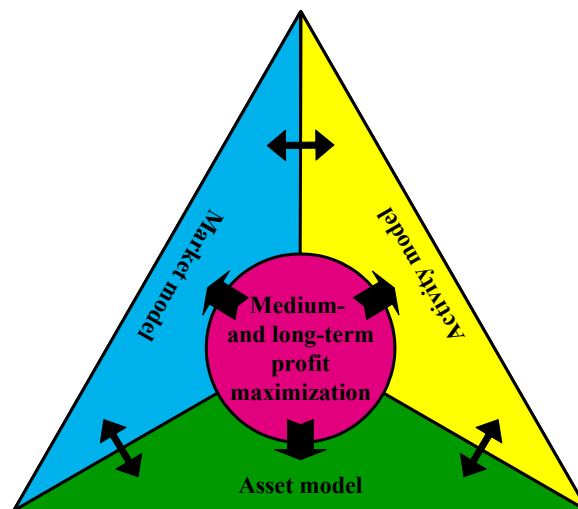


Classification and Sustainability Analysis of E-Learning Applications

Gabriela Hoppe² and Michael H. Breitner³



¹ Copies or a PDF-file are available upon request: Institut für Wirtschaftsinformatik, Universität Hannover, Königsworther Platz 1, 30167 Hannover (www.iwi.uni-hannover.de).

² Diplom-Ökonomin (hoppe@iwi.uni-hannover.de).

³ Full Professor for Information Systems Research/Business Administration (breitner@iwi.uni-hannover.de).

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Dipl.-Ök. Gabriela Hoppe and Prof. Dr. Michael H. Breitner⁴

Institut für Wirtschaftsinformatik, Universität Hannover,
<http://www.iwi.uni-hannover.de>

Abstract: E-learning applications become more and more important. Reasons are the paramountcy of knowledge, life-time learning, globalization and mobility. Not all providers of e-learning applications succeed in closing the gap between production costs and revenues. This results mainly from inconsistencies in composing a business model. Sustainable business models for e-learning integrate and consolidate strategic propositions concerning market model, activity model and asset model. Balancing core activities and successful revenue models is essential. At the same time the features of the provided e-learning application have to be aligned with the requirements of specific target groups. Sustainable provision of e-learning applications with different complexity, especially telling apart CBT from WBT applications, is based on different business models.

Keywords: E-learning, sustainability, business models

1 Introduction

A discrepancy can be observed: Some providers of electronic learning (e-learning) applications offer sustainable products and realize profits by offering e-learning applications. They are likely to become key players of e-learning. Others – developing with the same or even more effort – do not succeed in supplying successful e-learning applications and/or supplying e-learning applications successfully. This paper reveals that this discrepancy between "economic e-learning winners" and "economic e-learning losers" is almost nothing but a seeming contradiction. A general framework for sustainable business models for e-learning applications is presented. First, a short overview of the e-learning environment is given and types of e-learning applications are identified. After that, components and aspects of sustainability of business models are introduced. Then, conditions for a sustainable supply of e-learning applications are analyzed in order to introduce prerequisites of successful, persistent business models for e-learning.

⁴ hoppe@iwi.uni-hannover.de and breitner@iwi.uni-hannover.de.

2 E-learning environment

2.1 Types and forms of learning and knowledge

Learning has a strong connection to knowledge. Acquiring or updating knowledge is the goal of intentional learning. Knowledge is defined as individual collection of information on one topic. Three different types of knowledge exist. We follow a bisectonal classification of theoretical knowledge:

- Declarative knowledge: The knowledge about names, facts, issues and contiguities. It is static because it cannot produce new knowledge.
- Procedural knowledge: The knowledge about how things work. Procedural knowledge is constructed actively and adequately to solve tasks and problems. It is dynamic because the results of procedures can generate new knowledge.

This view is completed by postulating an additional form of highly implicit practical knowledge, see [Baum1993, p. 76]. It is non-verbalizable and can only be generated by practicing. Knowledge can be assigned to three types of skills: cognitive, affective and psychomotor. This separation is only analytical. In practice, learning processes combine at least cognitive and affective aspects.

Not only one universal theory of learning can be seen as prototype for explaining the acquisition of any type of knowledge. Different theories and forms of learning exist depending on the desired outcome of the learning process. Table 1 shows the contiguity between forms of knowledge and two main forms of learning which are derived from the extreme positions of theoretical paradigms how learning works.

Type of knowledge	Learning form
Declarative knowledge	Behavioral learning
Procedural knowledge	Complex learning
Practical knowledge	

Table 1: Contiguity between type of knowledge and learning form

Behavioral learning is based on the behaviorist theory of learning assuming a passive recipient of information. The learner only reacts to information given. Behavioral learning is suitable for learning incoherent facts without structure. On the contrary, **complex learning** bases on cognitive and constructivist points of view. It assumes an active learner who individually constructs his knowledge. Complex learning allows abstraction processes leading to comprehension and insight. These processes allow transferring learned issues to new tasks and constructing new knowledge. Different e-learning applications base on different learning forms.

2.2 Types of e-learning applications

Learning is a form of information processing. It is always based on means of communication to transfer relevant information. Manifold communication media for transferring learning material exist. Learning which is supported and/or made possible by the use of information and communication technology (ICT) is here defined as **e-learning**. ICT may not only act as auxiliary means but has to be immediately connected with the learning process, see [Seuf[†]2001, p. 13]. ICT suitable for enabling or supporting e-learning is called **e-learning technology**.

Following a broad definition of information systems, an **e-learning system** includes:

1. e-learning software and hardware,
2. organizational aspects, i. e. any kind of organizational regulation related to the use of e-learning, e. g. the embedding in a course arrangement,
3. and human resources, i. e. "e-learners" on the one hand and people who concept, program, maintain and support the hard- and software and concept, implement and survey organizational concepts on the other hand.

Any part of an e-learning system offered by an e-learning supplier is an **e-learning product**. The product definition follows Kotler, see [Kotl2000, p. 396]. An e-learning product can be a tangible **good**, e. g. a CD-ROM or video conferencing equipment, or an intangible **service**, e. g. offering a web based learning software or tutorial assistance. The content provided by an e-learning software and the transfer of content supported by an e-learning software are the core of an e-learning system.

Software performing a specific task or function is called an application. Applications which are suitable to support or enable e-learning are called **e-learning applications** here. They are focused in this paper. We distinguish four types of e-learning applications and regard them by three perspectives in this section:

- their objective,
- their technical realization, and
- the didactic point of view.

Table 2 presents an overview of **objective and general characteristics** of the four types of e-learning applications.⁵

⁵ More features, resulting in specific advantages for users, are presented in section 3.2.2.

E-learning application	Characteristics
Drill-and-practice	The application takes on only basic functions of a teacher. Learning sequences are completely predetermined. The application serves training purposes. The goal is to stabilize knowledge by presenting content in form of questions.
Tutor system	The application can serve training purposes as well as the gain of knowledge. Content is provided on basis of the learner's reactions and/or continuative information and comments are given. Intelligent tutor systems (ITS) are enhanced tutor systems characterized by a high adaptivity ⁶ and generativity ⁷ .
Simulation	The application enables learning by discovery by reproducing realistic situations. It generates a clipping of the reality parameters of which can be varied. Learning sequences are normally not predefined, tutors or feedback are normally not provided. Computer games are also classified as simulations.
Computer supported cooperative learning (CSCL)	CSCL comprises tools and instruments for cooperative learning which is technically based on networks. In a sense, CSCL applications enable application sharing and support learning methods via workflow technologies. Tutors can be provided but the focus is not on presenting predetermined content.

Table 2: Objectives and general characteristics of e-learning applications

Depending on the **technical realization** we distinguish **computer based training (CBT)** and **web based training (WBT)**.⁸ E-learning applications which are stored on or delivered by any kind of computer disk, i. e. hard disk, floppy disk, DVD, or CD-ROM, are classified as CBT. CBT takes place offline. WBT is a technical enhancement of CBT. Learning resources are made available via networks, mostly via world wide web (WWW). This allows also methodological enhancements. Content of a WBT application is usually dynamic. WBT allows just-in-time access to information. A learner is not restricted to specific hardware e-learning software is installed at but can use any hardware providing access to the WBT network.

⁶ Adaption of future programme behaviour to the previous knowledge, requirements and goals of the learner.

⁷ Flexible arrangement of learning elements.

⁸ As far as a physical distance between teacher and learner is realized, education via CBT and WBT is also called "teleteaching" respectively "telelearning".

From a **didactic point of view**, e-learning applications differ due to the persecuted learning target and due to the supported organization forms. The **learning target** is here grasped by two dimensions:

- The **type of skills**, i. e. cognitive, affective or psychomotor skills. Cognitive skills are best investigated. The primary goal of e-learning providers is the mediation of cognitive skills, so this paper concentrates on such applications. E-learning applications mediating other skills are however reasonable. Especially the need to mediate soft skills, mainly basing on affective skills, increases in importance and is – at least in part – realizable by using e-learning applications.⁹ E-learning applications for explicitly mediating affective skills could be called "ethic brain-food"¹⁰.
- The **learning level** indicating the pursued learning result and differing for each type of skills. It is determined by the type of knowledge which is gained.

Learning situations have several organizational aspects. The embedding of an e-learning system or a part of it in a didactical framework is also called an **e-learning arrangement**.¹¹ Also the combination of different e-learning applications is sometimes called an arrangement. The combination of "traditional" face-to-face education and e-learning is called **blended learning**. Blended learning can be part of an arrangement. Depending on the arrangement, e-learning technology can either be used to replace, to support or to complement traditional teaching methods. Due to the classification of e-learning applications one organizational aspect comes to the fore: the learning scenario. The **learning scenario** is depicted by the allocation of the control of the learning process and the form of communication and interaction. Three types of learning scenarios are typical:

- **Learner centered learning** is self-dependent and autonomous learning. The learner deals independently with learning tasks.
- **Group centered learning** focuses on interaction. Learner and teacher as well as learners among themselves interact. Group learning can have advantageous implications on learning processes: Information can be exchanged, knowledge can be combined, and feedback can be given.
- **Instructor centered learning** is based on the traditional teaching model "instruction". It is characterized by a unidirectional, i. e. frontal, tuition. The instructor is the active part, and he is controlling subject and course of the learning process. He performs, demonstrates, represents, and/or executes.

⁹ Training soft skills by e-learning is extensively discussed by Büser, see [Büse2000].

¹⁰ According to the definition of "health food" especially enriched to meliorate health.

¹¹ Bodendorf gives an overview over e-learning media and arrangements, see [Bode2000].

Figure 1 presents a didactic classification scheme for particular e-learning applications. The paper is focused on cognitive skills. The other layers of the classification cube are only indicated by dashed lines.

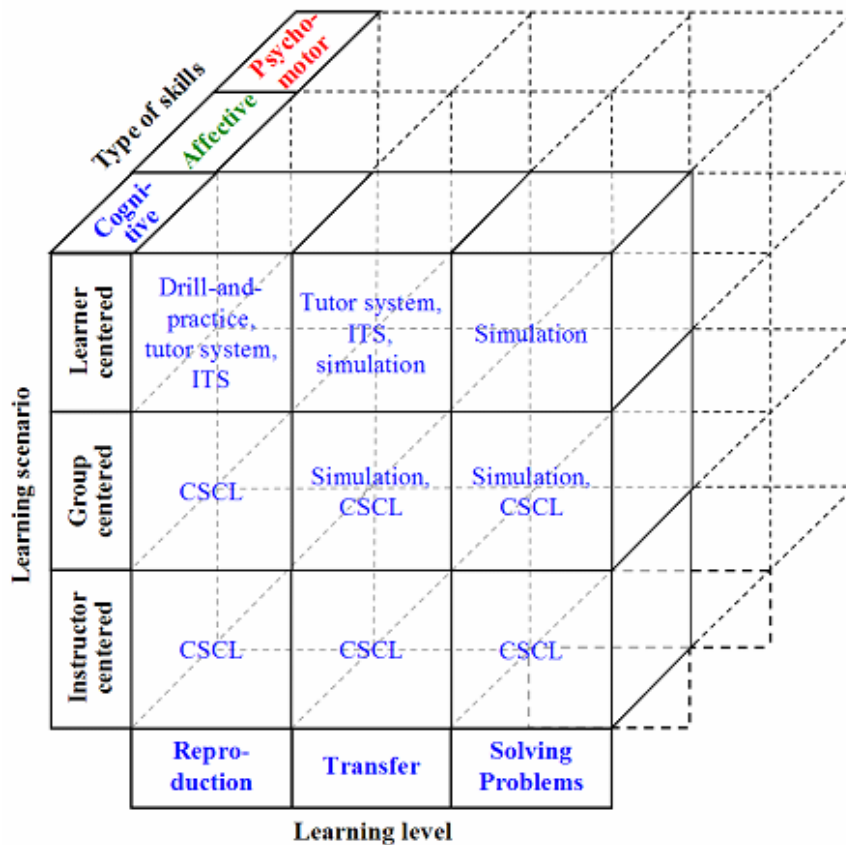


Figure 1: Classification cube for e-learning applications

E-learning applications are of different complexity, see Figure 2. Complexity comprises both, technical realization and number of supported didactic options and features. While a computer based drill-and-practice application is rather uncomplex and behaviorist, net based simulations and CSCL applications are rather classified as complex constructivist applications. Tutor systems range in between, depending on their realization.

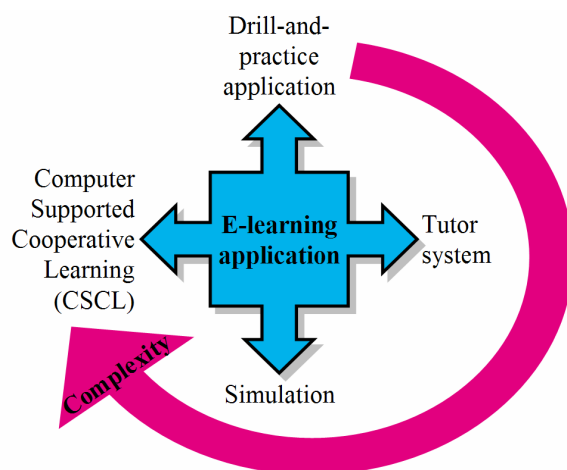


Figure 2: Complexity of e-learning applications

2.3 Conditions of e-learning

The use of e-learning applications is embedded in various conditions influencing their deployment and benefits. Figure 3 depicts four groups of conditions we differentiate. Not all conditions are affectable, some have to be considered as general conditions of e-learning. **Learner specific conditions** are given by the learners' profiles: actual needs, age and level of maturity, individual level of previous knowledge, and favored type of perception¹². From these characteristics other conditions result, e. g. learning purposes and goals, attentional and motivational tendencies, use of learning strategies, attitudes towards the favored learning space, favored learning time, and will to pay for education. The learner-profile can not be influenced by the use of e-learning technology. Since the basic motivation of learning is curiosity, play instinct, and the drive to discover, learning goals and strategies as well as attentional and motivational tendencies can be affected by e-learning technology. **Societal conditions** are the societal change concerning cultural, educational and general demographic and sociological structures. It comprehends also economical, political and legal situation and technical feasibility. They comprise statements about income or lifestyle of learners. Societal conditions are considered as invariable here. They heavily influence the general societal attitude towards e-learning technology. Keywords like rapid technical change, increasing globalization and mobility, increasing importance of knowledge, flexibility, employee-qualification and life-time learning depict important aspects of the actual societal status. **Institutional conditions** of the institution which provides and/or deploys e-learning technology, e. g. location and size, available resources,

¹² I. e. auditive, visual, haptic or verbally abstract.

sponsorship and financing, objectives, members and structures. **Technical conditions** result from specific characteristics of e-learning technology.

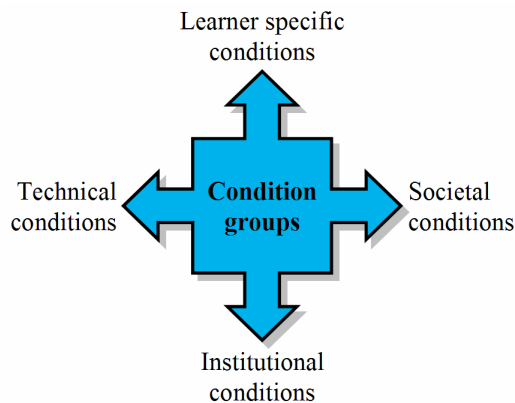


Figure 3: Conditions of e-learning

3 Business models for e-learning

3.1 Business models

According to Timmers, a **business model** is defined in a very comprehensive way. It represents the "architecture for product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues." [Timm2000, p. 32]. Osterwalder and Pigneur concretize and extend this view by postulating four issues a business model has to address: product innovation, customer relationship, infrastructure management, and financials, see [OsPi2002, p. 2f.]. Wirtz suggests six partial models a business model should contain: market model, procurement model, manufacturing model, supply model, distribution model, and asset model, see [Wirt2001, p. 211]. All authors agree a business model integrates aspects of specific sectors of business economics represented by single models for each sector. As an essence of the presented approaches we suggest three interdependent **partial models**, see Figure 4.

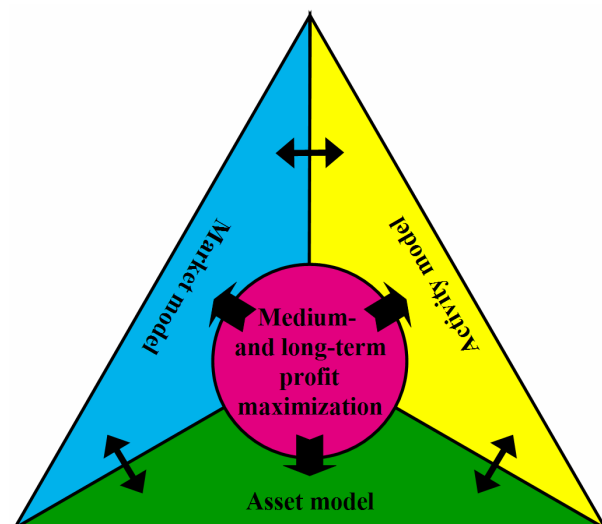


Figure 4: Interdependent partial models of a holistic business model

Pecuniary reward is as well the incitement as the objective of defining a business model. Making profit is the intention of every business. Companies with a business model not making medium- and long-term profits are not able to persist.

The **market model** defines the various actors, their roles and the market structures. A separation of supply and demand model is useful. Statements about customer segments and positioning of a business are included. The **activity model** focuses on activities a business performs. It integrates manufacturing, marketing, after sales and support activities. The activity model is based on either the concept of a value chain or a value shop or network; these concepts are introduced by Porter and Millar, see [PoMi1985] respectively Stabell and Fjeldstad, see [StFj1998]. Marketing aspects comprehend the marketing mix, i. e. product, price, place, and promotion.¹³ An important marketing aspect is product design including statements about product functionality, quality, appearance, and target group. The value the product delivers to all actors is considered. Further marketing statements concern pricing policy and distribution channels including logistic aspects. Promotional issues are associated to communicational aspects, involving advertising and public relations. The **asset model** comprehends cost model and revenue model.

Business models provide an architectural framework for a **business strategy**. They link the business planning level, i. e. planning positioning and objectives of a business, with the business process level, i. e. implementing this information, see [OsPi2002, p. 3]. According to Porter three generic types of business strategies exist: **Overall cost leadership** aims on achieving the lowest provision costs,

¹³ An intensive discussion of marketing aspects provides e. g. Kotler, see [Kotl2000].

differentiation¹⁴ concentrates on creating customer value in a specific area, **focus** aims on specific narrow market segments and follows either cost leadership or differentiation, see [Port1980].

3.2 Sustainability

Sustainability is a term originally stemming from forestry and focusing on preventing ecological resources for later generations. Adopted to economics sustainability focuses on constancy, permanence and preventing resources – from an economic perspective. **Economic sustainability** means medium- and long-term success, i. e. usually profit maximization.

Sustainable products are products offering a medium- and long-term value to customers. They persist over a period of time. **Sustainable supply of products** demands sustainable business models. Sustainability in this respect bases on the integration of all three partial models of a business model. Offering sustainable products is one aspect of sustainable business models. Thus, **sustainable business models** should consider the following aspects affecting all three partial models:

- The three partial models of business models have to be defined consistently.
- Costs can be lowered by concentrating on core activities basing on core competencies. Cooperations and alliances should be considered. Strong partners are also connected with image aspects of an e-learning offer.
- Revenues can be earned by different models, in part presented in section 3.4. They generally differentiate in either a customer pays for a product or a third party provides revenues. Both models require mid- and long-term customer orientation.
- Investments must aim on medium- and long-term profit generation. The gap between provision costs and selling price must be closed. This can be realized by lowering costs and/or by earning more revenues. Revenues must compensate provision costs and exceed them in the long run.
- Due to fast changes in the e-learning environment, the adaptivity and scalability of a business model comes to the fore. **Adaptivity** refers to the ability to adapt to changing market structures, e. g. customers' needs. **Scalability** encompasses development, delivery technology and/or distribution, see [Seuf2003].
- Target group and market segment have to be chosen carefully. Revenues can be earned by addressing a small target group gaining a rather high revenue per customer. If the revenue per customer is rather low, a large target group is necessary to earn revenues of a comparable scale.

¹⁴ Differentiation can refer to product features, service activities, and alliances.

- Customers are more likely to buy a product with high customer delivered value¹⁵, basing on low-cost and/or differentiated products. Based on this, customers can be bound to a company and its products. This binding can also base on switching barriers. Third parties are normally interested in sponsoring saleable products. Branding has to be seen in combination with customer binding, too. Brand recognition is one crucial factor for the success of market leaders in e-learning, see [Seuf2003].

Means to grant sustainability are primary medium- and long-term cost-benefit analyses. These analyses aim on the one hand on determining the balance between the costs of following a specific provision alternative and the benefits this alternative implies, i. e. the revenue it may generate. A supplier must choose which core activities to perform. They should be aligned with the core competencies of a company and reinforce each other, see [Port1996]. On the other hand cost-benefit analyses aim on seeking out the balance between the costs a customer has to pay for a product and the benefit it implies for him, i. e. the customer delivered value. Thus, the supplier's point of view is complemented by the customer's point of view. It is to be taken into account that benefits must not be originally monetary. But they have to be measurable monetarily, at least indirectly. Only then it is possible to oppose costs and benefits.

3.3 Adaptation to e-learning

3.3.1 The market for e-learning applications

Demand. First of all, sustainable business models for e-learning applications demand customer orientation. Potential users of e-learning-applications can be classified to identify typical market segments with different needs and requirements. In some cases, this can be continued down to the level of individual learners. E-learning applications are to a different extent used in all educational sectors due to the need of life-time learning and continuous qualification. On the one hand, learning institutions integrate them more or less in traditional course programs. On the other hand completely e-learning-based education institutions evolve. Examples are the open university in Great Britain, see <http://www.open-university.co.uk>, in Germany the Virtuelle Hochschule Oberrhein VIROR, see <http://www.viror.de> or WINFOLine, see <http://www.winfoline.de>. An overview of providers of educational products offer Lehner¹⁶, see [Lehn2000], and Hagenhoff and Röder, see [HaRö2001]. This trend comprehends education institutions as well as institutions for postgraduate professional, technical, further or private education and training. The USA take the leadership in deploying e-lear-

¹⁵ Difference between total customer value and total customer cost, see [Kotl2000, p. 354].

¹⁶ Lehner also discusses prospects and limits of virtual universities.

ning technology. Almost every US-american university uses e-learning technology. Today, e-learning is far more used in companies, i. e. in continuing education, than in education institutions. According to surveys, german companies invest between 750 € and 1500 € annually in professional education for each employee. Generally spoken, companies are much more price-insensitive concerning the use of learning technology than public schools or universities. There, the use of e-learning technology must not exceed costs for traditional education. E-learning applications are not only demanded by learning institutions but also by individual, autonomous learners focusing special learning objectives. The use of rather uncomplex and relatively low-priced e-learning applications, e. g. a language training CD-ROM, is widespread. The single learners' will to pay for education in general and especially for e-learning applications strongly depends on societal, especially cultural conditions. In the USA, education fees are common practice. In comparison to that, e. g. german learners are not used and not willing to pay extensive fees for educational technology. This is one of the reasons for the cutting edge of the USA concerning the deployment of "modern" learning technology.¹⁷

Supply. E-Learning applications are provided either by commercial providers or by academic research and development (R&D) providers. Many commercial providers are publishing houses trying to enter the e-learning sector. Depending on the focused educational sector, governmental grants or cooperations with universities are possible. Mainly, commercial providers focus on supplying e-learning products for professional training, see [ScHe2000, p. 27]. Academic R&D institutions often focus on the effective and efficient use of e-learning technology for rather complex content. An attractive design of the user interface has only second priority. In contrast, commercial providers normally dissociate from research issues and concentrate on fast-to-produce and easy-to-sell e-learning technology which can be created cost-efficiently. This is related to mainly optically very attractive packages and user interfaces and relatively low prices.

3.3.2 Activities in supplying e-learning applications

The supplier has to enter a specific market segment and has to identify the related customers' needs. Based on this, he can properly market the values of his e-learning application. As pointed out in section 2.2, the use of e-learning applications is embedded in an e-learning system. A learner needs more than a single e-learning application to take advantage of e-learning. He also needs suitable hardware, possibly a tutor or an advisor, and support for technical aspects. Additionally, e. g. if he pursues a degree, he needs to be answered organizational facts. Successful e-learning is based on a coherent, harmonious concept including organizational, social, economic and technical aspects. Customer and supplier and also costs and benefits of an e-learning application must be seen in connection with the whole

¹⁷ An overview of e-learning markets in the USA and in Germany is presented by Bentlage and Hummel, see [BeHu2002, p. 121ff.].

e-learning system. Content always has to be regarded in combination with technology and service related aspects. If possible, technology should enable e-learning but not influence its quality; content and structure should be divided to grant future extensibility, see [Hohn2001, p. 5]. Considering this, the chances of generating a critical value for the consumer exceeding the costs for using the e-learning application can be hugely increased. Each e-learning application has its proper benefits; but by offering additional services or by embedding applications in comprehensive arrangements, a surplus of benefit can be produced. This aspect becomes more and more important the more complex an e-learning application is. Possible benefit surpluses should be considered in marketing and CRM activities. Revenues and costs related with these benefits have to influence the asset model.

Regarding the whole process of manufacturing, marketing and deploying e-learning products in a value chain, there are several possible primary activities to identify, see Figure 5.¹⁸ They are accompanied by support activities. Since there are interdependencies, activities shown in this value chain must not have the logical sequence shown. The possibility of deconstructing the value chain is one important aspect for business models for e-learning.¹⁹

Support activities. They accompany the whole business process and can not be assigned to specific primary activities. Comprised are the necessary infrastructure, technology development, human resource management, procurement, and quality management. Quality management is a special aspect influencing also product design. It should include periodical evaluation of the manufacturing process as well as the product functionality, ergonomics and quality.

Manufacturing activities. By research activities, content for e-learning applications is generated. Not all e-learning applications focus on mediating content, e. g. CSCL. Didactic planning involves decisions about if – and if, which – content is provided and how the methodology is designed. Didactic planning has to be based on the target group and involves the decision about the provided type of e-learning application. The programming is also part of the manufacturing. By programming, content is combined with the didactic concept respectively the e-learning application is "cemented" in terms of a marketable software. Then, depending on the focused distribution channel, the software is packaged.

¹⁸ The presented value chain implies activities Keating postulates, too, see [Keat2002, p. 58 and 63]. A value chain model for creation of value within "traditional" universities is presented by Müller-Böling, see [Müll2001].

¹⁹ Keating gives examples of e-learning suppliers having deconstructed the value chain, see [Keat2002, p. 63].

Marketing activities. An important marketing decision concerns the **product design**. With reference to section 2.2 we differentiate four types of e-learning applications with different objectives, features and benefits. Objectives and features have already been outlined above. The outcome of the benefits is closely related to the learner specific conditions, especially his learning objectives and the desired learning scenario.

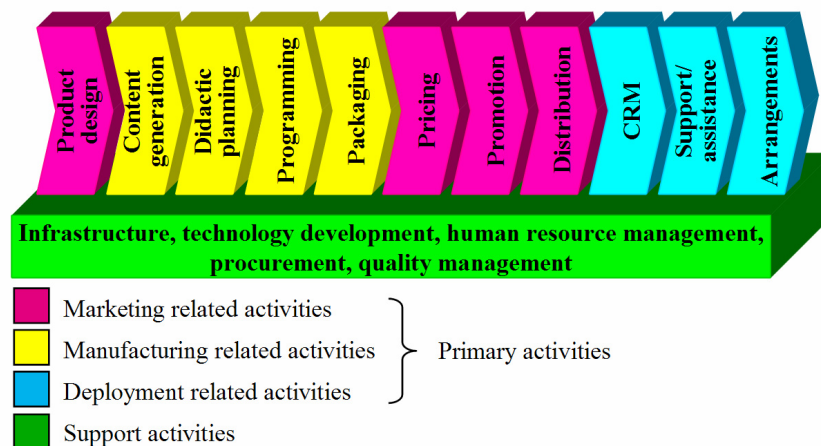


Figure 5: Value chain of e-learning manufacturing, marketing and deployment

Examples for general advantages of using e-learning applications are the independence of time and space, granted by e-learning applications which do not focus on synchronous communication. These enable learning-on-demand and saving costs, e. g. for traveling to seminars, for tutors, for printing and sending learning material, for wage continuation in non productive times. Life-time learning can be managed flexibly and efficiently. Companies deploying e-learning can realize competitive advantages. Additionally, the use of ICT can easily address different perception types and positively influence attentional and motivational tendencies which are determining the effort of learning processes. Complex content can often be better visualized by IT-based animations, which become demonstrative and flexible. E-learning applications focusing on self-directed learning induce efficient learning, because the learning pattern is only determined by one learner's profile. Computers are patient and tolerant, i. e. learners can choose duration, tempo and sometimes difficulty and can repeat learning units. Group centered e-learning applications facilitate asynchronous and synchronous communication and enable knowledge sharing. E-learning applications engage active learning by demanding activity and self-dependence. They enable self-information, gaps in one's knowledge are discovered before the

final exam.²⁰ **Important examples for general disadvantages for users of e-learning applications** are the necessary hardware infrastructure and the necessary technical know-how. Especially applications focusing on synchronous audiovisual communication demand high processing rates and bandwidth due to the need of compressing and decompressing audio- and video data. Difficulties in coordination and communication as well as demotivation can result from lacking social impressions and coordination automatisms.

Apart from that, each e-learning application has its individual benefits. These are not presented in this paper. Figure 6 presents a compressed overview of important advantages of e-learning applications. Disadvantages of e-learning applications result mainly from not having the advantages of another application. Disadvantages are not explicitly mentioned here.

The benefits of e-learning applications have to face the costs for using them to determine the customer delivered value. Depending on the didactical and technical complexity of the e-learning application the prerequisites for its use are more or less complex. Not only benefits but also costs of an e-learning application are combined with these complexity levels. Learners have to consider costs for buying respectively using the e-learning application, if necessary for additional hardware and they need to obtain the technical competence for using the application. The benefits of a drill-and-practice application or a tutor system face only the acquisition costs which are usually low, i. e. the CD-ROM price. If realized as WBT, the use of an application generally causes additional network costs. But, due to its characteristics the benefits of a WBT are admittedly higher than the benefits of a CBT. Costs for using simulations and CSCL applications are usually higher because they often require special hardware. Depending on their complexity, instruction may be needed. The higher costs are also facing enhanced benefits. Since the customer delivered value results from benefits *and* costs, less benefits do not mean less delivered value. Every e-learning application is suitable to reach specific learning goals.

As to the **pricing policy** it is to be observed that prices raise with increasing complexity and individuality of an e-learning product. "One-for-many" applications can be produced cheaper and priced lower than specialized applications. A typical example for a low-price e-learning application is a CBT drill-and-practice trainer for business english, e. g. PONS Inter@ktiv, see <http://www.pons.de>. Tutor systems are still relatively low-priced but exceed simple drill-and-practice programs, e. g. MS-Office Trainers. Simulations exist on the one hand as standardized, rather low-priced versions, e. g. simulations for founders of a new business, see <http://www.ugs.de/ugssim/uebersicht/index.shtml>.

²⁰ For more benefits of multimedia based and web based learning see e. g. Fandel and Hegener, see [FaHe2001, p. 116], Rosenberg, see [Rose2001, p. 30f.] or Bentlage and Hummel, see [BeHu2002, p. 148f.].

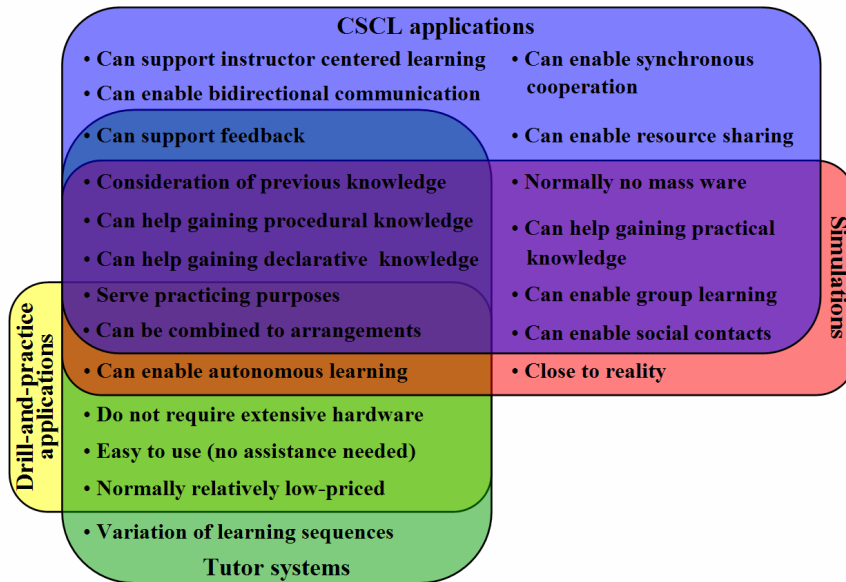


Figure 6: Advantages of e-learning applications

On the other hand, simulations are designed for specific purposes, e. g. flight simulations, crash simulations for financial service providers, or scenario simulations for insurances. Specialized simulations are often very expensive since they are individually programmed. They often require special hardware sometimes sold in package with the software. CSCL tools exist as standardized low-priced software, e. g. chat-rooms, and as well as hardware-bound tools, e. g. video-conferencing software. CSCL hardware also is often sold in package with CSCL software. E-learning applications are often **promoted** like other products. Typically, they are especially advertized via internet. Traditional promotion comparable to books is rather common for commercial products. Academic e-learning products are rather promoted internally between universities.

Possible **distribution** channels depend on the one hand on the character of the e-learning product. The product can be supplied "non physically", i. e. downloadable or even usable via networks, or it has to be packaged and physically shipped. On the other hand, the distribution channel depends on the target group. Other criteria are complexity and standardization level of the e-learning product. Typically, non standardized, individually programmed or very complex e-learning applications address a very special target group and require individual consulting. Distribution rather takes place in person. Uncomplex, standardized mass products can in contrast be distributed without consulting by using mass distribution channels. They can be distributed by wholesalers, by retailers, even by discounters, by catalogue, by home shopping or via online-shops. Today, learning software can e. g. be purchased from Amazon, see <http://www.amazon.com>.

Intangible software-products like web based courses, e. g. the courses offered by Teles European Internet Academy, see <http://www.teia.de>, can be offered as downloadable or online version. This enables direct marketing and compression of the distribution channel.

Deployment related activities. Depending on the complexity of e-learning applications, the deployment of e-learning applications by users demands more or less after sales activities. The more complex the application and the more a customer has to pay for it, the more important is the generation of value for the customer after having supplied the actual product. To establish trustful, long-term relationships with customers and to make customers recommend a product to others, a **customer relationship management**, and the generation of value surpluses are essential. Values should exceed the advantages of the single e-learning applications since value surpluses are the only possibility to differentiate from competitors offering the same product to the same customer segment. Extra value can be granted by different measures, e. g. **assistance and support** for users of an e-learning application. If useful, single e-learning applications can be embedded in comprehensive **e-learning arrangements**. These can include

- the provision of communication facilities, e. g. a forum, chatrooms, newsgroups or bulletin boards,
- the provision of exams respectively degrees,
- the delivery of further information on e-learning issues, e. g. a newsletter,
- the provision of tutors and coaches for special applications, or
- the granting of access to different e-learning applications.

E-learning study courses can be arranged virtually or comprehending phases of presence. A modular design of e-learning applications and the division of content and structure of applications helps making applications reusable and combinable. The existence of network effects using a specific e-learning application supplied by a special e-learning supplier could be another reason for customer binding.

3.3.3 Costs and revenues of supplying e-learning applications

Regarding the asset model a big difference between commercial and academic suppliers of e-learning applications can be observed. Concerning academic suppliers of e-learning applications, the gap between costs of production and selling price is very often subsidized by public organizations or by grants, e. g. the constitution of WINFOLine was mainly supported by funds of the participating universities and by third-party funds, see [Ehre⁺2001, p. 10]. In contrast, commercial

providers have to close this gap themselves. Depending on which activities an e-learning supplier concentrates on, he has to consider the following **costs**.²¹

- Fixed costs for generally maintaining the company, e. g. personnel, buildings, equipment, insurances, etc. For physical products facilities are normally more expensive than for non physical products.
- Periodical costs for surveying market structures, for defining the product, for positioning the company, etc.
- Variable costs for generating content, planning the didactic organization and manufacturing the distributable e-learning product. The whole production costs will be lower for standardized one-for-many applications or reusable applications than for individualized products.
- Promotion costs depend on the chosen promotion media. They can be lowered by cooperating with other suppliers, e. g. by cross linking offers in the internet.
- Costs for packaging and distribution vary depending on the distribution channel. Especially netbased distribution is relatively cheap as packaging and shipping costs are not to apply. Personal distribution is the most expensive distribution form. Distribution costs include costs for charging revenues. Concerning web based applications, the implementation of online payment possibilities can virtualize whole business processes and save transaction costs.
- After sales services comprise a variety of possible activities and costs. If a supplier hosts e-learning applications or an e-learning platform, he has to consider costs for e. g. IT-infrastructure including network fees²², for down-times of the e-learning system or for security measures. Costs for after sales services can also occur for tutors, possibly including their training, and other pedagogic personnel or marketing people realizing a CRM. In the after sales sector costs can also be saved by cooperating with other suppliers, e. g. by combining modular e-learning applications to individual study courses. Web based activities tend to offer the hugest saving potentials.

Revenues can be generated by selling an e-learning application and for charging fees for services the supplier additionally offers. Different revenue models exist. Wirtz differentiates direct revenues and indirect revenues, see [Wirt2001, p. 215]. Direct revenues result either from products or transactions, e. g. the price of buying a CBT application or fees for using a WBT application, or are independent from it, e. g. a general fee for joining an e-learning community. Fees for using an application can depend on the time of use or on the content used. Indirect revenues can also result from the product, e. g. provisions, or can be independent from it,

²¹ Exemplary, Fandel and Hegener, see [Fand⁺2001, p. 128ff.], present an overview of provision cost for a relatively simple e-learning course.

²² Especially synchronous technologies demand high processing rates.

e. g. fees for banner-ads or for collected user data. Different revenue models imply not only the final users of e-learning application as potential payers. Third parties, e. g. education institutions wanting to offer an e-learning application to its learners, sponsors or data mining agencies, are possible payers, too.

3.4 Exemplary business models for e-learning applications

Figure 7 depicts exemplary activity models for e-learning applications. The illustration follows the approach of Keating who presents four general types of business models for e-learning products widespread in the USA, see [Keat2002, p. 58].

Following the **integrated model**, a supplier fulfils all manufacturing, marketing and deployment related activities using in-house resources. This model demands the highest costs for a supplier. Concentrating on offering WBT, the activities of packaging and physical distribution are very low. Examples for suppliers of integrated WBT are Western Governors University (WGU), see <http://www.wgu.edu>, and WINFOLine, see <http://www.winfoline.de>. Both are based on a partner model, integrating resources from education institutions of different states, regarding WINFOLine also from sponsors, private industry partners and international associates.

A **content generator** concentrates on delivering content for e-learning applications. Often content generation comes along with didactic planning, at least part of product definition, programming and packaging. Profiles of a content generator and a **manufacturer** are often combined. A content generator and manufacturer of e-learning applications is e. g. Kingscourt/McGraw-Hill, see <http://www.kingscourt.co.uk/col.htm>, providing digital learning resources for "Curriculum Online", see <http://www.curriculumonline.gov.uk>, an initiative of the British Department for Education and Skills, see <http://www.dfes.co.uk>. Manufacturing an e-learning application needs a large cost pool.

A **navigator** focuses on promotion. CBT-Verlag, see <http://www.cbt-verlag.de>, is an example for a navigator for CBT applications. Especially for WBT applications a common method is the provision of learning portals. A **learning portal**²³ is a contact point which matches suppliers and demanders of e-learning systems, see [Rose2001, p. 157]. Learning portals generally link as well commercial as academic e-learning offers. In most cases, learning portals not only act as meeting points but offer also access to e-learning applications. In combination with this, they normally comprise additional services, like forums for users or additional information on the subject of e-learning.

²³ Learning platform is another common term.

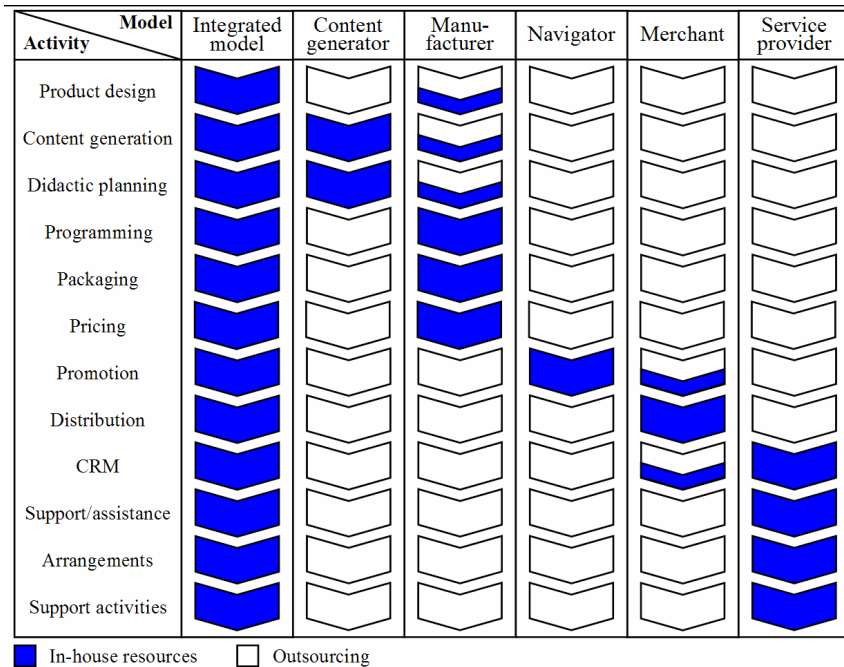


Figure 4: Business models for e-learning based on core activities, see [Keat2002, p. 58]

In doing so, they are not clearly separable from **merchants** and **service providers**. Merchants are responsible for distributing and billing e-learning applications to customers what can for WBT also be done via learning portals. The core activities of service providers can by the way be far more differentiated or concentrate on only one of the exemplary primary or support activities. E. g. a service provider can concentrate explicitly on brokerage activities and bring together parties interested in e-learning. He can, for example, also focus on administrative activities, tutoring, or quality management. Examples for learning portals respectively platforms are manifold. Sun Microsystems provides a learning platform targeted to professional training, see <http://suned.sun.com/>. Among other things there is access to courses, skill management, assessment, technical assistance and e-learning arrangements containing also blended learning with traditional classroom phases. Content can be either delivered by the learner's company or content and also complete courses are delivered by allied strategic partners like e. g. Avaltus, see <http://www.avaltus.com>. Global Learning, see <http://www.global-learning.de>, is a learning portal not only addressing professional training. Global learning focuses on bringing together supply and demand as well as providing additional information on e-learning. The supplier iBusiness, see <http://www.ibusiness.de>, has the same focus.

Centering the revenue aspect, Rapp differentiates nine business models, see [Rapp2003]. Since the models he presents are commonly found on the WWW they are not all suitable for supplying CBT e-learning applications. Some of the models he postulates however adopt models being common practice in the "bricks-and-mortar" business. The suitability of revenue models for specific e-learning applications is discussed in section 3.5. We adopt five revenue models which are common in the sector of e-learning:

- Earning revenues by **selling e-learning products** bases on menue prices for products.
- Revenues by **brokerage** come from fees or commissions for bringing interested parties together and facilitating transactions.
- **Subscription** fees are levied for participating in e-learning services, e. g. a newsletter or a forum. Both models are special revenue models for selling service activities.
- **Advertising** messages can be posted by a supplier of e-learning products. Promoting and/or merchandising the e-learning product and/or related services on the one hand, the supplier earns money by posting advertising messages on the other hand. Advertising can also be the sole source of revenue while products and services are offered for free.
- The **sale of customer related information** to data mining agencies demands the collection of user data.

3.5 Sustainable business models for e-learning

A supplier's business model addresses his core business. The core business is defined by the activities he accomplishes with his in-house resources and by his revenue model and has to be aligned with the target group. The six activity models can be connected to the five revenue models to compose consistent and useful business models. The revenue model has to be aligned with the core activities and the target group.

Colored marks in Table 3 indicate relations between matching core activities and revenue sources. The brightness of the color indicates how useful a relation is. The darker the color the more useful the relation. White marks are least useful.

		Activity model					
		Integrated model	Content generator	Manu- facturer	Navigator	Merchant	Service provider
Revenue model	Sale of e-learning products	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red
	Brokerage	Dark Red	White	White	Red	Light Red	Dark Red
	Subscription	Dark Red	White	White	Red	Red	Dark Red
	Advertising	Dark Red	Red	Red	Dark Red	Light Red	Dark Red
	Sale of customer related information	Dark Red	White	White	Red	Dark Red	Dark Red

Table 3: Intensity of the relation between core activities and core revenue sources

A supplier normally cannot be assigned to only *one* business model. In reality, business strategies are mostly based on a combination of different business models. The presented types of business models are idealized and stereotyped to clarify typical characteristics. The classification of business models makes clear that benefiting from different sources of revenue can not be easily connected to all types of activity models. In this respect it is important to generally tell apart the supply of CBT from the supply of WBT applications. The description of exemplary business models in section 3.4 already clarified that not each business model is suitable for the supply of CBT *and* WBT. Computer based e-learning applications represent rather "traditional" products being marketed like e. g. other software products. Web based products offer new chances and challenges. Especially due to the internet both new kinds of business models evolve and existing business models are reinvented. This concerns possible service models and possible revenue models. E. g. the collection of user data has become more popular by the use of the internet facilitating the collection. Or the posting of banner ads is a common model for suppliers providing a web site related to the e-learning product.

Comparing costs for implementing the models to realizable revenues, general aspects of sustainable business models for e-learning applications come to the fore:

- Business models based on manifold revenues generally are not to prefer to business models with only one typical revenue source. Critical for a supplier is the balance between investments and likely revenues. Crucial is that the following inequality combining costs (C) with revenues (R) and the likelihood (p) to be achieved: $C < p \cdot R$.

- Sufficient revenues are likely for products offering customers balanced costs and benefits. Often, critical aspects for possible customers to pay for an e-learning application are not the acquisition costs. Especially companies are absolutely willing to pay for e-learning applications offering substantial benefits for their employees. Benefits vary for different target groups. Since companies normally want to train several employees, not the overall costs for an application but the costs per employee are regarded. As a result, fixed costs for acquiring an application may be higher.
- For standardized CBT applications, e. g. drill and practice, tutor systems or simulations, an observable sustainable business model is the combination of "Sale of e-learning products" and "Manufacturer". This results from low complexity and isolated usability of CBT applications. This business model is not addressed to a specific target group; it matches individual learners as well as education institutions. Standardized CBTs profit from the large target group and often create high revenues even though they are relatively low-priced.
- For specialized CBT applications, e. g. tutor systems or simulations, the same business model is sustainably applicable. Although the target group is very small, these applications create high revenues since they are relatively high priced and are often sold in combination with hardware and support contracts.
- WBT applications imply surplus benefits due to their characteristics. Web based applications can not only be marketed via networks, but users even access and use them online. They allow the provision of special net based services. WBT services can – apart from their inherent benefits – easily create additional network effects. From a supplier's perspective, these services are relatively easy and cost-effective to implement, e. g. economies of scale can be realized, and cooperations can reduce costs. At the same time they allow the application of supplementary revenue models like brokerage, subscription, advertisement and the sale of user data. The relation between benefits and costs is positively influenced. A business model for WBT applications can be made sustainable by combining low-cost services granting user benefits.

4 Conclusion

To foresee future trends is difficult. Considering the development of the general conditions of (e-)learning, the benefits and the use of e-learning applications will increase rapidly. This leads to the assumption that sustainable business models for complex e-learning applications are easier to develop. The following reasons suggest that sustainable business models also for complex e-learning applications are realistic today:

- Meaning and importance of knowledge increases. There is a need for high-quality learning applications which also allow the transfer of knowledge into practice. This makes the advantages of e-learning applications more valuable.
- Working and education environment are changing. People are required to adapt quickly – and often with their own initiative – to frequently and rapidly changing knowledge and technologies. The qualification of employees is more and more important. Life-time learning is one keyword of modern job profiles. Learning applications which allow fast and easy diffusion and update of information are needed.
- Societies and especially learners are changing. The readiness to pay for education already increases and a further increase is likely, especially the approach to the American education system leads to this assumption.
- Technical conditions are changing. The development and enhancement of technologies enables price reductions. Hardware, software and network fees decrease.
- Globalization is omnipresent. Companies are expanding worldwide and are outsourcing functions and activities to other countries with different requirements. Mobility of people is important in this context. Learning applications are needed which allow learning continuously and everywhere, i. e. mobile.
- The need of learning complex content and of using complex applications is there. It will – due to the further development of the information society, the globalization and technological change – increase permanently.

Different business models suitable for e-learning exist. They base on combining core activities with revenue sources. Sustainability depends on the success of aligning this combination with the needs of the target group. Target groups are influenced by individual and societal conditions. Depending on the type of an e-learning application business models vary in sustainability. Lacking sustainability of business models for e-learning applications is mainly caused by inconsistencies in their definition. An example: A university follows the integrated model and offers diverse voluntarily usable e-learning applications to its students. The university will likely not succeed in closing the gap between huge provision costs by selling the products to its students since the necessary costs for buying or using the applications would – from the students' point of view – be too high to exceed their benefits. The university should consider one or several of the following measures:

- Enlarging its target group, e. g. to professional education,
- offering useful additional services,
- cooperating with competitors to focus on core competencies and reduce provision costs, or/and
- implementing additional revenue models.

The assumption only simple computer based e-learning applications can be exploited successfully is not correct. A sustainable business model is the combination of "manufacturing" and "selling" for one-to-many and also for specialized computer based drill-and-practice applications. For complex WBT applications combining the provision of services with several revenue models is sustainable.

Sustainability means medium- and long-term success. It is based on concentrating on core competencies, pursuing the right target group, finding suitable revenue models, and then designing the appropriate product. The definition of the three partial models of a business model has to base on interdependent decisions equal in importance. None of the three partial models may be neglected. The business model has to be consistent. Customer-orientation, quality in combination with branding, cooperation with strong partners, the creation of win-win-situations and adaptivity and scalability of business models are keywords for sustainability leading to cost-reduction and increasing revenues..

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