HOW CAN ECONOMICALLY SUCCESSFUL TRAINING BE CONDUCTED IN A SHORTAGE OCCUPATION? –A SINGLE STUDY FROM THE HEALTHCARE SECTOR ON THE ECONOMIC VIABILITY OF A BLENDED LEARNING TRAINING COURSE

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ABSTRACT

Discussion about the shortage of skilled workers is especially prevalent in the healthcare sector. The economic viability of training provision is considered, based on the example of an in-service course for medical-technical radiology assistants (MTRA). The discussion on viable business models related to information technology is lacking proven approaches in many respects. In the following article a procedural model for the design and evaluation of e-learning business models is applied to evaluating the economic viability of a case study. The subject of the case study is a technology-based education service provider which offers blended learning training. The discussion of the results focuses on the entrepreneurial attractiveness of such business models and recommendations are made for further studies.

KEYWORDS

Training; Further education; Business model; Profitability analysis; Blended learning; Visualization of Financial Implications

1. INTRODUCTION

The German Hospital Institute has found that one in five hospitals in Germany cannot fill its vacancies for medical-technical radiology assistants (MTRA). In 1994/95 2273 students gained a qualification in this profession, while in 2009/10 there were only 1471 potential new entrants to the labour market (Still, 2013). At the University Hospital of the Saarland, a pilot project was started and an extra-occupational course offered for medical technicians. This training course was evaluated and compared with a training course requiring full attendance (Druhmann & Hohenberg, 2009). The aim of this single study is to analyse the economic viability of a business model used in blended learning courses for shortage occupations.

With the commencement of the commercial use of the Internet the search began for appropriate business models and sound ways to apply them. The “business model” concept provoked heated

debate, also in the field of business IT (e.g. Hess, 2012). A fitting definition of the term “business model” for this article, which emphasizes its character as a tool, is provided by Weiner, Renner and Kett (2010). In this definition, a business model should consider the perspectives of the customer, service production and provision, and economic relations, both as individual elements and in their connections to each other (Weiner et al., 2010, p 23). These authors also provide an overview of the current state of business model research (pp. 49ff). However, they level criticism at the current situation: “business model research continues to be strongly paper-oriented” (Weiner et al., 2010, p 106). Case studies like the one presented in this paper represent a step in the direction of applied research. In particular, technology-based training providers supply interesting case studies for business model analysis. This is an industry that is very rarely the focus of publications on business model research. For example, e-learning/blended learning activities are not explicitly included in the frequently cited science-based classification of business model types according to Laudon and Traver (2011).

Nevertheless, the further education market, measured in terms of gross domestic product (about € 27 billion in 2003), has gained far greater significance than the markets for agriculture, forestry and fishery (Dt. Bildungsserver, 2011a; Destatis, 2004).

The heterogeneous supply structure in the further education sector is dominated by small and medium enterprises (SMEs), with the majority of providers being micro enterprises (with up to 25 employees) (Dietrich & Schade, 2008) out of the estimated 12 to 15 thousand providers in Germany (e.g. DIE, 2008 and Lünendonk, 2008). Exactly these small private training providers are faced with enormous challenges due to the processes of change in the culture of teaching and learning and in educational technologies described below. The ubiquitous slogan "lifelong learning" indicates that learning has become an ongoing task. This development is reflected in the demand for further education, exemplified by the following statement: "Distance learning or distance studying is the method of choice for an increasing number of Germans who are continuing their education at the same time as working and raising a family. [. . .] About 387,000 people participated last year in a state-approved correspondence course or a course offered by a distance learning university. This is 2.0 percent more than in the preceding year. Since 2005, the numbers have increased by 25 percent." (Forum-Distance-Learning, 2012, p. 1). Due to the increasing interest in part-time training courses, the demand for suitably designed teaching-learning scenarios is also growing. The so-called “new media” have long been gaining ground in the market, and the use of the Internet and multimedia elements is steadily increasing in continuing education courses: from 2821 in 2011 to 5664 in 2013 (Dt. Bildungsserver, 2011a). In summary it can be said that e-learning – or more generally, the use of new media in education – is not just the continuation of the old ways of education with new methods, but will lead to restructuring activities which are difficult to predict today. “Educational institutions will have to become used to being permanent construction sites” (Sesink, 2006, cit. based on Appelt, 2010, p 151).

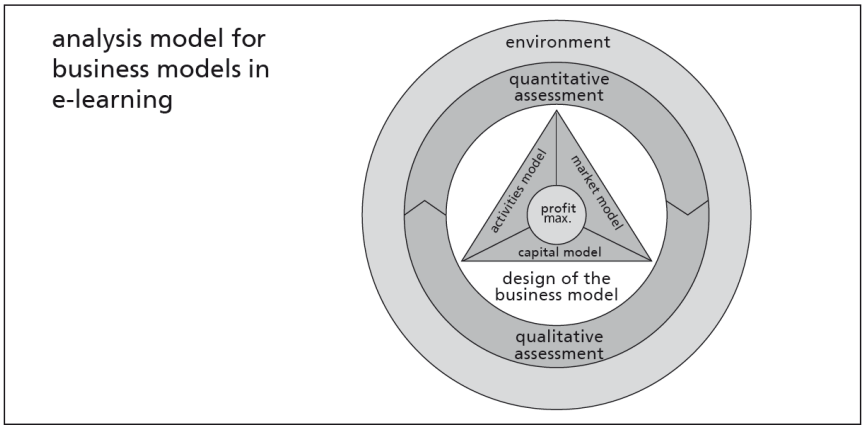
Reactions to and implementation of answers to the challenges faced by the further education market must be feasible in economic terms for (small) educational institutions with their own identity and funding (Kraft, 2010, p 419). This means that the entire (re)modelling of entrepreneurial activity must be measured by economic criteria. A possible process model is described in the following section and in Section 4 the results of using it to analyse business aspects are presented.

2. ECONOMIC EVALUATION OF BLENDED LEARNING BUSINESS MODELS

As a promising approach with practical benefits, the process model for the design and evaluation of blended learning business models developed by Brocke, Buddendick, Gaiser and Haug (2007) is used as a template for the evaluation of the case study. This process model should help to subject the design of business models and the results of such design to continuous economic evaluation (in an iterative cycle). The core consideration of profit maximisation should be achieved by the triad of a market, activity and capital model (Brocke et al., 2007, p 10). Figure 1 outlines the process model: the three sub-models are evaluated using quantitative and/or qualitative methods. The focus of the assessment in this article is on the capital model.

The market model is used to describe the structure of the e-learning market as well as the different stakeholders and their roles (Grob, vom Brocke & Bensberg, 2004), with the purpose of creating an innovative product (product portfolio) which gains market acceptance to the extent that it allows long-term business success. This includes customer segmentation, the delineation of strategic business fields, an assessment of market attractiveness, and an industry structure and competitor analysis which enables providers to classify themselves as quality or cost leaders, or as niche providers (Brocke et al., 2007). A quantitative assessment is undertaken by means of a deposit page that includes estimates of opportunities and threats.

Figure 1: analysis model based on v. Brocke et al. (2007, p. 10)



2.1 Figures and tab

In the activity model (e-learning) activities are described which a (training) provider carries out in the course of their business activity (Grob et al., 2004). The reconciliation of their core competencies with the planned e-learning business model is the basis for qualitative assessment of the activity model (Brocke et al., 2007). The calculation or forecast of the withdrawal page (resource consumption) is the core step towards quantitative assessment of the activity model (for example by means of event-driven process chains or process cost accounting, e.g. according to Gutbrod & Fischer, 2004). In the capital model, the organisational or legal form and the financing are defined for the e-learning business model. The legal framework is considered, the capital requirements are determined and the available or planned lending and investment options in the capital market are investigated. Qualitative assessment of the capital model for the planning period is carried out in a scenario analysis. Methods of investment appraisal, e.g. Visualization of Financial Implications – VoFi, are used for quantitative evaluation. The payments over several periods associated with the e-learning business model are compressed to target values and evaluated, and can be used to compare different business model alternatives as required.

The additional comments focus on the capital model. They are operationalised for practical application and are used to carry out a quantitative evaluation (profitability assessment) of the subject of the case study.

3. THE CASE STUDY: A TECHNOLOGY-ORIENTED TRAINING SERVICE PROVIDER

The subject of the case study is a typical participant in the training market. Scientific Learning Systems (SLS, www.sls-saar.de) is an SME and niche provider. Its business objective provides for a three-year training course leading to a qualification as a state-certified radiology assistant (MTRA).

The SLS itself is a spin-off of the Saarland University Clinics. The goal was to create a modern, customised computer-based training scenario. The blended learning approach was selected for the training course. To meet the requirements and the professional and living conditions of those interested in the training, the MTRA blended learning course combines attendance periods (every six to eight weeks for two to three days) sequentially with self-learning phases, which are supported by multimedia elements and Internet-based communication tools.

In this way, the drawbacks of traditional distance learning courses and pure e-learning scenarios should be compensated, and there should be clear advantages over the attendance-based training from which the course was developed. The development of blended learning training began in 2002. In 2003 the first year started with 20 participants (the number of participants is limited to 25 per year). A learning management system (LMS) was developed for the blended learning scenario. The learning scripts are distributed on this LMS. These scripts are enriched with visualization elements such as interactive graphics, animation and simulations. Numerous instructional videos were produced for a variety of subjects, such as recording technology, and linked into the course texts. A particular focus of this teaching-learning scenario is on learner support during the self-learning phases. For this purpose, a so-called multimedia response system is used, involving a very short response time by the lecturers. Trainees receive elaborate (e.g. Narciss, 2006) audio-visual feedback to their questions by e-mail; for example, if they have problems while solving a physics task. This intensive exchange between students and lecturers during the self-learning phases enables an individual learning path to be developed for each learner. If components of this type are absent from a modern teaching-learning scenario, or if they are inadequately designed, the learners may become dissatisfied due to a lack of support and inadequate individual feedback or delays in providing it (Ojstersek, 2007, p 196). Minocha, Schroeder and Schneider (2010) even propose a clear expectation of lecturers that they should assume the role of providers of feedback, particularly when e-learning components and social software are used. However, these components cause a considerable financial outlay on the part of the training provider.

Despite a sort of consolidation phase for e-learning based training options that can be currently seen, the development costs of computer-based training (CBT) and web-based training are still very high (Meister & Kamin, 2010). Likewise, learner support during the self-learning/online-phase has proven to be very costly overall (Bremer, 2004, p 51).

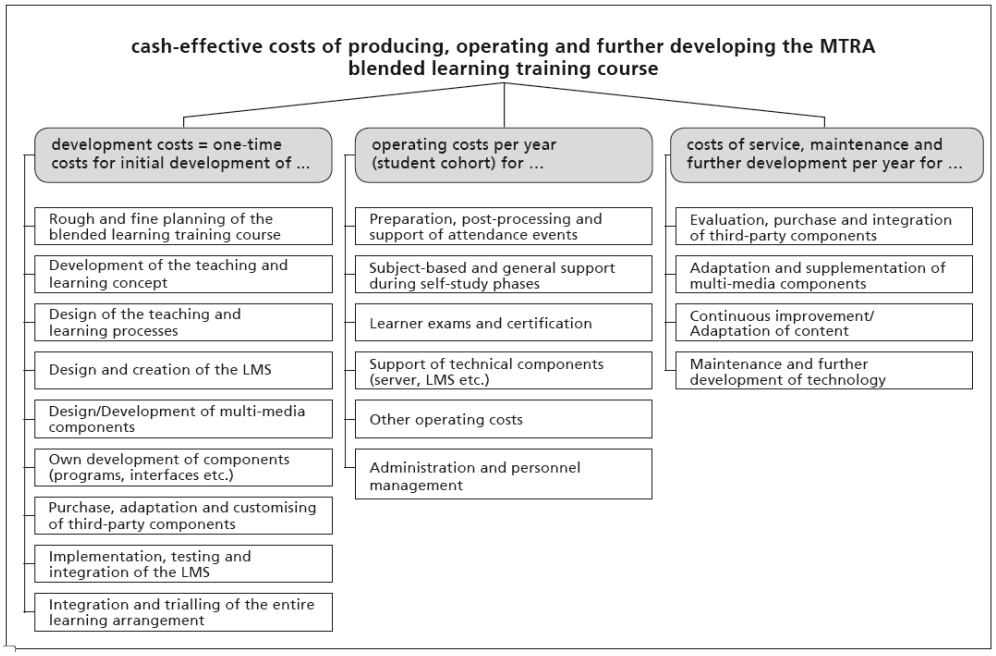
So far, the MTRA blended learning training course has been fully booked, so that the deposit page has shown the maximum volume, in terms of the market model. Nevertheless, this business model has not been imitated by other MTRA training providers (or by those offering courses for related professions such as pharmaceutical technical assistants - PTA). One reason could be lack of assessment or evidence of the cost-effectiveness of such training opportunities, and hence that

of the underlying business sector. Moreover, established procedures are lacking. In the following a possible approach and the results of the case study outlined above are described.

4. ECONOMIC ASSESSMENT WITHIN THE CAPITAL MODEL

Firstly, a cost structure was developed which is specially tailored to the MTRA blended learning training programme. This was necessary, as so far no standard cost structure has been developed on the basis of the various approaches in the literature. Cost-generating activities were initially identified on the basis of the teaching-learning processes, and the associated cost types defined – structured according to the phases of design, use and development of the MTRA blended learning training measures (see Figure 2).

Figure 2: Pragmatic cost model for determining the payment-related expenses for production, operation and development of the MTRA training course. Cash-effective costs of a blended learning course (own compilation based on SEIBT, 2005, p 43; RUMBLE in comparison with 2001 cit. at GUTBROD & FISCHER, 2004, p 3)



The withdrawal page in the case study consists of investment and current expenses (operating costs and cost of maintenance, care and development), each containing fixed and variable costs.

The **investment costs** include the initial production costs, which are comparable to those which arise in the establishment of a conventional teaching-learning scenario. Work must be carried out on the rough and fine planning of the training course on a project basis (initialisation, organisation and team building, project management and time and budget controls, etc.). This includes, for example, the creation of a suitable teaching and learning concept and design of the associated processes. The one-off design costs are determined mainly by personnel costs (salaries). The costs of preparing the learning scripts were halved, as they are also used in the attendance variant.

The non-recurring technology costs include expenses for the selection, acquisition/creation, production and implementation of the self-developed LMS. Further cost considerations are the desired functionality (e.g. with or without a virtual classroom) and the degree of integration of

digital media. Licence fees in the higher education environment are usually moderate, thanks to discounts from manufacturers or the use of open source software (e.g. Moodle). The purchase of appropriate hardware plays a minor role in the initial costs.
The **running costs** can be broken down into operating costs and service, maintenance and further development costs. The operating costs are reported per calendar year. Personnel costs incurred in the provision of teaching make up about 60 percent of total operating costs. They include attendance events, support during the self-learning phases, interdisciplinary coaching and examination costs. The number of students and teachers who use the LMS, the nature of the technical infrastructure and software systems, and organisational responsibilities determine the operating costs of the LMS. A maximum of 75 students and 14 lecturers have access to the self-developed LMS of the MTRA training course; a 20-percent position for a multimedia technician is added for technical support.

The proportion of organisational administration by the technical support for the LMS is not insignificant: it includes user and rights management, technical support with regards to login, browser and codec problems and misplaced passwords. The operation of the institute's own server and associated network also leads to proportional personnel and hardware costs. Other operating expenses consist primarily of a lump sum for the use of space at the University Hospital. In 2011 greater efforts were made to modernise the teaching-learning scenario (teaching and learning methods, extending the functionality of the LMS, new learning videos, embedding a virtual classroom). The investment and running costs can be summarised as follows:

Table 1: Selected information on the cost side of the MTRA blended learning training (based on Druhmann, 2013 p. 195ff)

Costs	Year	Amount
Investment costs	2002/2003	€ 248.712,-
Operating costs	2009	€ 71.147,-
Costs of service, maintenance and further development	2009	€ 11.067,-
"Modernisation investment"	2011	€ 82.172,-

For the Visualization of Financial Implications (VoFi) calculation the investment costs are pragmatically divided into proportions of two thirds for the first year and one third for the second (development) year, since implementation activities and the launch of the training course incurred higher costs in the first year.

The market model is not referred to in detail at this point (see Sections 1 and 3), because the customer target group is defined and deposits are generated in the case study solely from the course fees collected (€ 149, - / participant and month; max. 25 participants/year). The MTRA blended learning training course has operated at full capacity since its launch.

The imputed connections of the complex deposit and withdrawal structure of a training course are shown below in the capital model. The VoFi was chosen as a suitable model for investment accounting. The concept of complete financial plans differs from the "classical" methods of investment accounting mainly in the fact that all payments caused by the investment are shown explicitly. This allows a relatively accurate and transparent assessment of the relevant series of payments, a differentiation of the financing side (equity/debt, e.g. short-and long-term forward-interest rates, repayment terms, etc.) and the resulting financial consequences. In the investment time t = 0, the initial net investment is financed through the use of own capital and possibly an initial loan. During the observation period, n years, of the investment, payment surpluses (including the liquidation surplus in t = n) are set as original payments. Taking into account

transfers, deposits and tax payments, interim financing arrangements (temporary financing) and reinvestments (temporary investments) need to be made which lead to annual financial balances of zero. The lending/net borrowing of each period is thus by definition zero and is derived from the gap between all incoming and outgoing payments in consideration of the initial stock of cash. The balance of assets and loans (inventory balance) shows the evolution of the target value over time. Of particular importance is the target or final wealth at the end of the useful life or at the end of the planning horizon. The result of the VoFi represents the final wealth of the investor achieved by making the investment as an absolute number. Particularly significant for the evaluation of business models in blended learning is the VoFi total return on assets, which expresses the return on investment (ROI) based on a dynamic number base.

The VoFi total return on assets shows the interest paid on capital employed over the useful life, which can be compared to a calculated basis for an investment decision using the average cost of capital. The VoFi return on total capital gGK is calculated according to the equation below (figure 3):

Figure 3: VoFi return on total capital gGK (Grob, vom Brocke & Bensberg, 2004, p 8)

$$g_{GK} = \sqrt[n]{\frac{EW^M + FK_0 + Z^S}{EK + FK_0}} - 1 \text{ für } EW^M + FK_0 + Z^S \geq 0$$

In order to use this equation to assess the absolute and relative benefits of the project, not only the final value of the investment alternative, but also the final value of the default alternative must be determined (e.g. using a risk-free financial asset; see Grob, 1989, p 73ff). As additional assessment information, the VoFi the pay-off period can be determined: this specifies the time it will take for the net initial investment to pay for itself, taking into account imputed interest on equity (Grob, 1989, p 92).

In order to make a meaningful calculation for the case study, the deposits and withdrawals incurred by the business model of the case study were recorded over a longer period (2002 to 2011) and adopted into the VoFi as elements of the payment sequence (all payments in arrears at the end of each year).

For the running costs (operating costs and service, maintenance and development) real data were available until 2011; for the following years an annual cost and price increase of four percent is assumed. On the revenue side a one-time ten percent increase in participant fees was calculated for 2011. The observation period for the VoFi calculation was set to 2016 (13 student cohorts); no end of the training courses, nor a sale with a fictitious, incalculable, return are assumed for this calculation. The observation period selected is long enough to ensure that the initialisation costs are not disproportionately weighted. A result, the revenue side is taken into account using the total real number of students in each cohort, considered several times, and also a sufficiently long observation of the outlay side, including a significant overhaul of the teaching-learning scenario.

The final value calculation is made in accordance with the VoFi model on the last date of the period: for any previous period a payment surplus (receipt surplus) is offset by interim financing (reinvestment). The VoFi pay-off period can be specified as an additional, time-critical figure: this indicates the period in which the net initial investment will pay for itself, taking into account an imputed interest rate of 4.4 percent on equity. The VoFi total return calculation for the case study is made for the case of 100% own financing (from existing cash funds). Thus, the VoFi total return is equal to the VoFi return on equity. The result is a VoFi own or overall profitability

of 5.10 percent (cf. Figure 4). The VoFi pay-off period is outside the period under consideration. A payback of the capital invested is therefore not to be expected within 13 years.

Figure 5: Extract from the VoFi of the MTRA blended learning training course (based on Druhmann, 2013, p. 199)

VOFI of MTRA Blended Learning training course – szenario „status quo"																
	t_0	t_1 2002	t_2 2003	t_3 2004	t_4 2005	t_5 2006	t_6 2007	t_7 2008	t_8 2009	t_9 2010	t_{10} 2011	t_{11} 2012	t_{12} 2013	t_{13} 2014	t_{14} 2015	t_{15} 2016
direct payments																
investments		-82.904	-165.808													
running costs			-24.523	-81.715	-82.532	-79.649	-81.564	-80.032	-78.895	-82.214	-85.503	-88.923	-92.480	-96.179	-100.026	-103.027
cash inflow	250.000		53.640	98.340	89.400	134.100	134.100	134.100	134.100	134.100	134.100	147.510	147.510	147.510	147.510	147.510
net total		-82.904	-136.691	16.625	6.868	54.451	52.536	54.068	55.205	51.886	48.597	58.587	55.030	51.331	47.484	44.483
equity	250.000															
dept capital	0															
interest on dept capital		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
amortisation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
bridge financing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
interest on bridge financing		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
reinvestment tn_t		-167.096	-34.582	-52.072	-57.638	-110.648	-160.418	-210.476	-260.419	-305.794	-346.746	-396.665	-441.778	-482.065	-517.497	0
interest on reinvestment		0	-4.177	-865	-1.302	-1.441	-2.766	-4.010	-5.262	-6.510	-7.645	-8.669	-9.917	-11.044	-12.052	-12.937
repayment		0	0	0	0	0	0	0	0	0	0	0	0	0	0	517.497
final value EW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**549.043**
residual debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
annuity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EW(t)	250.000	167.096	38.760	52.937	58.940	112.089	163.184	214.486	265.681	312.305	354.391	405.333	451.695	493.109	529.549	549.043
opportunity	250.000	261.000	272.484	284.473	296.990	310.058	323.700	337.943	352.813	368.336	384.543	401.463	419.127	437.569	456.822	476.922
delta EW(t)	0	-93.904	-233.724	-231.537	-238.050	-197.969	-160.516	-123.457	-87.132	-56.032	-30.152	3.870	32.567	55.540	72.727	72.121
VOFI-Pay-off-Period		nein	nein	nein	nein	nein	nein	nein	nein	nein	nein	ja	ja	ja	ja	ja
Long-term interest debit balance	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%	6,5%
Short-term interest debit balance	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%	8,5%
Long-term interest credit balance	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%
Short-term interest redit balance	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%	2,5%
VOFI-return on total capital	**6,2%**															

The imputed nominal and credit interest rates were defined as follows:

- Long-term interest on debit balance: 6.5 % (range of promotional loans for SMEs: 2.45–9.1 %; www.genobank.de),
- Long-term interest on credit balance: 4.4 % (average return on 10-year government bonds 2003–2011; www.bundesbank.de),
- Short-term interest on debit balance: 8.5 % (assumption, as dependent inter alia on creditworthiness, credit rating, existing liabilities etc.);
- Short-term interest on credit balance: 2.5 % (average money market interest rate 2003–2011; www.bundesbank.de)

The calculated VoFi return is positive and can thus seem advantageous for the project, in terms of financial criteria. However, the absolute figure of 5.1 percent should be compared to the returns from alternative investment opportunities. Thus, the absolute size of the return is slightly above the average yield on 10-year government bonds (4.4 percent), which considering the difference to this very low-risk investment alternative represents a very small premium when the risk and profit for the training provider are taken into account. The VoFi Pay-off-Period of over thirteen years, calculated using the opportunity interest rate, also seems uninviting from a business perspective. Direct comparison with other schools or providers of MTRA training with national accreditation is not available, as none of the other MTRA training service providers nationwide have so far implemented a blended learning concept. An extension of the "peer group" for a comparison of returns also affords no meaningful comparisons, due to the fact that the relevant financial data

have not been published. In addition, an analysis would need the same framework conditions for the comparative case studies as for the case study in this article.

For example, the withdrawal page would have to be created using the same cost structure, and the same accounting procedure would have to be used to calculate the measured values (e.g. VoFi).

5. CONCLUSION AND OUTLOOK

Training service provision is an industry that has been faced with profound and necessary changes in its activities for several years. Due to "modern" teaching-learning scenarios, marked by time- and location-independent learning and a high degree of multimedia and ICT use, providers are confronted by significant challenges to their business models, despite a growing market. In particular, economic viability is essential for training providers, so that the result for this case study (in the form of equity or total return) is all the more disappointing. Due to the full student numbers for the MTRA training course (so far), the search for economic optimisation can concentrate on the activity model. An area for analysis is the use of multimedia and blended learning elements, because this is responsible for the majority of the initialisation costs in the training scenario (about two thirds). Individual attention during the self-learning phases accounts for 25-30 percent of the total ongoing costs during the provision of training: these are mainly personnel costs for teachers. Thus changes in the training scenario need to be justified from an economic, but also from an educational perspective. For this purpose it will be necessary to carry out more interdisciplinary education-economic cost-benefit analyses within larger samples. This is because the assessment of the economic viability of this blended learning business model was performed using a customised cost model and an as yet infrequently used investment calculation method (VoFi). Both instruments could be used in further studies.

On the one hand this could increase the frequency of use of the application itself, so that the number of results achieved in the same way would be increased, which in turn would allow comparisons between business models.

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