Common Patterns of Cloud Business Models

Completed Research Paper

Stine Labes
Technische Universität Berlin
stine.labes@tu-berlin.de

Koray Erek
Technische Universität Berlin
koray.erek@tu-berlin.de

Rüdiger Zarnekow
Technische Universität Berlin
ruediger.zarnekow@tu-berlin.de

ABSTRACT

Cloud computing has been established as a significant topic in the information technology (IT) industry, especially since cloud services are expanding in the portfolios of IT service providers. New businesses emerged to provide cloud services and established businesses extend their traditional business with aspects of cloud computing. The contribution of this paper is how the cloud focus influences the IT service provider's business model. Based on an extensive literature analysis and synthesis, the characteristics of a cloud business model are transferred into a structured research framework with 103 design features. Subsequently, cloud business models of 29 selected IT service providers are analyzed and matched with the framework. With the help of a cluster analysis, four common patterns of combination are identified for cloud business models. Finally, these patterns will be evaluated with respect to critical success factors and to issue recommendations for action.

Keywords

Cloud computing, business model, pattern, framework

INTRODUCTION

In the past, individual companies in mature industries differed only marginally, so their business models converged to an industry standard model (Staehler, 2001). The increasing market saturation as well as the trend towards niche markets, but eminent the diversity of business models enabled by the internet, induce more and more complex and differing business models. In these complex digital business structures and value networks cloud computing is perceived as a key technology and well-known business concept. Today, many newcomers in the IT market launch a cloud business and provide IT services on a cloud technology basis. Progressive vendors of traditional IT services extend their business and get their IT services ready for the cloud. Due to the character of cloud computing, the business model of a cloud service provider (CSP) will change (PAC, 2012; Pueschel, Anandasivam, Buschek and Neumann, 2009; Weinhardt, Anandasivam, Blau, Borissov, Meinl, Michalk and Stößer, 2009). For instance, by selling on-demand services the description of generating revenue has to be considered more explicitly in contrast to traditional goods and services. For this field of interest, we concentrate our research on the cloud provider's perspective and address the following research questions:

(1) What is an appropriate framework to analyze cloud providers' business models?

(2) Which common cloud business model patterns are successful?

(3) Which recommendations for cloud service providers can be derived?

Consequently, this paper's contribution is threefold: First, a structured business model framework is constructed based on a previous literature research. Afterwards, the business models of selected CSPs are analyzed and classified using this framework. Statistical methods determine promising patterns of combination. The patterns can be interpreted as typical characteristics of successful cloud business models. Finally, we draw conclusions and evaluate the analysis results regarding recommendations for action.

THEORETICAL FOUNDATIONS

This research project examines an interdisciplinary topic and proceeds at the interface of business and computer science. For this purpose, the two combined topics cloud computing and business model theory will be introduced briefly.

Cloud Computing

In accordance with the cloud computing concept, scalable resources (e.g. networks, servers, storage, applications and services) can be rented on-demand via internet without the need for long-term capital expenditures and specific information technology (IT) knowledge on the customer side. It is possible to obtain virtual images of complete software applications or IT infrastructures. Basically, cloud computing consists of three service layers, which are based on each other: "Software as a Service" (SaaS), "Platform as a Service" (PaaS), and "Infrastructure as a Service" (IaaS). Furthermore, cloud services can be implemented roughly as four provisioning models concerning the opening to a publicly accessible network (internet): public, hybrid, community, and private (Mell and Grance, 2009; Weinhardt et al., 2009) (see Figure 1).
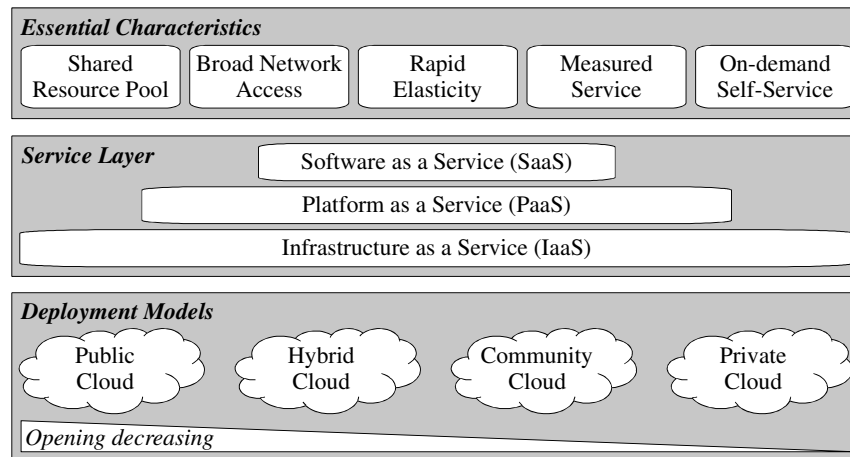

Figure 1: Cloud computing basics

Business Model

By its definition, every company has a business model. It is a model-based, i.e. simplified and aggregated, picture or description of a business – of "what a company is doing in order to create and commercialize value" (Burkhart, Krumeich, Werth and Loos, 2011) (see also Osterwalder, Pigneur and Clark, 2010 or Wirtz, 2010). The objective of a business model is to set a foundation for the following issues: understanding the appreciation of an existing business; recognizing own weaknesses to acieve the improvement of the business; and systematically evaluating new business ideas with their competitive advantages and success probabilities (Staehler, 2001).

The definition and conceptualization of a business model can be concretized in many ways. A widely accepted approach is still missing in science and practice (Alt and Zimmermann, 2001; Burkhart et al., 2011; Popp and Meyer, 2010; Scheer, Deelmann and Loos, 2003; Seppaenen and Maekinen, 2005; Weiner, Renner and Kett, 2010; Wuestenhagen and Boehnke, 2006). Many researchers presented various definitions for the business model concept from different perspectives, often considering a component-based view. Bringing these definitions to a common denominator means to unify numerous varying components in a large number of different definitions. Miscellaneous classifications of these definitions are given by several researchers (Shafer, Smith and Linder, 2005; Al-Debei, El-Haddadeh and Avison, 2008; Burkhart et al., 2011; Zolnowski and Boehmann, 2011). Within previous research (Labes, Erek and Zarnekow, 2013), we analyzed these classifications with up to 30 considered definitions. With respect to a comprehensive approach, we aggregated them again to the following business model components (see Figure 2), we will use as basis for the later analysis.

Following our comprehension, a company can have several business models for different business fields. Each business field has it's own business strategy (in compliance with the corporate strategy) – in our case it is the cloud business with the strategic orientation towards the cloud market. At the "Value Generation" side, internal capability factors, like technologies, resources, skills and activities as well as an external supplier network are incorporated. The use of these factors results in costs. The centered "Value Proposition" defines the offering factors by describing the product and its unique selling proposition. The "Value Distribution" side comprises internal delivery aspects like the communication or distribution

channel, and external market factors like targeted customer segments. The value capturing is described by the revenue block. These general components are the basis for the structured business model framework, which is used to analyze the cloud business models.
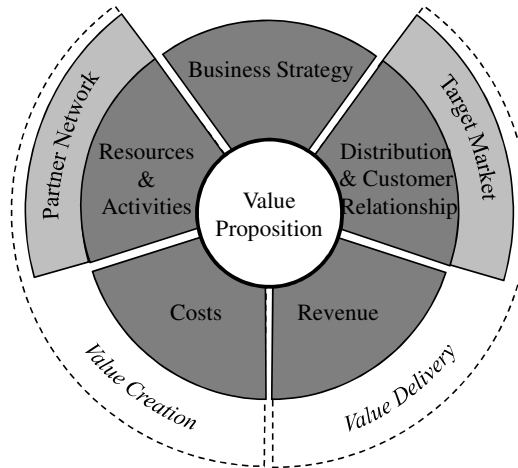

Figure 2: Business model components (Labes et al., 2013)

RESEARCH APPROACH

This research applies a multi-method approach with theoretical and practical implications. The research work consists of two complementary parts: (1) the theoretical development of the business model framework as the basis for the analysis, and (2) the quantitative deduction of common patterns. While the first part is based on the design science discipline (Hevner, March, Park and Ram, 2004), the second part complements this with elements of the behavioral science paradigm (Kaplan, 1964).

In the theoretical part, the method of reference modeling (Wilde and Hess, 2007) is used, to combine deductive and inductive elements in order to build a design outline for the business model template. In previous research, a comprehensive literature analysis about cloud computing and business models (Labes et al., 2013) present the deductive basis for this framework. With reflection of existing cloud business models, the framework is completed with design features inductively. In addition, the framework has been evaluated in interviews with academic cloud experts and discussed in two workshops with IT practitioners. The resulting morphological box is used as analysis basis for the second research part (see Figure 3).

The practical part of the research is the quantitative evaluation in form of a cross-sectional analysis (Wilde and Hess, 2007) of existing cloud business models. Meanwhile, there exist hundreds and thousands of cloud business models on the global cloud market. For the initial analysis, internet rankings of cloud services were considered to determine well-known CSPs. 29 service providers with their cloud business model were selected. Every examined business model is analyzed using the morphological box. The characteristics of the design features are encoded using a dual control principle. Finally, the coded business models are processed with statistical methods that reveal common patterns in cloud business models (see Figure 3).
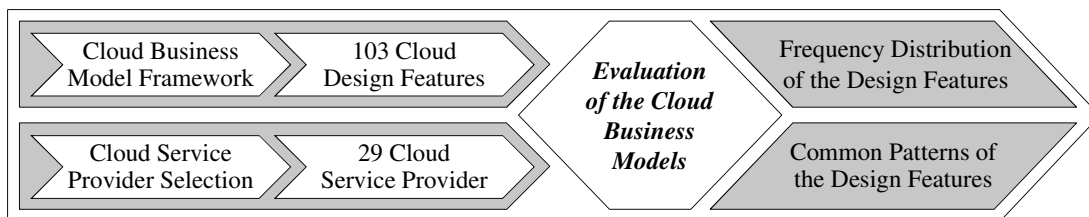

Figure 3: Research approach

Cloud Business Model Framework

As a foundation to conduct the business model study we present the structured business model framework, classified as a morphological box (see Figure 4). The categories are the basic components of a business model, as they are introduced in the theoretical foundations. The sub-categories and design features are the result of previous research (Labes et al., 2013) as well as various discussions and workshops with cloud academic cloud experts and related IT service providers. The design features in the morphological box show the possible options to "assemble" a business model.

Category	Sub-Category	Design Feature						
Business Strategy	Market strategy	Market adaption		Market design		Market diffusion		Market co-construction
	Market entry	New in market			Market expansion		Knowhow transfer	
	Diversification	Horizontal			Vertical		Lateral	
Value Proposition	Core product („as a Service")	Storage	Computing	Network	Development environment	Development tool	Software	Business process
	Product system	Database	Search	Billing	Messaging	Data processing	Adminis- tration	Market place
	Product system width	Manifold range				Limited range		
	Product system depth	Manifold range				Limited range		
	Additional services	Integration		Consulting		Human resource		Support
	Provisioning model	Private		Community		Hybrid		Public
	Emotional customer experience	Consolidation	Structuring	Standardi- zation	Flexibility	Scalability	Cost savings	Time savings	Sustainability
Value Creation — *Partner Network*	Cooperation intensity	Ecosystem		Strategic alliance		Loose cooperation		Purchase
	Partner type	Technology			Business		Consulting	
	Business field	Complementary (vertical value chain level)			Similar (mix of horizontal and vertical)		Substitutive (horizontal value chain level)	
Resources & Activities	Resources	Hardware		Software		Network	Data / content	Knowhow	Human resource
	Activities	Production		Aggregation		Aggregation with Add-on	Comparison & Categorization	Integration	Consulting
Costs	Primary costs	High initial costs			High fix operational costs		High variable operational Costs	
Value Delivery — *Target Market*	Market focus	Mass			Branch		Niche	
	Customer focus	Major enterprises		SME	Start-ups		Public sector	Consumer
Distribution & Customer Relationship	Communication channel	Internet		Telephone		Print		Personal
	Distribution channel	Web interface			Mobile		On-site	
	Customer relationship	Self service		Online profile	Community	Support	Monitoring	Transparent SLAs
Revenue	Primary revenue	Main service				Supplementary service		
	Customer payment model	One-time charge		Subscription	Reservation	Pay-per-Use	Spot	Free
	Partner payment model	Sponsoring		Advertising		Commission	Share of turnover	Membership

Figure 4: Cloud business model framework

- **Business Strategy**: This component deals with the strategic alignment and goals of a business (Shafer et al., 2005), in our case the cloud business. IT service vendors "employ different strategies to leverage and shape the formation and evolution of the global cloud computing market in a highly entrepreneurial fashion" (Su, 2011). Four categories of cloud strategies were determined in the literature: (1) Market adaption as a strategy of a single company which adapts to the cloud market; (2) Market design, a strategy for a single company which forms the cloud market with new institutional arrangements; (3) Market diffusion as a strategy for the inter-organizational field adapting the market; and (4) Market co-construction, also for the inter-organizational purpose, but shaping the market with a mobilized set of actors (Su, 2011). Other characteristics for the strategy block are the qualification for the cloud market entry and how the cloud business is related to current or previous business activities.

- **Value Proposition**: The value proposition is an integrated service system to fulfill the customer's needs. Following the approach of Belz, a service system consists of seven levels, from the core product up to individual emotional customer experience (Belz, 1997). We modified this approach properly to cloud business models, used them as sub-categories, and assembled the sub-categories with concrete design features. The core product or service of a cloud business is integrated in a cloud product system. The range of this product system is considered in width (entire spectrum of the services) as well as in depth (variety of services with the same focus). Additional services complete the cloud service. The cloud service can be provisioned in the four basic deployment models (see theoretical foundations of cloud computing). The integrated service system focuses on different emotional customer experiences.

- **Value Creation**: In the cloud business, manifold CSPs are integrated in a partner value network (Leimeister, Riedl, Böhm and Krecmar, 2010). The partner network can be described by the intensity of cooperation between the business and the partners. These partners complement the existing knowhow and resources in different business fields and value chain levels to extend the product portfolio or to ensure the availability, quality, and scalability of a cloud service. To create the value proposition, some typical cloud resources are processed with cloud specific value activities. The cloud service can be an own production completely or is built by aggregating existing services, possibly extended by an own add-on. Furthermore, the cloud service can consist of comparing and categorizing activities, integration assistance or consulting services (Jeffery, Neidecker-Lutz and Schubert, 2010). Finally, the value creation and value proposition elements result in costs. In the cloud value network, costs are shifting from classical fixed to usage-dependent costs and require a consideration of the total cost of ownership (Li, Li, Qiu and Wang, 2009; Mach and Schikuta, 2011).

- **Value Delivery**: Studies reveal that a precise selection of consumers and appropriate pricing can gain higher revenue (Anandasivam and Premm, 2009). The target market can be divided in the general market focus (Porter, 1998) and the specific customer focus with five identified options. The channels are the interface to the target market and can be distinguished into standardized network-based and traditional used for individual assistance. Since Web 2.0, customers are often part of the value creation (O'Reilly, 2005); therefore the customer relationship should be empowered (Clark, 2010). To maintain the customer relationship, various features for cloud customers are provided to increase the trust in the cloud provider. By delivering the value proposition, revenue streams can be generated based on the core product and service or with by-products and supplementary services. Revenue possibilities in the cloud are manifold; we distinguish between a direct customer-based and an indirect partner-based payment model. This distinction enables e.g. free services for the customer and profit for the provider.

Cloud Service Provider Selection

The huge variety of CSPs implicates the need for a selection of providers. For this purpose, we prioritize which CSPs we want to analyze first. This selection is based on a structured process, with worldwide CSP rankings. The first step is the evaluation of existing CSP rankings, based on internet search. In the second step, the 17 determined rankings (see Table 1) with 123 named CSPs are collected in one worksheet to give an overview of the ranking points for each named CSP.

	Ranking	Year	Positions	Source (last access 2013-02-07)
1	SearchCloudComputing	2012	10	http://searchcloudcomputing.techtarget.com/photostory/2240149039/Top-10-cloud-providers-of-2012
2	BTC Logic Infrastructure	2010	10	http://www.btclogic.com/documents/BTCLogic_TopTen_Q12010.pdf
3	BTC Logic Foundation	2010	10	http://www.btclogic.com/documents/BTCLogic_TopTen_Q12010.pdf
4	BTC Logic Platform	2010	10	http://www.btclogic.com/documents/BTCLogic_TopTen_Q12010.pdf
5	BTC Logic Network	2010	10	http://www.btclogic.com/documents/BTCLogic_TopTen_Q12010.pdf
6	BTC Logic Applications	2010	10	http://www.btclogic.com/documents/BTCLogic_TopTen_Q12010.pdf
7	BTC Logic Security	2010	10	http://www.btclogic.com/documents/BTCLogic_TopTen_Q12010.pdf
8	BTC Logic Management	2010	10	http://www.btclogic.com/documents/BTCLogic_TopTen_Q12010.pdf
9	Cloudreviews Cloud Storage	2012	10	http://www.cloudreviews.com/top-10-cloud-storage.html
10	Cloudreviews Cloud Apps	2012	10	http://www.cloudreviews.com/top-10-cloud-apps.html
11	Cloudreviews Cloud Hosting	2012	10	http://www.cloudreviews.com/top-10-cloud-hosting-services.html
12	HostMonk Hosting	Feb 2013	13	http://www.hostmonk.com/ranks/popularity/cloud
13	Cloud Directory Cloud Hosting	Feb 2013	20	http://www.clouddir.com/mostpopular/
14	Talkincloud Cloud Service Provider	2012	20	http://talkincloud.com/tc100
15	Convios Study - private user Germany	2012	10	http://web.de/presse/img/media/5d616dd38211ebb5d6ec52986674b6e4.pdf
16	Cloudhostingreviewer Cloud Hosting	2012	4	http://www.cloudhostingreviewer.com/
17	Forrester Private Cloud Vendors	2011	10	http://platformcomputing.blogspot.de/2011/05/

Table 1: Cloud service provider rankings

In the third step, an average ranking point (ARP) is calculated for each CSP. For equalization and reduction reasons, only CSPs with two or more references were considered. This leads to 29 resulting CSPs with ARPs from 1.38 to 13.50, portrayed in the following ranked table (see Table 2). To give an overview, the offered cloud services of the CSPs are described briefly in the same table.

	CSP	Description	ARP	Ref.
1	Amazon	Huge product range of cloud infrastructure, administration, and application services	1.38	8
2	Dropbox	Web service for data synchronization and online data storage	3.00	2
3	Salesforce.com	Cloud software (CRM) and platform services, incl. a market place	3.00	4
4	RackSpace	Set of modular and open source based cloud infrastructure and administration services	3.44	9
5	IBM	Integrated solutions for Infrastructure, platform and administration services and consulting	3.71	7
6	Cisco	Tailor-made integrated infrastructure and collaboration cloud software services	4.00	2
7	CenturyLink / Savvis	Specific cloud hosting solutions	4.33	3
8	1&1	Dynamic cloud hosting packages	4.50	2
9	Oracle	Comprehensive set of cloud services, with communication/booking only via telephone	4.60	5
10	FireHost	Managed cloud hosting with focus on security	5.00	2
11	Joyent	Small portfolio of IaaS services with reference to complementary partner solutions	5.00	2
12	AT&T	Huge cloud service portfolio for business customers (IaaS, PaaS, SaaS, virtual desktops)	5.50	2
13	Citrix	Interoperable comprehensive SaaS solutions based on VMware	5.50	2
14	NetSuite	Cloud software (ERP), platform and infrastructure applications, incl. a market place	5.50	2
15	SingleHOP	IaaS, PaaS with scalable hosting and user-friendly mobile management applications	5.50	2
16	VMware	Market leader in virtualization, offering PaaS solutions and administration applications	5.50	4
17	EMC	Wide-ranging cloud product portfolio with distribution via partners	5.67	3
18	Google	Comprehensive but flat set of cloud infrastructure, platform and software services	5.80	5
19	Softlayer	Scalable cloud hosting	6.00	3
20	SugarSync	Web service for data synchronization and online data storage	6.00	2
21	GoGrid	Small product spectrum of IaaS services with a variety of partner programs	6.25	4
22	HP	Storage and platform service, virtual private cloud solution	6.50	4
23	Microsoft	Comprehensive cloud portfolio for private (SaaS) and business (PaaS, SaaS) customers	6.57	7
24	CA	Cloud integration solutions, administration applications and SaaS	7.00	2
25	Eucalyptus	AWS compatible IaaS with resource localization	7.50	2
26	Verizon/ Terremark	IaaS and individual business-specific integrated solutions	8.00	3
27	Enomaly	Private cloud hosting, virtual desktops and a spot cloud market for capacity	8.50	2
28	LayeredTech	Private cloud hosting	10.00	2
29	Hexagrid Computing	Intransparent cloud portfolio, promised IaaS cloud platform	13.50	2

Table 2: Selected CSPs for analysis

For each CSP a web-based analysis of the CSP's business model is conducted. This analysis includes the intensive browsing of the CSP's homepage as well as further web, press release, and news search with focus on the particular business model. Along the business model components, the characteristics of each CSP's business model are documented in one table. This table bases on the cloud business model framework and provides all design features (103 in number) as rows in the table. With "0" (= not applicable) and "1" (= applicable) it is documented in the columns which design features are implemented in each of the 29 business models. The characteristics are not exclusively in one design feature, various characteristics are possible in parallel. Some characteristics, i.e. the partner payment model, are not comprehensively observable in the search process, which are compensated with estimations. All "0"s and "1"s in this table (103 x 29 data size) are the basis for the statistical evaluation in the next section.

EVALUATION OF THE CLOUD BUSINESS MODELS

Based on the results of the previous section, statistical procedures are conducted to evaluate the findings. In this statistical analysis, we present the frequency distribution of the design features in cloud business models and determine common patterns in the business models of CSPs.

Frequency Distribution of the Design Features

First, we consider the frequency distribution of the results and remark conspicuous frequency distances between alternative design features in the same sub-category.

- **Business Strategy** (see Figure 5): In the sub-categories of the business strategy, we notice that an inter-organizational market strategy is completely underrepresented. Market adaption and market design is nearly equal frequented. Among ranked and well-known CSPs, new cloud market entrants are as rare as a lateral business model diversification to cloud business. The most providers follow the cloud hype and expand their established business models on a horizontal level with already existing knowhow.
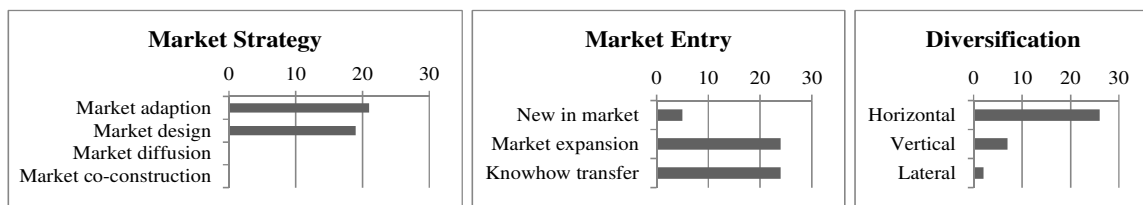

Figure 5: Frequency distribution of the "Business Strategy"

- **Value Proposition** (see Figure 6): The main core product of the ranked CSPs is balanced except "Business Process as a Service" (BPaaS). While storage, computing power, development environments, development tools, and software are frequently represented, BPaaS is a side issue. The product system supplements the core product primarily with administration, data processing, and marketing opportunities. The product system width and depth is slightly emphasized on a manifold range towards a limited range. As an additional service, the support is part of every cloud business model, while physical human supporters are rare. Public cloud services are ahead of the private and hybrid provisioning model, whereas community clouds are underrepresented. The promised customer experiences are primarily scalability as well as cost and time savings. Sustainability with regard to cloud services is rarely mentioned and therefore questionable.
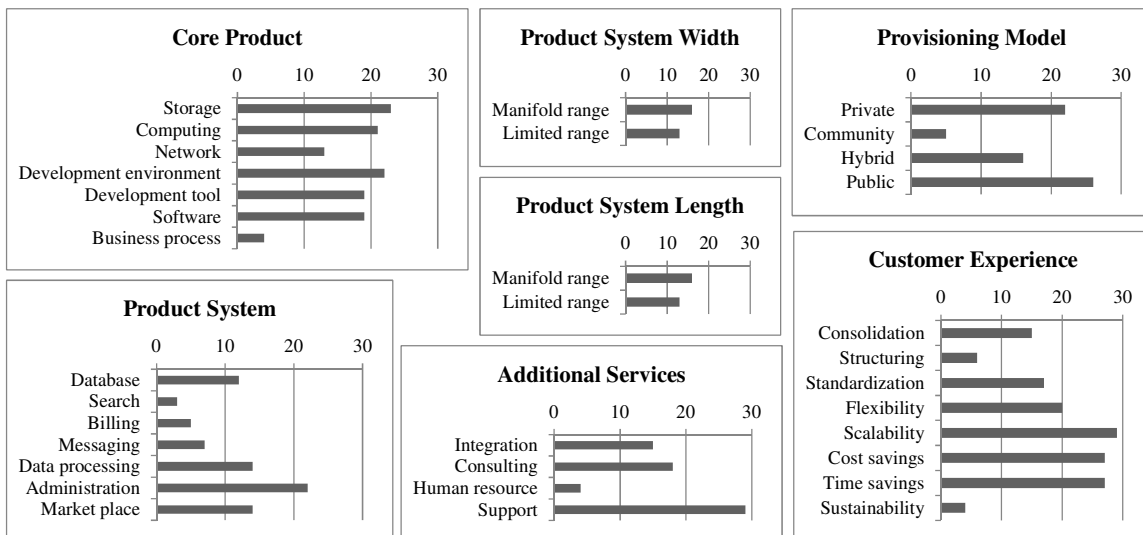

Figure 6: Frequency distribution of the "Value Proposition"

- **Value Creation** (see Figure 7): In cloud businesses, the partner network is pronounced. Ecosystems, strategic alliances, and loose cooperations are almost equal in the amount. Partner relationships are maintained primarily to technology partners in similar or complementary business fields. In most cases of the ranked CSPs, the resources to create value are hardware, software, and knowhow. Besides, the value is created through in-house production of the service and partly complemented with consulting and integration services. Providing comparisons and categorizations of cloud services seems not to be a recognized provider type and is rarely represented within the ranked CSPs. Due to the existing knowhow and business expansions, primary costs are almost never initial costs and tend to be variable operational costs, partially mixed with fix variable costs.
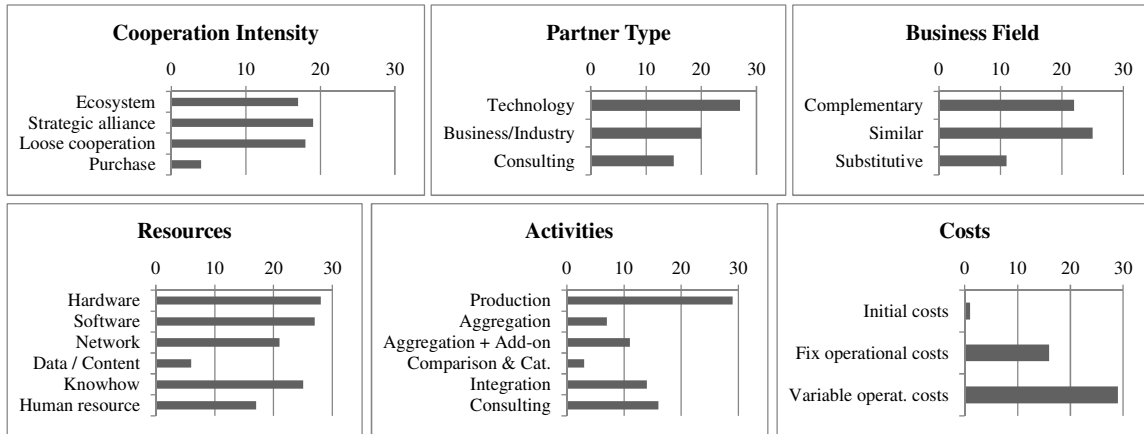

Figure 7: Frequency distribution of the "Value Creation" (Partner Network, Resources & Activities, and Costs)

- **Value Delivery** (see Figure 8): The target market focus is on mass and branch markets, whereby primarily SMEs are addressed. The considered cloud services are of less relevance for niche markets and the public sector or consumers. To get in touch with the customer, the communication and distribution channel is mainly the internet and via telephone communication or mobile distribution. Traditional channels are underrepresented in communication and distribution. The customer relationship is strongly pronounced. In general, the revenue of the ranked CSPs is generated by the main service. Revenue streams are skimmed primarily in a subscriptions and pay-per-use manner, a partner payment model is used rarely.
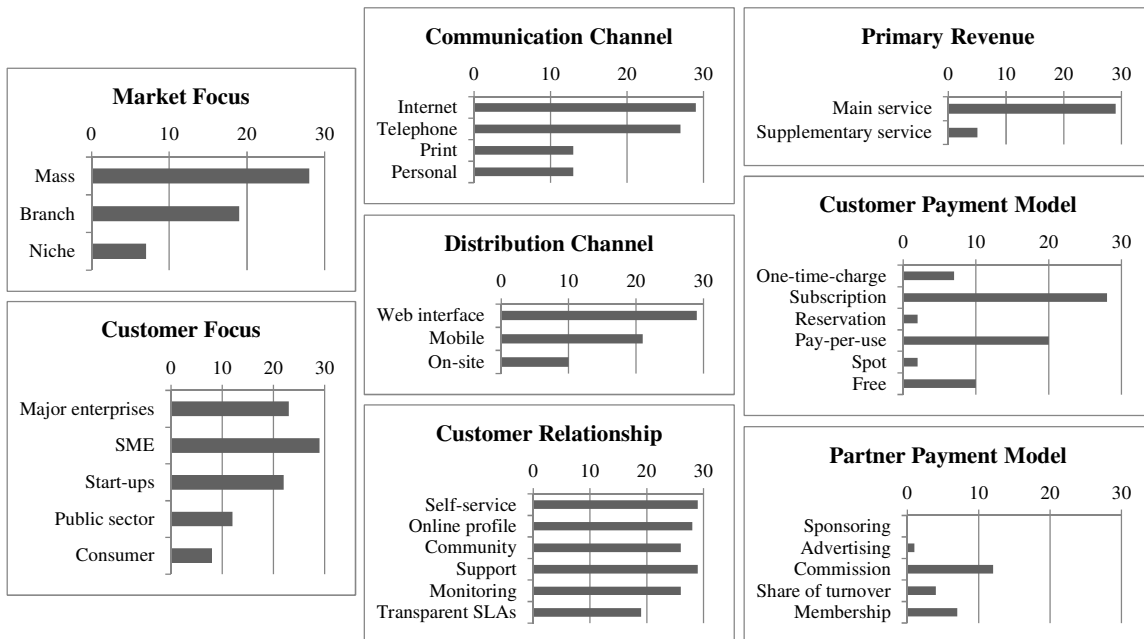

Figure 8: Frequency distribution of the "Value Delivery" (Target Market, Distribution & Customer Relationship, and Revenue)

Common Patterns of the Design Features

In the second step, we perform a cluster analysis to discover patterns in the business model components. A cluster analysis is a method to determine unknown correlations in a data pool and helps to group similar data into clusters. In the ideal case, the clusters are internal homogeneous and external heterogeneous (Anderberg, 1973). The grouping can base on similarity or distance measure; for an ordinal scale level ("0" = not applicable, "1" = applicable) a similarity measure is more suitable (Bacher, Pöge and Wenzig, 2010). To find an optimum of clusters, an agglomerative hierarchical clustering method is chosen. This method starts with one data in one cluster and is grouping the clusters step by step according to their similarity until they belong to one route cluster. The agglomerative hierarchical clustering analysis (with linkage between the groups and squared Euclidean distance scale) is applied to the 103 design features with their characteristics in the 29 analyzed business models. A dendogram (see Appendix, Figure 11) shows the clustering process (abscissa) for the design features (ordinate) and serves as a basis for defining the number of clusters. Hence, we identify the number of clusters by visual examination and decide to group the design features into four clusters (cluster distance of 17.5). The biggest one is the cluster 4 with 43% of the design features, followed by cluster 3 and 1 with 31% and 22%. The cluster 2 is underrepresented with 4%. By analyzing the clusters, it seems well planned that they differ regarding the absolute frequency of the applicable design features. Cluster 1 includes design features with an average of about five absolute listings, cluster 2 has about eleven, cluster 3 has about 16, and cluster 4 has an average of 25 listings (see Figure 9). This fact leads to the derivation that typical cloud business model design features exist, primarily collected in cluster 4, and some untypical design features, grouped in cluster 1 and 2.
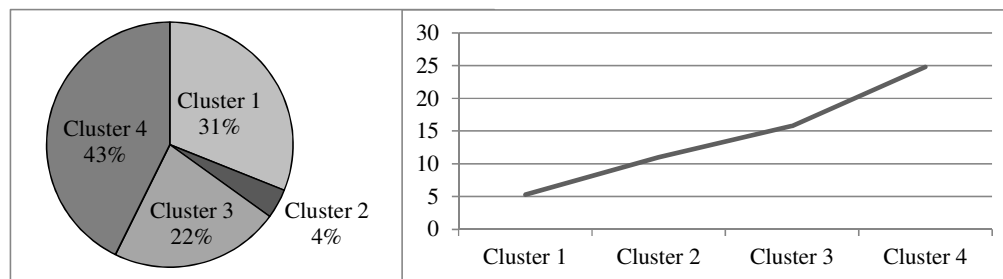

Figure 9: Size of the five clusters and average of the absolute listings of "applicable" design features in the clusters

To finish the analysis, the following bullet points explain the four identified clusters. Abstracting the descriptions of the clusters, common patterns of business models can be derived (see Figure 10).

- **Cluster 1**: This cluster includes primarily less frequently listed design features. These design features describe providers in the inter-organizational field with a vertical lateral diversification strategy. The value proposition consists of network services or BPaaS with search, billing or messaging services and additional human resource services. Structuring or sustainability is the promised customer experience and no partner relationships are maintained. Moreover, content is the resource, processed with aggregating or comparing activities, producing initial costs. Niche markets for the public sector or customers are addressed via a traditional on-site distribution channel. The revenue is generated with supplementary services and results from customer payment (without subscription and pay-per-use) or a partner payment model. Within the analyzed CSPs no provider exclusively fits into this cluster.

- **Cluster 2**: The second cluster is the smallest one. It describes newcomers in the cloud market with a limited range in the product system width and depth, generating the value proposition by aggregating other cloud services and complementing them with an add-on.

- **Cluster 3**: This cluster comprises primarily average applied design features. Providers offer development environments and tools or cloud applications in a product system with databases and data processing as well as a market place to publish services and applications for sale or rent. The product system's width and depth is manifold, additionally extended with integration and consulting services. Provisioned with a hybrid deployment model, the customer consolidation and standardization values were addressed. An ecosystem partnership with primarily consulting partners in substitutive business fields is maintained. Creating the value, especially human resources act with integrating and consulting activities and cause fix operational costs. The services are finally distributed to branch markets via traditional communication channels.

- **Cluster 4**: The biggest cluster includes primarily high frequently listed design features. CSPs adopt the cloud trend and tend to design the cloud market. They expand their business with a horizontal diversification and benefit from the knowhow transfer. The core product or service is mainly IaaS with administration and support service, provided

in public or private clouds to ensure flexibility, scalability, as well as cost and time savings for the customer. A strategic coupled or loose linked partner network is maintained with technology and business partners in complementary or similar business fields. With hardware, software, network, and knowhow resources, the cloud service is produced and primarily results in variable operational costs. Focusing on the mass market, major enterprises, SMEs and start-ups are addressed. The communication and distribution is conducted via modern and internet-based channels, supported by comprehensive customer relationship maintenance (self-service, online profile, community, support, monitoring possibilities, and transparent SLAs). The revenue of the cloud service is earned with the main service via a direct customer-based subscription or pay-per-use pricing model.
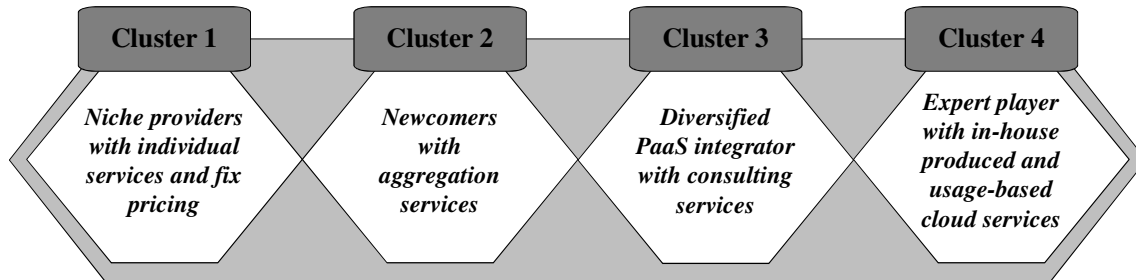
Cluster 1	Cluster 2	Cluster 3	Cluster 4
Niche providers with individual services and fix pricing	*Newcomers with aggregation services*	*Diversified PaaS integrator with consulting services*	*Expert player with in-house produced and usage-based cloud services*

Figure 10: Abstracted patterns in the cloud business model clusters

DISCUSSION AND CONCLUSION

The purpose of our article was the analysis of cloud business models and the identification of common business model patterns in the cloud business. Therefore, we introduced a business model framework as a basis for the analysis and evaluated the business models of 29 deliberately selected CSPs to answer the research questions. The analysis revealed four common patterns in the cloud business models. The first cluster is underrepresented within the analyzed CSPs and do not seem to describe cloud characteristics in particular. Amazon is applicable to the most characteristics of this cluster, but only as an extension to a higher fit with cluster 3 and 4. Dropbox, Salesforce, and Eucalyptus have the best fit to the second cluster. The most providers, like HP or Cisco, occupy the third cluster in combination with many characteristics in cluster 4 only. The CSP with a large number of characteristics in the third cluster and the highest distance from other clusters is EMC. Cluster 4 is the most frequently represented arrangement of characteristics, often in combination with the third cluster. Providers, like Softlayer and 1&1, fit into this cluster and have the highest distance from other clusters.

The analyzed CSPs for the cluster creation are well-known and ranked in various cloud provider rankings; therefore the clusters seem to be a favorable recipe for success. Following this, we considered how traditional service providers match with these cloud business model clusters and can succeed in the cloud market. The following recommendations for action for IT service providers, that want to exploit the cloud market, were derived:

- **Cluster 1**: Niche providers with individual services and fix pricing
  IT service providers which does not hold own hardware, software or knowhow resources to transform them into standardized cloud services, are rather not yet able to keep up with the competition in the cloud market. They should concentrate on individual services in niche markets that will see no advantages in a cloud operation.

- **Cluster 2**: Newcomers with aggregation services
  Newcomers in the cloud market can benefit from the standardized and interoperable cloud services and should concentrate on aggregating existing cloud services, extended by an additional feature.

- **Cluster 3**: Diversified PaaS integrator with consulting services
  Experienced players should use their knowhow to enable other emerging IT service provider in the cloud business, by focusing on integrating and consulting services.

- **Cluster 4**: Experienced player with in-house produced and usage-based cloud services
  Expert IT service providers, hosting own standardized hard- and software resources, can profit from economies of scale when providing on-demand cloud infrastructure services to the mass market.

Within the research evaluation we uncover several gaps for future research options. Community clouds, in terms of inter-organizational cooperation of cloud providers, are clearly underrepresented. Likewise, partner payment models are not represented in practice and could be investigated in further research. Sustainability, as a benefit of cloud computing, can not be confirmed as a key promise of CSPs and is questionable.

In further research we will conduct a second cluster analysis grouping the CSPs. In this context, more characteristics of the CSPs can be mentioned, like the size, the legal form, or the average ranking point, to compare the providers with the identified clusters.

However, some limitations and drawbacks of our paper have to be reflected. Considering multiple rankings by the same organization (see BTC Logic in Table 1) we take the risk of an unintentional ranking weight. In addition, the design features are not independent of one another which influences the cluster analysis. Finally, a comprehensive success factor analysis has to be more complex and should contrast between ranked and not ranked CSPs.

REFERENCES

1. Al-Debei, M. M.; El-Haddadeh, R.; Avison, D. (2008): Defining the Business Model in the New World of Digital Business. In: *AMCIS - Americas Conference on Information Systems* 14.

2. Alt, R.; Zimmermann, H.-D. (2001): Preface: Introduction to Special Section – Business Models. In: *EM - Electronic Markets* 11 (1), S. 3–9.

3. Anandasivam, A.; Premm, M. (2009): Bid Price Control and Dynamic Pricing in Clouds. In: *ECIS - European Conference on Information Systems* 17.

4. Anderberg, M. R. (1973): Cluster analysis for applications. New York: Academic Press.

5. Bacher, J.; Pöge, A.; Wenzig, K. (2010): Clusteranalyse. Anwendungsorientierte Einführung in Klassifikationsverfahren. 3. Aufl. München: Oldenbourg.

6. Belz, C. (1997): Leistungssysteme. In: *Leistungs- und Kundensysteme. - St. Gallen. -*, S. 12–39.

7. Burkhart, T.; Krumeich, J.; Werth, D.; Loos, P. (2011): Analyzing the Business Model Concept — A Comprehensive Classification of Literature. In: *ICIS - International Conference on Informations Systems* 32.

8. Clark, J. P. (2010): A Software Business Model That Turns Users into Partners. Entrepreneurialism. In: *THE FUTURIST* (July/August), S. 28–29.

9. Hevner, A. R.; March, S. T.; Park, J.; Ram, S. (2004): Design Science in Information Systems Research. In: *MISQ - Management Information Systems Quarterly* 28 (1), S. 75–105.

10. Jeffery, K.; Neidecker-Lutz, B.; Schubert, L. (2010): The Future of Cloud Computing. Opportunities for European Cloud Computing beyond 2010. In: *European Commission Information Society and Media*.

11. Kaplan, Abraham (1964): The conduct of inquiry. Methodology for behavioral science. San Francisco: Chandler Pub. Co.

12. Labes, S.; Erek, K.; Zarnekow, R. (2013): Literaturübersicht von Geschäftsmodellen in der Cloud. In: *International Conference on Wirtschaftsinformatik* 11.

13. Leimeister, S.; Riedl, C.; Böhm, M.; Krecmar, H. (2010): The Business Perspective on Cloud Computing: Actors, Roles, and Value Networks. In: *ECIS - European Conference on Information Systems* 18.

14. Li, X.; Li, Y.; Qiu, J.; Wang, F. (2009): The Method and Tool of Cost Analysis for Cloud Computing. In: *IEEE International Conference on Cloud Computing*, S. 93–100.

15. Mach, W.; Schikuta, E. (2011): A Consumer-Provider Cloud Cost Model Considering Variable Cost. In: *DASC - Dependable, Autonomic and Secure Computing* 9, S. 628–635.

16. Mell, P.; Grance, T. (2009): A NIST Notional Definition of Cloud Computing. In: *NIST - National Institute of Standards and Technology*.

17. O'Reilly, T. (2005): What is Web 2.0. Design Patterns and Business Models for the Next Generation of Software. In: *O'Reilly Media*.

18. Osterwalder, A.; Pigneur, Y.; Clark, T. (2010): Business Model Generation. A handbook for visionaries, game changers, and challengers. Hoboken, NJ: Wiley.

19. PAC (2012): The Impact of Cloud Computing on the Project Services Market - 2012. Project Services Research Program. In: *PAC - Pierre Audoin Consultants*.

20. Popp, K.; Meyer, R. (2010): Profit from software ecosystems. Business models, ecosystems and partnerships in the software industry. Norderstedt: Books on Demand.

21. Porter, M. E. (1998): Competitive strategy: techniques for analyzing industries and competitors: with a new introduction: Free Pr.

22. Pueschel, T.; Anandasivam, A.; Buschek, S.; Neumann, D. (2009): Making money with clouds: Revenue optimization through automated policy decisions. In: *ECIS - European Conference on Information Systems* 17.

23. Scheer, C.; Deelmann, T.; Loos, P. (2003): Geschäftsmodelle und internetbasierte Geschäftsmodelle. Begriffsbestimmung und Teilnehmermodell. In: *ISYM - Information Systems & Management*.

24. Seppaenen, M.; Maekinen, S. (2005): Business model concepts: a review with case illustration. In: *IEEE IEMC - International Engineering Management Conference* 16, S. 376–380.

25. Shafer, S. M.; Smith, H. J.; Linder, J. C. (2005): The power of business models. In: *Business Horizons* 48, S. 199–207.

26. Staehler, P. (2001): Merkmale von Geschäftsmodellen in der digitalen Ökonomie. Lohmar, Köln: Eul.

27. Su, N. (2011): Emergence of Cloud Computing: An Institutional Innovation Perspective. In: *ICIS - International Conference on Informations Systems* 32.

28. Weiner, N.; Renner, T.; Kett, H. (2010): Geschäftsmodelle im "Internet der Dienste". Stuttgart: Fraunhofer-Verl.

29. Weinhardt, C.; Anandasivam, A.; Blau, B.; Borissov, N.; Meinl, T.; Michalk, W.; Stößer, J. (2009): Cloud Computing – A Classification, Business Models, and Research Directions. In: *BISE - Business & Information Systems Engineering* 1 (5), S. 391–399.

30. Wilde, T.; Hess, T. (2007): Forschungsmethoden der Wirtschaftsinformatik. Eine empirische Untersuchung. In: *WI - Wirtschaftsinformatik* 49 (4), S. 280–287.

31. Wirtz, B. W. (2010): Electronic Business. 3. Aufl. Wiesbaden: Gabler.

32. Wuestenhagen, R.; Boehnke, J. (2006): Business models for sustainable energy. In: Maj Munch Andersen und Arnold Tukker (Hg.): Perspectives on radical changes to sustainable consumption and production. Sheffield: Greenleaf, S. 253–258.

33. Zolnowski, A.; Boehmann, T. (2011): Business modeling for services: Current state and research perspectives. In: *AMCIS - Americas Conference on Information Systems* 17.
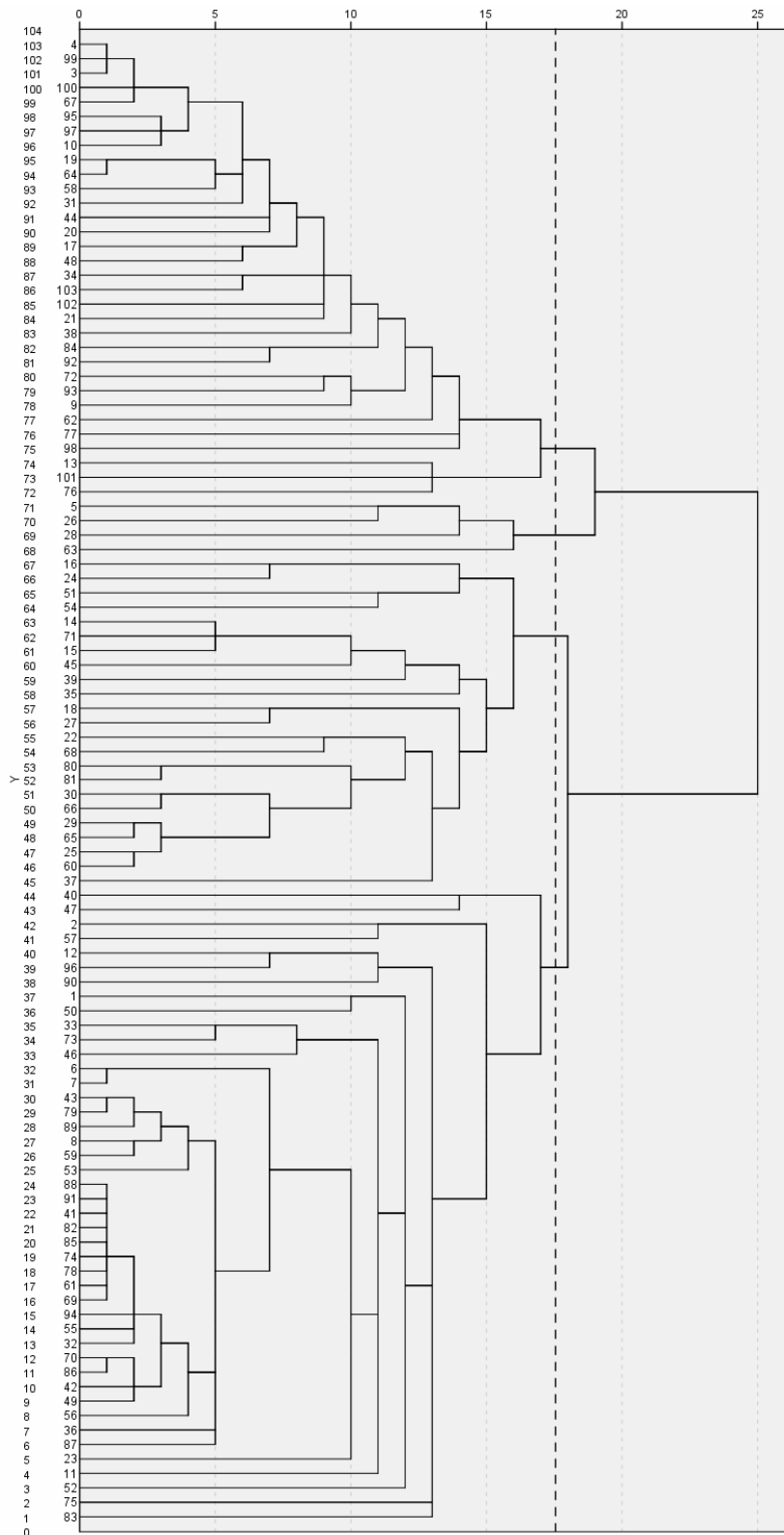
APPENDIX

Figure 11: Dendogram of the hierarchical cluster analysis (linkage between the groups, squared Euclidean distance)