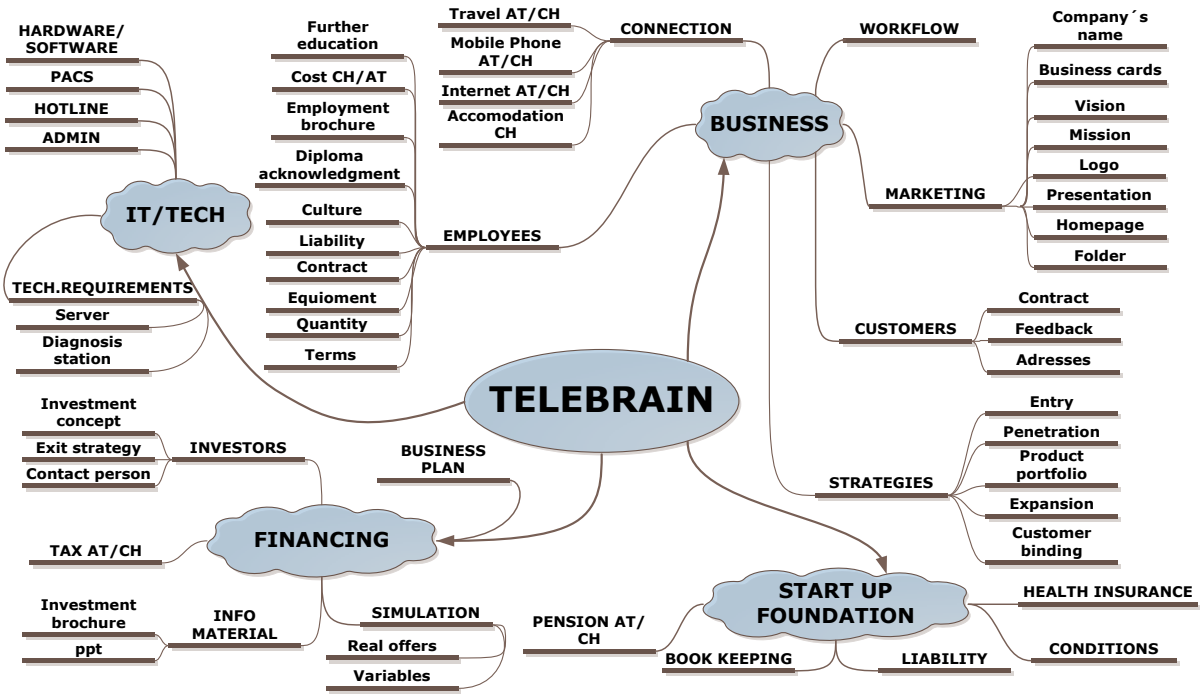

Figure 1: Objects of consideration for the Telebrain project

3.1.3 Work breakdown structure

"The objective of the work breakdown structure (WBS) is to display performance planning by phases as a tree diagram. Thinking in terms of project phases helps project members to structure projects in a process-oriented way. The WBS contains all the tasks to be performed in a project, displayed as work packages. Level 1 of the WBS tree displays the project, and level 2 is a process-oriented structure of the project by phases, where possible" [20].

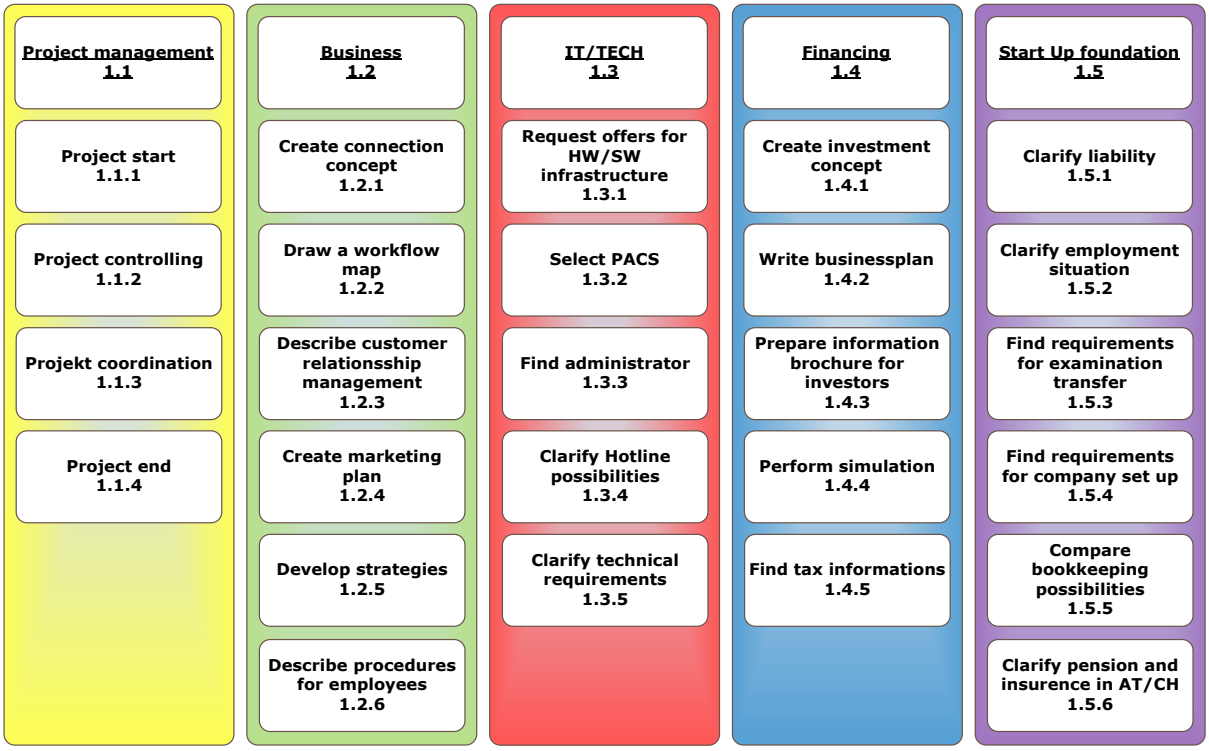

Figure 2: Work breakdown structure for the Telebrain project

3.1.4 Work package specifications

"The contents and results of work packages are defined in work package specifications. They are used as a basis for the agreement on objectives between the project manager and the persons responsible for the work package (project team members)" [20].

PSP Code: 1.2.4	Title: Create marketing plan	Duration: 12 weeks
Content: • Name, Vision, Mission • Logo, Visitenkarten, Investmentfolder concept, PPT layout • Homepage concept • Find graphic artist • Graphic artist reworks all visual & handout materials • Find homepage programmer • Homepage programming • Buy domain and publish homepage		Progress: 20% 40% 75% 80 85 90 95 100%
Results: • Coherent marketing enviroment, including a marketing plan, visuals and handouts		
Non content: • Publish not professional content • Give too much information to the competition		

Figure 3: Work package specification for WBS 1.2.4

PSP Code: 1.4.1	Title: Create investment concept	Duration: 11 weeks
Content: • Check internet and publications for info • Find addresses and contact details in CH • Find addresses and contact details in AT • Create investment concept for investors • Define exit strategy for investors • Write Executive Summery, Create elevator pitch • Organize meeting with investors present idea • Bei Investoren Executive Summery einreichen		Progress 10% 20% 30% 45% 60% 80% 90% 100%
Results: • Written Executive Summery and PPT submitted to potential investors		
Non content: • Publication of sensetive information • Not Key persons got the summery • Competition knows about my project		

Figure 4: Work package specification for WBS 1.4.1

3.1.5 Project scheduling

"When planning the project workflow and list of dates, a decision needs to be made regarding the planning contents, planning depth and the planning methods to be used. Scheduling objects can either be the entire project or portions thereof, such as the individual project phases. Different scheduling methods can be used for different planning objects. When planning the project workflow and list of dates, the milestone planning, project deadline list, bar chart, linked bar chart and network planning methods can be used. Milestone planning is the crudest planning method and absolutely vital. The work breakdown structure with its work packages is used as the basis for this" [20].

Number	Code	MILESTONE	PLANED DATE	ADJUSTED DATE	FINISH DATE
1	1.1.1	Project start	01.04.2013	01.05.2013	01.05.2013
2	1.2.2	Teleradiological requirements clarified	21.06.2013	21.07.2013	12.06.2013
3	1.4.3	Liability questions clarified	21.07.2013	21.08.2013	01.07.2013
4	1.3.6	Complete workflow created	14.08.2013	15.09.2013	Open
5	1.3.1	Staff plan established	01.11.2013	01.12.2013	Open
6	1.5.6	Business plan finished	15.12.2013	15.01.2014	Open
7	1.1.4	Project end	31.12.2013	31.01.2014	Open

Table 1: Milestone plan for the Telebrain project

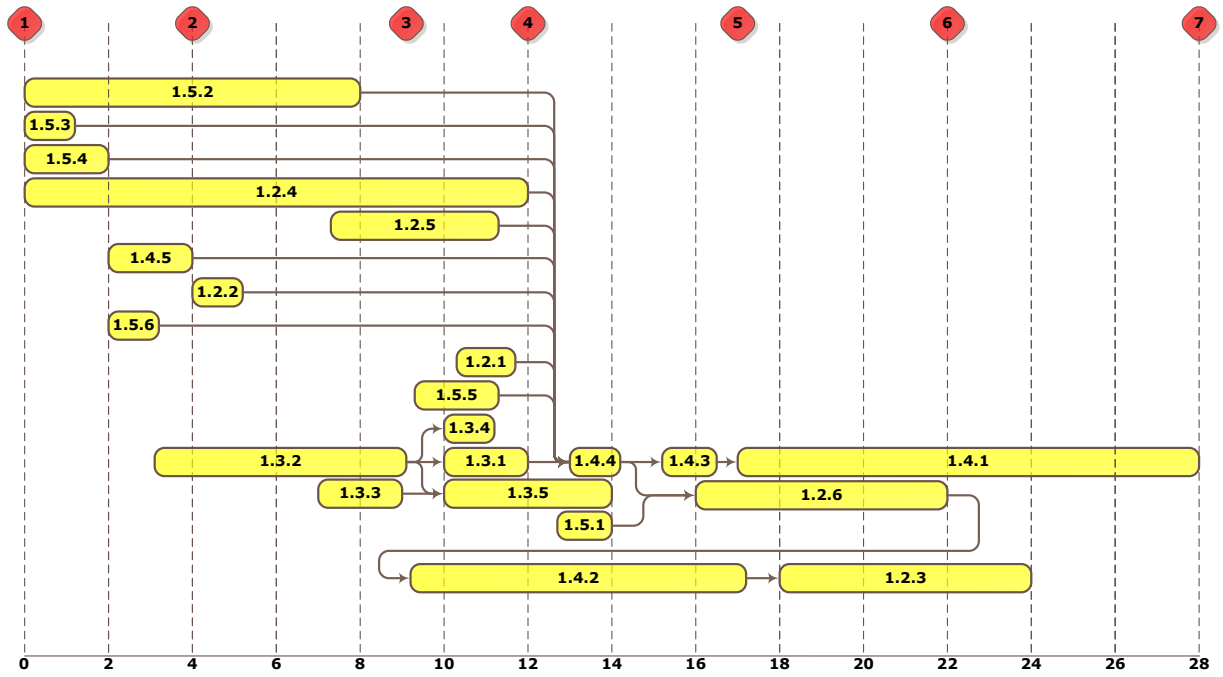

Figure 5: Linked bar chart for the Telebrain project

3.1.6 Project risks

"Project risk is defined as the possibility for positive (opportunity) or negative (danger) deviation from the project objective. Project risks are events or developments that affect project performance (quality), deadlines, costs or revenues. Risk management in projects is a project management task. In the course of the project risk management process, a risk assessment, risk response and risk monitoring is performed based on the project specifications. The risk assessment comprises the risk identification, risk analysis and risk evaluation. Risk analysis is defined as the likelihood of events occurring together with the impact of these on the project. Risk is evaluated by comparing the risks analysed (risk expected value) with the tolerable project risk. If the risk expected value is greater than the tolerable project risk, then preventive risk response measures must be planned" [20].

Number	Name	Description	Action	Influence	Probability	Impact
R1	Certification	Radiologist have to do exams	Find certified radiologists	Negative	Low	High
R2	Application	Radiologist have to do the application by themselves	Use authentified legal repesentative	Negative	Middle	Low
R3	Legal	No information from friends	Go to a lawer	Negative	Middle	Low
R4	Guidelines	Teleradiology only in rare cases	Define service as consultation service	Negative	Middle	High
R5	Distribution	No distribution of exams possible	Create server in CH	Negative	Middle	High
R6	Payment	Payment in CH higher than in AT	Flip process to CH/AT	Negative	Low	High
R7	Tech	Technical requirements not realizable	Find providers from outside EU	Negative	Middle	Middle
R8	Diagnosis	Reading only with examination	Split local roles of radiologists, perform real teleradiology	Negative	Low	Middle
R9	Security	Required security not combinable with equipment and workflow	Create new concepts for equipment and workflow	Negative	Low	Low
R10	Hardware	Hardware cost higher than financal resources	Search for additional investors, ask family and friends	Negative	Low	Low
R11	Software	Software cost higher than financial resources	See R10	Negative	Middle	Low
R12	Compatibility	Bought and developed software not compatible	Find new administrator, buy software service, only one provider	Negative	Middle	High
R13	Workflow	Thoeretical workflow doesn´t work in practical application	Extend initial tryout phase, create new concept	Negative	Low	Low
R14	Contract	It´s not allowed to hire directly medical stuff	Sign direct contract between customer and radiologist	Negative	Low	Low
R15	Company	It´s not possible to set up a company	Set up company in AT	Negative	Low	Low
R16	Financing	Capital too low to start	See R10	Negative	Low	Low
R17	Plan	Investment concept can not be ceated	Find consultants and ask	Negative	Low	Low
R18	Study	Respond rate of market study too low	Change to telephone and direct visit	Negative	Middle	Middle
R19	Sales	Thoretical sales concept is not working in practical application	Find consultants and ask	Negative	Middle	Middle

Table 2: Qualitative risk analysis for the Telebrain project

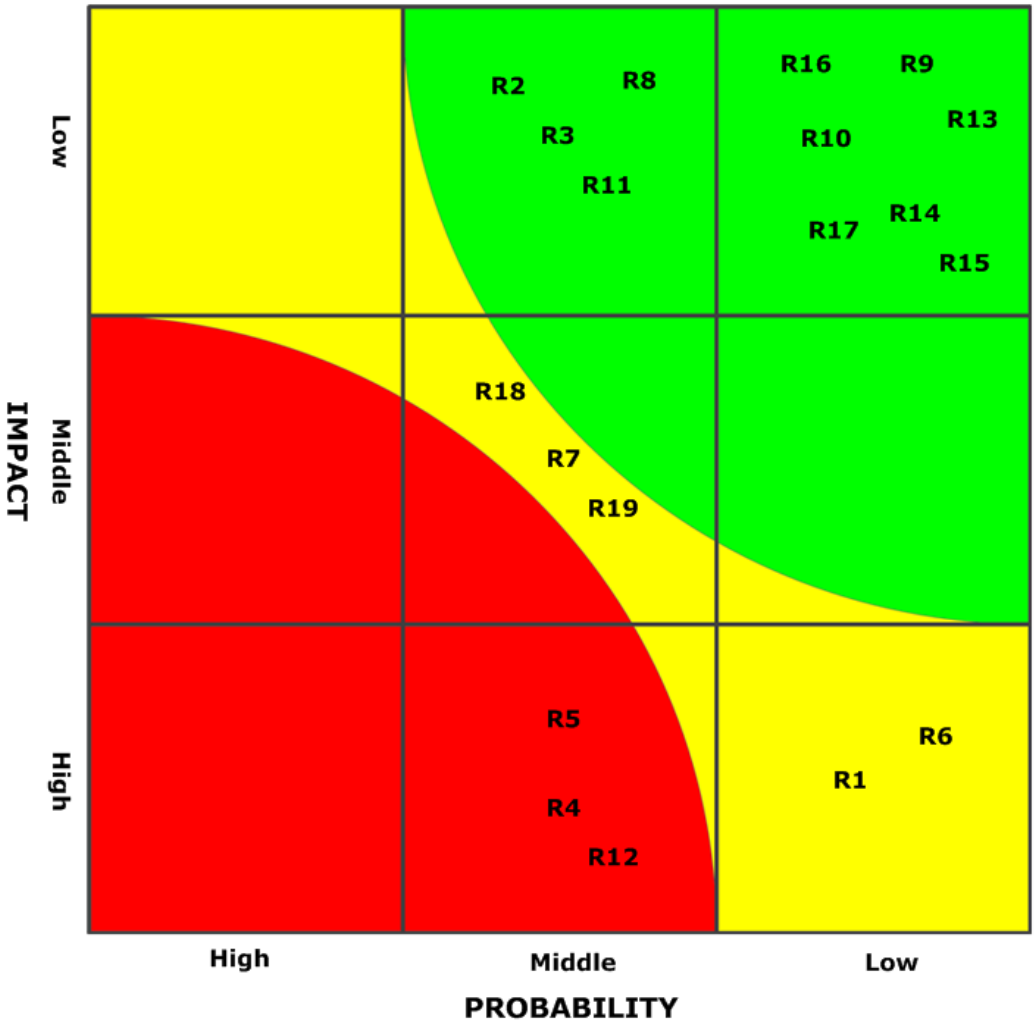

Figure 6: Risk matrix

3.2 PEST Analysis

3.2.1 Political factors

The politics of Switzerland take place in the framework of a multi-party federal parliamentary democratic republic. For any change in the constitution, a referendum is mandatory; for any change in a law, a referendum can be requested. Through referenda, citizens may challenge any law voted by federal parliament and through initiatives introduce amendments to the federal constitution, making Switzerland the closest state in the world to a direct democracy.

The legislation is supporting the creation of an innovative and attractive environment for companies. It starts with the ability to consider change in legal decisions as an opportunity. Therefore, Switzerland is one of few countries in Europe, which opened its healthcare market to telehealth services. The Swiss Society of Radiology published a white paper about teleradiology with all basic legal information included. However, Tarmed Suisse, which is responsible for the payment of medical service to the medical institutes, has not created any billing position for teleradiological service. Thus, nowadays it forces all teleradiology companies nowadays to create bilateral agreements with every customer.

Switzerland has a competitive tax system. The cantons are creating advantageous systems in order to attract more companies. This results in one of the most effective tax system worldwide. The average tax preparation and payment time is 63h per year, which is the 7 shortest time in the world (Austria 170h) [21]. The overall tax rate for companies is on average 30.7% and is lower than in Austria (53.1%) [22]. However, it is still possible to create a more tax saving structure, if a canton with a lower tax rate than the average for the domicile of the company (e.g. Zug) is chosen. Additionally, all services in the medical sector are free of value added taxes (VAT) [23].

The domestic credit provided by the banking sector includes all credits to various sectors on a gross basis, with the exception of credits to the central government and was in the year 2012 185% of the GDP[24]. The risk premium on lending is the interest rate charged by banks by loans to private sector customers, minus the "risk free" treasury bill interest rate at which short-term government securities are issued or traded in the market. The value was low over the last years and in 2011 it was 2.9% (Figure 7) [25]. This beneficial economic environment resulted in a constant high number of new established companies with 25000 in last year (Figure 8) [26].

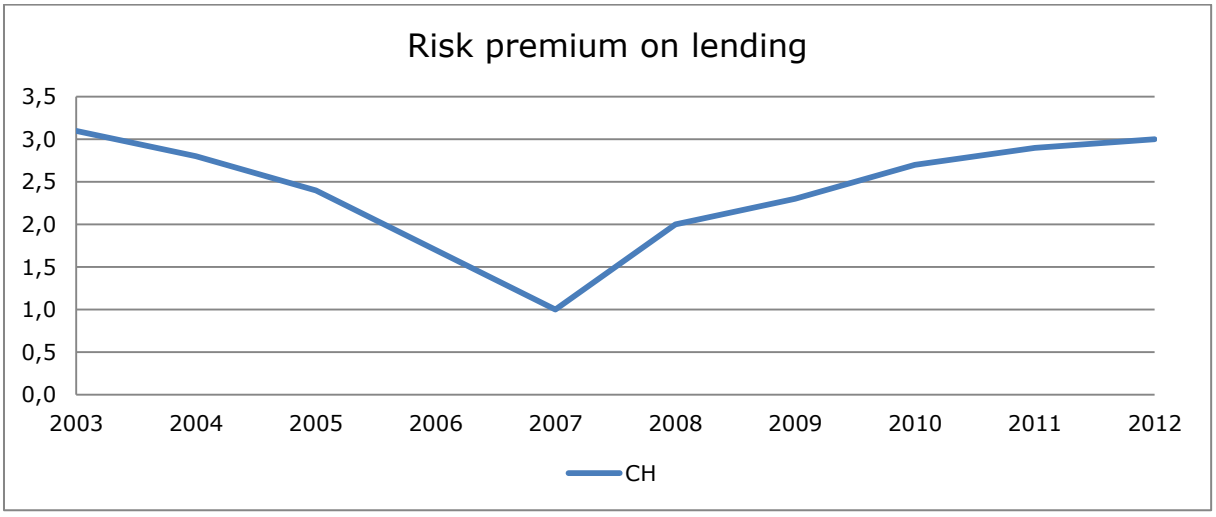

Figure 7: Risk premium on lending in CH, between 2003 and 2012, Source World Bank

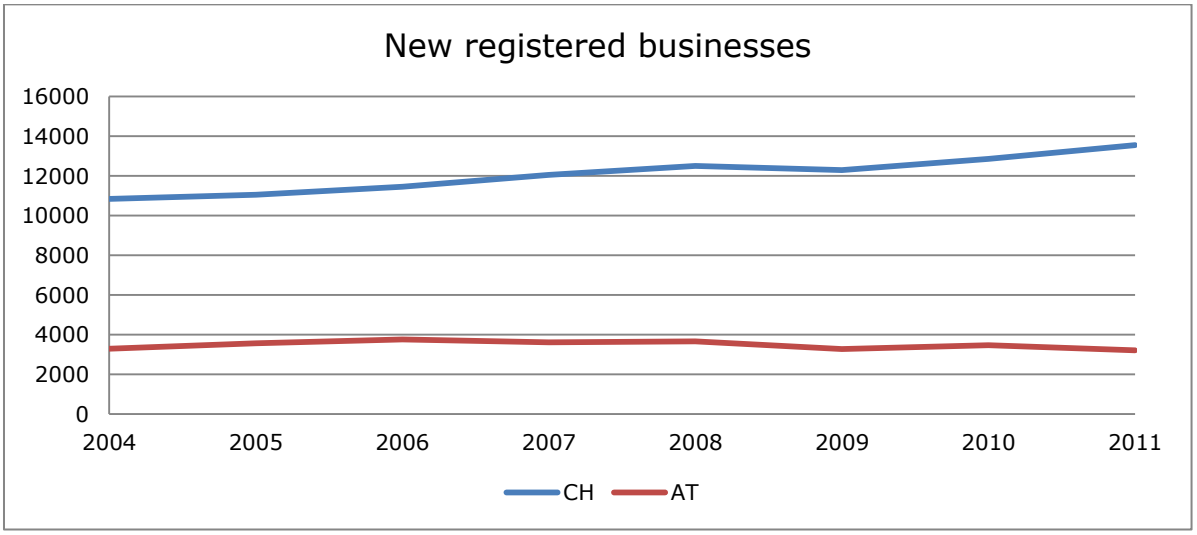

Figure 8: New registered businesses in CH and AT between 2004 and 2011, Source World Bank

3.2.2 Economic factors

The economy of Switzerland is one of the world's most stable economies. Its policy of long-term monetary security and political stability has made Switzerland a safe haven for investors, creating an economy that is increasingly dependent on a steady tide-of foreign investment [27]. Switzerland's economy benefits from a highly developed service sector. It is led by financial services as well as a manufacturing industry that specializes in high-technology and knowledge-based production [27]. Switzerland has achieved one of the highest per capita incomes in the world with low unemployment rates and a balanced budget.

Historically, from 1956 until 2013, Switzerland Inflation rate averaged 2.65% reaching an all-time high of 11.92% in December 1973 and a record low of -1.37% in June 1959 [28]. The actual rates were published by the World Bank (Figure 9) [29]. In 2012, the rate has been at -0.5%, which means a deflation for this period. It is expected, that this scenario turns in 2013 in a regular inflation with a value of 0.5% [29]. However, the published values for 01/13 and 02/13 were still negative (-0.3% and -0.2%) [29].

The exchange rate of the Swiss Franc influences directly the project Telebrain, especially the financial management of all investors form the Euro currency area. To predict the trend, professional finance publications were analysed, mainly from the Raiffeisen research centre [30]. Nowadays, the EUR/CHF exchange rate is in the range of 1.23 and the fundamental value around 1.32. (Figure 10) Therefore, in the years 2013 and 2014 certainly higher prices can be estimated but values like few years ago seem to be highly unlikely. However, in a time-horizon of five to ten years the long-term upward trend will be continued. Different inflation rates between Switzerland and the Euro Zone (the Switzerland has generally lower inflation) create a natural downward pressure on the fundamental EUR/CHF exchange rate (CHF upward trend). Politicians of the Swiss National Bank (most recently Vice President Danthine)

confirmed its previous monetary policy. Therefore, it can be assumed that this minimum rate of 1.20 will stay longer upright. In case of further escalation of the European debt crisis, the Swiss National Bank would be willing to defend the EUR/CHF level of 1.20. However, in the worst-case scenario of a breakup of the EU currency area this can be no longer expected. The SNB would enable free play of market forces. Thus, in this scenario the EUR/CHF should trade significantly under the mark of 1.20.

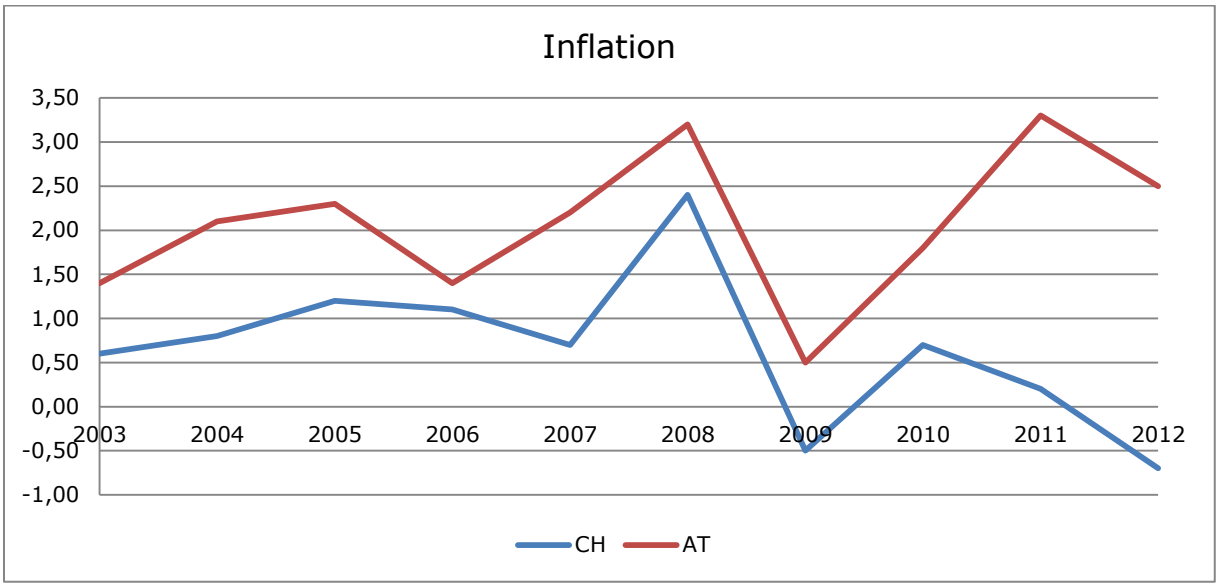

Figure 9: Inflation rates in CH and AT between 2003 and 2012, Source World Bank

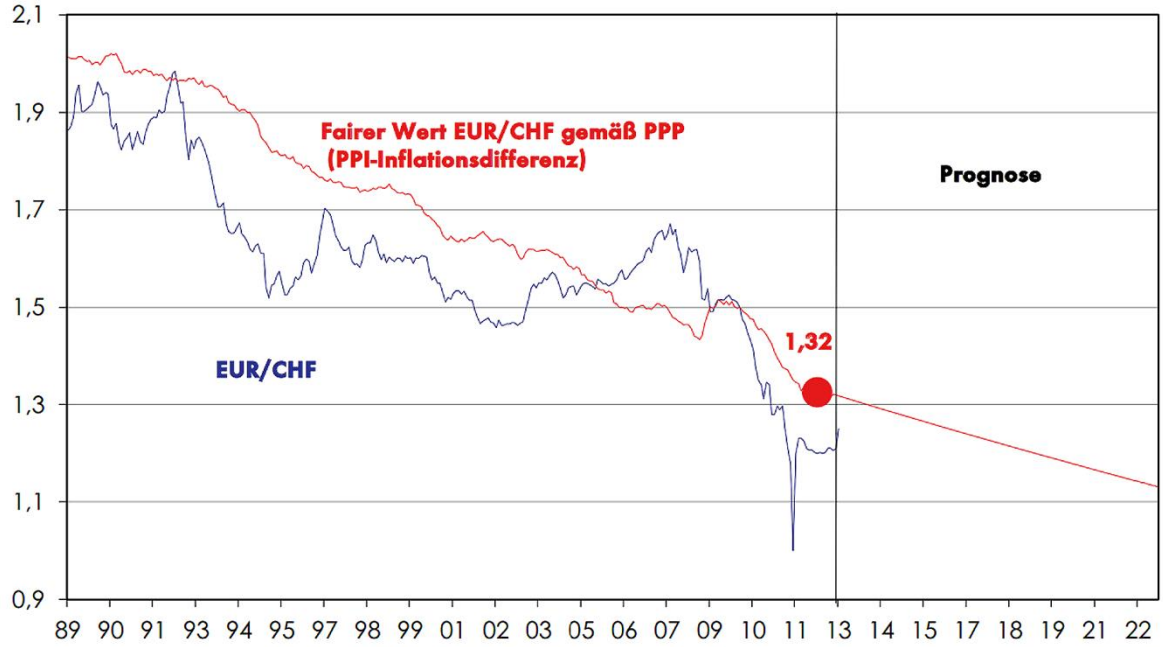

Figure 10: Exchange rate CHF-EUR, Source Raiffeisen Research

3.2.3 Social factors

Switzerland has a population of 8.02 million as of 2012. In 2007, the population grew with a rate of 1.1%, mostly due to immigration and for in 2008 with 1.6%, a level not seen since the early 1960s [31]. Its population includes a two-thirds majority of German speakers and a Latin minority. 10% of the population natively speak an immigrant language. More than 75% of the population live in the northern and western part of Switzerland [31]. However, like in the most western countries the population is faced with the problem of fast aging. This development is caused by a low birth rate combined with increasing life expectancy. Nowadays, for women born in 2011 the expected life duration is 84.7 versus 79.2 in 1981 and for men 80.3 versus 72.4 in 1981 (Figure 11). In July 2006, the Swiss Federal Office of Statistics published a projection estimating that by 2050, one in three adult Swiss will be of retirement age (as opposed to one in five in 2005). Total population was projected to stagnate in 2036 at around 8.1 million and fall slightly to 8 million in 2050. The predicted age structure for 2050 is: 0-20 years: 1.4 million (18%), 20-64 years: 4.4 million (55%) 65 and over: 2.2 million (27%) [31]. The increasing life expectation means a more intensive medical care at higher age with higher costs. The average health care costs per year of a 70 years old citizen are 10843 CHF and for a 90 year old 43747 CHF (Figure 12) [32]. This results in progressively increasing national health care cost. In 1990, the expanses were equal to 7.9% of the GDP. 20 years later in 2010 this rate increased to 10.9% [33]. In nominal values it means an increase from 26.78 to 62.6 billion Francs [34]. Additionally, it should be considered that all insured citizens, still have to pay approximately 30% more privately to the already covered treatments costs [35]. This is one of the highest values in Europe (for Austria app. 15%) and if this sum can be reduced, it would be a great opportunity in the medical market.

Switzerland consistently ranks high in the quality of life. In the Mercer´s [36] quality of life survey placed in rank 2, including

safety, education, hygiene, health care, culture, environment, recreation, political-economic stability and public transportation. In the Monocle´s [37] most liveable cities index placed in rank 1 including safety/crime, international connectivity, climate/sunshine, quality of architecture, public transportation, tolerance, environmental issues and access to nature, urban design, business conditions, pro-active policy developments and medical care. For these and many other reasons, such as the four languages, it serves as an excellent test market for businesses hoping to introduce new products into Europe.

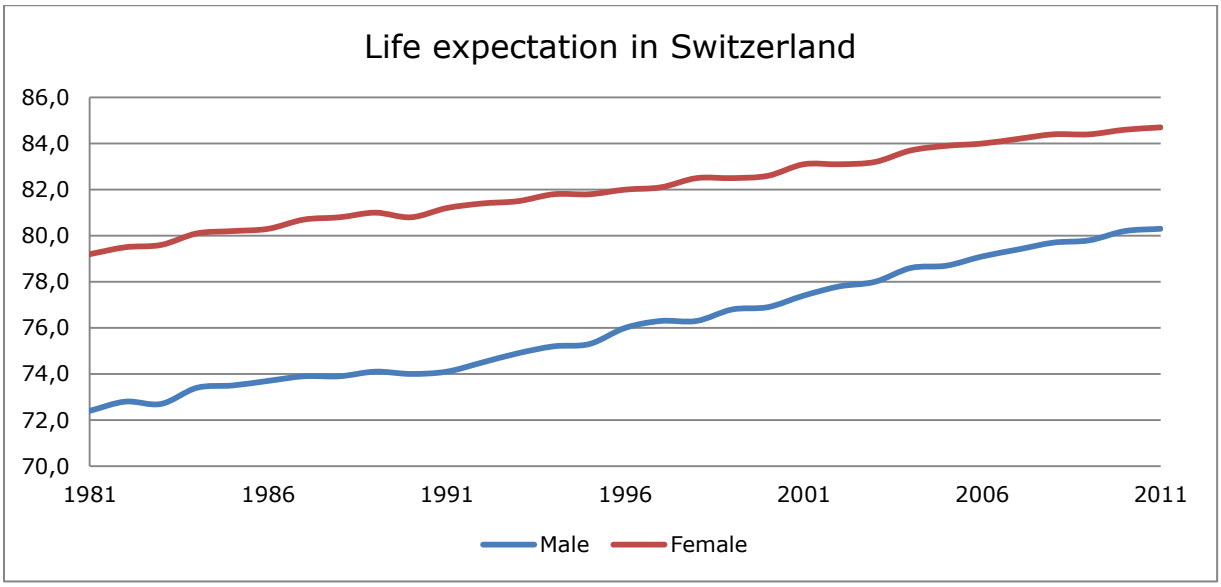

Figure 11: Life expectation in Switzerland for different years of birth, Source World Bank

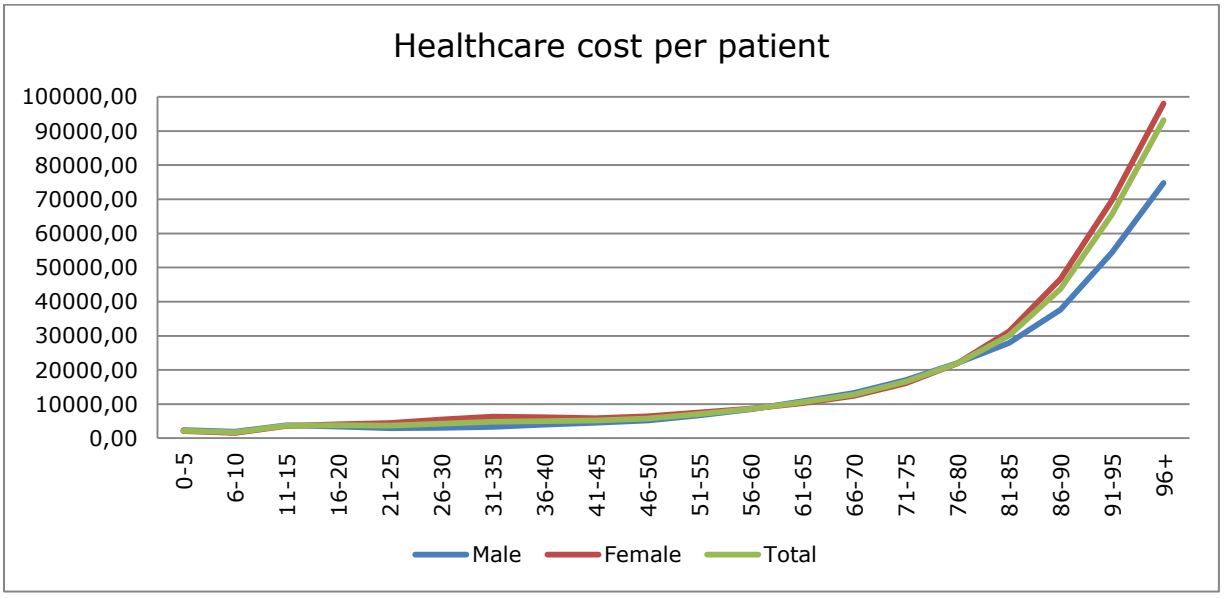

Figure 12: Healthcare cost by age per patient per year, Source: BFS

3.2.4 Technological factors

The potential of telehealth services has been evaluated by the Centre for technological assessment in 2004 [38]. This innovative service sector brings different threats and opportunities. Following opportunities were presented: improvement of the medical treatment quality by second opinions and expert assessments; cost saving through more efficient organization of treatment, even when the health care offer has been expanded; using resources exactly where they are needed; patients have access to more information and a greater range of choices; telemedicine can contribute to the economic competitiveness of Switzerland. On the other hand, the threats were: incomplete information in comparison with direct personal contact; faulty diagnoses and treatments; if the patient has to pay for telemedical applications out of his own pocket, then this runs opposite to the goal of offering equal and fair access to health care; the expansion of the health care offered through telemedicine can set off a cost explosion in health services; the lack of data protection endangers the private sphere of the patients and the medical providers and the lack of data security primarily puts the health of the patients at risk. Despite all opportunities and threats the Federal Office of Public Health in Switzerland published a statement on teleradiology and concluded that teleradiology will be introduced worldwide in the near future [39]. Therefore, the goal should be nowadays to create an environment for the future in order to minimize the risks and increase the benefits.

An important technological aspect for an online company is the quality and the geographical distribution of the internet providers. A computed tomography examination can in some cases reach 1GB in size. Therefore a suitably data throughput has to be guaranteed. Both, the connection quality and the quantity are increasing continuously. Nowadays, more than 80% of the Swiss citizens are using internet on a regular basis (Figure 13) [40]. But it should be considered, that older people, who mainly use the medical care system, have a limited access. In the group of over 70 years old only 30% uses the internet. However, the percentage

is increasing in every subpopulation and due to market maturity of the young segment other segments will be more and more supplied. The technological development of the data connection area forces the providers to introduce progressively new network technologies. The customers benefit from increasing bandwidth and decreasing costs. The quantity of 10-100Mbit/sec connections has already the highest market share and the optical fibre based >100Mbit/sec connections showed between 2010 and 2011 a growth rate of more than 1000% (Figure 14) [41].

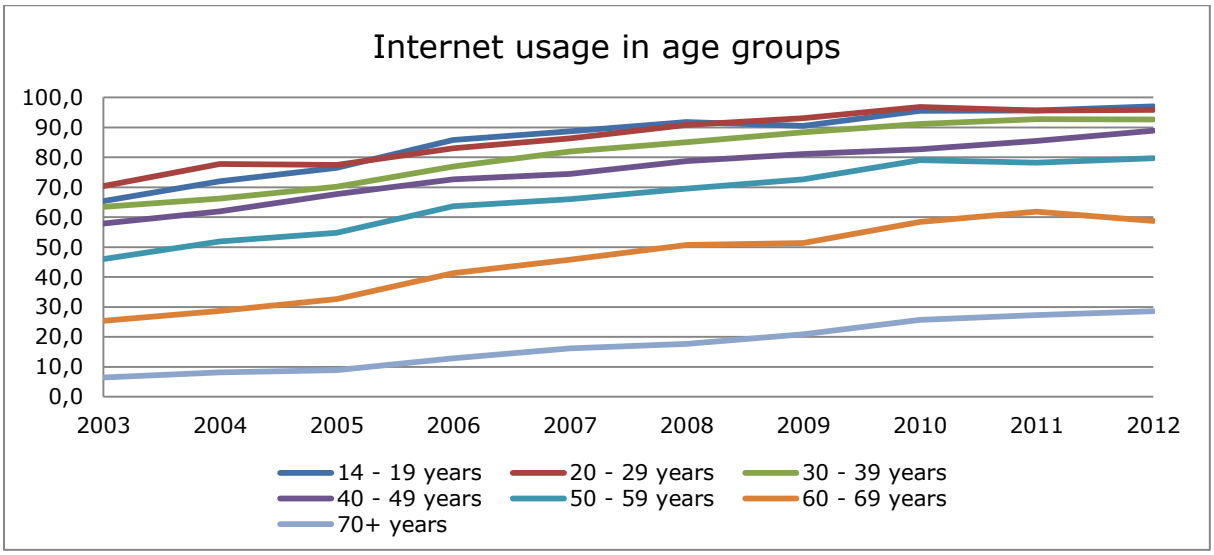

Figure 13: Internet usage in % in age groups, Source: BFS

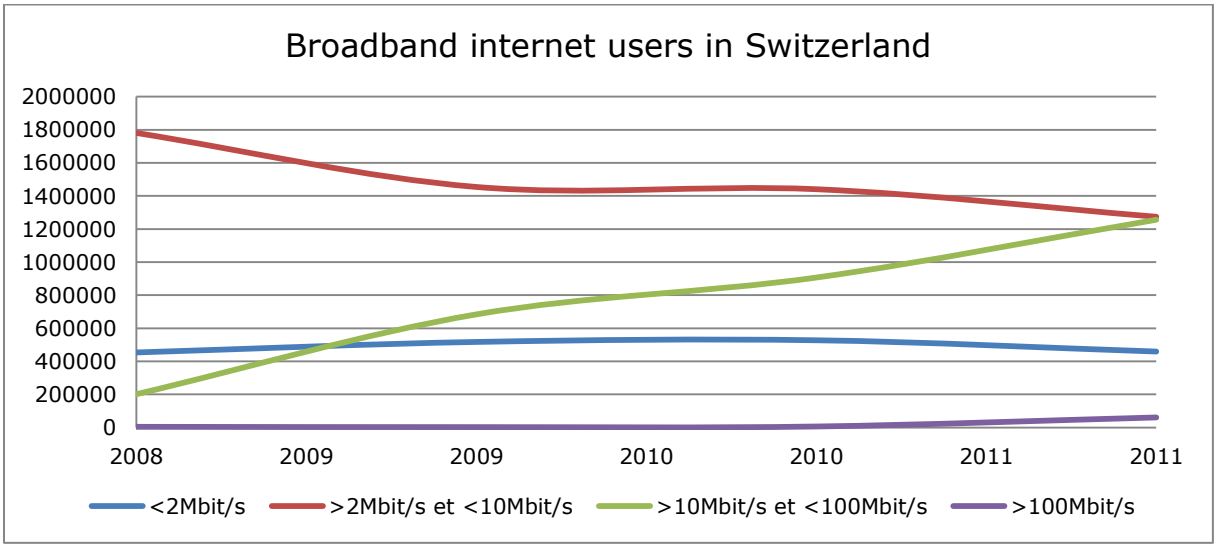

Figure 14: Broadband internet users in CH by connection, Source: BFS

3.3 Market Analysis

3.3.1 Size and growth

From 2004 to 2009 Health care costs in Switzerland showed an average annually growth rate of 3.66% (Figure 15) [35]. This trend is caused by a rising life expectancy and population growth. In particular, radiological imaging shows higher growth rates due to the technological development and associated expansion of the indication area. In 2012, the number of imaging devices in Switzerland has been as follows: 230 MRI, CT 266 and 5602 X-ray for conventional imaging [42]. The number of tests carried out with this equipment is unknown. In 2009, a cumulative number of 165.5 CT and MRI examinations per 1000 population were performed in Germany, which has a comparable healthcare system. In the same year 995 conventional X-ray examinations without mammography and 600 dental examinations were carried out. From 2004 to 2009, the quantity of MRI examinations increased annually 9.58% on an average rate and CTs by 5.91% (Figure 16) [43]. If we adapt these values to the Swiss population, it stands for about 1.300.000 CT/MRI examinations, about 8.000.000 conventional radiography without mammography and about 4.700.00 dental x-rays per year. Due to the demographic changes previously described it is expected, that the growth will continue without significant changes in the near future.

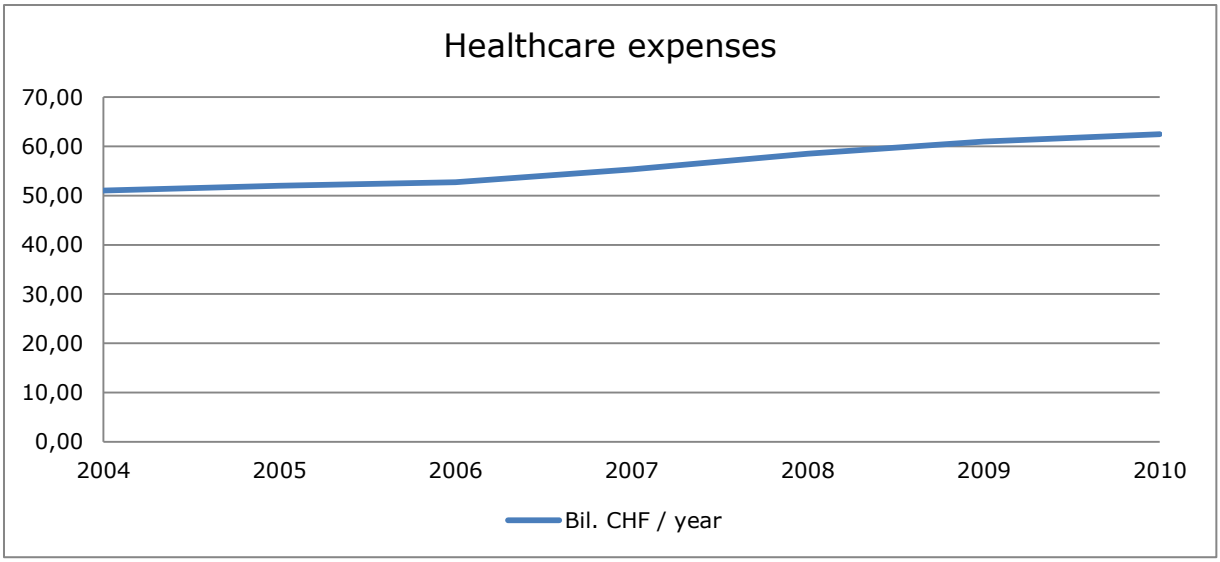

Figure 15: Annually health care expenses in Switzerland from 2004 till 2010 in billion CHF, Source: BFS

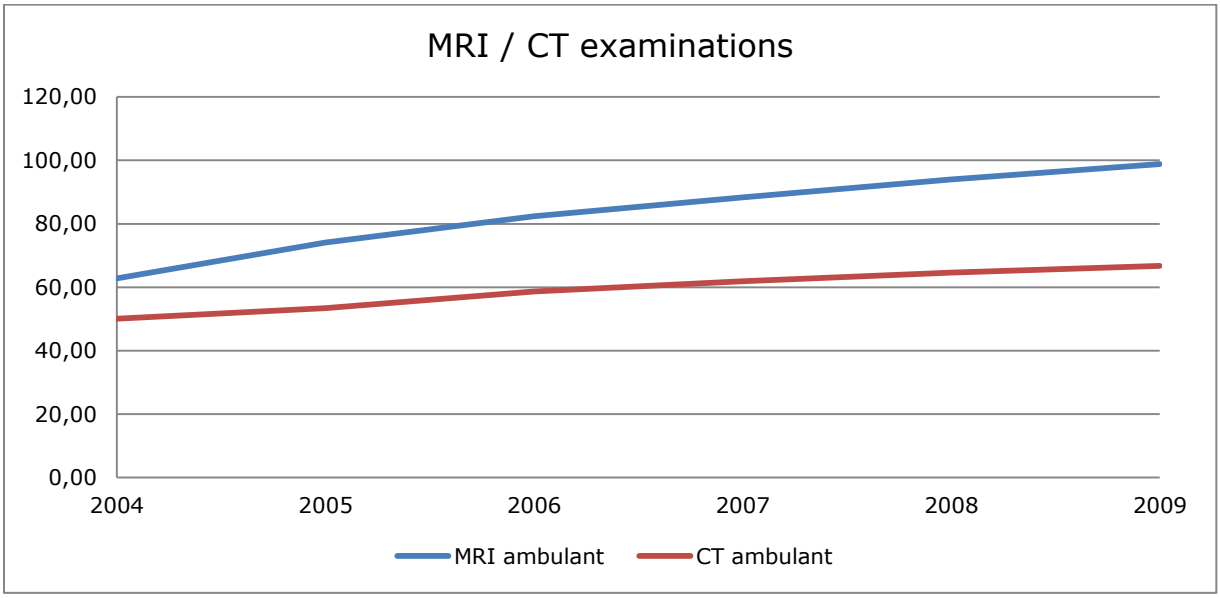

Figure 16: Annually ambulant MRI and CT examinations per 1000 person between 2004 and 2009, Source BFS

3.3.2 Competitors

Nowadays only one main direct competitor (Radiolutions AG) is on the market. It is a small company founded in 2011. It is run by Dr Adel Abdel Latif, a member of the Switzerland´s high society, his wife Simone Kromer and one secretary. On 21.07.2012 their first child Soraya was born but Simone kept on working as a secretary in the firm. Dr Adel Abdel Latif graduated in medicine (Basel) 1997 and worked afterwards for 12 years in different hospitals as a stuff radiologist. He began 08.2011 his MBA

education in Luzern (HSLU) and will graduate in 05.2013. Radiolutions AG has two main fields of activity. The first one is personnel leasing and recruiting of medical human resources. In this field, the pressure from the market is increasing. Big companies enter the Swiss market (honorararzt.ch, zedig.ch) and a severe migration of doctors from Germany takes place. In this situation Radiolutions AG will probably not be able to keep its market-share. The second field is teleradiology, where external reporting of examinations is performed. The product portfolio includes CT/MRI for 120CHF, conventional x-Ray for 55CHF and Mammography (price unknown) [44]. In March 2012, a branch in Zug (Baar) was founded, but exists only as a domicile address to create a tax saving structure. The firm owned 2011 at least 100.000 CHF, which are needed for founding an AG in Switzerland. Due to his extroverted personality (won the "Mr Schweiz" elections 1996, won kickboxing competitions, always present in media) it is conceivable, that the goal of Abdel is to demonstrate his financial potential as well. The family is still living in a small flat in Küssnacht in front of a train track, what indicates that the firm is probably not delivering enough financial earnings. The strength of this company is based on the strong network of Abdel and his local experience in the field of Radiology.

Indirect competitors are teleradiology firms from abroad, especially UK and the USA, which are already experienced and have enough financial resources. However, these competitors face entry barriers from the Swiss legislation as well as lingual problems and till today none of these firms is present on the Swiss market. Other cross-market competitors, who are currently focused on medical human resource leasing and recruiting, can increase their portfolio and entry the teleradiological segment. Especially Zedig AG has the knowledge of creating such an institution due to their medical consulting activity, the needed network of human resources and a strong financial situation. However, these firms do not have an innovative process comparable to Telebrain and the expected price strategy will be in

the range of Radiolutions AG. Therefore, it will be difficult for them to survive a direct competition with Telebrain in the future.

An important factor that has to be emphasised is that, some hospitals are creating no commercial teleradiological networks to coordinate their resources. In fact, this can lead to a lower demand, but the reporting price within these institutions will be still at the same level and the resource problems are shifted from one place to another.

3.3.3 Porter´s five forces

Threat of new entrants

+ Common technology
+ Low capital requirements
+ No need to have high capacity and output
+ Absence of strong brands
- Restricted distribution channels
- Customer loyalty
- Very high legal barriers
- Unclear legal situation

Threat of substitute products

+ The product can be substituted by the customer
+ No switching/ending costs
+ No contractual obligations
+ No investment costs
- Value added but no increasing costs
- Unique product quality
- High level of loyalty
- Personal relationship with high service level

Bargaining power of customers

+Limited number of customers
+Customers with high volume
+Low cost of switching between suppliers

+Easy to substitute product by themselves

- Small number of supplying firms
- High effort to integrate process
- No increasing costs
- Pressure from insurance companies and patients

Bargaining power of suppliers

+ Supplying new industry
+ Minimum level of cost
+ Organizational change
+ Personal legal responsibility
- Input supplied not unique
- Supplier market fragmented
- Big number of potential suppliers
- Benefits of Life-quality

Competitive rivalry

+ Low product differentiation
+ Strong buyer position
+ Usually high fixed costs
+ Low exit barriers
- Low number of competitors
- Big market with crisis independent growth
- Great level of customer loyalty
- Undeveloped market

3.4 Business model

3.4.1 Business model canvas

Key resources

- "What Key Resources do our Value Propositions require?
- Our Distribution Channels? Customer Relationships?
- Revenue Streams?" [45]

- Radiologists, licensed for the Swiss market, equipped with a reporting monitor, digital voice recorder, voice recognition system and a broadband internet connection.
- Secretaries, equipped with laptops, keyboards, headsets, and a broadband internet connection.
- Sales agents, equipped with tablet computers, advertisement material
- IT and organizational Hotline
- Online PACS system

Key activities

- "What Key Activities do our Value Propositions require?
- Our Distribution Channels?
- Customer Relationships?
- Revenue streams?" [45]

- Guarantee a connection between institutes, radiologists & secretaries
- Create oral reports of radiological examinations
- Convert oral reports into written reports
- Deliver written reports to institutes within 24h
- Find, convince, satisfy and hold key customers

Key Partners

- "Who are our Key Partners?
- Who are our key suppliers?
- Which Key Resources are we acquiring from partners?
- Which Key Activities do partners perform?" [45]

- Radiological institute partner in Switzerland:
  use its customers network,
  guarantee a minimum quantity of examinations
  have the possibility to test the system in real situation

have a local Medical Director

- Radiological stuff manager
  enter a network of radiological employees
- Radiological opinion leaders
  influence the decisions of institute heads/owners
  influence insurance companies to create specific offers for patients

Value proposition

- "What value do we deliver to the customer?
- Which one of our customer's problems are we helping to solve?
- What bundles of products and services are we offering to each Customer Segment?
- Which customer needs are we satisfying?" [45]

- Tired of managing your human resources – the virtual radiologist will work for you 24/7 and the virtual secretary will deliver a written report within 24h.
- Worried about your human resource capacities – use our service on demand without restrictions
- Uncertain about a case, nobody is perfect – use anonymously our network of highly specialized radiologists
- Confused by technical configurations – we do the setup and ensure the system will be always accessible whenever you want
- Afraid of the cost for this service – full flexibility guaranteed combined with costs comparable to your current expanses for reporting
- Reporting radiologists can work fully flexible, independent from the localization, choose the workload, define a focus on a radiological area and therefore achieve deeper knowledge of this area
- Patients receive due to the specialization of radiologists more detailed diagnoses and a report delivery system to the family doctor will be established in the future

Cost structure

- "What are the most important costs inherent in our business model?
- Which Key Resources are most expensive?
- Which Key Activities are most expensive?" [45]

- Hardware server
- Software PACS
- Radiologists creating oral report
- Equipment radiologists and secretaries
- Direct sales force
- Service try-out

Customer segments

- "For whom are we creating value?
- Who are our most important customers?" [45]

- The first group (Segment A) is created by private radiological institutes and radiological clinics in hospitals.
- The second group (Segment B) includes non-radiology physicians in private practices performing conventional x-ray examinations, dentists performing panoramic x-ray radiography and dental clinics in hospitals performing panoramic x-ray radiography examinations.
- The third group (Segment C) covers insurance companies being in competition among each other.
- All companies producing medical goods and services that are interested to gain the attention of radiological physicians are the forth group (Segment D).
- Patients, who are uncertain about their radiological diagnosis and wish to have a second reading of their radiological examination, represent the fifth group (Segment E).

Customer relationship

- "What type of relationship does each of our Customer Segments expect us to establish and maintain with them?
- Which ones have we established?
- How are they integrated with the rest of our business model?
- How costly are they?" [45]

Segment A: most important, accessed directly by a sales force agent and key account managment, attention by recommendation system and direct contact, high cost

Segment B: direct sales force, online sales, attention by postal advertisement, non-rewarded recommendation in medical networks and articles in medical magazine, middle – high cost

Segment C: accessed directly by key account managers, high cost

Segment D: phone sales, low cost

Segment E: Online sales, advertisement in patient groups and hospitals, very low cost

Channels

- "Through which Channels do our Customer Segments want to be reached?
- How are we reaching them now?
- How are our Channels integrated?
- Which ones work best?
- Which ones are most cost-efficient?
- How are we integrating them with customer routines?" [45]

- Radiological networks, which will be entered by our radiology partner
- Key persons within the radiological community
- Rewards for recommendation

Revenue streams

- "For what value are our customers really willing to pay?
- For what do they currently pay?
- How are they currently paying?
- How would they prefer to pay?
- How much does each Revenue Stream contribute to overall revenues?" [45]

- The customers pay for a finished and delivered radiological report
- The customer gets paid from the insurance company for the examination and forwards a part of this payment to Telebrain for the reporting service
- Our online database will provide customers with a real-time payment status

3.4.2 Customer service

The customers can be divided into five main groups based on the quantity of examinations performed and the revenue stream characteristics.

The first group (Segment A) is created by private radiological institutes and radiological clinics in hospitals. The service portfolio will include reporting of CT/MRI and conventional x-ray examinations. These customers represent the most important part of the portfolio and will be accessed directly by a sales force agent. The attention will be created by recommendation system within radiological physician networks. Additionally, a payback structure will be implemented, where the recommender will be rewarded. The reward will be a free reporting voucher every month with a value of 1% of the last month´s turnover of the recommended institution. To increase the acceptance of our service within the institutes, a period with a free contingent will be provided. In this period, our system will be tested and evaluated without contractual obligation. Every customer will have their after-sales agent, who will call every month and ask for feedback of the last period. Additionally, once

every 3 months he will visit the customer. Organizational questions will be clarified directly on the telephone, if this is not possible, the agent will visit the customer within 24 hours. Technical problems will be forwarded to the provider of the IT system and a call back of the customer will be organized. The IT provider will be responsible to solve all technical problems within 24 hours. The main revenue will be the charge for the radiological report. The service will be cashed up monthly for the reports delivered within the last 30 days. Usually, 4 weeks are given to proceed with the payment. When the full value is paid within 2 weeks, a 5% discount is provided and when the payment is delayed, a 10% surcharge is added.

The second group (Segment B) includes non-radiology physicians in private practices performing conventional x-ray examinations, dentists performing panoramic x-ray radiography and dental clinics in hospitals performing panoramic x-ray radiography examinations. These customers will create a lower volume of examinations, and will use our service particularly in cases of diagnostic uncertainty. The attention will be created by postal advertisement, non-rewarded recommendation in medical networks and articles in medical magazines. The relationship will be reduced to the functional level. For organizational questions, the customers will use an email contact form. If it is not possible to find a solution for the problem, an agent will call the customer within 24 hours. Emails with technical problems will be forwarded to the IT system provider, which will be responsible to solve all technical problems within 24 hours. The invoice for the service will be delivered monthly for the reports delivered within the last 30 days. If the payment is not accomplished within 30 days, a 10% surcharge is added. Additionally, it will be possible to purchase packages of 15 readings in advance with a discount rate of 10%.

The third group (Segment C) covers insurance companies being in competition among each other. Therefore, the companies are willing to create cheaper offers for customer segments which are more price-

sensitive but in return accept some restrictions in their policies. With an adequate geographical distribution of our service, it will be possible to create policies, which include an instruction to use practices with teleradiological services. In this case, a part of the revenues will be passed to the patients, which benefit directly from the lower cost of the health insurance. We, the radiological institutes and the insurance companies benefit from the increased number of customers. The insurances will be visited directly by sales agents, which have not only to sell our business idea, but also to support the companies with financial analyses. To influence decision makers at the companies, we previously need to establish a network of opinion leaders, who will support our idea.

All companies producing medical goods and services that are interested to gain the attention of radiological physicians are the forth group (Segment D). Therefore, it will be possible to participate in monthly auctions of advertisement space on our homepage. In order to prevent the visitors from advertisement overload, only one limited space will be offered. The companies will be contacted per email and per telephone.

Patients, who are uncertain about their radiological diagnosis and wish to have a second reading of their radiological examination, represent the fifth group (Segment E). Therefore, all partner institutes will be provided with written advertisement material. This material will be hand over to patients, who seem to be interested in that kind of additional service. The patients have to pay for the service directly in the institute, and 50% of the revenue is passed to our company. This cost structure should encourage our partners in informing the patients that this additional service can be provided.

3.5 Cultural Analysis

3.5.1 Hofstede´s theory

A fundamental knowledge in cultural differences was presented using the Hofstede´s cultural dimension theory. This theory describes how far the

values of the individuals within a society are influenced by the collective society´s culture and how these values relate to their behaviour.

Primarily, four different cultural dimensions were presented and included: Power distance, Individualism, Uncertainty avoidance and masculinity vs. feminity. This dimensions are explained by Hofstede as follows: "Four anthropological problem areas that different national societies handle differently: ways of coping with inequality, ways of coping with uncertainty, the relationship of the individual with her or his primary group, and the emotional implications of having been born as a girl or as a boy"[46]. Long term orientation was added as the fifth dimension, after an international study in 23 different countries was performed, using an innovative survey instrument developed with Chinese employees and managers [47]. In order to understand the national differences the dimensions have to be defined in detail.

Power Distance (PDI)

„This dimension expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The fundamental issue here is how a society handles inequalities among people. People in societies exhibiting a large degree of power distance accept a hierarchical order in which everybody has a place and which needs no further justification. In societies with low power distance, people strive to equalise the distribution of power and demand justification for inequalities of power"[47].

Individualism versus collectivism (IDV)

„The high side of this dimension, called Individualism, can be defined as a preference for a loosely-knit social framework in which individuals are expected to take care of themselves and their immediate families only. Its opposite, collectivism, represents a preference for a tightly-knit framework in society in which individuals can expect their relatives or members of a particular in-group to look after them in exchange for

unquestioning loyalty. A society's position on this dimension is reflected in whether people's self-image is defined in terms of I or we"[47].

Masculinity versus femininity (MAS)
„The masculinity side of this dimension represents a preference in society for achievement, heroism, assertiveness and material reward for success. Society at large is more competitive. Its opposite, femininity, stands for a preference for cooperation, modesty, caring for the weak and quality of life. Society at large is more consensus-oriented"[47].

Uncertainty avoidance (UAI)
„The uncertainty avoidance dimension expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is how a society deals with the fact that the future can never be known: should we try to control the future or just let it happen? Countries exhibiting strong UAI maintain rigid codes of belief and behaviour and are intolerant of unorthodox behaviour and ideas. Weak UAI societies maintain a more relaxed attitude in which practice counts more than principles"[47].

Long-term versus short-term orientation (LTO)
„The long-term orientation dimension can be interpreted as dealing with society's search for virtue. Societies with a short-term orientation generally have a strong concern with establishing the absolute Truth. They are normative in their thinking. They exhibit great respect for traditions, a relatively small propensity to save for the future, and a focus on achieving quick results. In societies with a long-term orientation, people believe that truth depends very much on situation, context and time. They show an ability to adapt traditions to changed conditions, a strong propensity to save and invest, thriftiness, and perseverance in achieving results[47]".

3.5.2 Cultural Analysis Austria vs. Switzerland

The analysis was performed using the online tool available on Hofstedes homepage. In general both countries are similar in the most dimensions

with small differences only. It seems that the geographical and cultural difference is modest (Picture 1).

The PDI score is 11 for AT vs. 34 for CH. Additionally, a difference between the German and French speaking population in Switzerland occurs (26 vs. 70). Both scores 34 and 26 represent a low power distance, where inequalities are avoided. For the individuals it means to be independent with equal rights. The hierarchies are created only for convenience and a high level of empowerment can be expected. In contrast to the results above, the French speaking community shows a distinctive power distance (score 70). Thereby an accepted hierarchical order exists, subordinates expect to be told what to do and challenges to the leadership are not well received.

The IDV score is 55 for AT vs. 68 for CH. This stands for an individualistic society, where individuals are expected to take care of themselves and their immediate families only. All decisions on hiring and promotion are based particularly on merit.

The MAS score is 79 for AT vs. 70 for CH. In masculine societies the work is extremely important and the emphasis is on competition and performance. There is a strong success orientation and if any conflicts occur, they have to be fought.

The UAI score of 70 for AT and 58 for CH shows a strong preference of avoiding uncertainty. Generally these societies are intolerant to unexpected and new behaviour. It is difficult to establish new ideas and decisions are taken only on careful analysis. Usually, there is a resistance against innovations. Individuals are motivated to work hard and punctuality is well appreciated.

The LTO score is 31 for AT vs. 40 for CH. It is a usual value for western countries and means a short term orientation. Short term oriented societies are focus on the past and present with the following values:

steadiness, respect for tradition, preservation of one's face, reciprocation and fulfilling social obligations. [47]

The Hofsted´s analysis is a powerful tool to analyse the cultural dimension. In this example a significant difference in power distance could be detected for the French speaking community. All other categories were similar to Austria. The German speaking market can be easily entered with only a low level of national adaptation and it will be the first region where the service will be established. The French speaking part of Switzerland will be covered in a second step after the firm has a satisfactory number of customers. In this step the different power distance has to be taken into consideration. The hierarchy for this department should be stronger with a clear structure. The employees will have a lower level of empowerment and will be involved in a more directive system.

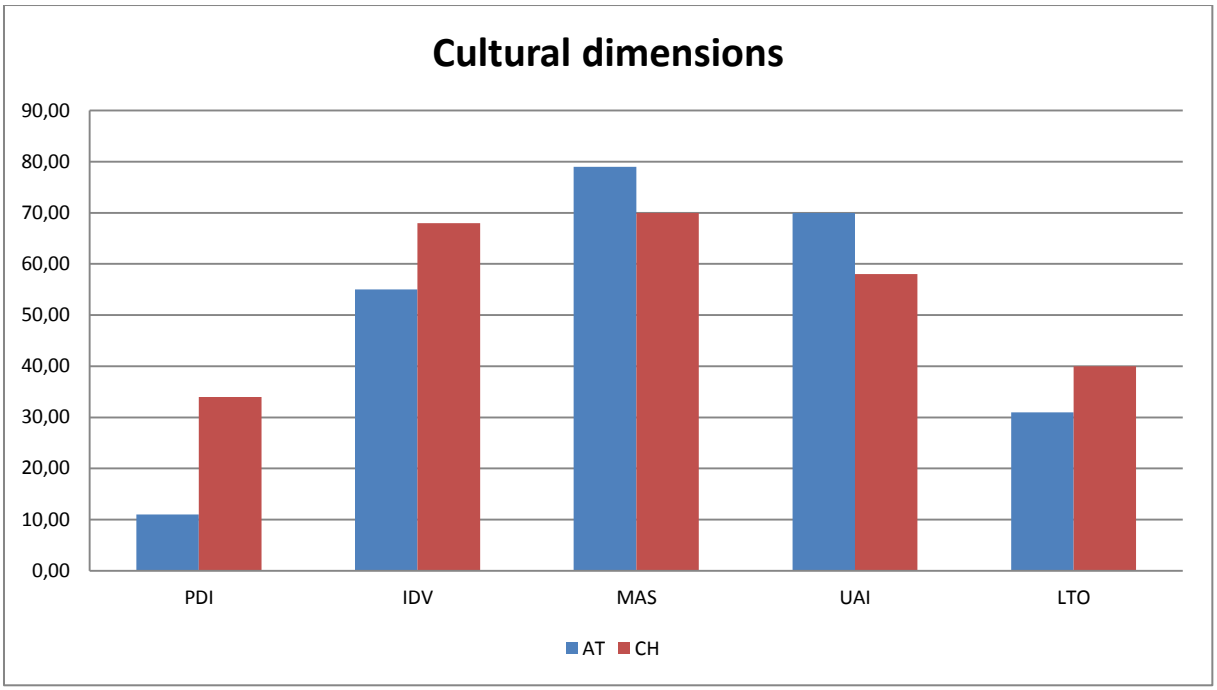

Figure 17: Hofsted´s analysis, AT vs. CH

4 Results of the excel simulation

4.1 Logic

The flow diagram below demonstrates the logic, which was implemented in the simulation. The main result is the weekly cashflow, which is generated from the five major groups of factors: Income, Fixed costs weekly, Variable costs weekly, Fixed company setup costs and Expansion set up costs. Each of the boxes stands for multiple variables and all boxes are combined by logic functions.

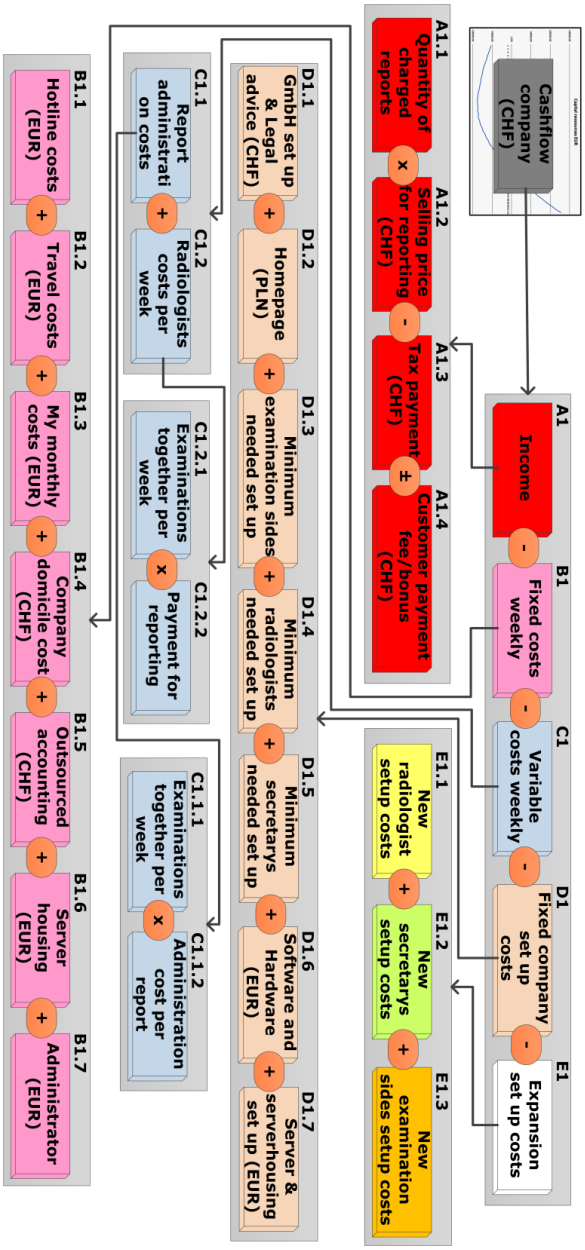

Figure 18: Logic behind the simulation

4.2 Variables

The tables below show the detailed variables, which were used inside the boxes of the simulation. Three different scenarios were created to predict different outcomes. In the first four weeks Telebrain will serve only one selected customer, which will get additionally to the try out period 10 free examinations per week. After this period we will regularly add new customers to the system. Each of these customers will get a try out period of 4 weeks with 10 free examinations as well. We estimate an average number of 25 charged examinations per week per customers, what means 5 per day. To motivate the customers to pay their bill as fast as possible, a payment strategy will be implemented. All customers, who pay within 14 days of the bill issue date, will receive a 5% discount. All customers, who do not pay within 28 days, will receive a fine of 5%. Our high quality approach will be supported by a double read strategy, and will guarantee our customers the highest level of satisfaction. After the first reading the written report and the examination will be delivered to a second radiologist for validation. All variables are presented in the tables below, and these particular values were set for the simulation of the first case.

NUMBER OF EXAMINATIONS	This number is variable and will be simulated in 3 scenarios
Simulation1 - Recrutation rate: weeks/examination side	
4,0	Quantity of weeks needed to find a new customer
Simulation2 - Recrutation rate: weeks/examination side	
6,0	Quantity of weeks needed to find a new customer
Simulation3 - Recrutation rate: weeks/examination side	
8,0	Quantity of weeks needed to find a new customer
Examinations charged per week per side	
25	Estimated number of paid examinations per week per customer
Additional test with 1st partner weeks	
4	Additional trial period with the first customer to check the equipment and adjust the workflow
Examinations for free per week test with 1st partner	
10	Quantity of free of charge examinations for the first partner in the trial period
Test period with all other partners weeks	
4	Duration of the free try out period for every customer
Quantity of examinations test with all other partners	
10	Quantity of free of charge examinations in the free try out period

Table 3: Simulation variables, Number of exams

INCOME	
Selling price for reporting CHF	
120,00	The price for the customer without tax, which has to be paid for the service

Table 4: Simulation variables, Income

TAX CALCULATION Kanton ZUG, Gemeinde BAAR	Calculation of the tax rate for CH, Zug, Baar
Corporate tax from net profit up to 100k effective (%)	
12,892	The effective tax rate for income under 100k CHF
Corporate tax net profit above 100k effective (%)	
17,283	The effective tax rate for income above 100k CHF
Capital tax exxective (%)	
0,732	The effective tax rate for capital

Table 5: Simulation variables, Tax

CUSTOMER PAYMENT STRATEGY	Strategy to motivate the customers to pay their bill as fast as possible
Payment <14 days %	
10	Estimated number of customers, which will pay within 14 days to recive a discount
Payment <14 days discount in %	
5	Discount percentage for customers, which paid within 14 days
Payment >28 days %	
10	Estimated number of customers, which will pay later than 28 days and will recive an additional fee
Payment >28 dalay fee %	
5	Fee percentage for customers which pay later than 28 days

Table 6: Simulation variables, Payment

VARIABLE COSTS	This cost occur only if a customer requests the service, the second reading is a marketing strategy to guarantee high quality and will be done by a second radiologist
Payment for 1st reading secretary	
3,00	Amount which will receive the secretary for typing the oral report for the radiologist
Payment for 1st reading radiologist	
20,00	Amount which will receive the radiologist for analysing the examination and dictating the report
Payment for 2nd reading secretary	
1,50	Amount which will receive the secretary for editing the first version of the report
Payment for 2nd reading radiologist	
10,00	Amount which will receive the radiologist for editing the first version of the report

Table 7: Simulation variables, Variable costs

FIXED WEEKLY COSTS	Fixed cost per week
Server housing (EUR)	
50,00	Cost for using a server housing service
Administrator (EUR)	
100,00	Cost for employing a administrator
My personnel costs (EUR)	
400,00	Accommodation and lodging cost in CH
Travel expenses (EUR)	
250,00	Cost for traveling between AT/CH and inside CH
Accounting (CHF)	
50,00	Cost for an accounting service
Company domicile costs (CHF)	
20,00	Costs for a domicile in Zug
Hotline costs (EUR)	
50,00	Costs for a hotline service
FIXED COSTS WEEKLY TOGETHER (CHF) 1109,12	

Table 8: Simulation variables, Fixed costs

EXPENSION COSTS	Costs which occur, when new customers are added
Registrations costs of radiologists (CHF)	
1200,00	Cost of radiologist certification for the Swiss market
Equipment costs radiologist (EUR)	
4000,00	Cost of equipment for a new radiologist, including a notebook, monitor certified for radiological diagnosis, voice recorder
Equipment costs secretary (EUR)	
500,00	Cost of equipment for a new secretary, including a notebook and audio system
Examination side setup (CHF)	
500,00	Cost of adding a new customer into the software architecture
Reports per radiologist per week	
50,00	Number of reports, that can be created per one single radiologist per week
Reports per secretary per week	
100,00	Number of reports, that can be created per one single secretary per week
Quantity of radiologist beginning	
3,00	Is the lowest number of radiologist to guarantee service
Quantity of secretaries beginning	
2,00	Is the lowest number of secretaries to guarantee service
Quantity examination sides beginning	
1,00	Is the number of customers at the beginning

Table 9: Simulation variables, Expansion costs

FIXED ASSETS SET UP	
Homepage (PLN)	
2500,00	Homepage creation costs in Poland
Software costs (EUR)	
30000,00	Software cost for reporting and distribution software
Hardware costs (EUR)	
10000,00	Redundant double server system
Server set up (EUR)	
1000,00	Admin costs for server set up
Server housing set up (EUR)	
200,00	Cost for housing set up in server room
FIXED ASSETS SET UP TOGETHER (CHF)	
51103,78	

Table 10: Simulation variables, Fixed assets

OTHER FIXED COSTS SET UP	
Company set up (CHF)	
1500,00	Administration cost for setting up a GMBH in CH
Legal advice (CHF)	
2000,00	Cost for legal advice for company set up
OTHER FIXED COSTS SET UP (CHF)	
3500,00	

Table 11: Simulation variables, Other fixed

Additional settings	
Exchange rate CHF EUR	
0,818	The actual exchange rate CHF/EUR
Exchange rate CHF PLN	
3,392	The actual exchange rate CHF/PLN
Capital invested	
150000	The estimated capital, before
Market size 2012	
1528000	Quantity of performed MRI/CT examinations in CH in the year 2012
Available market 2012	
611200	Part of the market, which can be theoretically served
Market growth rate annually	
5	Estimated future market growth rate, calculated from the average growth rate of the last five years

Table 12: Simulation variables, Additional settings

4.3 Structure of the simulations

The structure of the simulation is presented in table 1 below. Three different business cases were simulated using different settings, which cover important decisions of the start-up company. These settings include: 1) Low exchange rate from 2007 vs. high exchange rate from 2013, which shows the stability of the project to external macro economical impulses 2) high selling price vs. low selling price, analyses the possible price strategies, where the high selling price is set to the level of the competition and the low price is approximately 30% under this level. Every case was simulated using the scenario technique, with a best case in Scenario 1, most probable case in Scenario 2 and the worst case in Scenario 3.

Case	Scenario	Low number of customers	Middle number of customers	High number of customers	Low CHFEUR exchange rate (2007)	High CHFEUR exchange rate (2013)	Low selling price (30% under competition)	High selling price (= competition)
Case 1	Scenario 1			X		X		X
	Scenario 2		X			X		X
	Scenario 3	X				X		X
Case 2	Scenario 1			X		X	X	
	Scenario 2		X			X	X	
	Scenario 3	X				X	X	
Case 3	Scenario 1			X	X			X
	Scenario 2		X		X			X
	Scenario 3	X			X			X

Table 13: Setting of the cases and scenarios

4.4 Cases

4.4.1 Examinations

Through all cases the number of performed examinations remained constant. In the first scenario, we estimate that we will need 4 weeks to find a new customer, for the second scenario 6 weeks and for the third 8 weeks. The average number of examinations performed per customer will be 25. In the first scenario, the cumulative number of performed

examinations per month will reach 1140 after 12 months, 2340 after 24 months and 3590 after three years (Fig. 19), in the second scenario 820, 1640, 2450 (Fig. 20) and in the third 640, 1270, 1890 (Fig. 21) respectively.

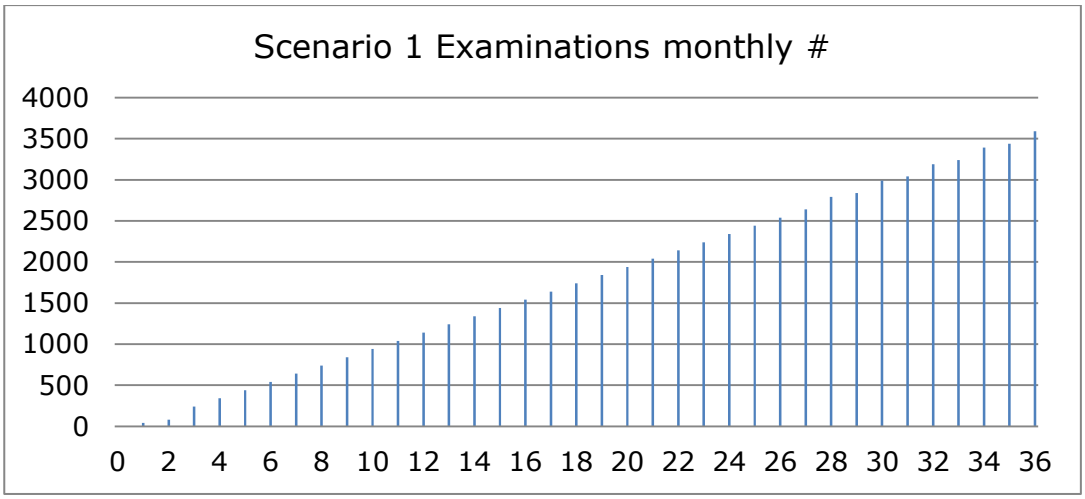

Figure 19: All cases, Scenario 1, Performed examinations

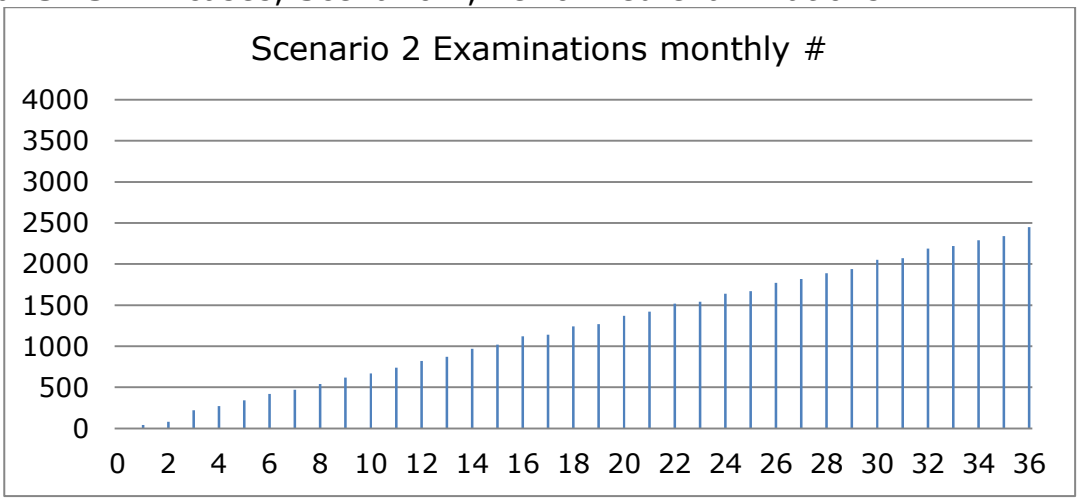

Figure 20: All cases, Scenario 2, Performed examinations

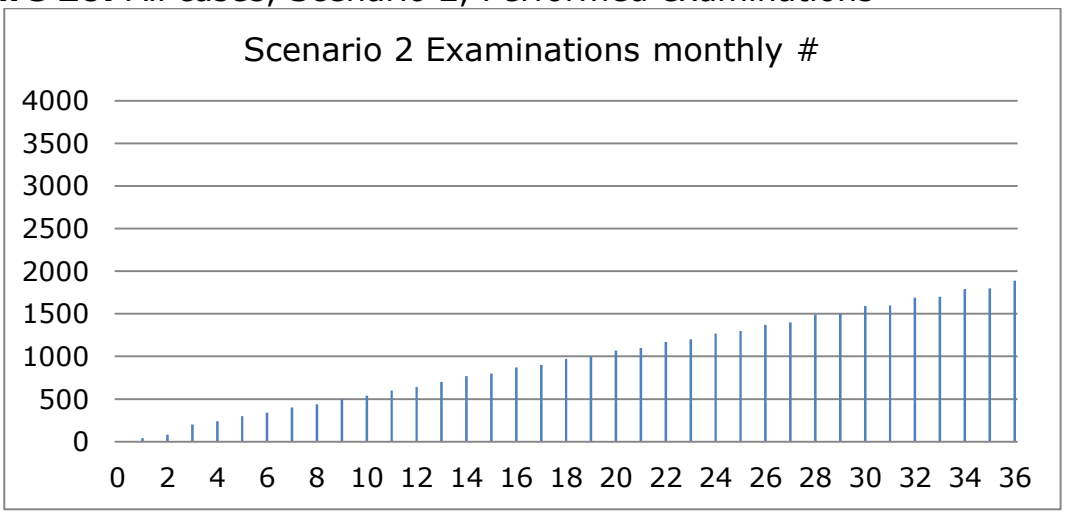

Figure 21: All cases, Scenario 3, Performed examinations

4.4.2 Market share

The number of performed examinations was combined with the market size and the estimated market growth rate. The market share was 0.58% after 12 months, 1.14% after 24 months and 1.69% after three years (Fig. 22), in the second scenario 0.43%, 0.8%, 1.16% (Fig. 23) and in the third 0.33%, 0.61%, 0.9% (Fig. 24) respectively.

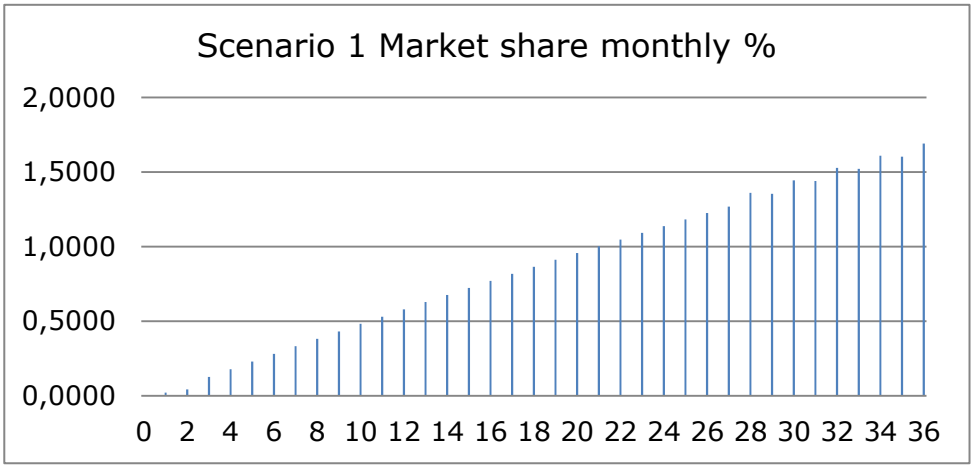

Figure 22: All cases, Scenario 1, Performed examinations

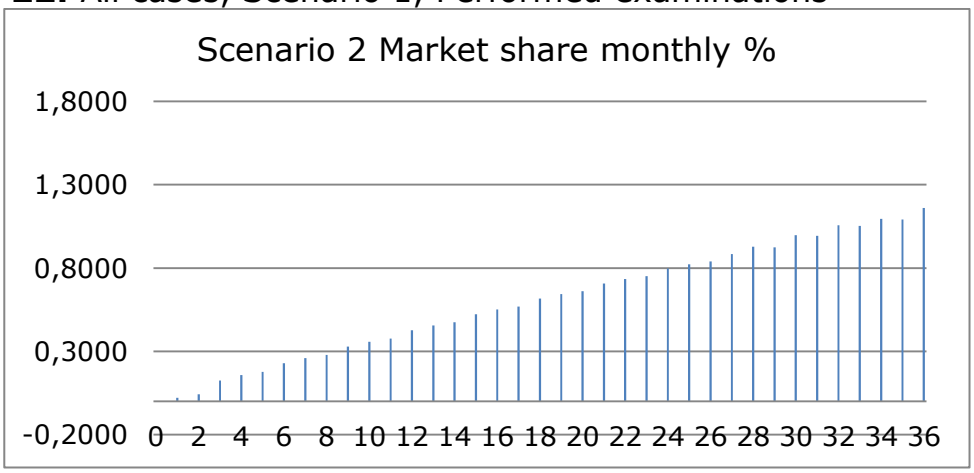

Figure 23: All cases, Scenario 2, Performed examinations

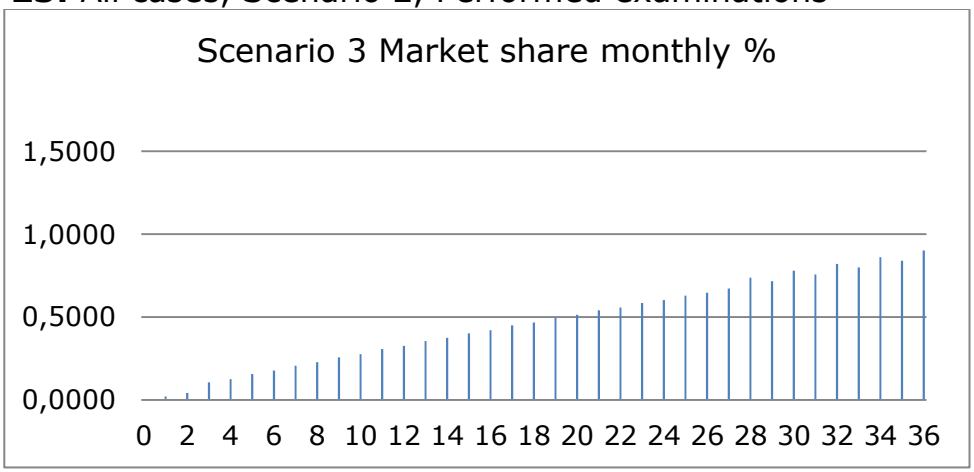

Figure 24: All cases, Scenario 3, Performed examinations

4.4.3 Case number 1

This is the best scenario for the company with a high selling price of 120 CHF, high CHFEUR exchange rate of 0.818 and a high number of customers. The WACC was calculated to be 6.93%, for three years the MVA 4338330.20 SFR, NPV of 3917234.96 and an IRR of 694%.

WACC	
risk free rate – rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	450676,51	1869608,63	3272927,39
Adjusted Taxes	80109,08	308817,31	533981,00
NOPLAT	370567,43	1560791,32	2738946,38
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	247,04%	1040,53%	1825,96%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	360167,93	1550391,82	2728546,88

Market Value Added (MVA)	
MVA	4338330,20

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	4488330,20
Non-operating Assets	0,00
CV = EV+Non-operating Assets	4488330,20

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	4488330,20

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-79032,68	391140,21	1537067,91	2698883,76
NPV anually	-79032,68	365780,64	1344217,52	2207236,79
NPV	3917234,96			
IRR	694%			

Table 14: Case 1, Scenario 1, financial details

In the second scenario the recruitment time of new customers was increased. The decreased number of performed exams caused a decrease of the MVA to 2929059.01 SFR, the NPV to 2674479.92 and a decrease of the IRR to 530%.

WACC	
risk free rate - rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	312016,13	1265728,14	2212081,17
Adjusted Taxes	56329,75	208758,64	361407,89
NOPLAT	255686,39	1056969,49	1850673,29
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	170,46%	704,65%	1233,78%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	245286,89	1046569,99	1840273,79

Market Value Added (MVA)	
MVA	2929059,01

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	3079059,01
Non-operating Assets	0,00
CV = EV+Non-operating Assets	3079059,01

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	3079059,01

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-79032,68	285220,99	1047721,03	1823701,90
NPV anually	-79032,68	266728,69	916267,24	1491484,00
NPV	2674479,92			
IRR	530%			

Table 15: Case 1, Scenario 2, financial details

In the worst case analysis the number of performed examinations is the lowest out of the three scenarios. The MVA is lower than in other scenarios and is 2230994.18 SFR and the NPV is 2060609.51. The IRR is significantly positive with 444%.

WACC	
risk free rate - rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	242446,17	972618,51	1678189,66
Adjusted Taxes	42175,13	160051,28	274160,45
NOPLAT	200271,05	812567,24	1404029,22
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	133,51%	541,71%	936,02%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	189871,55	802167,74	1393629,72

Market Value Added (MVA)	
MVA	2230994,18

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	2380994,18
Non-operating Assets	0,00
CV = EV+Non-operating Assets	2380994,18

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	2380994,18

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-79032,68	234516,95	806846,27	1388649,02
NPV anually	-79032,68	219312,05	705614,17	1135683,30
NPV	2060609,51			
IRR	444%			

Table 16: Case 1, Scenario 3, financial details

In all three scenarios the monthly cash flow becomes positive within three months. In scenario 1, the flow reaches a level of 211901 after 36 months, in scenario 2: 142337 and in scenario 3: 103959 after the same period of time.

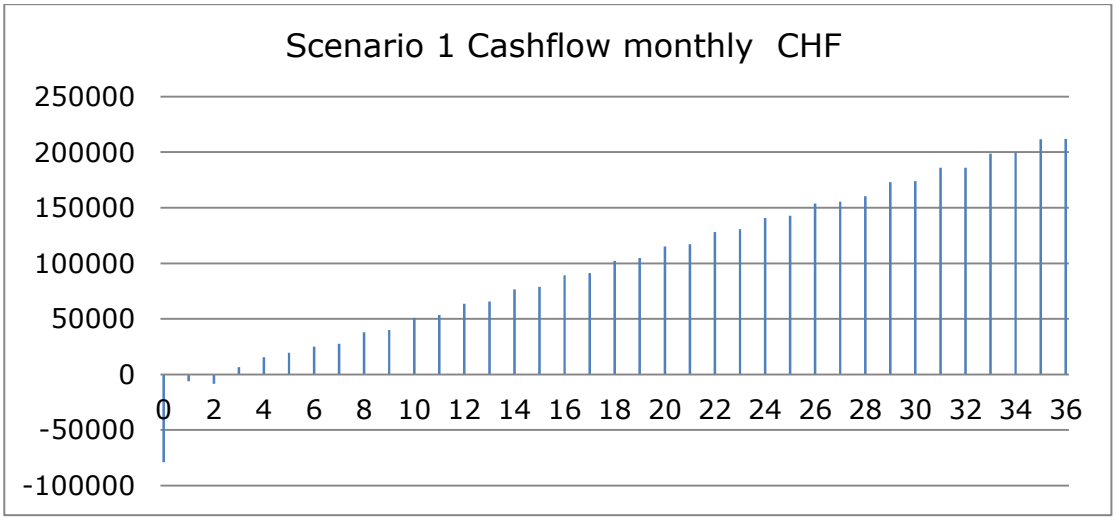

Figure 25: Case 1 Scenario 1 Cash Flow

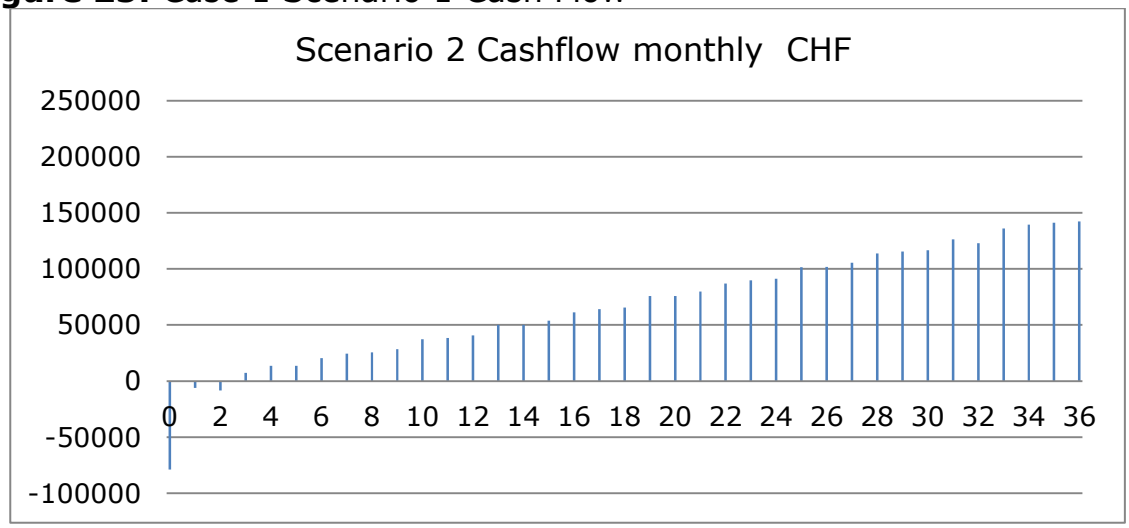

Figure 26: Case 1 Scenario 2 Cash Flow

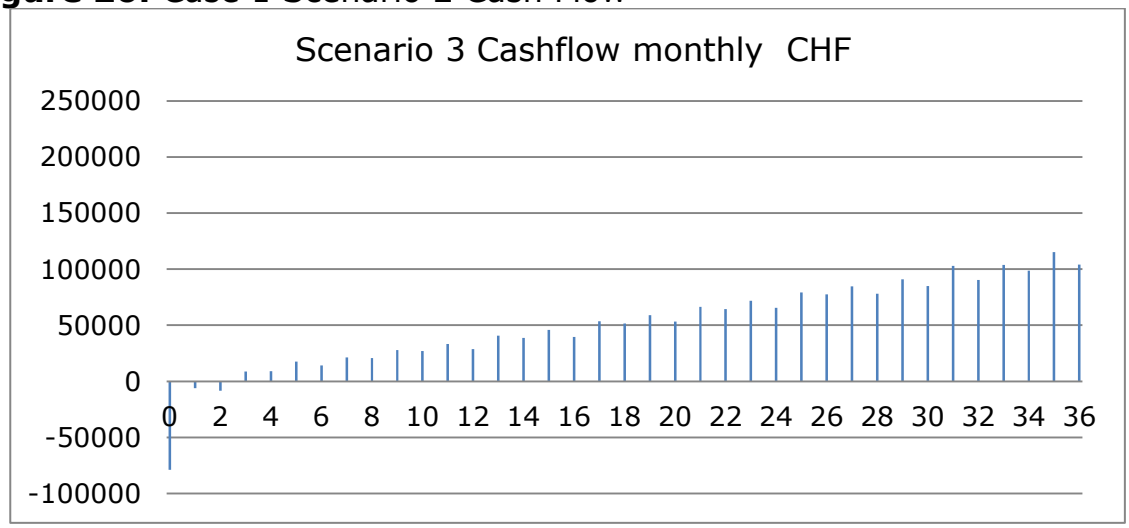

Figure 27: Case 1 Scenario 3 Cash Flow

In all three scenarios the firm's liquidity remains positive. In scenario 1, the liquidity is 3790188 after 36 months, in scenario 2: 2613266 and in scenario 3: 2025537 after the same period of time.

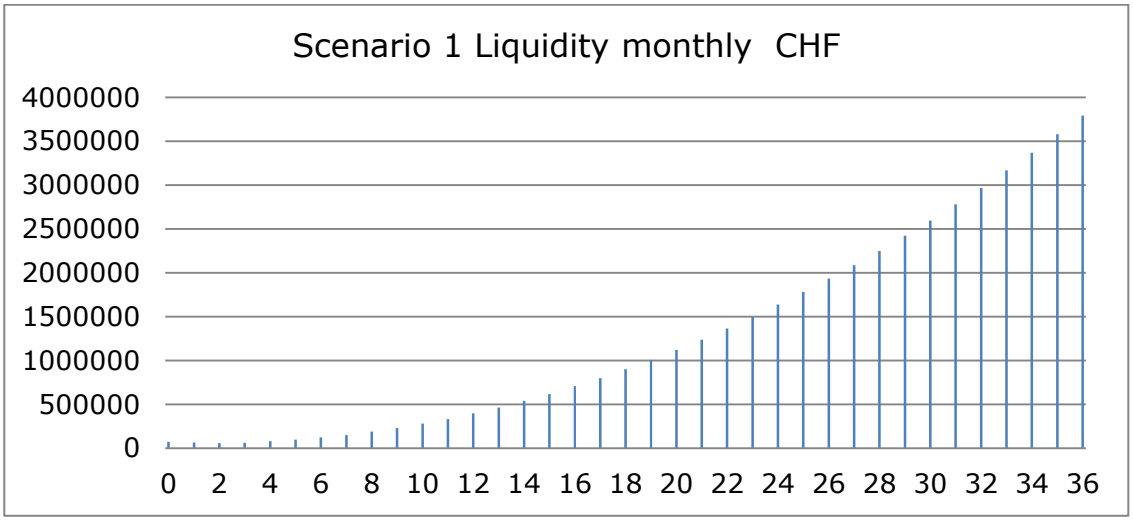

Figure 28: Case 1 Scenario 1 Liquidity

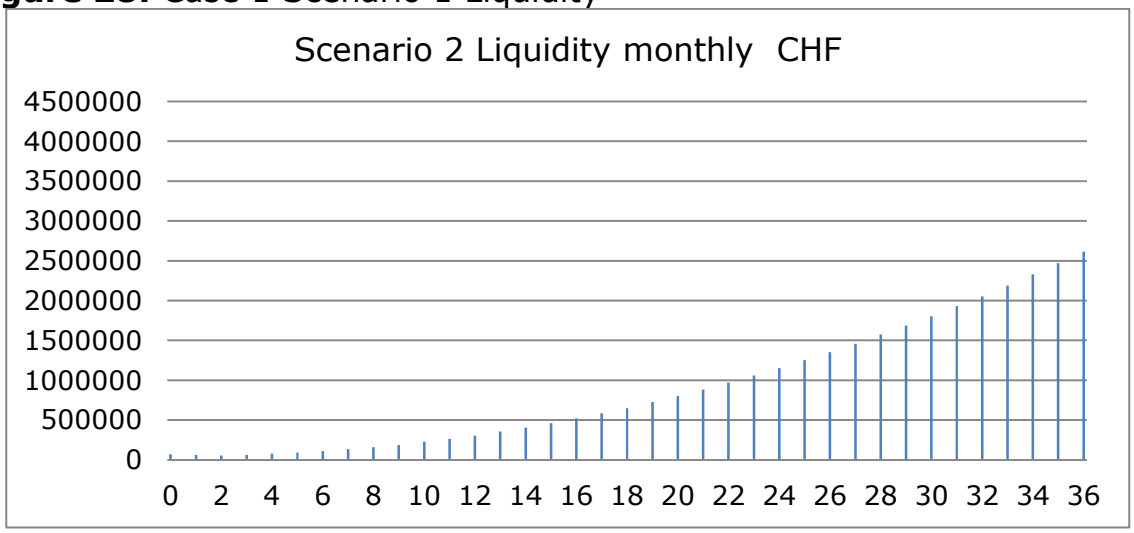

Figure 29: Case 1 Scenario 2 Liquidity

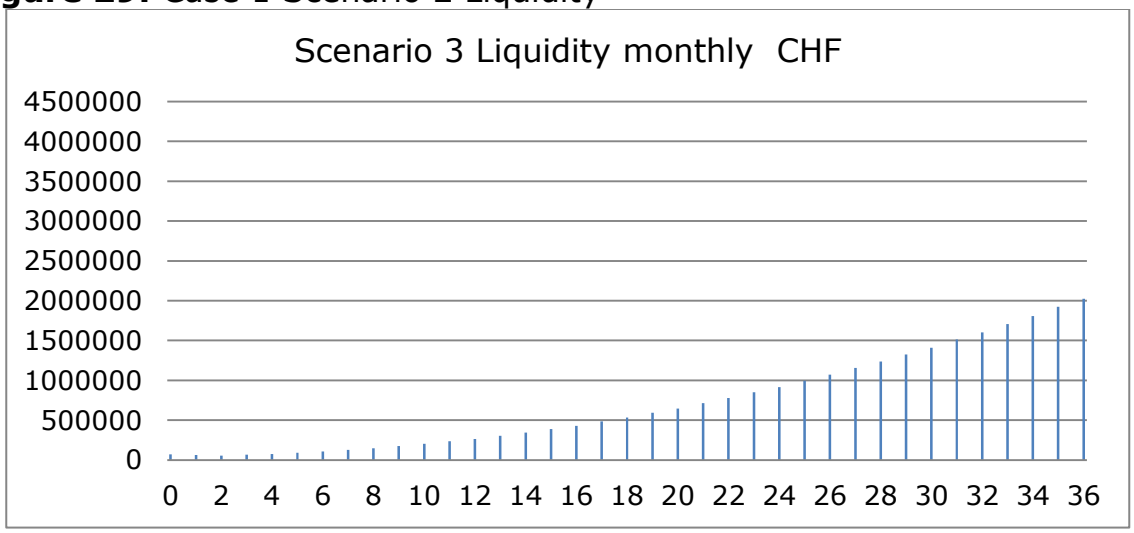

Figure 30: Case 1 Scenario 3 Liquidity

4.4.4 Case number 2

This is the best scenario with a low selling price of 80 CHF, high CHFEUR exchange rate of 0.818 and a high number of customers. WACC remains at the same level; the MVA is 1924687.81.20 SFR, NPV 1749671.44 and IRR 350%.

WACC	
risk free rate - rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	147716,51	839488,63	1514807,39
Adjusted Taxes	26352,96	139002,76	247331,88
NOPLAT	121363,55	700485,87	1267475,50
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	80,91%	466,99%	844,98%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	110964,05	690086,37	1257076,00

Market Value Added (MVA)	
MVA	1924687,81

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	2074687,81
Non-operating Assets	0,00
CV = EV+Non-operating Assets	2074687,81

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	2074687,81

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-79032,68	141936,33	684985,81	1244623,51
NPV anually	-79032,68	132733,89	599043,11	1017894,45
NPV	1749671,44			
IRR	350%			

Table 17: Case 2, Scenario 1, financial details

In the second scenario the number of customers decreased. The lower number of customers caused a decrease of the MVA to 1263631.69 SFR and a decrease of the IRR to 268%. The NPV is 1178679.52

WACC	
risk free rate - rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	87586,13	551508,14	1012071,17
Adjusted Taxes	11845,43	91158,43	165723,81
NOPLAT	75740,70	460349,71	846347,36
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	50,49%	306,90%	564,23%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	65341,20	449950,21	835947,86

Market Value Added (MVA)	
MVA	1263631,69

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	1413631,69
Non-operating Assets	0,00
CV = EV+Non-operating Assets	1413631,69

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	1413631,69

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-79032,68	105275,30	457998,27	831092,27
NPV anually	-79032,68	98449,78	400534,87	679694,87
NPV	1178679,52			
IRR	268%			

Table 18: Case 2, Scenario 2, financial details

In the third scenario with the lowest number of customers the MVA decreased to a level of 932833.46 and the IRR to 220%. The NPV dropped to a level of 893369.89, but is still positive.

WACC	
risk free rate - rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	57386,17	415558,51	757129,66
Adjusted Taxes	8870,07	68540,08	123958,90
NOPLAT	48516,10	347018,43	633170,77
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	32,34%	231,35%	422,11%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	38116,60	336618,93	622771,27

Market Value Added (MVA)	
MVA	932833,46

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	1082833,46
Non-operating Assets	0,00
CV = EV+Non-operating Assets	1082833,46

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	1082833,46

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-79032,68	82762,01	346898,07	626777,84
NPV anually	-79032,68	77396,13	303374,02	512599,74
NPV	893369,89			
IRR	220%			

Table 19: Case 2, Scenario 3, financial details

In all three scenarios the monthly cash flow becomes positive within three months. In scenario 1 the flow reaches a level of 96445 after 36 months, in scenario 2: 63316 and in scenario 3: 44403 after the same period of time.

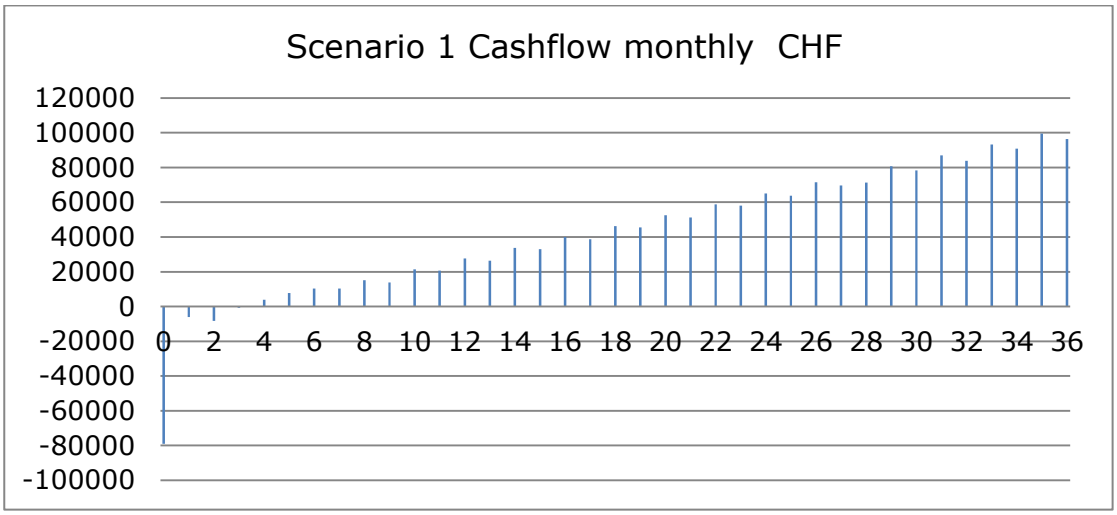

Figure 31: Case 2 Scenario 1 Cash Flow

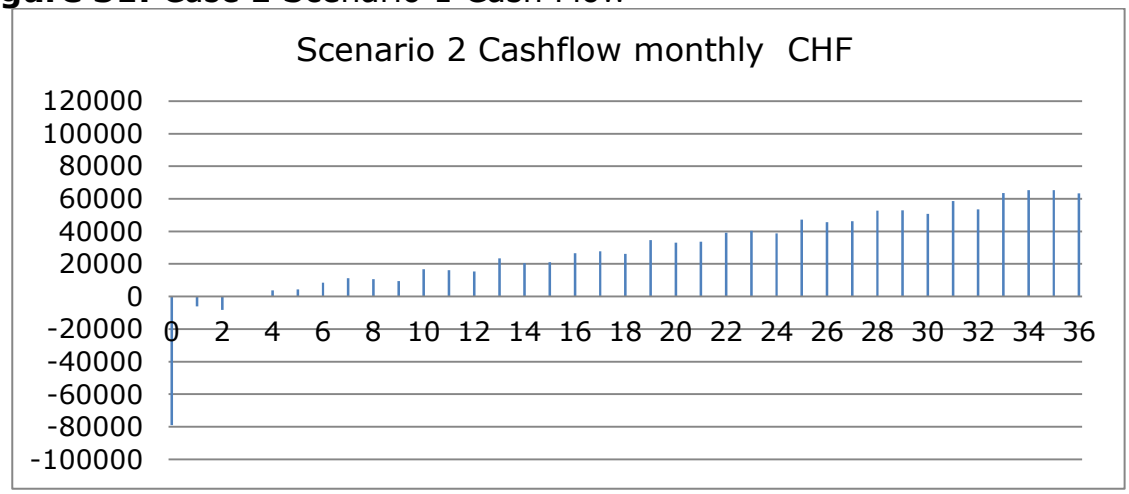

Figure 32: Case 2 Scenario 2 Cash Flow

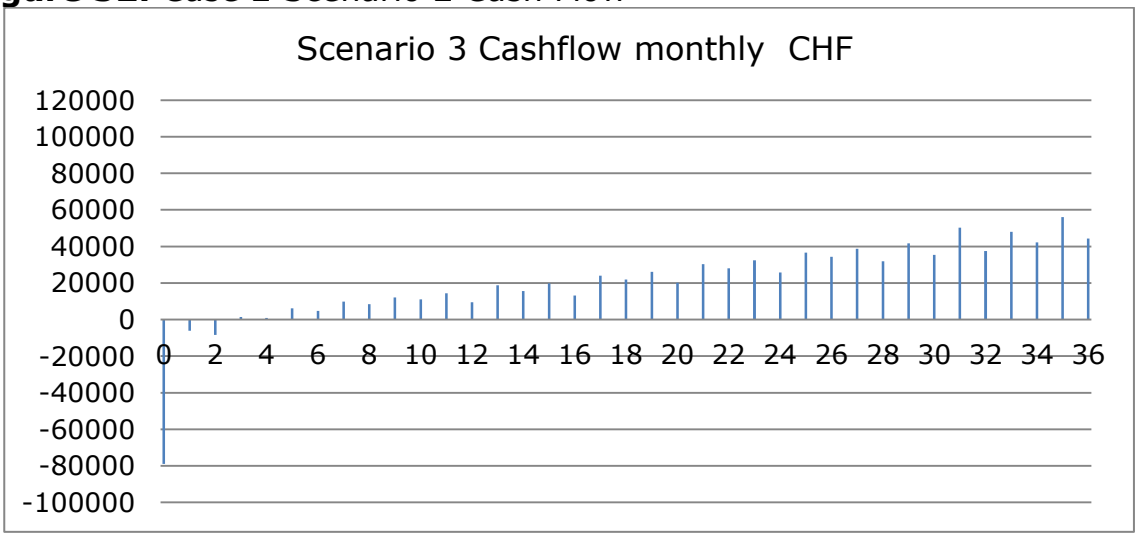

Figure 33: Case 2 Scenario 3 Cash Flow

In all three scenarios the firm's liquidity remains positive. In scenario 1, the liquidity is 1722580 after 36 months, in scenario 2: 1183065 and in scenario 3: 908163 after the same period of time.

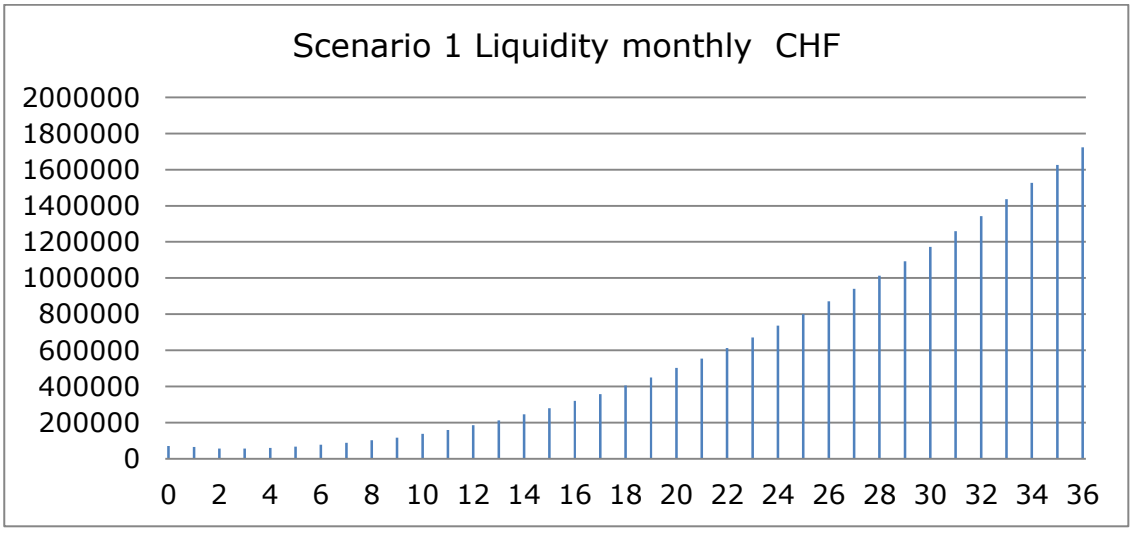

Figure 34: Case 2 Scenario 1 Liquidity

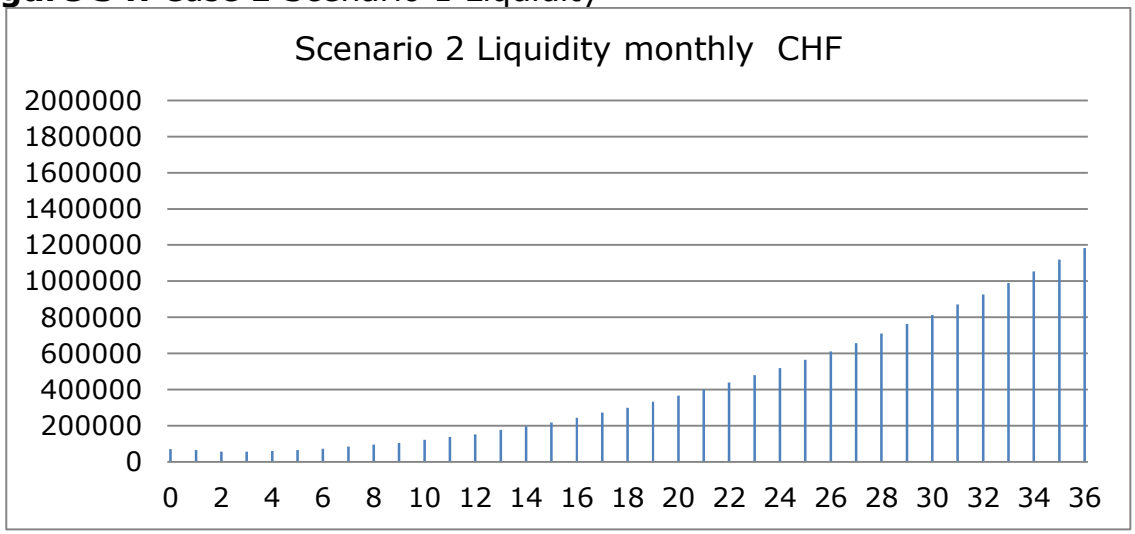

Figure 35: Case 2 Scenario 2 Liquidity

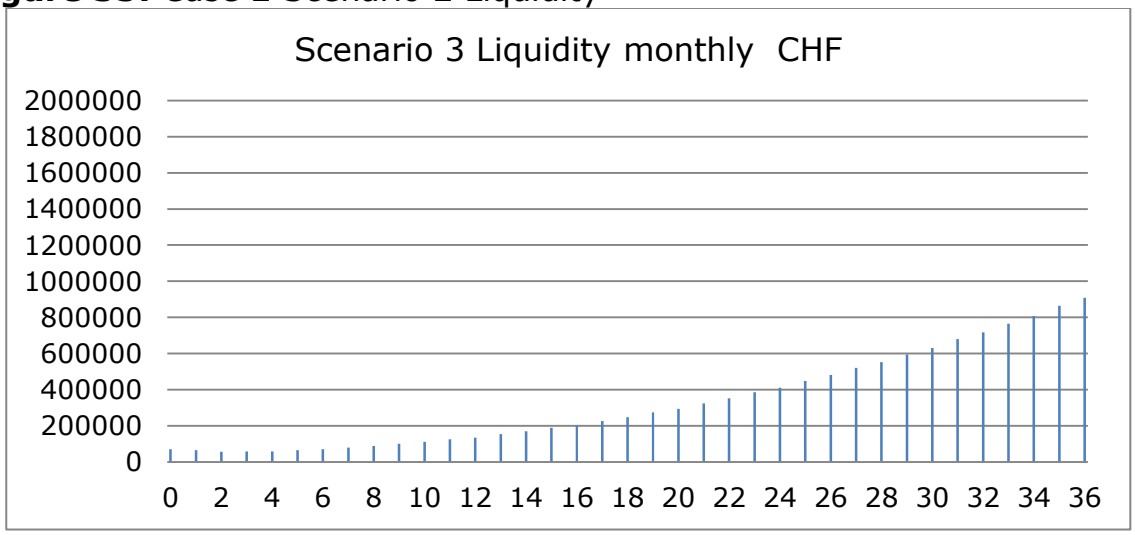

Figure 36: Case2 Scenario 3 Liquidity

4.4.5 Case number 3

This is the best scenario for the company with a high selling price of 120 CHF, low CHFEUR exchange rate of 0.594 and a high number of customers. For three years the MVA was 3272568.83 SFR, the IRR 426% and the NPV 2955935.04.

WACC	
risk free rate - rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	286313,11	1416318,08	2525027,72
Adjusted Taxes	50557,51	234330,52	412116,35
NOPLAT	235755,60	1181987,56	2112911,36
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	157,17%	787,99%	1408,61%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	225356,10	1171588,06	2102511,86

Market Value Added (MVA)	
MVA	3272568,83

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	3422568,83
Non-operating Assets	0,00
CV = EV+Non-operating Assets	3422568,83

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	3422568,83

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-105603,05	261006,59	1158515,95	2077061,25
NPV anually	-105603,05	244084,23	1013161,12	1698689,69
NPV	2955935,04			
IRR	426%			

Table 20: Case 3, Scenario 1, financial details

In the second scenario the recruitment time of new customers was increased. The decreased number of performed exams caused a decrease of the MVA to 2168711.75, the NPV to 1994120.34 and a decrease of the IRR to 324%.

WACC	
risk free rate - rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	182567,51	940324,20	1694010,90
Adjusted Taxes	34187,94	155336,22	277111,42
NOPLAT	148379,58	784987,98	1416899,48
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	98,92%	523,33%	944,60%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	137980,08	774588,48	1406499,98

Market Value Added (MVA)	
MVA	2168711,75

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	2318711,75
Non-operating Assets	0,00
CV = EV+Non-operating Assets	2318711,75

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	2318711,75

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-105603,05	185974,00	778787,87	1392860,76
NPV anually	-105603,05	173916,38	681076,16	1139127,80
NPV	1994120,34			
IRR	324%			

Table 21: Case 3, Scenario 2, financial details

In the third scenario with the lowest number of customers the MVA decreased to a level of 1623373.64 and the IRR to 269%. The NPV dropped to a level of 1521432.17, but is still positive.

WACC	
risk free rate - rf	2,70%
market risk premium - (rm - rf)	5,10%
beta (raw beta)	0,83
Cost of Equity - r(equity)	6,93%
Cost of Debt - r(debt)	4,50%
Debt (including minority interest)	0,00
Equity	150000,00
Total Assets	150000,00
Tax rate	17,28%
Debt ratio = (D/V)	0,00%
Equity ratio = (E/V)	100,00%
WACC = E/V x r(equity) + D/V x r(debt) x (1-TAX)	6,93%

ROIC weeks	0-52	53-104	105-156
EBIT (m)	130483,33	713237,24	1272965,00
Adjusted Taxes	23750,99	117561,06	208252,89
NOPLAT	106732,35	595676,18	1064712,11
Capital Invested	150000,00	150000,00	150000,00
ROIC = NOPLAT/Capital Invested	71,15%	397,12%	709,81%

EVA weeks	0-52	53-104	105-156
EVA = (ROIC-WACC) x Capital Invested	96332,85	585276,68	1054312,61

Market Value Added (MVA)	
MVA	1623373,64

Company Value (CV)	
Enterprise Value = MVA+Capital Invested	1773373,64
Non-operating Assets	0,00
CV = EV+Non-operating Assets	1773373,64

Shareholders Value (SHV)	
Total liabilities	0,00
Minority Interests	0,00
Adjusted Liabilities	0,00
SHV = CV-Adjusted Liabilities	1773373,64

Internal rate of return (IRR)	0	1-52	53-104	105-156
CASHFLOW Incremental	-105603,05	150815,82	593119,64	1053627,34
NPV anually	-105603,05	141037,68	518703,05	861691,44
NPV	1521432,17			
IRR	269%			

Table 22: Case 3, Scenario 3, financial details

In all three scenarios the monthly cash flow becomes positive within three months. In scenario 1, the flow reaches a level of 161405 after 36 months, in scenario 2: 106846 and in scenario 3: 76012 after the same period of time.

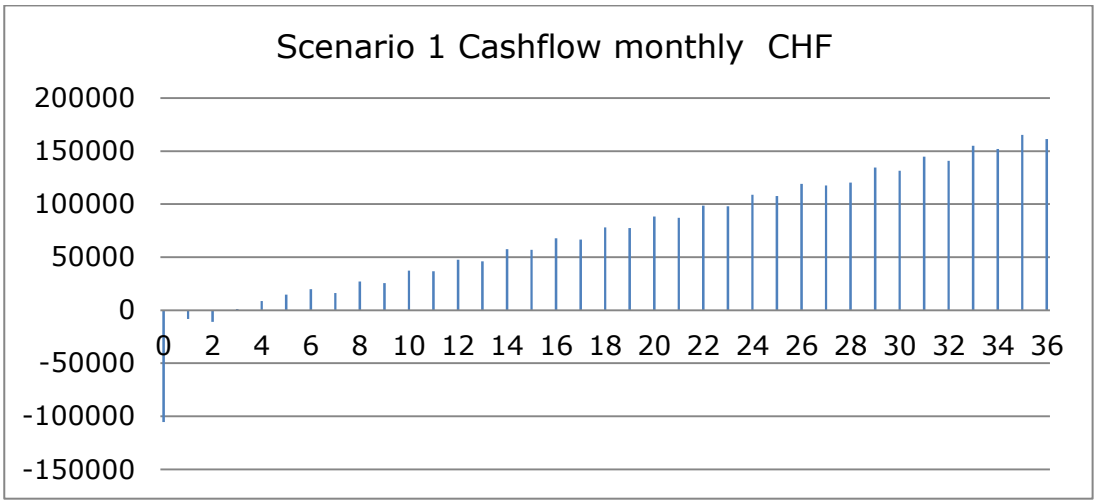

Figure 37: Case 3 Scenario 1 Cash Flow

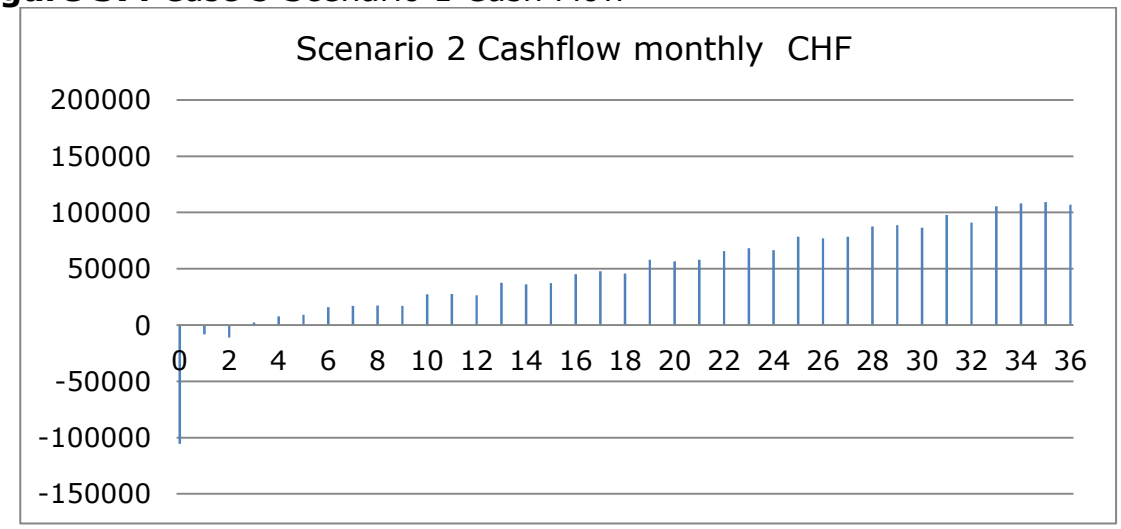

Figure 38: Case 3 Scenario 2 Cash Flow

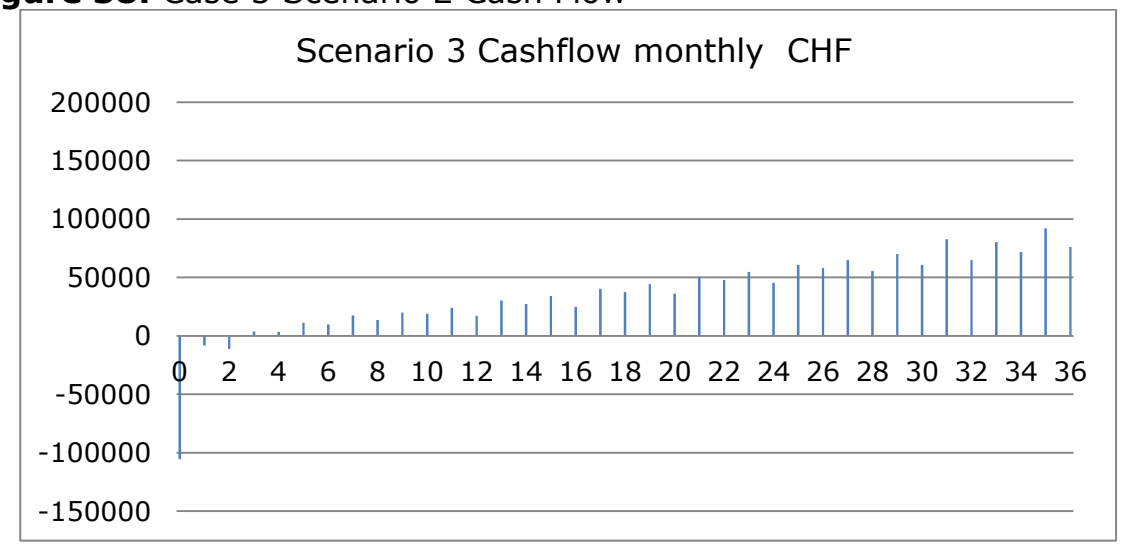

Figure 39: Case 3 Scenario 3 Cash Flow

In all three scenarios the firm's liquidity remains positive. In scenario 1 the liquidity is 2840921 after 36 months, in scenario 2: 1931319 and in scenario 3: 1477334 after the same period of time.

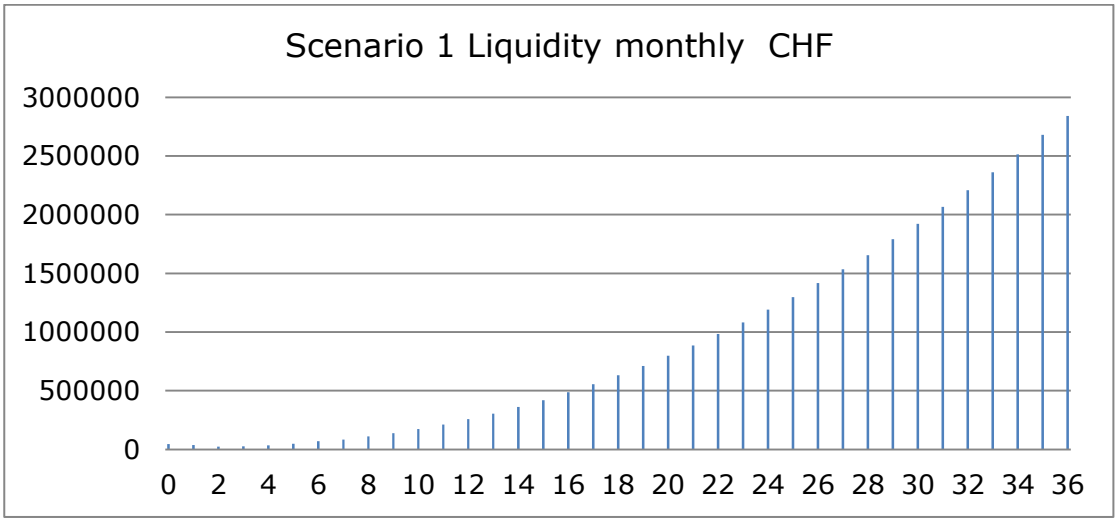

Figure 40: Case 3 Scenario 1 Liquidity

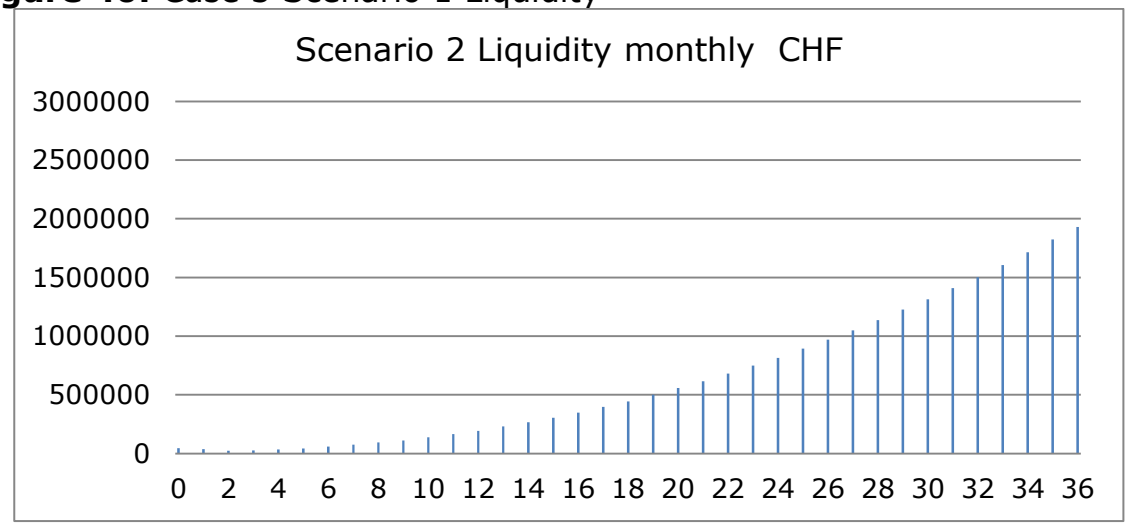

Figure 41: Case 3 Scenario 2 Liquidity

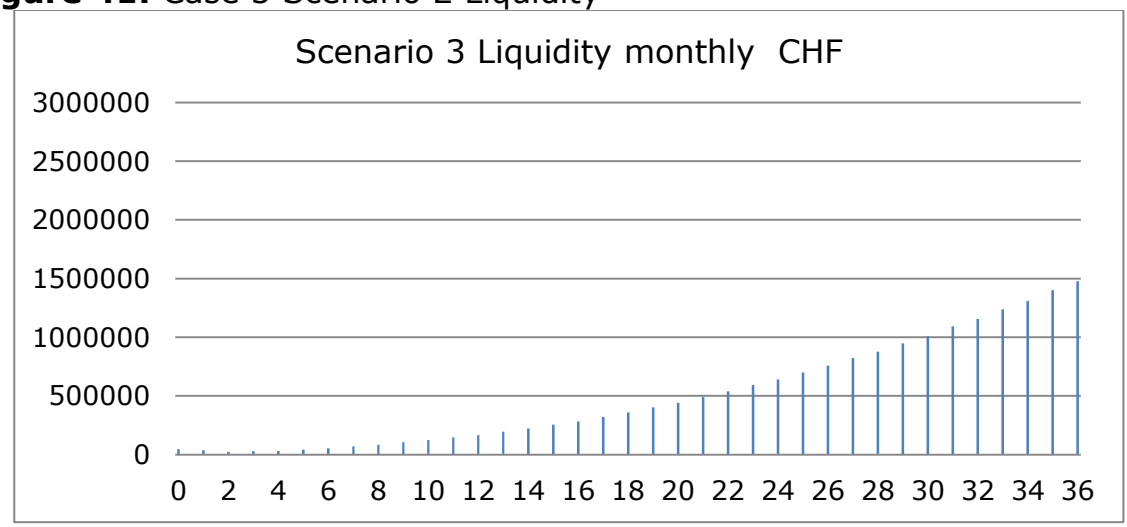

Figure 42: Case 3 Scenario 3 Liquidity

5 Interpretation, discussion, future prospects

The project Telebrain is based on a simple but effective idea. The created examination will be digitally exported from Switzerland to Austria to ensure a better cost structure due to lower labour cost. The advantageous cost structure will be used to establish selective advantages on the market and to guarantee a leading position. The highest possible quality of the service will be achieved by analysing the examinations twice by two independent radiologists (double read strategy). The first month will be offered as a try out time to every customer with free examinations to force the acceptance of the new service (entry strategy) and every customer will get a bonus if our service is recommended to others (penetration strategy). These strategies were implemented in the excel simulation (case 1) and three important variables were modified: number of customers (scen. 1-3), selling price (case 2) and the exchange rate (case 3). The best case analysis (case 1 scenario 1) shows the potential of the project. The customer recruitment is with 2 weeks/customer the highest of all scenarios, but it seems to be realistic even to exceed this frequency in reality. Despite the high number of performed examinations per month (3590 after 36 months) the market share is still extremely low (1.68% after 36 months) and gives the opportunity for further growth. The MVA is 4338330.20 and the IRR 694% for the three years period, which means that the project is extremely lucrative for investors. In the other two scenarios (case 1 scenario 2 & 3) the recruitment was reduced to 4 and 8 weeks per customer, but the IRR was positive (530% & 444%), what means that if the recruitment is not delivering the expected number of new customers, the project will be still stable and profitable. The reduction of the selling price (case 2) shows the result of an additional low price strategy, which could be temporary used to create more pressure on the competition. Due to the lower price the turn over and the cash flow decreases. However in all three recruitment scenarios (Case 2 scenario 1,2 & 3) the IRR was positive (350%, 268% & 220%) and the project worth executing. In the 3 case the external impact of a disadvantageous

exchange rate was investigated. The level was set to a minimum which occurred in the last 20 years on the market. Although this situation would have a significant impact on the project, the IRR would still be positive (426%, 324% & 269) and Telebrain profitable. From the economic point of view we do have an opportunity window and a company operating in this economic environment could create a high level of value for both shareholder and stakeholder. However, it is not possible to fully clarify the legal situation yet. Nowadays, the legal framework is not stable enough and it is changing inside and outside the EU. The EU showed in the last years a modest initiative to create an environment for new business opportunities. However, the EU directives are treated by the Member States only as suggestions and have no direct effect on the national level. Therefore, new developments in the legal framework are not expected in the next years. In the teleradiological sector Switzerland is far ahead other German speaking countries and has at least a basic legal environment with clarified responsibilities. However, the national healthcare system is protected by barriers from outside and makes it nearly impossible to establish cross-border projects. The decision of the "Bundesamt für Gesundheit" (Appendix: Written request and written response) included a clear statement, that if the diagnosis as a medical service is provided abroad, the costs will not be reimbursed in accordance to the principle of territoriality of the compulsory health insurance. For a company offering a cross-border teleradiological service this decision means that: I) it provides the service only for private patients without a reimbursement of the insurance company, but in this case its market shrinks nearly to zero, or II) it provides the service inside of the borders without the selective advantage of lower labour cost from abroad, but in this case it will be difficult to survive the competition on the market. The question now is what to do. I have invested 2 years in this project but now it will be closed. I have learned two lessons: I) if you have a good idea the smallest problem is to find investors II) if your idea is not working the next one will come soon.

This thesis is a small chapter of my personal journey and will be closed in the same way it began:

"Remember the two benefits of failure. First, if you do fail, you learn what doesn't work; and second, the failure gives you the opportunity to try a new approach."

Roger Von Oech

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Appendix

Week	Market share	Available Market	Liquidity	Increment al Cash flow	Operating cash flow before changes in nwc	NOPLAT	Increment al Taxes	EBIT	Incremental non cash expenses (depr., amort.)	EBITDA	Incr. cash expenses (COGS, SGA)	Sales
0	0,0000	47015	70967	-79033	-12036	-12036	0	-12036	0	-12036	12036	0
4	0,0212	47196	64844	-6124	-6124	-8185	0	-8185	2061	-6124	6124	0
8	0,0422	47377	56533	-8311	-8311	-10372	0	-10372	2061	-8311	8311	0
12	0,1262	47558	62955	6421	6421	4360	0	4360	2061	6421	15059	21480
16	0,1781	47739	78418	15464	15464	13402	0	13402	2061	15464	19276	34740
20	0,2296	47920	98003	19585	19585	17523	3661	21185	2061	23246	23494	46740
24	0,2807	48100	123032	25029	25029	22968	4799	27767	2061	29828	28912	58740
28	0,3314	48281	150628	27595	32485	30273	6325	36599	2212	38811	31929	70740
32	0,3817	48462	188558	37930	37930	35718	7463	43181	2212	45393	37347	82740
36	0,4317	48643	228446	39888	45389	43008	8986	51994	2381	54376	40364	94740
40	0,4813	48824	279280	50834	50834	48453	10124	58577	2381	60958	45782	106740
44	0,5306	49004	332680	53400	58290	55758	11650	67409	2532	69940	48800	118740
48	0,5794	49185	396415	63735	63735	61203	12788	73991	2532	76523	54217	130740
52	0,6280	49366	462108	65693	71194	68493	14311	82804	2701	85505	57235	142740
56	0,6760	49556	538532	76425	76425	74961	15663	90624	1464	92088	62652	154740
60	0,7237	49746	617523	78991	83881	82266	17189	99456	1614	101070	65670	166740
64	0,7710	49936	706849	89326	89326	87711	18327	106038	1614	107652	71088	178740
68	0,8179	50126	798133	91284	96785	95001	19850	114851	1784	116635	74105	190740
72	0,8645	50316	900362	102230	102230	100446	20988	121433	1784	123217	79523	202740
76	0,9108	50505	1005158	104796	109686	107751	22514	130265	1934	132200	82540	214740
80	0,9567	50695	1120288	115130	115130	113196	23652	136848	1934	138782	87958	226740
84	1,0023	50885	1237361	117073	122574	120561	25190	145751	2013	147764	90976	238740
88	1,0475	51075	1365380	128019	128019	126005	26328	152334	2013	154347	96393	250740
92	1,0924	51265	1495947	130567	135457	133395	27872	161267	2062	163329	99411	262740
96	1,1369	51455	1636848	140902	140902	138840	29010	167849	2062	169912	104828	274740
100	1,1811	51645	1779693	142844	148345	146204	30549	176753	2141	178894	107846	286740
104	1,2251	51834	1933483	153790	153790	151649	31686	183335	2141	185476	113264	298740
108	1,2684	52034	2088829	155346	160236	158046	33023	191069	2190	193259	117481	310740
112	1,3593	52233	2249193	160364	165865	164001	34267	198268	1865	200132	122608	322740
116	1,3541	52433	2422232	173039	173039	171265	35785	207049	1774	208824	125916	334740
120	1,4440	52632	2596092	173860	178750	176826	36947	213772	1925	215697	131043	346740
124	1,4385	52831	2782014	185922	185922	184099	38466	222565	1823	224388	134352	358740
128	1,5274	53031	2968149	186136	191637	189644	39625	229270	1992	231262	139478	370740
132	1,5217	53230	3166960	198810	198810	196908	41143	238051	1902	239953	142787	382740
136	1,6096	53429	3366592	199632	204522	202469	42305	244774	2053	246827	147913	394740
140	1,6036	53629	3578279	211687	211687	209772	43831	253603	1915	255518	151222	406740
144	1,6906	53828	3790180	211901	217402	215318	44989	260307	2084	262392	156348	418740
148	1,6843	54027	4014748	224569	224569	222615	46514	269129	1953	271083	159657	430740
152	1,7703	54227	4240138	225390	230280	228176	47676	275853	2104	277956	164784	442740
156	1,7639	54426	4478576	238438	238438	236472	49410	285881	1966	287848	166892	454740

Table 23: Detailed results of case 1 scenario 1 part 1

Week	Depriti ation	Fixed assets	Fixed costs	COGS	Cost radiol. Registr.	Radiol. equip.	Secret. Equip.	Exam side setup	2nd reading secretary	2nd reading radiologist	1st reading secretary	1st reading radiologist	Charg ed exams	Exams monthly	Needed radiol.	Needed secret.	Number exam sides
0	0	66996	4436	0	3600	14670	1222	500	0	0	0	0	0	0	3	2	1
4	2061	0	4436	1687	0	0	0	0	73	489	147	978	0	40	3	2	1
8	2061	0	4436	3374	0	0	0	500	147	978	293	1956	0	80	3	2	2
12	2061	0	4436	10122	0	0	0	500	440	2934	880	5868	200	240	3	2	3
16	2061	0	4436	14340	0	0	0	500	623	4156	1247	8313	300	340	3	2	4
20	2061	0	4436	18557	0	0	0	500	807	5379	1614	10758	400	440	3	2	5
24	2061	0	4436	22775	1200	0	0	500	990	6601	1980	13203	500	540	3	2	6
28	2212	4890	4436	26993	0	4890	0	500	1174	7824	2347	15648	600	640	4	2	7
32	2212	0	4436	31210	1200	0	0	500	1357	9046	2714	18093	700	740	4	2	8
36	2381	5501	4436	35428	0	4890	611	500	1540	10269	3081	20538	800	840	5	3	9
40	2381	0	4436	39645	1200	0	0	500	1724	11491	3447	22983	900	940	5	3	10
44	2532	4890	4436	43863	0	4890	0	500	1907	12714	3814	25428	1000	1040	6	3	11
48	2532	0	4436	48081	1200	0	0	500	2090	13936	4181	27873	1100	1140	6	3	12
52	2701	5501	4436	52298	0	4890	611	500	2274	15159	4548	30318	1200	1240	7	4	13
56	1464	0	4436	56516	1200	0	0	500	2457	16381	4914	32763	1300	1340	7	4	14
60	1614	4890	4436	60733	0	4890	0	500	2641	17604	5281	35208	1400	1440	8	4	15
64	1614	0	4436	64951	1200	0	0	500	2824	18826	5648	37653	1500	1540	8	4	16
68	1784	5501	4436	69169	0	4890	611	500	3007	20049	6015	40098	1600	1640	9	5	17
72	1784	0	4436	73386	1200	0	0	500	3191	21271	6381	42543	1700	1740	9	5	18
76	1934	4890	4436	77604	0	4890	0	500	3374	22494	6748	44988	1800	1840	10	5	19
80	1934	0	4436	81822	1200	0	0	500	3557	23716	7115	47433	1900	1940	10	5	20
84	2013	5501	4436	86039	0	4890	611	500	3741	24939	7482	49878	2000	2040	11	6	21
88	2013	0	4436	90257	1200	0	0	500	3924	26161	7848	52323	2100	2140	11	6	22
92	2062	4890	4436	94474	0	4890	0	500	4108	27384	8215	54768	2200	2240	12	6	23
96	2062	0	4436	98692	1200	0	0	500	4291	28606	8582	57213	2300	2340	12	6	24
100	2141	5501	4436	102910	0	4890	611	500	4474	29829	8949	59658	2400	2440	13	7	25
104	2141	0	4436	107127	1200	0	0	500	4658	31051	9315	62103	2500	2540	13	7	26
108	2190	4890	4436	111345	1200	4890	0	500	4841	32274	9682	64548	2600	2640	14	7	27
112	1865	5501	4436	117671	0	4890	611	500	5116	34108	10232	68215	2700	2790	15	8	28
116	1774	0	4436	119780	1200	0	0	500	5208	34719	10416	69438	2800	2840	15	8	29
120	1925	4890	4436	126106	0	4890	0	500	5483	36553	10966	73105	2900	2990	16	8	30
124	1823	0	4436	128215	1200	0	0	500	5575	37164	11149	74328	3000	3040	16	8	31
128	1992	5501	4436	134542	0	4890	611	500	5850	38998	11699	77995	3100	3190	17	9	32
132	1902	0	4436	136650	1200	0	0	500	5941	39609	11883	79218	3200	3240	17	9	33
136	2053	4890	4436	142977	0	4890	0	500	6216	41443	12433	82885	3300	3390	18	9	34
140	1915	0	4436	145086	1200	0	0	500	6308	42054	12616	84108	3400	3440	18	9	35
144	2084	5501	4436	151412	0	4890	611	500	6583	43888	13166	87775	3500	3590	19	10	36
148	1953	0	4436	153521	1200	0	0	500	6675	44499	13350	88998	3600	3640	19	10	37
152	2104	4890	4436	159847	0	4890	0	500	6950	46333	13900	92665	3700	3790	20	10	38
156	1966	0	4436	161956	0	0	0	500	7042	46944	14083	93888	3800	3840	20	10	39

Table 24: Detailed results of case 1 scenario 1 part 2

Written request:

Eidgenössisches Departement des Innern EDI
Bundesamt für Gesundheit BAG
Direktionsbereich Kranken- und Unfallversicherung
Abteilung Leistungen
Sektion Medizinische Leistungen

Sehr geehrter Herr Gurtner,

in naher Zukunft möchte ich ein Teleradiologie-Unternehmen in der CH gründen. (Radiologische Untersuchung des Patienten und Auswertung der Untersuchung an zwei unterschiedlichen Orten, verbunden mit einer gesicherten Internetverbindung) Mein Anwalt hat nun auf die rechtlichen Problemstellungen hingewiesen. Eine davon ist die Abrechnung mit der Sozialversicherung. Sofern es möglich ist möchte ich zu den folgenden Inhalten eine schriftliche Stellungnahme Ihrerseits beantragen.

1) In meinem Geschäftsmodell soll der Inhaber des radiologischen Instituts (da wo die Untersuchung durchgeführt wird) für die Rückerstattung der Kosten durch die Sozialversicherung einreichen. Anschließend werde ich vom Inhaber des radiologischen Instituts für meine erbrachte Leistung (Erstellung des Befundes) bezahlt. Ist das in dieser Form zulässig?

2) Die Befunderstellung durch meine Radiologen soll ortsunabhängig erfolgen - von Zuhause aus in der CH, aber auch durch teilweise im Ausland sich befindende in der CH zugelassene Radiologen. Nun bezogen auf Ihre Stellungnahme vom 19 Dezember 2003 (Stellungnahme des BSV zur Übernahme von im Ausland durchgeführten Laboranalysen durch schweizerische Krankenversicherer im Rahmen der obligatorischen Krankenpflegeversicherung). Kommt diese Stellungnahme auch hier zum Tragen?

3) Wenn ja: Wenn ich mich auf die Leistung eines Auslands-Labors beziehe, wird die Leistung zur Gänze im Ausland erbracht. Bei auswärtiger radiologischer Befunderstellung ist es nicht ganz der Fall. Der Tarmed-Abrechnungstarif unterscheidet nicht zwischen – Anfertigung / Auswertung von Untersuchung / Befundschreiben. Es wird als ein Schritt definiert und auch so abgerechnet. Somit ist der Prozess der Patientenuntersuchung als Ganzes zu sehen – und es wird nur ein Teil im Ausland erbracht – wie viel von diesem Prozess darf im Ausland erfolgen um trotzdem noch die Übernahme der Kosten durch die Krankenpflegeversicherung für den Inhaber des radiologischen Instituts zu garantieren? Wie erfolgt der Nachweis (meinerseits/ihrerseits) dass die Leistung im In- oder Ausland erfolgt ist? Reicht es in diesem Fall wenn der Inhaber den Befund mit seiner Unterschrift (zusätzlich zum im Ausland sich befindenden Radiologen) bestätigt – um die Leistungserbringung nach dem Territorialitätsprinzip in der CH zu garantieren?

Vielen Dank für Ihre Auskunft,
mit freundlichen Grüßen

Dr. Borny Robert

Written response:

Sehr geehrter Herr Borny

Besten Dank für Ihre Anfrage. Bitte entschuldigen Sie, dass wir Ihnen erst jetzt darauf antworten.

Ärztinnen und Ärzte, die zu Lasten der obligatorische Krankenpflegeversicherung (OKP) ambulante Leistungen erbringen (sei es als selbständige Ärzte nach Art. 36 KVG oder als Ärzte, die in einer ambulanten Einrichtung nach Art. 36a, z.B. Gruppenpraxis oder einem Ärztezentrum tätig sind), müssen über eine Aus- und Weiterbildung verfügen, die im Medizinalberufegesetz (MedBG, SR 811.11) definiert ist.

Von 2001 bis 2011 sah Artikel 55a des Bundesgesetzes über die Krankenversicherung (KVG, SR 832.10) die Möglichkeit eines Zulassungsstopps vor, welcher es den Kantonen erlaubte, die Anzahl der Praxiszulassungen auf ihrem Gebiet zu beschränken resp. deren Vergabe von einem entsprechenden Bedarfsnachweis abhängig zu machen. Der entsprechende Artikel ist seit 1.1.2012 nicht mehr in Kraft, eine Wiedereinführung wird aktuell in den eidgenössischen Parlamentskomissionen und demnächst im Parlament diskutiert.

Die OKP, welche im KVG geregelt ist, übernimmt im Grundsatz nur Leistungen im Ausland, wenn diese in der Schweiz nicht erbracht werden können und die Leistung zudem aus medizinischen Gründen notwendig ist (Art. 34 Absatz 2 KVG, Art. 36 der Verordnung über die Krankenversicherung KVV, SR 832.102). Dieses sogenannte Territorialitätsprinzip besagt somit, dass die Kosten für Leistungen, welche im Ausland erbracht werden, nur unter bestimmten Voraussetzungen von den schweizerischen Krankenversicherern übernommen werden dürfen.

Zudem werden die Kosten durch die Krankenversicherer übernommen, welche durch die Behandlung eines Notfalls im Ausland entstehen.

Im vorliegenden Fall steht weder eine Leistung, welche in der Schweiz nicht erbracht werden kann noch ein Notfall zur Diskussion. Die radiologischen Leistungen bestehen aus ärztlichen und technischen Leistungen. Die technischen Leistungen bestehen in der korrekten Durchführung der Aufnahmen, die ärztlichen Leistungen in der Überprüfung der Indikation für die Zuweisung und allenfalls deren Modifikation nach Rücksprache mit dem zuweisenden Arzt, die Beurteilung der Bildqualität (mit der Fragestellung: Weitere Aufnahmen oder Wiederholung nötig?) und die Befundung. Die Überprüfung der Indikation (zusätzlich zum Aktenstudium und allenfalls der Rücksprache beim zuweisenden Arzt) kann eine Untersuchung des Patienten erfordern. Von den genannten Leistungen kann nur die Befundung im telemedizinischen Verbund geleistet werden. Wird die Befundung als ärztliche Leistung im Ausland erbracht, so darf diese gemäss dem Territorialitätsprinzip nicht durch die OKP rückvergütet werden.

Die Stellungnahme des Bundesamtes für Sozialversicherungen zur Übernahme der Kosten von im Ausland durchgeführten Laboranalysen durch schweizerische Krankenversicherer im Rahmen der obligatorischen Krankenpflegeversicherung aus dem Jahr 2003 weicht vom Grundsatz des Territorialitätsprinzips nicht ab. Vielmehr kommt zum Territorialitätsprinzip das Prinzip der Positivliste hinzu. Eine Laboranalyse wird somit gemäss Bundesamt für Sozialversicherung nur zur rückvergütungsfähigen Pflichtleistung, wenn sie explizit in die Analyseliste aufgenommen worden ist. Die Teleradiologie ist in der Analysenliste nicht aufgeführt, daher kann aus der Stellungnahme des Bundesamtes für Sozialversicherungen auch kein Anspruch auf Rückvergütung abgeleitet werden.

Die Empfehlungen des Ressort Bildkommunikation der Schweizerischen Gesellschaft für Radiologie (SGR SSR) kommen zum Schluss, dass im Tarmed noch keine Abgeltungen für die Teleradiologie oder die Übermittlung von radiologischen Daten vorgesehen sind. Da die Leistungsträger die Untersuchung und die Befundung als eine Einheit sehen, ist eine Abgeltung für eine Mehrfachbefundung nicht vorgesehen. Die Empfehlungen der SGR SSR sehen vor, dass bei der Abgeltung der Standort, an dem die technische Leistung erbracht wird, zu beachten ist. In der Regel wird der Kostenträger dort bezahlen, wo der Patient untersucht wird, also dort, wo die technische Leistung erbracht wird. Es gilt somit der Taxpunktwert der entsprechenden Region, unabhängig davon, ob die Befundung in einem anderen Tax-Punkt-Wert-Raum erbracht wird. Zur Abrechnung muss ein Leistungserbringer gegenüber dem Kostenträger mit seiner EAN-Nummer auftreten. Wird die Befundung durch einen zweiten Arzt durchgeführt, sollte die Abgeltung durch eine bilaterale Vereinbarung geregelt werden.

Aus den obigen Ausführungen ergibt sich, dass die Kosten für teleradiologische Leistungen im Ausland durch die schweizerische OKP nicht rückvergütet werden können resp. dürfen.

Vorbehalten bleibt eine Vergütung der in Ihrem Geschäftsmodell erbrachten Leistungen durch die Zusatzversicherung der schweizerischen Krankenversicherungen. Eine allfällige Rückvergütung wäre in diesem Fall rein privatrechtlicher Natur, daher ist es uns nicht möglich, zu dieser Anwendungsmöglichkeit Stellung zu nehmen.

Freundliche Grüsse

Dr. med. Felix Gurtner