Software as a Service: The Application Level of Cloud Computing

6

6.1 Overview

This chapter is devoted to cloud computing, a new form of IT service delivery via the Internet. The main focus will be on the software as a service (SaaS) concept, as this book primarily discusses issues relating to software rather than hardware. SaaS is regarded as a key trend—and figures on many IT decision-makers' agendas. SaaS involves providing a standard software solution to customers in the form of a service over the Internet. The SaaS provider is responsible for the operation and maintenance of the multitenant software. These providers do not charge license fees. Instead, users pay fees for the right to use software components and services. These are generally paid monthly, quarterly, or annually (for empirical findings on this subject, please refer to Sect. 6.4.2). In addition, software and service providers may leverage other revenue models, such as advertising or pay-per-use.

To come straight to the point: The idea behind SaaS is nothing new. Indeed, critics often gibe that it is "old wine in new bottles". A similar approach, termed application service providing (ASP), was already being pursued in the 1990s (Günther et al. 2001). SaaS is nothing more than an extension of ASP that,—due mainly to the development and widespread adoption of innovative Internet technologies and standards—has a great deal of potential and opens up new possibilities for users and providers. To leverage SaaS solutions today, most users need only Internet access and a Web browser. Formerly, by contrast, taking advantage of ASP services necessitated high upfront investment and considerable expertise. For users, this means that switching to SaaS is generally simpler and, therefore, more cost-effective than it once was. Moreover, service-oriented architectures and open standards, such as Web service protocols, make it easier to integrate SaaS solutions with in-house systems and other services. However, to observe that SaaS is nothing revolutionary is not to infer that this concept will not continue to spread or that it is of little interest to providers and users.

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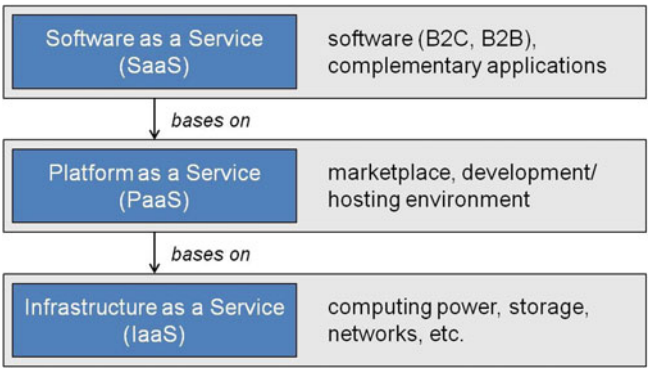

Fig. 6.1 Spectrum of cloud computing offerings (Vaquero et al. 2009)

In Sect. 6.2 we will begin by giving a general overview of cloud computing. Building on this, in Sect. 6.3 we will describe potential applications of SaaS and give examples of well-known SaaS products. Section 6.4 will offer empirical findings on the adoption of SaaS solutions from the user's perspective, before discussing the provider's viewpoint in Sect. 6.5. A key focus of the latter section will be on empirical findings regarding the business and pricing models of software providers.

6.2 Basic Principles of Cloud Computing

The basic idea behind cloud computing is that providers deliver standardized services to customers via the Internet. For users, this offers an opportunity to save costs and benefit from greater flexibility. Providers aim to make efficient use of resources and increase revenues through new business models.

As is commonly the case with new IT concepts and solutions, a multitude of definitions has sprung up. Here, we shall follow the definition offered by the national institute of standards and technology (NIST): "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." (cf. Zhang/Cheng/Boutaba; Mell/Grance).

Some examples are the virtual computing environment, Amazon Elastic Compute Cloud (EC2), Google Apps, and Microsoft Azure. Now, almost all major IT players, such as Dell, Hewlett Packard, and IBM, are offering cloud solutions. But even companies from other sectors, such as the financial industry and research, are considering putting their excess computing resources on the market.

Cloud services are normally categorized as follows: infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) (Fig. 6.1).

IaaS solutions include computing power, storage, and networks. The customer manages these leased infrastructure components via a user interface. Two examples are EC2 and Amazon Simple Storage Service (S3). Amazon EC2 is a virtual computing environment. Users can lease preconfigured instances, each of which is effectively a virtual PC. The Small Instance includes a 1.7 GB main memory, a virtual core with an EC2 Compute Unit, and 160 GB instance storage (hard disk storage) based on a 32-bit platform. Amazon S3 is an online storage Web service. In conjunction with tools or further cloud services, S3 can be used as an external hard drive with unlimited scalability.

PaaS solutions encompass a variety of services that support the development and sale of software. The idea is that software developers—from individual programmers to leading vendors—develop complementary applications for the corresponding platforms. Apple's App Store is an example from the business-to-consumer (B2C) space. In the business-to-business (B2B) space, there is the AppExchange platform provided by Salesforce.com, which enables users to develop and market CRM applications. More than 1,000 such applications are now available. Further examples of these types of platforms include Google App Engine and Microsoft Windows Azure (cf. Zhang/Cheng/Boutaba).

Software as a service involves the delivery of software to customers, who access it via a network. All the user needs is an Internet browser, which can be installed on a variety of devices, including mobile ones. We will discuss this subject in greater detail later in this chapter.

Providers commonly offer multiple service models. For instance, Salesforce.com provides its CRM system as a SaaS solution, while its development and deployment platform, Force.com, and sales platform, AppExchange, are PaaS solutions. Google also offers a platform in the shape of Google App Engine, and a SaaS solution, Google Apps.

Another classification is based on the operating model, i.e., public and private clouds. Public clouds are open systems that are shared by multiple customers. They usually allow customers to flexibly expand their usage as required.

In contrast, private clouds, also known as private managed clouds, are closed systems—for example, belonging to a particular company or provider. Being more limited physically, they are less flexible. On the other hand, the stored data is better protected against unauthorized access by third parties. When both types of cloud are used, this is termed a hybrid cloud. For example, hybrid solutions allow users to lease additional external resources to cope with peak loads.

As regards technology, the concepts of virtualization and multitenant architecture are pivotal to cloud computing. Virtualization comprises software and hardware-based techniques that add a layer of abstraction between the user's applications and the provider's physical resources. This can be illustrated by looking at data storage in the IaaS layer: Providers can make efficient use of their resources by distributing customers' data to servers with free storage space. For customers, however, this means that they often have no idea where their data are physically stored.

Multitenant architecture is closely linked to virtualization. It means that rather than providing each customer with a dedicated technical infrastructure, all customers use the same platform.

Setting aside private cloud offerings, cloud computing is a form of outsourcing, as functionality and/or processes are outsourced to third parties (see also Chap. 4). As a result, the advantages and disadvantages of cloud computing are similar to those of outsourcing:

- Concentration on core competencies: By outsourcing tasks such as day-to-day application management or data storage, customers can free up resources for other activities, such as their core competencies.
- Simplification and greater flexibility: Cloud computing enables customers to streamline their IT management and make it more flexible. For example, it can be scaled up or down at short notice as required. Providers can add or remove storage and computing resources on demand.
- Cost savings: This is a key benefit of cloud computing. Fixed hardware and HR costs are converted into variable usage fees, avoiding costly capital expenditure. By exploiting economies of scale, providers are able to pass on attractive prices to customers.
- Access to external knowledge and skills: While cloud computing does enable customers to draw on external expertise, experience shows that outsourcing often entails the loss of in-house knowledge and skills. This is a drawback for one thing because it means the user organization is more heavily dependent on the outsourcing provider. If there are standards that make it easier to switch between providers, this becomes less of a problem.
- Security: Even major providers who work to the highest professional standards cannot always prevent system failures, as evinced by the server outages experienced by Amazon, Google, and Salesforce.com. The costs incurred by downtime vary widely, depending on the industry and the company affected. With online broker systems, for example, these costs are estimated at 6.5 million dollars an hour. On top of the direct costs of the outage, there are damages that are harder to quantify, such as loss of reputation and angry customers and suppliers.
- Protection of customer data: Another central issue for cloud computing is the protection of customer data from loss, hackers, or other threats. For example, a server fault at T-Mobile USA resulted in the deletion of data belonging to thousands of Sidekick users. The company was not able to restore all of the lost data. Of course, these types of slip ups are not the preserve of cloud providers alone—they also happen to customers themselves, as the recent incidents at games vendor Sony aptly demonstrate.
- Lock-in: The oft-times inadequate interoperability between different providers' offerings and with existing (legacy) systems poses another risk. As the standards for application programming interfaces are still incomplete, changing providers can prove to be a costly exercise for customers. As a result, this increases customers' dependency on the cloud provider. However, this lock-in

effect is not exclusive to cloud computing, either. High switching costs are associated with other types of standard software, such as ERP systems, which is why companies seldom change providers. Like ERP, cloud computing can also necessitate organization changes at the customer end. However, less scope for customization means that there is also less of a lock-in effect than with ERP or other standard solutions.

- Further risks: Measuring and monitoring the provider's performance can also be difficult. Another issue is how much the customer's IT organization will need to be restructured as a result of cloud computing.

This list is by no means exhaustive: Given that cloud computing is a relatively new area, further problem fields are sure to surface.

Simply put, the business model of cloud providers consists in providing customers with IT resources in return for a fee. That makes cloud computing particularly appealing to companies that already have extensive resources, such as Amazon and Google. The less use they make of these resources themselves (e.g., storage space, or processing power), the more the providers stand to profit. As a result, a cloud provider can realize economies of scale, delivering cost advantages in relation to IT infrastructure, hardware, software, and human resources.

For IaaS, customers are mostly charged a usage-based fee. Hourly rates can vary depending on the resource or service used and the user's location. For Amazon's Small Instance, these costs amount to a few cents per hour. Interestingly, Windows users tend to pay higher prices than Linux/Unix users. A fixed fee may also be offered, which reduces the variable costs per hour. This type of pricing is particularly attractive to heavy users. In addition, processing power and storage capacity may be auctioned. PaaS providers often make free tools available to developers, to entice them to produce applications for the platform. One such example is the Force.com development environment provided by Salesforce.com. Usage-independent fees are prevalent with SaaS, with the number of users being the main parameter. For instance, Google offers SMEs services like G-Mail, a calendar, Google Sites, word processing, and a spreadsheet program for 40 € per user per year. Customers of SAP Business ByDesign can choose between a number of versions priced between 19 and 199 € per user per month, depending on the scope of functionality, and include operation and maintenance (as at April 2011).

From a technical perspective, nothing about this modern version of outsourcing is revolutionary. Similarly, the principle of virtualization is not really all that new. However, cloud computing is interesting from an economic perspective, given that the costs are significantly lower than those of traditional outsourcing offerings. Moreover, thanks to open interfaces, the cloud can be accessed relatively quickly and simply, i.e., the barriers to entry are low. Competition between cloud providers is likely to increase dramatically, which will influence prices. As a result, cloud computing will have a considerable impact on users' IT. In turn, this could mean that cloud computing will effect lasting changes on the IT industry.

In the following sections, we will take a closer look at software as a service, the cloud computing layer most closely connected to software.

6.3 SaaS: Applications and Examples

SaaS is suitable for a variety of applications. However, this business model particularly lends itself to functions and processes that can be standardized to a high degree. This includes CRM software (see also the empirical findings in Sect. 6.3.2).

The following pages offer three SaaS case studies: salesforce.com, SAP Business ByDesign, and Google Apps.

Software as a Service at Salesforce.com

Salesforce.com is a US-based provider of on-demand business applications and operator of a cloud platform. As is typical for SaaS solutions, revenues are not generated by the sale of software licenses, but through subscription fees for the CRM system components used by the customers. These components, plus the entire infrastructure, support, and other services, are delivered over the Internet.

In addition to sales automation, Salesforce.com also offers solutions for marketing, partner management, content management, innovation management, knowledge management, and customer service. The CRM application is offered in five different versions (Contact Manager, Group Edition, Professional Edition, Enterprise Edition, and Unlimited Edition).

Since 2007, Salesforce.com has offered an on-demand platform for Web-based applications, Force.com. Users and developers can employ Salesforce's infrastructure to develop custom applications, which they can either use themselves or offer via the AppExchange marketplace.

Customers pay monthly fees for using the software components and services they choose. That saves them the—frequently high—upfront costs of acquiring software licenses and implementation. With SaaS, upgrading software also falls within the provider's remit. Salesforce.com's contracts have a minimum term (agreed by the parties) and if they are not terminated, are automatically extended for the same period of time. Fees are calculated according to the number of licensed users and the fixed monthly costs. The latter varies widely between versions (€ 4 for Contact Manager and € 270 for the Unlimited Edition per user and month).

Salesforce.com was founded in 1999 by Marc Benioff, a former Oracle executive. Right from the start, the company delivered its software over the Internet. By 2008, Salesforce.com had conquered 10 % of the market for CRM systems, notching up annual sales of $ 1 billion. This earned it third place, behind only SAP and Oracle. Moreover, Salesforce.com has won a series of awards for its innovative products. It now has more than 67,000 customers with over 1.5 million users, and employs around 3,600 people.

SAP's Business ByDesign

SAP ERP is mostly deployed by companies with large workforces. To enable further growth, SAP has expanded its ERP product portfolio to include offerings for small and mid-sized enterprises (SMEs). Products aimed at this group include Business One (for SMEs with up to 100 employees), Business ByDesign (100–500 employees), and Business All-in-One (up to 2,500 employees). Of these, Business ByDesign is delivered exclusively as an on-demand business application (SaaS). As is commonly the case with SaaS, SAP is responsible for hardware, software, service, and support.

The core of Business ByDesign comprises eight modules: Executive Management, Financial Management, Customer Relationship, Supplier Relationship, Human Resources, Supply Chain, Compliance, and Project Management. Users can be authorized for specific functions or entire areas. Because the modules are integrated, users can perform analyses across multiple modules.

One potential advantage for users of SaaS makes itself felt when changes are made to financial regulations or other legislation: with conventional licensing models, users often have to acquire and/or install corresponding software updates. By contrast, in the ideal case, SaaS solutions are updated by the provider, without the customer having to do anything at all.

Unlike SAP ERP, Business ByDesign can only be customized by programming to a minor degree. It can only be tailored to users' needs by configuring the standard version. However, it is possible to add functionality via the SAP NetWeaver platform. The standard solution supports 7 of the 17 industries identified by SAP, including automotive, high tech, and electronics.

Customers pay for Business ByDesign based on the number of users. In contrast to other SaaS applications (for example salesforce.com), it is not possible to select only one module.

Office Software as a Service by Google: Google Apps

In addition to its well-known search engine, Google offers a variety of other Internet applications—including the Google Apps software package. This includes the Gmail e-mail service (which is called Google Mail in the UK and Germany, to avoid any conflict with existing names). The package also contains a calendar, word processing and spreadsheet programs, and an instant messenger. Google Apps is primarily aimed at enterprise. However, consumers can access all components of the package individually via Google's home page.

As usual with SaaS, neither the user interface, the program logic, nor the data are stored on the user's computer. To use the software, all customers need is an up-to-date Web browser.

The price list for Google Apps is short. The free Standard Edition is aimed at smaller organizations and offers only limited functionality. Google's ads are displayed to users, and the storage capacity per user account corresponds in size to a private Google Mail account. The Professional Edition offers greater storage capacity and support services in addition to availability guarantees and programming interfaces for integrating the software with existing IT environments.

According to Google, it has acquired around two million corporate customers, since launching the Professional Edition. Apart from Google itself, high-profile clients include Procter & Gamble and General Electric. Google also works with developing countries to increase the take-up of its offering. For example, the official Google Blog reported that the software is deployed by some 70,000 students at universities in Rwanda and Kenya.

With its Google Apps offering, Google has well-established desktop solutions such as Microsoft Office and Open Office in its sights. Similar SaaS products include IBM's Lotus Live and Microsoft's Office Web Apps. Google Apps may have a competitive disadvantage in its relatively late entry to the market, in light of lock-in situations on network effect markets (also see Sect. 2.2). However, the growing market for on-demand office solutions offers potential for Google.

Besides these high-profile examples, a multitude of other SaaS solutions are available. Software providers are also showing signs of interest in this business model.

6.4 SaaS from the User's Perspective: Opportunities and Risks

6.4.1 Background

Taking advantage of a SaaS offering essentially means outsourcing, i.e., contracting out functions or processes to third parties (Buxmann et al. 2008b). This means that some of the potential advantages and disadvantages of SaaS can be deduced from those of outsourcing. Against this background, we will now explore the opportunities and risks associated with SaaS. Based on prior research into conventional IT outsourcing (Earl 1996), the ASP market (Kern et al. 2002) and early findings on the adoption of SaaS (Benlian et al. 2009), five categories of opportunities and five of risks may be identified (Benlian et al. 2010). These are outlined in Table 6.1.

We will now analyze, in greater detail, the opportunities and risks outlined in Table 6.1.

A key advantage of SaaS solutions from the user's perspective is the opportunity to reduce costs and improve cash flow, given that software solutions no

Table 6.1 Opportunities and risks of SaaS from the user's perspective (based on Benlian and Hess 2010 with extensions by the authors)

Chancen		Risken	
Category	Description	Category	Description
Cost and Cashflow benefits	Delivery of SaaS applications may lead to lower overall costs and improved cash flow	Financial risks	SaaS customers may end up paying more for application provision (e.g., due to Internet outages, increased customization costs, or price rises); risk of higher opportunity costs, as SaaS applications are generally less adaptable to company-specific requirements
Strategic and operational flexibility	SaaS customers may have greater scope to change provider (e.g., due to short notice periods for termination and reduced dependence)	Strategic risks	SaaS customers may lose business-critical resources or knowledge when outsourcing their application development and management
Improved quality	SaaS providers may be forced to deliver a continuously high quality of service, given that their customers are able to terminate at short notice	Operational risks	SaaS providers may not fulfill the Service Level Agreements in terms of availability, performance, and application interoperability
Access to specific resources	SaaS customers may benefit from the SaaS provider's resources, skills and technologies	Security risks	Business-critical data may be transferred to the SaaS provider, and/or mission-critical processes may be negatively impacted
Concentration on core competencies	SaaS customers may find it easier to concentrate on their core competencies if they outsource application development and management	Social risks	Outsourcing applications to a third party may invoke opposition from employees or lead to negative publicity

longer need to be installed on the company's servers. Nor is there any need for testing, development, or maintenance. Users also save upfront licensing costs.

SaaS involves regular, fixed costs for operations, support, and maintenance. For this reason, it is often discussed in terms of a rental or subscription model. Most providers do not charge extra for updating the software. However, in addition to the application rental costs, users also have to bear implementation costs—for example, for the technical and organizational integration of the SaaS solution. The integration with existing in-house systems can be particularly challenging. Having said that, in the conventional model, users not only have to bear implementation costs, they also have to pay upfront license fees (refer to Sect. 3.3). On top of this, there are annual support and maintenance fees. Users also face update costs roughly every 7–10 years.

As a general rule, implementation costs (hardware, software, business process applications, human resources), including licenses, are higher for a conventional standard software solution than for SaaS (Altmann et al. 2007, p. 40). One of the reasons for this is that the solution is not dependent on a specific operating system or platform, and so there are little or no additional IT costs. This means that SaaS solutions can be made available faster.

In addition, the implementation costs of SaaS solutions are often lower, because they normally offer less scope for customization than conventional standard software (Buxmann et al. 2008b). Of course, this also means that the cost benefit must be offset against a reduced ability to tailor the software to specific organizational requirements.

Another—much-vaunted—potential opportunity arising from SaaS is greater (strategic and operational) flexibility: Enterprises can simply change SaaS provider, for example if targets set in the contract are not met. Because the installation of hardware and software is the provider's responsibility, users tend to enjoy greater independence. In general, they need to make fewer investments in their own IT infrastructure and can terminate the contract ahead of time at relatively short notice. Assuming that the SaaS provider stores the user's data in an open data format, migrating the data is also relatively easy. However, as several real-life cases show, this purported flexibility is often no more than wishful thinking.

In the following, we scrutinize this potential advantage (i.e., greater flexibility in terms of choosing providers) a little more closely. As outlined in Sect. 2.2.4, changing standard software solutions generally entails high switching costs for users. This is particularly true of ERP systems—which means that in real life, users rarely change providers. What exactly is the reason for these high switching costs? The most significant factor is not the licensing costs of an alternative software solution. Rather, it is because most ERP software reflects the user's business processes—and may have driven their re-engineering. As a result, switching the provider entails significant and costly operational changes. In principle, the same applies to SaaS. Once these solutions are integrated into the user's IT environments, a certain lock-in effect is unavoidable. The more the organization has invested in the integration, the greater the lock-in effect—and therefore the dependence on the provider. However, because SaaS solutions generally involve limited customization, open standards, and service-oriented architectures, there is less lock-in than with conventional standard software.

The opportunity to improve quality is seen as a consequence of SaaS' lower switching costs for user organizations: SaaS providers are therefore compelled to respond to the wishes and requirements of their customers. Another factor named as a source of better quality is SaaS providers' specialization in the delivery of the latest IT infrastructures, and their economies of scale. Quality is also improved through the prompt installation of updates, patches, and extensions. Moreover, providers are well placed to analyze customers' usage of their software. Providers see this as an opportunity to better understand their customers' needs and make their solutions more user-friendly. On the other hand, not all users are overjoyed at the fact that their activities can be logged and evaluated. Similarly, as we

discovered in many of our interviews with users, automatic updates are not necessarily regarded in a positive light, either. This applies especially to updates that affect navigation of the software as this may not meet with the employees' approval.

Access to specialized resources, skills, and technologies is often mentioned in the context of quality improvements. Because of their specialization, SaaS providers generally have the means and opportunities to invest in the newest generation of information technologies. In addition, the employees of SaaS providers can specialize exclusively in SaaS application provisioning and amass expert knowledge that ultimately benefits the end customer.

Finally, any discussion of the advantages of SaaS will include the standard argument that outsourcing software development, customization, and maintenance to a specialist third party enables companies to concentrate on their core business. This frees up resources in the IT department (both human and financial), which can then be devoted to strategic tasks. For example, routine support activities can be outsourced to the SaaS provider, allowing the in-house IT team to concentrate on strategic IT projects.

On the other side of the equation, there are financial, strategic, operational, security, and social risks to consider. In particular, financial risks are associated with hidden costs, which are common in outsourcing. Often, these cannot be estimated at the time the contract is concluded. One possible explanation for these hidden costs is that user organizations need to engage specialist system integrators—for example, to adapt the software to the company's specific needs or integrate the SaaS application with in-house applications. However, hidden (future) costs can also arise when SaaS providers raise their subscription prices, after companies have invested in tailoring the solution and have migrated their data. Providers may also ask for additional fees for alternative access channels to the SaaS solution (e.g., via mobile devices). Last but not least, the user organization may incur considerable expenses (e.g., loss of sales) resulting from system outages or poor performance (e.g., slow Internet connections).

Strategic risks result from the fact that a company outsourcing mission critical resources puts itself in a position of dependence, which could limit its freedom to act. For example, companies may no longer be able to respond flexibly to changes in their own corporate strategy, because they have lost the ability to tailor the software to their individual needs. In this scenario, the software could be customized by the SaaS provider or a system integrator, of course. In reality, however, this could not be implemented quickly enough to generate a competitive advantage.

Finally, social risks allude to the danger that employees (e.g., in IT or user departments, or employee representatives) will oppose the delivery of SaaS applications by a third party—or in other words, the outsourcing of (what are presumably) critical business functions. This could not only damage the company's reputation but also cause friction inside the company, negatively impacting on productivity. However, this risk is not peculiar to SaaS, and can result from many other types of organizational change.

Table 6.2 Breakdown of sample (Benlian et al. 2010)

Category	Percentage	Category	Percentage
Number of employees		Sales in millions of euros	
<10	27.3	<1	28.2
10–49	25.4	1–9	41.3
50–99	20.8	10–99	16.9
>99	26.5	>99	13.6
Use of SaaS applications (in years)		Position of respondent	
0 (non-customer)	59.4	CEO, CIO	24.9
>0 (currently SaaS customer)	40.6	Head of IT	62.5
I have been familiar with SaaS for … years		Commercial manager	8.4
<2	17.3	Other and N/A	4.2
>2	82.7		

6.4.2 Empirical Study on Opportunities and Risks for SaaS Users

6.4.2.1 Data Set and Methodology

To investigate the opportunities and risks of SaaS from the user's perspective, we conducted an empirical study (Benlian et al. 2010). In July 2009, we took a random sample of 2,000 companies from the Hoppenstedt company database and sent them an electronic and a paper-based questionnaire. The questionnaire was aimed at heads of IT and CIOs/CTOs, who would have the background knowledge required to answer the questions. Of the 2,000 companies, 349 (of which 142 were SaaS customers and 207 non-customers) responded, returning a total of 922 completed questionnaires. On average, therefore, each company evaluated two to three application types used in their organizations with respect to the opportunities and risks of deploying SaaS (whether currently or potentially in future).

Non-customers were asked to evaluate how knowledgeable they were about SaaS, to ensure that they had indeed looked into the topic. More than 85 % of non-customers responded that they were familiar with SaaS solutions. Only 5 % indicated that while they understood the principles behind SaaS applications, they had not yet thought about implementing any.

The sample included companies from the following industries: Mechanical engineering/automotive, wholesalers and retailers, insurance/banks, telecommunications/information/media/entertainment, real estate and construction, logistics, public sector and healthcare, and service providers. Further, characteristics of the respondent companies are outlined in Table 6.2.

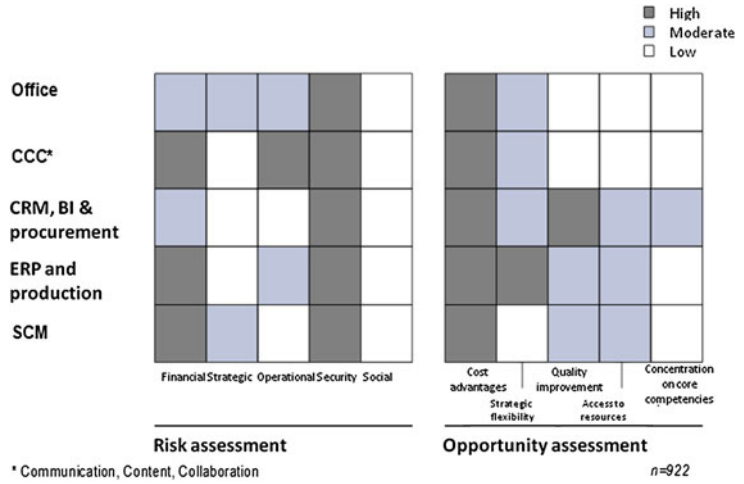

Fig. 6.2 Opportunity risk analysis for various application types (Benlian et al. 2010)

6.4.2.2 Findings

The participating companies were asked whether and to what extent they currently used SaaS applications, or were planning to do so in future. This question spanned the period between 2008 and 2012. Their current or planned deployment was measured in terms of the percentage of their IT budget spent on SaaS for the relevant type of application (e.g., ERP or CRM) (Benlian et al. 2010).

The results show that acceptance was greater for highly standardized applications such as CRM or office applications than for less standardized application systems. Expenditure on SaaS for highly standardized types of applications ranges between 8 and 14 % of the IT budgets for 2008 and 2009 and 23–35 % for 2010–2012.

Less standardized types of applications are much less likely to be delivered via SaaS, with just 0–3 % between 2008 and 2009 and between 4 and 11 % between 2010–2012. However, because of the low base effect, less standardized application systems will see higher growth rates in the near future. For ERP systems, we found an average growth of 54 %—and an impressive 95 % for SCM applications (Benlian et al. 2010).

In the next step, respondents were asked to gage the opportunities and risks of deploying SaaS. Enterprises cited short- to middle-term cost advantages as the greatest opportunity. Clearly, SaaS is regarded as a means to reduce costs. In addition, companies also regarded flexibility as a moderate to a major advantage. Furthermore, the respondents saw CRM, ERP, and SCM applications as offering moderate to good opportunities for improving quality and access to specialized resources and skills. Interestingly, SaaS is not seen as an opportunity to focus on the company's core competencies.

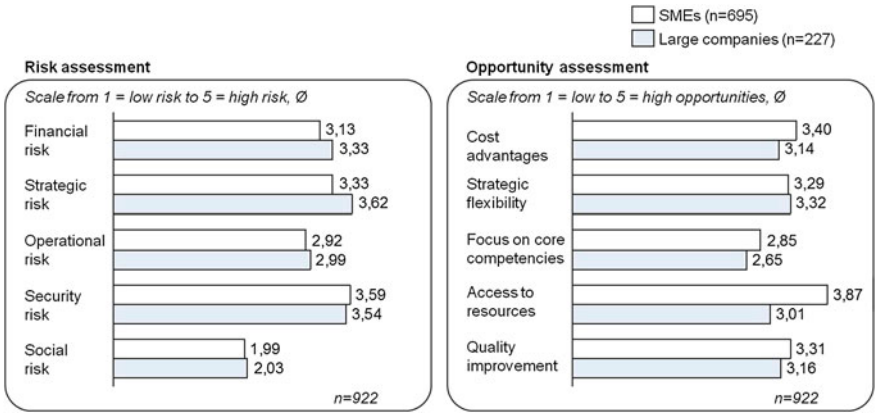

Fig. 6.3 Opportunity risk analysis: large companies compared to SMEs (Benlian et al. 2010)

According to the results of our study, security concerns emerged as the most significant form of risk, across all types of applications. In addition, respondents saw considerable financial risks in relation to CCC, ERP, and SCM applications. We can conclude from this that many companies fear that deploying SaaS applications will incur hidden costs that will only be revealed in the course of time. The companies in our sample did not see any social risks, either in terms of resistance from employees or damage to the company's reputation as a result of surrendering critical parts of the business.

Our results concerning the opportunities and risks of SaaS are visualized in the following diagram (Fig. 6.2).

If we compare the opportunity risk analysis for SMEs with that for larger companies, we find only small differences (see Fig. 6.3). For larger organizations, however, the strategic risk of losing business-critical skills to a SaaS provider is a particular concern. SMEs' greatest fear, on the other hand, is that the delivery of SaaS applications via an Internet interface could lead to loss of data and/or a connection failure.

In terms of opportunities, SMEs especially value the advantage of being able to draw on specialized resources, skills, and technologies that they themselves do not possess. They also saw greater cost advantages in SaaS than major enterprises did. By contrast, larger companies emphasized strategic flexibility and potential quality improvement over cost advantages. Neither SMEs nor large enterprises regard being better able to concentrate on their core competencies as a key advantage of SaaS.

A comparison of the opportunity and risk assessments of current SaaS customers and non-customers reveals some interesting differences. While on average, non-customers evaluate the risks of SaaS as being consistently high, SaaS customers tend to focus on the advantages (see Fig. 6.4).

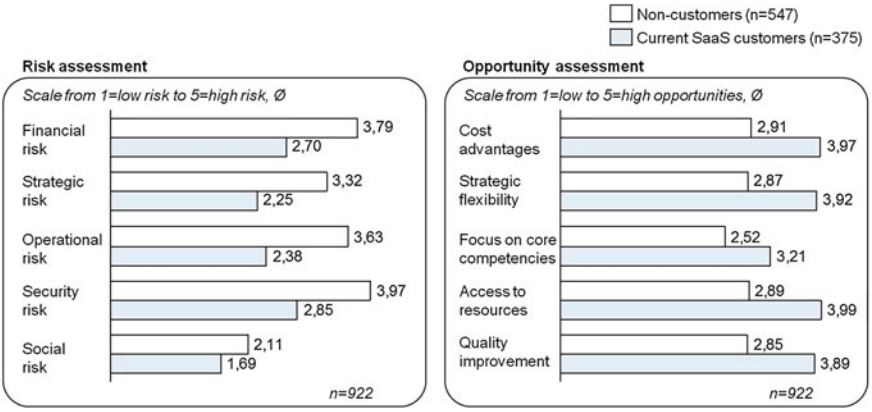

Fig. 6.4 Opportunity risk assessment: SaaS customers compared to non-customers (Benlian et al. 2010)

Analyzing the details, we see that security is a greater concern for non-customers. In addition, this group rates financial and operational risks as critical. Current SaaS customers regard security and financial risks in the same light. However, they see the risk of employee opposition to SaaS and its possible consequences (downsizing) as minimal.

6.5 SaaS from the Provider's Perspective: Pricing Strategies and Business Models

6.5.1 Basic Considerations

In the previous section, we could deduce some of the potential advantages and disadvantages of SaaS for users from those for outsourcing. We can do the same for providers. Assuming they have a large customer base, SaaS providers can exploit economies of scale and therefore cost advantages. This applies to IT infrastructure, hardware, software, and human resources. If the SaaS provider is also the vendor of the software in question, further savings can be made in development. Because the software is operated solely via a single platform, there is no need for costly modifications to make it run on different operating systems.

Moreover, SaaS may make it easier to offer customers a range of product versions. For example, different solutions for large organizations and mid-sized enterprises can be provided through the same platform.

Companies that offer SaaS are naturally subject to the risks that every provider of software faces. In addition, users' diminished dependence on a particular provider, as discussed in the previous section, can also pose a risk for SaaS providers.

SaaS providers can also learn from the results of the study presented above, specifically that non-customers are still apprehensive about deploying SaaS. Their

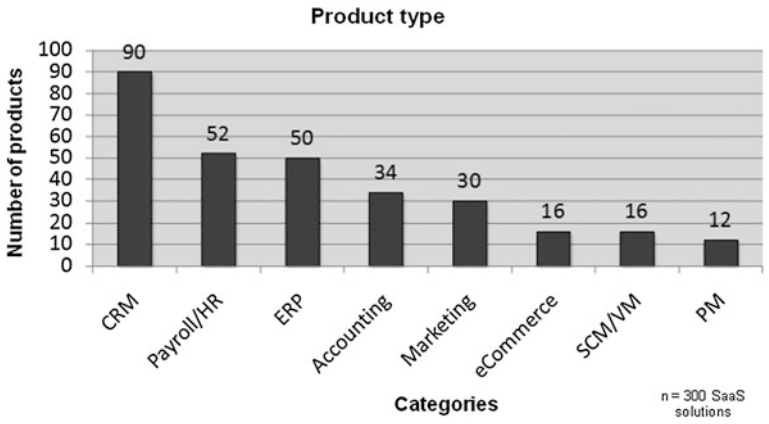

Fig. 6.5 Surveyed SaaS solutions by product type

main concerns relate to security and financial risks. Consequently, SaaS providers should improve their communications by focusing on the positive experiences of current customers to win over the rest. SaaS providers should also avoid tailoring their offerings solely to SMEs. Our results show that large user organizations appear to evaluate opportunities and risks much the same as SMEs, which suggests that they have a similar need for straightforward, affordable, on-demand software solutions.

In the following section, we will continue to examine SaaS from the provider's perspective. In particular, we will investigate the various pricing strategies pursued by software companies.

6.5.2 Empirical Study of SaaS Providers' Pricing Strategies and Business Models

Between February and May 2010, we conducted a content analysis on the websites of 259 US providers, to identify their pricing models for SaaS products. In addition, the study encompassed statistics about the provider (the size of the company and the year it was founded) and the product type of the SaaS solutions on offer.

To find SaaS providers for our study, we used the "Software-as-a-Service Showplace".[1] Currently, this Internet portal lists more than 1,300 SaaS providers. According to the portal's operators, the majority of these enterprises are US based. Providers can register themselves according to the type of application and industry.

The study's target group was providers with SaaS products for business customers. The sample was also limited to US-based providers. We cannot guarantee

[1] http://www.saas-showplace.com

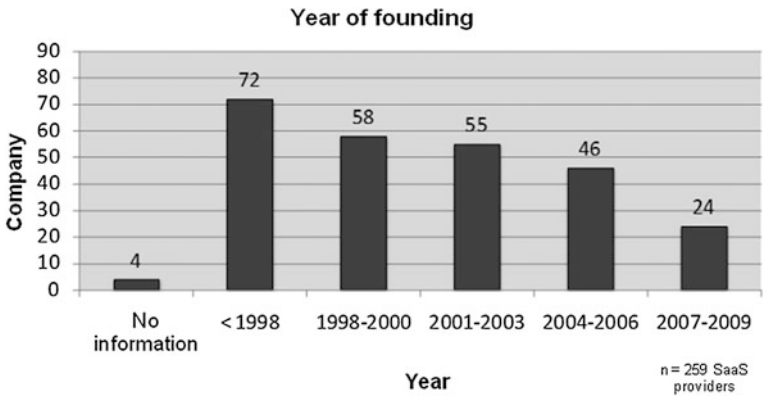

Fig. 6.6 Breakdown by year of founding

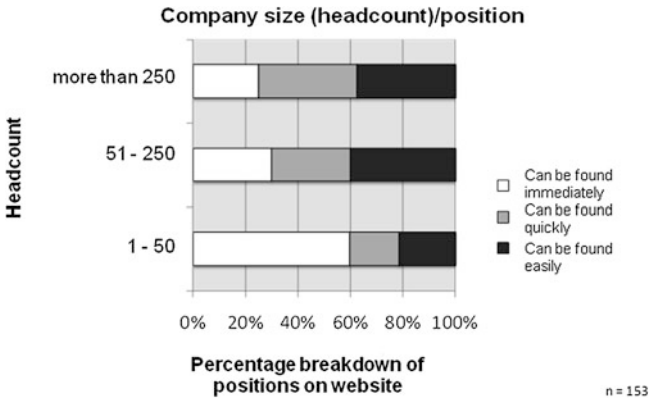

Fig. 6.7 Effort needed to find pricing information on SaaS providers' websites in relation to company size

that this group is representative of US SaaS providers as a whole. However, as we included all providers in the B2B category, and other portals offered few additional providers, we shall assume that our sample can be regarded as characteristic of the industry as a whole. The portal's list is regularly updated and expanded by the site's operator, as well as through registration by SaaS providers.

Of our sample group of 259 companies, 56 % had up to 50 employees. A fourth of providers had between 51 and 250 staff. Only 13 % had a headcount exceeding 250. We were unable to establish the number of employees for the remaining 6 %.

Figure 6.5 shows a breakdown of the 300 SaaS solutions in our analysis (one company can offer multiple solutions) by product type.

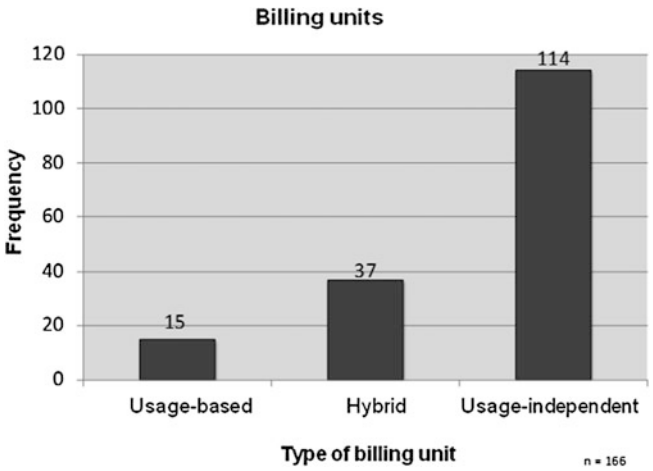

Fig. 6.8 Use of different types of pricing basis

As SaaS is a relatively new form of software delivery, we also looked at the year in which each provider in our sample was founded. The following diagram shows the results, divided into 3-year intervals (Fig. 6.6).

Our empirical investigation focused on the billing units used, in order to discover to what extent usage-based pricing models are employed, and by which providers. The availability of this information on providers' websites gave us an indication of the transparency of their pricing models. In most cases, providers' websites stated both the billing units and the corresponding prices.

We found details of billing units on the provider's website for 55 % of the 300 SaaS solutions in our analysis. For the other 45 %, no other information was available. The availability of this information is a good approximation for the transparency of pricing models for customers: The billing units and corresponding prices are the crucial information that customers need in order to understand the product's pricing model. We then investigated which providers published pricing information on their websites, and which did not.

More than 60 % of small SaaS providers (those with up to 50 employees) provided an above average amount of pricing information on their websites. In contrast, this applied to less than 40 % of the providers with a workforce of more than 250. A more detailed analysis of the smaller enterprises confirmed this correlation: Smaller SaaS providers tend to provide more pricing information on their websites than large providers.

With regard to the effort needed by customers to find pricing models on providers' websites, we found the following: (Fig. 6.7)

We found pricing information immediately on 60 % of smaller SaaS providers' websites, i.e., the pricing model was described on the home page, or there was a button labeled "price" or "pricing" that led to this information. The "Cannot be found easily" category included cases, where pricing information could not be

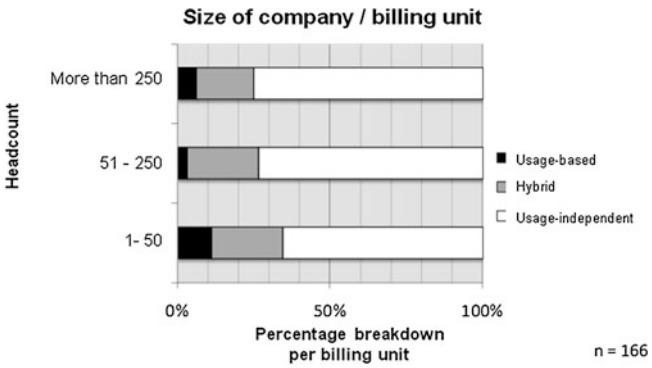

Fig. 6.9 Billing unit type by company size

found intuitively or quickly, for example, where it was hidden away in Terms and Conditions, FAQs, News, and other places.

Looking at the pricing basis for US providers' SaaS solutions, we can see that exclusively usage-based pricing models are rare. The majority, or 114 of the 166 SaaS solutions, are usage independent (Fig. 6.8).

On the basis of the available data, we are unable to satisfactorily answer the question of whether a particular type of billing unit is more common among particular types of providers: Usage-based pricing is seldom used by small, mid-sized, or large SaaS providers alike (Fig. 6.9).

Comparing the age of the SaaS provider with the billing unit employed also fails to bring any relationship to light. It is noticeable that, of the companies in our sample that were founded between 2007 and 2009, none of them employ exclusively usage-based pricing models.

Overall, we can conclude that usage-based pricing has not (yet) established itself as the primary model. Instead, user-based models continue to dominate. In the following section, we will look at this subject in greater depth. We will consider demand structures with usage-based and usage-independent pricing models through the lens of a case study.

6.5.3 Case Study to Compare Usage-Based and Usage-Independent Pricing Models

In the following section, we will further explore the issue of usage-based and usage-independent pricing of SaaS solutions using an example. In particular, we want to test the validity of the oft-cited claim that SaaS is especially suited to usage-based pricing (e.g., Kittlaus and Clough 2009, p. 59; Choudhary 2007).

Against this background, we carried out a case study involving a provider of statistical software for the B2B market. This software provider is planning to deliver an application via SaaS, which it currently offers as an on-premise version.

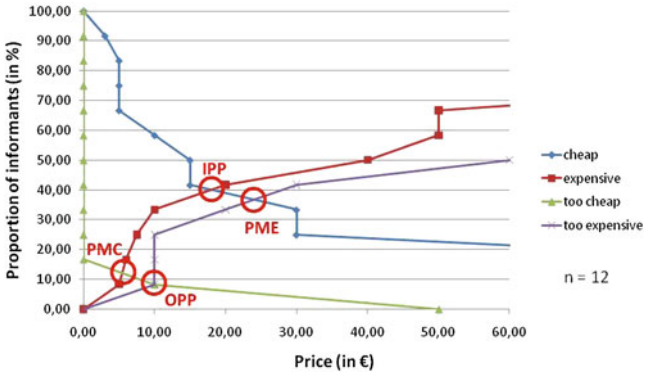

Fig. 6.10 Results of the PSM with usage-independent pricing (Lehmann et al. 2010)

In this context, the question arises of what pricing model should be employed for the new solution.

6.5.3.1 Data Set and Methodology

In February and March 2009, we conducted a telephone survey of the software provider's customers. We used van Westendorp's *Price Sensitivity Meter* or PSM (van Westendorp 1976) to compare customers' willingness to pay for a SaaS solution when it comes with usage based as opposed to usage-independent pricing. Because of the small sample size and the opportunity we had to discover the reasons for these decisions by this means, we decided against other methodologies, such as conjoint analysis.

The van Westendorp method is a form of direct survey, whereby customers are asked four questions on a previously defined product. These questions ask respondents at what price they would consider the product "affordable", "expensive", "too expensive", and "too cheap" (these being the method's four price points). Individual participants' answers are aggregated and presented as curves on a diagram. The intersections of these four curves define the region in which the price for the product should be located. The point of PSM is not to determine a concrete price-demand function. Rather, it is intended to identify an "acceptable price range" (Lock 1998, p. 507) for an innovative product when it is not yet apparent what the price should be.

The *sample* consisted of 28 of the software provider's customers, who already use the intended SaaS product in its on-premise version. As a result, these customers are familiar with the application's functionality and the costs of the current licensing model.

With respect to the size of the company, 38 % of our sample comprised small and mid-sized businesses whose annual sales are below 500 million €, while 62 % were large enterprises whose annual sales exceed 500 million €. The sample

companies were mainly automotive OEMs and suppliers in German-speaking countries. We will devote the following section to the survey's findings.

6.5.3.2 Findings

The van Westendorp method was implemented twice in this survey. First, "concurrent users" was chosen as the billing unit for the SaaS application's pricing model. A total of 12 out of 28 respondents, i.e., around 43 % percent, gave answers on all four price points. The results are illustrated in Fig. 6.10

As explained above, PSM provides a price range within which the price for the application should lie. This recommended price falls between the "point of marginal cheapness" (PMC) and the "point of marginal expensiveness" (PME)—in this case between € 5.46 and € 24.10 per month and concurrent user.

Our survey of the demand structure with usage-based pricing, which was conducted at the same time, had a much smaller response rate. One of the functions of the software is the production of statistical reports. Accordingly, "per completed report" was chosen as a usage-based billing unit for the software. Only 14 % of participants (four out of 28) gave concrete figures for all four price points.

However, the results do offer some insight into why usage-based pricing models play such a minor role. In addition to concrete price points, the telephone survey allowed respondents to give reasons for their inability to estimate a suitable price: It transpired that respondents were not actually sure how intensively they used the software they deployed. As this is what determines costs with usage-based pricing, these customers were unable to estimate their willingness to pay.

The choice of billing unit—such as the number of reports produced—turned out to be a further problem. Given the versatility of the software, and the many different ways it is employed by users, opinions varied as to what a suitable usage-based billing unit might be.

The results obtained from respondents' replies also contained some surprises. For example, two respondents' estimations of what was a "cheap" price varied by a factor of more than 1,000—which indicates that what customers would be willing to pay varied over a huge range. For the provider, this state of affairs is especially unwelcome. As we explained at some length in Sect. 3.3, to reach as many customers as possible and best exploit their willingness to pay, a homogeneous demand structure with a low variance is required.

Generally speaking, price discrimination is a good way of exploiting customers' different reservation prices. Given the magnitude of these differences, however, this may be difficult to implement. Furthermore, presumably due to their distribution over the Internet, the pricing of SaaS products tends to be more transparent than, for instance, on-premise software. This makes third degree price discrimination particularly difficult.

In conclusion, the study's findings do not support the oft-cited assertion that SaaS is highly suited to usage-based pricing. In most cases, providers employ

usage-independent billing units. For most customers, prices based on usage, such as per completed transaction, are optional.

However, it should be noted that this study of demand structures was conducted among potential customers of one particular SaaS offering. Comparable surveys relating to other types of SaaS products, such as ERP or CRM software, would be of interest, as would a general analysis of the relationship between the demand distribution and the form of pricing model offered.