Emerging Business Models in Education Provisioning

A Case Study on Providing Learning Support as Education-as-a-Service

https://doi.org/10.3991/ijep.v7i3.7337

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Abstract—This study aims to give a deeper understanding on emerging business models in the context of education. Industry 4.0/the Industrial Internet in general and especially recent advances in cloud computing enable a new kind of service offering in the education sector and lead to new business models for education: Education-as-a-Service (EaaS). Within EaaS, learning, and teaching contents are delivered as services. By combining a literature review with a qualitative case study, this paper makes a three-fold contribution to the field of business models in education: First, we provide a theoretical definition for a common understanding of EaaS. Second, we present the state-of-the-art research on this new paradigm. Third, in the case study we describe a "best practices" business model of an existing EaaS provider. These insights build a theoretical foundation for further research in this area. The paper concludes with a research agenda for further research in this emerging field.

Keywords—Education-as-a-Service, EaaS, Educational Service, Educational Offering, Cloud Services

1 Introduction

In the age of Industry 4.0/the Industrial Internet and especially the Internet of Things (IoT), education and new forms of education delivery gain a new importance. Technologies such as cloud computing empower new forms of education delivery and have a high impact on the education sector. Cloud computing is the enabler for new concepts like Education-as-a-Service (EaaS). It can "offer a unique business model for higher education that will transform the way modern education is delivered" [1]. The use of EaaS is attractive for research and education purposes [1]. It may lead to benefits such as lower costs, flexibility, scalability, accessibility, etc. [1-6], and help to improve the quality of teaching and efficiency of learning [1]. Chang and Wills [1] showed in a case study, that students feel more motivated and interested in learning in an EaaS setting. Cloud computing can provide the necessary resources for life-long learning and competency building in the area of Industry 4.0.

The potential of cloud computing in the area of education is immense, especially with regards to Industry 4.0 education. It can provide the necessary means, such as access to IT systems and training systems, which are required for learning the competencies needed for Industry 4.0. However, educational and learning requirements differ from business requirements in general. Therefore, a standard cloud provider may not understand educational and learning requirements [7]. Thus, cloud service providers who are specialized on education and possess the know-how and experience to offer services for education and learning are needed. Large IT companies such as Google, Amazon, HP, IBM, or Microsoft already offer services for the education sector. However, despite the increasing number of EaaS providers and users in this area, research on this phenomenon is still limited to describing some of the products from the companies mentioned above and listing their benefits [7]. Barrett, Davidson, Prabhu and Vargo [8] suggest researchers to further focus on education services. Gonzalez-Martínez, Bote-Lorenzo, Gomez-Sanchez and Cano-Parra [4] propose to conduct case studies with practitioners in this area. Current publications on the EaaS approach mostly cover requirements of higher education institutions, e.g., Masud and Huang [5] and Sultan [6]. However, there is little focus on the EaaS provider aspects and especially the benefits that EaaS can bring for Industry 4.0 education.

With this work, we want to address this gap by giving a definition for EaaS and describing an example EaaS business model from a provider perspective. Thus, we build a common understanding and a theoretical foundation for further research and theories regarding EaaS. To reach this goal, we use a systematic literature review to identify and explain typical elements of EaaS provider business models. Since literature in this area is still scarce, and the EaaS concept is still evolving, a case study with a well-established EaaS provider is conducted in a second step. The objective of this case study is to understand and extend the elements of the EaaS business models with findings from practice. Moreover, we discuss further research opportunities in this field especially in context of Industry 4.0 education.

2 Definitions

In this chapter, we give definitions of the main concepts of this work: EaaS and business models.

2.1 Education-as-a-Service (EaaS)

Education-as-a-Service (EaaS) is an area, in which new cloud-enabled business models evolve. These consist of an offering of cloud services that are used for teaching and training purposes. “EaaS is not only a new way of delivery of education but also an economical and sustainable business model” [1].

Masud and Huang [5] define EaaS as an application delivered to an educational institute securely over the internet. While other authors go beyond this definition by adding additional features and functionalities to the delivered service, Ghazizadeh [3] describes EaaS as a platform; a virtualized or centralized data storage accompanied by

educational services. However, he does not describe in detail the meaning of "educational services". For Alshuwaier, Alshwaier and Areshey [2] and Alshuwaier, Alshwaier and Areshey [9], an EaaS provider delivers programs, computer lab content and supporting services. Shunye, Dayong and Zijuan [10] specify these "supporting services" by calling them teaching resources that can be lectures, reference documents, video, audio, etc. Chang and Wills [1] define EaaS as a combination of a cloud architecture, applications, and services such as lectures, quizzes, assignments, student support, etc. They further mention that support and training can also be part of the delivered service.

Cloud software is the main component of the delivered service [1-3, 5, 9]. Above that, different authors mention teaching supporting resources as further components of EaaS: Course or lab materials or quizzes [1, 10], additional extra services such as support, and training [1, 10], or audio or video material [10].

From these definitions, we derive that EaaS describes a composed service that can be defined as:

A cloud service that is offered to different target groups for teaching or training purposes and is composed of three elements: (1) Access to a software, platform, or infrastructure provided as a cloud service; (2) Accompanying curricula with theoretical and practical materials about the cloud service that can be used to conduct a complete course; (3) Supporting tools and services, e.g., technical support, training sessions for the teaching staff, or demo videos. These key components of the EaaS model are visualized in Fig.1.

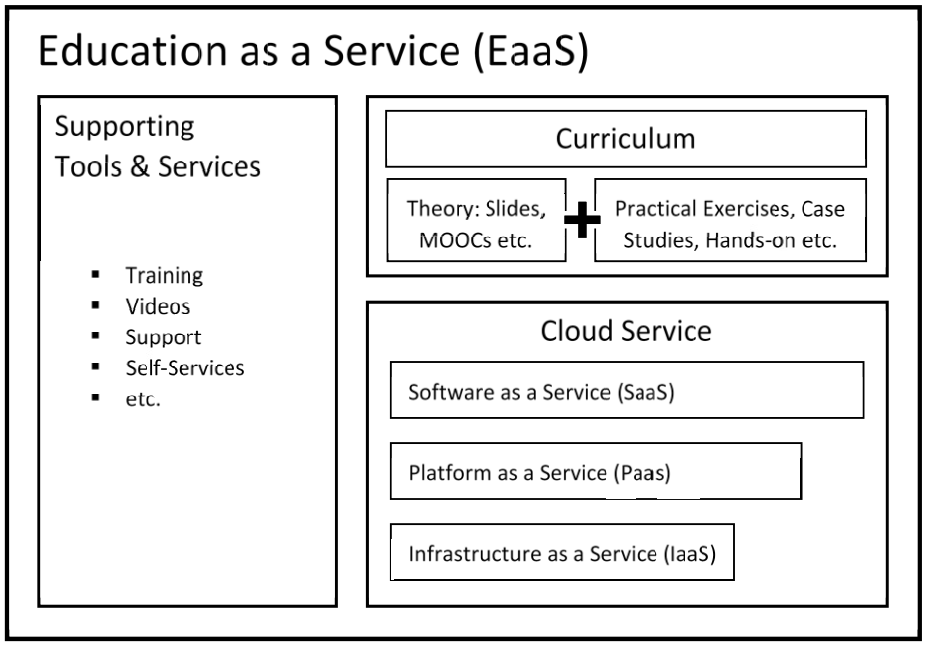

Fig. 1. Key components of the Education as a Service model

2.2 Business Models

Business models have attracted substantial attention in research as well as in practice. Various authors (e.g., Zott, Amit and Massa [11]) have suggested business models by defining and then describing their elements. However, the de-facto standard in practice and research evolved from the business model components initially suggested by Osterwalder [12] and further extended to a business model canvas by Osterwalder, Pigneur and Smith [13]. Accordingly, we decided to use this model to explore the EaaS domain.

3 Literature Review

In this chapter, we first describe the methodology and then the results of our systematic literature review regarding EaaS business models.

3.1 Methodology

To understand the EaaS business model, we conducted a conceptual literature review as described by Webster and Watson [14]. We used the following search string: ("cloud" OR "SaaS") AND ("education" OR "teaching" OR "learning") AND ("provider" OR "business model"). The purpose of this literature review was to find descriptions of the business model elements for EaaS and not to conduct a literature review on EaaS in general, as Gonzalez-Martínez, Bote-Lorenzo, Gomez-Sanchez and Cano-Parra [4] already published a structured literature review on the topic. While Gonzalez-Martínez, Bote-Lorenzo, Gomez-Sanchez and Cano-Parra [4] describe EaaS in general, e.g., tools and examples, we focus on business models for EaaS.

Our search included leading databases such as IEEE, ACM, ScienceDirect, Scopus, EbscoHost, Web of Science, SpringerLink, and Google Scholar. Due to the amount of hits, the search in Google Scholar was limited to the top 30 articles, sorted by relevance. After the first screening of the articles' abstracts, 44 relevant articles remained which treated the topic of cloud providing in education. In a second screening, each article was analyzed in total in order to see whether it contained business model elements. The final result after this step was a set of 19 articles.

3.2 Results

The articles were analyzed in order to extract information for the different sections of the business model canvas. Although most of the papers did not mention the concept of a business model directly, we were able to extract business model related information from them. **Error! Reference source not found.** gives an overview on the identified articles and the section of the EaaS business they are contributing to. None of the articles contained information regarding channels or cost structures. Therefore, those columns are empty in Table 1.

Table 1. Results of the literature review (Own representation with regards to the categories of the Business Model Canvas by Osterwalder, Pigneur and Smith [13])

	Key Partners	Key Activities	Key Resources	Value Proposition	Customer Relation.	Channels	Customer Segments	Cost Structure	Revenue Streams
Alabbadi [7]				x			x		x
Alshuwaier, Alshwaier and Areshey [2]		x	x	x	x		x		
Ghazizadeh [3]		x	x	x			x		x
Masud and Huang [5]		x	x	x			x		x
Radhakrishnan, Chelvan and Ramkumar [15]		x	x	x			x		x
Alshuwaier, Alshwaier and Areshey [9]		x	x	x			x		
Shunye, Dayong and Zijuan [10]		x	x	x			x		
Toguchi [16]				x			x		
Georgescu and Matei [17]				x	x		x		
Shi, Yang, Yang and Wu [18]							x		
Chang and Wills [1]	x	x	x	x	x		x		x
Khmelevsky and Voytenko [19]				x			x		
Lakshminarayanan, Kumar and Raju [20]		x		x			x		
Masud, Yong and Huang [21]				x			x		
Mircea and Andreescu [22]			x	x			x		x
Thomas [23]							x		
Masud and Huang [24]		x		x			x		x
Sultan [6]				x			x		x
Gonzalez-Martínez, Bote-Lorenzo, Gomez-Sanchez and Cano-Parra [4]		x		x			x		x

Key Partners: In the literature, there is little information about key partners of EaaS providers. The only mentioned partner is a software manufacturer, which provides the software that is made available to the customers as part of the EaaS [1].

Key Activities: The key activities of EaaS providers include typical cloud provider activities like installation, hosting, operation, and maintenance [1, 3-5, 9, 15, 20, 24]. Moreover, they offer operational support and train-the-trainers for the affiliated institutions [1]. However, while focusing on EaaS as a specialized cloud provider for education, the key activities go beyond the mentioned activities, as they offer additional teaching resources and supporting services. For this reason, the development of lab contents and curricula [1-3, 10] or the creation of video and audio materials and additional teaching resources [1, 10] are also part of the key activities of an EaaS provider.

Key Resources: By being a cloud provider, an EaaS provider needs key resources that include hardware resources such as infrastructure components, servers, network,

and storage [1-3, 15, 22], software/application resources [2, 5], and support staff [1]. Additionally, for this special kind of provider, curricula and teaching resources are further key resources [1, 2, 9, 10].

Value Proposition: The most mentioned value in all analyzed articles is that using EaaS is less expensive than hosting and maintaining the system in-house [1-7, 9, 10, 15-17, 19-24]. The use of EaaS minimizes or even eliminates many cost factors, such as energy cost, personnel cost and licensing cost. However, lower costs are only one aspect of the value proposition offered by EaaS providers. Further success factors of cloud providing, such as scalability, flexibility, accessibility, efficiency [1, 3-5, 7, 15, 17] and service quality [1], are also part of the value proposition. Apart from this, EaaS may provide a more qualitative and effective learning experience, as students have the possibility to work directly in a real system and a complete learning environment, including curricula and additional materials for teachers [4, 6]. This way, EaaS makes teaching more complete and less complicated for the teachers while it provides researchers with special software and hardware required for various research aims [6]. Additionally, EaaS allows for new learning scenarios [4] by revolutionizing the ways of teaching and learning.

Customer Relationships: Customer relationship is not in the focus of the analyzed papers since they analyze EaaS mainly from the educational institution side and not the provider side. Therefore, only few information on this business model aspect could be found in the literature. Alshuwaier, Alshwaier and Areshey [2] mention an ecosystem where leaders can share best practices. Such a structure would help EaaS providers to build a strong relationship to their customers such as educational institutions. Georgescu and Matei [17] propose a similar approach and go further by suggesting a strong relationship between EaaS providers and educational institutions where the provider understands the expectations of the target group and gives suggestions for improved use of EaaS. Chang and Wills [1] mention a strong assistance and support from the provider staff, which creates a stronger relationship between the parties.

Channels: The analyzed articles do not focus on delivery channels. However, since EaaS providers are a special kind of cloud providers, it can be assumed that the main delivery channel is online: the internet.

Customer Segments: The first customer segment are customers using EaaS for teaching. The major group in this area are higher education institutions [1-6, 9, 10, 15, 17-22, 24]. Some authors also mention schools and colleges [2, 18], others focus on schools only as teaching customers [16]. Another customer segment are researchers [2, 3, 6, 9, 19-23]. Each of these customer segments has its own requirements and the offered service should be adapted to each of them.

Cost Structure: None of the analyzed articles has given any information about cost structures. However, the basic cost structure can be derived from the key resources and activities of an EaaS provider, leading to costs such as hardware costs, software license costs, various costs for the development of the teaching resources, and personnel costs.

Revenue Streams: Two revenue streams were mentioned in the analyzed literature: pay-per-use [1, 3, 4, 6, 7, 22], where the customer pays based on the time in

which the service was used or for the teaching units, or payment on subscription basis [5, 15, 24] where the costumer pays an agreed fee per month or per teaching period and can use the service as often and as much as needed.

The analyzed literature covers the sections of the business model on different detail levels: While information about the value proposition and customer segments could be found in almost every analyzed article, no direct or only very little information about key partners, channels, or cost structure could be identified. One reason for this is, that the analyzed articles did not directly address business models of EaaS. However, the main reason is that all the analyzed articles are written from the user perspective. No articles that handle the EaaS provider perspective could be identified.

4 Case Study SAP University Competence Center Munich

According to the results from the literature review, EaaS literature is limited to describing some examples and benefits of the service, mainly from the customer side. However, only little information on the EaaS provider side can be obtained. In this section, we want to make a contribution to research regarding the perspective of EaaS providers by analyzing the business model of a concrete EaaS provider. Therefore, we use an inductive, exploratory research strategy: a single in-depth case study. Single case studies can be used to explore a phenomenon in a rare or extreme situation [25]. Selecting a specific organization for a case study can be justified by the fact that this case can provide insights that other organizations cannot [26]. We selected the SAP[1] University Competence Center (UCC) at the Technical University of Munich (TUM)[2]. The SAP UCC Munich is a pioneer EaaS provider that is acting in this sector since 2003. It has established an international customer base of more than 200 educational institutions in the EMEA region. Furthermore, this organization recognizes the importance of education for Industry 4.0 specific topics by offering specialized curricula in this area.

4.1 Case selection and data collection

The SAP UCC Munich offers SAP enterprise systems as EaaS for teaching and research. It runs enterprise systems by providing the required infrastructure, platform and application services. Above that, it covers educational aspects such as providing ready to use teaching data and cases as well as curricula for software and related topics.

The main data sources of the case study are public documents such as customer presentations, public websites and portals[3], and a series of published videos and other publications. Furthermore, a large number of internal documents was used, including internal process documentations, wiki, contractual agreements as well as internal strategy documents.

[1] SAP: https://www.sap.com/index.html. Last accessed on June 6th, 2017.
[2] TUM: Technical University of Munich. https://www.tum.de/. Last accessed on June 6th, 2017.
[3] SAP UCCs EMEA: http://sap-ucc.com/. Last accessed on June 6th, 2017.

The mentioned data sources have been triangulated with five formal semi-structured interviews with members of the SAP UCC Munich and several informal conversations with the SAP UCC Munich management, staff, and customers referring to the main activities of the SAP UCC Munich.

4.2 Data Analysis

The objective of this case study is to reconstruct the business model of the SAP UCC Munich as an example business model of an EaaS provider. We used the nine elements of the business model canvas (cp. [13]) as major categories to guide the data analysis of all documents, interviews, and transcripts we had. First, any information related to any of the business model canvas sections was extracted from the sources. Second, the information was grouped in subcategories and matched to the different items of the canvas.

4.3 Results: The Business Model of the SAP UCC Munich

The SAP UCC Munich provides about 30 educational services for teaching and research in the area of SAP enterprise systems. These educational services represent complex bundles of hardware, software, services, teaching data and material. They comprise topics such as access to the in-memory database SAP HANA for teaching topics like development and analytics, or an SAP ERP or S/4HANA client for teaching Business Process Management, digitalization, automation, and further Industry 4.0 related topics [27].

All educational services are operated on a common IT infrastructure and hardware and come with a set of services such as support, maintenance, and community management for the lecturers. Support includes a hotline from 8 am to 6 pm from Monday to Friday as well as an online service desk for technical issues, problems, and questions regarding the teaching materials and the products in general.

The educational services mainly differ on the software layer (e.g., in products such as SAP ERP, SAP S/4HANA, SAP BW, SAP HANA, SAP Business Objects, etc.) and in the corresponding teaching data and materials for these software solutions. Fig. 2 shows the key elements of the service *SAP S/4HANA for Teaching* as an example. For each software layer the UCC offers also a dataset with data based on a model company.

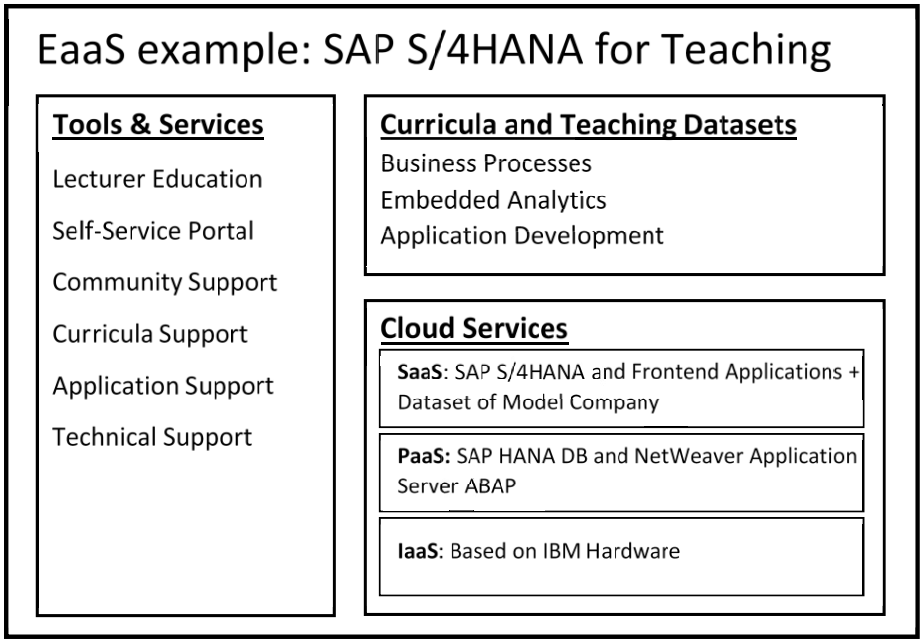

Fig. 2. Example: Educational service "SAP S/4HANA for Teaching" at the SAP UCC Munich

From an organizational point of view, the SAP UCC Munich represents a sub-organization of the chair for Information Systems at TUM, staffed with about 12 full time employees. Most of the SAP UCC Munich members are research associates focusing on research topics such as enterprise systems, IT-service management, education, performance, and computing center management. In the following, we discuss the main elements of the SAP UCC Munich business model, using the business model canvas as the underlying structure:

Key Partners: The SAP UCC Munich is operating in an ecosystem of different partners within the SAP University Alliances Program[1] and the IBM[2] Academic Initiative[3]. The software partner SAP is providing software licenses and trainings for the UCC operators as well as for the educational institutions using the services. The hardware partner IBM is supporting the UCC with latest hardware to run the SAP systems in its own data center in a virtualized environment. The data center's infrastructure, such as power supply and air conditioning, are provided by the local IT group at TUM, which thus acts as the infrastructure partner. Above that, the UCC is working closely on updating and implementing new curricula with co-creation partners, e.g., professors and lecturers at TUM or other institutions.

[1] SAP University Alliances: https://www.sap.com/training-certification/university-alliances.html. Last accessed on June 6th, 2017.
[2] IBM: https://www.ibm.com/de-de/. Last accessed on June 6th, 2017.
[3] IBM Academic Initiative: https://www-01.ibm.com/software/ch/de/academic-initiative/. Last accessed on June 6th, 2017.

Key Activities: The key activities at the SAP UCC Munich cover the technical system management such as setup, operation, and maintenance of SAP systems and the underlying infrastructure. This covers topics such as system installation, monitoring, backup, upgrades, and patches. Above that, the SAP UCC Munich offers various support services for the provided SAP systems, including technical and application support as well as educational support for curriculum materials and demo datasets. On top of this, the SAP UCC Munich provides community services for the connected institutions. These cover, for example, the content management of portals which are used to share curriculum materials, software, and best practices with and among lecturers as well as the organization of customer events, like train-the-trainers or user group meetings. The fourth key activity is the development and maintenance of curriculum materials together with curriculum development partners.

Key Resources: The key resources to perform these activities are threefold: First, there is a flexible and reliable IT-infrastructure. Flexible in the way that it enables cloud-based provisioning of SAP systems for which resources can be adapted dynamically according to the teaching and research needs of the customers. Reliable is meant in the sense that the system availability, which is vital for teaching, can be assured. Second, software licenses and software support for operating the IT-infrastructure are required to assure a reliable system operation, such as system management software, software for monitoring or configuration management tools. Third, knowledge of the SAP UCC Munich staff in various SAP software solutions as well as the corresponding curricula is important to assure efficient support for the offered educational services. Finally, the curriculum materials – developed by the SAP UCC Munich in cooperation with curriculum development partners – represent a major resource for providing educational services.

Value Proposition: Regarding its value proposition, the SAP UCC Munich aims to provide reliable and up-to-date enterprise systems for teaching and research at a moderate fee. While providing curricula and demo data, it allows lecturers a quick start into new innovative teaching topics such as in-memory databases.

Customer relationship: The SAP UCC Munich uses various ways to maintain the relationship to its customers. The most common way is the personal assistance of lecturers through a service desk based support during daily support hours. This is extended by a set of self-services, e.g., to activate new lecturers or students or to download client software required for accessing the SAP systems. For urgent questions, a hotline is available Monday – Friday, 8 a.m. to 6 p.m. Moreover, customers are informed about new services and events through newsletters and community portals. Finally, co-creation with a smaller group of customers takes place to develop or improve curricula and the offered services.

Channels: There are various channels through which contacts to prospective customers are established. Since the customer base is educational institutions, this covers for example the presentation of the service offerings on research conferences, a yearly user group meeting for new or prospective customers as well as the use of community portals. As soon as the contact is established, the communication is directed through a central email support address offering personal assistance. After the customer is con-

nected to the SAP UCC Munich, further requests are handled with the service desk and the hotline (cp. customer relationship).

Customer Segments: The SAP UCC Munich has two customer segments: On the one hand, the major segment comprises teaching customers who are using SAP's enterprise systems for teaching purposes, e.g., to illustrate how to implement business processes using an ERP solution, how to develop and use analytic tools, or how to develop enterprise applications. The main part of those teaching customers are higher education institutions such as research universities or universities of applied sciences. A smaller part is represented by secondary education institutions such as vocational schools and schools. The second, currently upcoming customer segment, are research customers that mainly use SAP solutions for research projects, e.g., in the area of big data analytics or Industry 4.0/the Industrial Internet.

Cost Structure: Considering the main costs of the SAP UCC Munich, they are split into hardware costs, infrastructure costs such as electricity, telephone, technical equipment, and staff expenses. As the educational institutions bring their own licenses provided by the SAP University Alliances program, there are no extra software costs fr the customers.

Revenue Streams: The SAP UCC Munich offers a subscription based price model. Most of the services can be booked for fixed time periods ranging from two weeks over quarters to one year for a certain subscription fee. This covers access to one SAP system or SAP client as well as access to all supportive tools. The lecturers are able to run as many courses as they want in this period.

5 A Business Model for Education-as-a-Service Providers

In this section, we propose a business model for EaaS providers. Fig.3 shows the key elements of this EaaS business model, using the business model canvas (cp. [13]) as overall structure. This model summarizes the elements discussed in the literature and was extended by findings from the case study. The comparison of the literature with findings from the case study showed that most of the business model elements from the literature do exist in the case of the SAP UCC Munich. Moreover, the case provided insights into topics that were only rarely discussed in the literature, such as partnerships, channels and cost structures. In the following, we will discuss the key findings per canvas section and contrast these findings with the existing literature.

Key Partners: Regarding the key partners of the EaaS provider, the literature is limited to the software manufacturer as a partner. The case study showed, that there might be further partners, such as hardware and infrastructure partners as well as educational or – more in general – training institutions providing teaching know-how required for the curriculum or training development. Each of these partners is vital for providing the offered services and contributes to the services on different levels such as the level of hardware and infrastructure, software, or curricula.

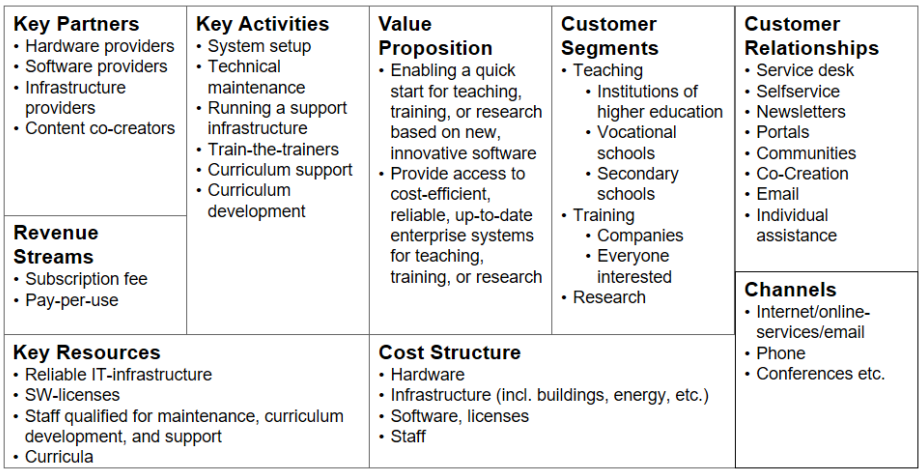

Fig. 3. Key elements of an EaaS business model

Key Activities: Considering the key activities, both literature and practice mention typical cloud provider activities, e.g., installing, operating, and maintaining the infrastructure. The development of curricula or trainings and the maintenance of supporting tools and services are further key activities that can be derived from literature and practice. According to the case study, technical, application, and curriculum support are further vital activities, while both highlight the education of teachers as a key activity of an EaaS provider.

Key Resources: According to the literature and the analyzed case, there are three key resources: a reliable IT-infrastructure, the knowledge of the employee, and the training and supporting material. The case study showed that software licenses for system operation and supportive tools might be a further key resource.

Value Proposition: Both literature and practice agree that EaaS may bring many benefits to teaching and training by offering a reliable up-to date infrastructure that enables modern teaching scenarios and allows a quick start in innovative topics. The literature also underlines the importance of cost-effectiveness with regard to EaaS, which was included in the value proposition of the analyzed case as well.

Customer Relationships: Building community portals as a platform for knowledge exchange between the EaaS provider and its customers is mentioned in the literature and the case study. Such tools help in building and maintaining customer relationships. EaaS providers like the analyzed SAP UCC also offer personal support for teachers and researchers. Co-creation with some of the customers in the development and improvement of curricula is a further kind of customer relationship that emerged in the case study.

Channels: The literature gives no insight into channels used to sell EaaS services. Based on the case study, an EaaS provider could be represented on research conferences to introduce its service to prospective customers, organize user group meetings for existing customers, and communicate with new or existing customers through portals or by email.

Customer Segments: The customer segments are identical in literature and practice, consisting out of customers focusing on teaching and research. As the case study shows, teaching customers might also be secondary education institutions such as schools, whereas the main focus in the literature lies on higher education. Moreover, continuing education of employees becomes more and more important, so companies and individuals who want to learn more may be interested in the offerings as well.

Cost Structure: The literature does not provide any information on the cost structure of EaaS providers. Based on the case study, an EaaS provider's costs might comprise hardware costs, license costs, infrastructure costs such as electricity, telephone, technical equipment, and personnel costs for the staff.

Revenue Stream: While the literature proposes two revenue stream options, namely pay-per-use and subscription fee, the case study shows that the subscription fee might be more appropriate in an EaaS business model. The pay-per-use model is successful in other cloud providing areas, but in teaching it is necessary for teachers and students to be able to stay on the system as long as needed without time pressure and with foreseeable costs, which leads to a subscription-based model.

6 Discussion

In the preceding sections, we proposed a business model for EaaS providers, based on the literature and a case study of a well-established EaaS provider. The literature showed that there is an increasing number of publications referring to the EaaS model in recent years, which underlines the growing importance of this topic in higher education. However, as most of these publications are written from a customer perspective, some business model areas such as partnerships or cost structure were not yet considered in the literature. By conducting a case study with an EaaS provider, we were able to reach a better and more detailed understanding of an EaaS provider business model. The analyzed case is an EaaS provider that offers enterprise systems for its customers in academia. This can be seen as a limitation, as some of the discussed elements may not be relevant for other educational services. On the other hand, enterprise systems represent one of the most complex information systems today, so that this kind of services provides a good starting point for extending the research on the business model of EaaS providers. Although the chosen EaaS provider has a long experience in this area, conducting further research, e.g. on the offerings, such as new curricula, platforms, or infrastructure, could bring deeper insights in the extension of the business model of an EaaS provider. The study however makes a first contribution by providing a closer look at the EaaS business model from a provider perspective. Furthermore, the analysis of the literature and the case data, considering current trends in IT and education, revealed possible areas of further research on the business model of EaaS:

6.1 Competency-based curriculum development:

The literature and the case study showed that curriculum development is a key activity of an EaaS provider. In general, a curriculum has concrete learning objectives, and comprises teaching materials such as slides, exercises, or lecturer notes. In order to define learning objectives more precisely, competencies can be defined in advance that determine the desired outcome when applying the curriculum. Thereby, it can be studied in detail whether defining competencies and developing a curriculum upon increases the learning success for students. Hence, competency-based curriculum development can be a promising avenue for further research. By defining competencies for a specific curriculum, and developing teaching materials which match these needs, it can be evaluated if the definition of competencies in fact supports the development of curricula and the achievement of the learning objectives. Thus, more precise curricula could be offered – what may increase the value proposition of EaaS providers.

6.2 Interactive teaching methods and gamification:

According to our previous studies, besides typical success factors of cloud providers, providing a complete learning environment is a central value proposition of EaaS providers. In general, this comprises the access to real enterprise systems and the provision of a curriculum with teaching materials. While the access to enterprise systems of an EaaS provider usually has to be standardized for reasons of scalability and efficiency, teaching materials should be adaptive to the lecturers' individual needs. However, most of the current teaching materials still lack flexibility and interactive methods to convey content. Therefore, an interesting topic for further research would be to analyze interactive teaching methods and evaluate whether they are suitable in the context of an EaaS provider. One possible method is the integration of teaching cases, which are realistic stories allowing the reader to put himself or herself in the situation of another person. By using these, students are confronted with realistic problems which allows them to understand complex content in an easier way. Another possible method would be gamification. Business games are a popular method to enrich the learning experience for students by modeling a part of the reality and simulating dynamic situations. By providing lecturers a simulation environment together with teaching materials and lecturer notes, a more interactive method is offered as part of the business model of an EaaS provider.

6.3 Education for Industry 4.0, IoT and the digital transformation:

Industry 4.0, IoT and the digital transformation are examples for current technological developments, respectively trends that influence our working environment significantly. Therefore, it is important that the future workforce is prepared properly to be able to work in these environments. However, according to Prifti, Knigge, Kienegger and Krcmar [28], there is a lack of structured education for these topics. Hence, providing curricula for Industry 4.0, IoT, and further current topics could extend the

value proposition of an EaaS provider. Considering the required competencies for these topics, teaching methods and content can be defined to reach the required learning outcomes. Thereby, an important part of the business model of an EaaS provider, which is the provision of curricula, can be extended with topics that are highly relevant for the education of the future workforce.

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Article submitted 23 June 2017. Published as resubmitted by the authors 13 August 2017.