Arthur D Little

THE GERMAN INTERNET INDUSTRY 2012 – 2016

FIGURES, TRENDS AND HYPOTHESES

WE ARE SHAPING THE INTERNET.

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Inhalt

Foreword

Twenty years have flown by since the Internet became available to the broad public. Starting as a rudimentary communication platform for computer nerds which depended on bandwidths below the level of perception, mainly distinguishing itself for services like email and gopher, the "Internet" has now become the driver for growth in the ICT industry.

However, the Internet is still misunderstood by large parts of the population, politics and the industry. For many, it is only Facebook and the Web, for others it is only the cloud, and some see an untamed Moloch from Sodom and Gomorrah that must be brought under control. Only few understand that the Internet is only a collection of protocols and services for telecommunication from which anyone can build their own network, and that the Internet can only be what it is when networks connect.

No one can operate the Internet alone. Many try to dominate or control it, but they need each other. That is what makes the commercial use of the Internet so challenging and innovative. Anyone can bring together the building blocks for his/her innovative idea in order to create something new, something different. The open standards of the Internet are the molecular starting points for the Internet industry creation of value.

The study published here is the 2nd study of the German Internet industry and it emphasises again that the Internet molecules can be successfully arranged into new and larger structures, and as a result become a value chain that can generate, at various intensities, an even larger creation of value.

In the first study we clarified these correlations in a layer model format. In this second study we have chosen a different approach, one that we hope will better un-

derscore the intensity of the dependencies within the individual layers.

Even without this graphic illustration of facts it becomes clear that a prosperous economy relies on the Internet at all levels and across areas of value creation. Hardly any other economic sector can claim better growth figures. Hardly any business sector promises more opportunity than risks, if it's handled well.

Sometimes it is just exactly this knowledge about the value chains and the understanding of correlations in tele-communications, as well as knowing the areas of application, which creates the individual success. Without knowledge of human psychology, the algorithms of set theory, and an understanding of bits and bytes, phenomena like Facebook et al. could not be realized.

I hope that, beyond the dry figures, reading this study will give you insight into the mechanisms of the Internet and its value chains and I am sure that for years to come we will witness how innovations on the Internet will change our lives. After all, we live in a time for visionaries.

Sincerely,

Harald A. Summa, CEO,
eco – Association of the German Internet Industry

Preface

The Internet industry has kept a rapid pace of development since the last study, published in 2009. All of us can experience its effects on our daily lives. New devices and new applications have monumentally changed social life in Germany (who was sitting on the couch in front of the TV while surfing the Internet on their tablets in 2009?). The impact of the Internet is perceptible in all aspects of business as well. The Internet industry itself has enormous momentum. Winners and losers change quickly and we expect at least an equally momentous and exciting development as in previous years. Average growth rates of over 11 percent per year across the industry, as well as growth rates of over 20, 30 or more percent in some segments, clearly highlight this momentum.

Let's take a look at some developments. The past few years have been shaped in particular by the arrival of smartphones and tablets. The question of whether the use of the Internet was intended for the office or home is no longer an issue, as it is no longer spatially limited. The triumphal march of the smartphone – soon to be used by almost 50 percent of German consumers – has made the mobile use of the Internet, whether it is via mobile phone network or WLAN, a mass phenomenon. Meanwhile, hundreds of thousands of apps have brought new business opportunities and have created new companies. The tablet has also contributed to this development, despite its one-digit penetration rate to date.

Social media has also heavily impacted our daily lives. The number of Facebook users in Germany has grown from 6 million at the beginning of 2010 to over 25 million users today.

Other platforms such as XING or LinkedIn have specialized in the professional arena and have become an important medium for employees and employers. The data protection issue, however, keeps surfacing, though it seems that at least the greater proportion of consumers in Germany have not (yet) had serious difficulties with it.

Equally, better access to broadband has contributed to us consuming "content" differently; consuming different content, and doing so more online. Today, in the USA and in France, more video is viewed via video-on-demand online than on classic DVDs or Blu-ray. This has also led to a sharp increase in average data use in Germany. A mobile phone customer uses about 200 MB per month, which is still well below the average in comparable countries, and a stationary broadband customer already uses far over 10 GB.

Last but not least, our work environment is faced with serious changes. The "cloud", which is only at the starting line, will lead to a further fusion of mobile and fixed Internet use. In the future it will be even less important where one is, which will lead to still further unimaginable changes in our daily work environment.

In order to keep being successful into the future, we have to overcome the challenges ahead of us. The Internet erases borders, and competition is being propelled into global dimensions previously unknown. That is why we must create framework conditions in Germany that will secure a place for our companies in global competition. Moreover, we must create the infrastructure conditions that will promote the super fast broadband access (>50MBit/s) in Germany.

Germany, with its 0.2 million subscribers, is noticeably behind international best practices.

However, we maintain our optimism that German companies will take this challenge head on and will keep developing positively. Many of our Internet industry customers amaze us with their innovative spirit, their risk taking, and their boundless desire to take part in shaping

the future. We are convinced that the German Internet industry will continue to be one of the most important drivers of the German economy far beyond 2013. We predict that the German Internet industry will create almost 80,000 new jobs over the period of the study and will establish itself as an important job creation engine.

Dr. Michael Opitz
Director, Head of TIME Practice Central Europe
Arthur D. Little

Dr. Nicolai Schättgen
Principal, Global Head of M-Commerce
Arthur D. Little

1. Introduction

Since the first email was received in Germany in 1984, the Internet has come to play an indispensable role in the lives and work of many people. The companies within the Internet industry are well established and significantly contribute to the GDP. Especially during the crises of the recent past, when many industry sectors had to scale down significantly, the Internet industry was still able to shine with strong growth. There are therefore more than enough reasons to update the study "The German Internet Economy 2009 – 2012, Review, Trends, and Drivers", published by eco – Association of the German Internet Industry and Arthur D. Little, and to dare a renewed outlook for the future of one of the most dynamic industries.

This new study, "The German Internet Industry 2012 – 2016: Figures, Trends, and Hypotheses", draws on the Internet value chain model of the Internet industry that was introduced in the previous publication[1]. The dynamic nature of the market, however, made small adjustments to the model necessary. That is why chapter 2 offers explanations pertaining to the new information-richer form of illustration.

For this study, a complex market model was developed to determine the most important current indicators, in order to make a forecast regarding these through to 2016. An extensive explanation of this model, the figures and a comparison to the previous study can be found in chapter 3.

Security is a cross-sectional sector, which, due to the fact that the Internet is rapidly penetrating all aspects of life, has been becoming increasingly important. We have therefore decided to examine this issue comprehensively, in all its facets, in chapter 4.

In chapter 5 we discuss the, as we see them, most important trends in the industry, as well as the growth drivers spanning to 2016, and formulate hypotheses regarding their future significance and development.

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[1] For this reason, we have not included a comprehensive explanation of the individual layers and have instead referred to the study "The German Internet Economy 2009 – 2012, Review, Trends, and Drivers." The study can be downloaded free here: http://international.eco.de/wp-content/blogs.dir/2/files/2012/05/the_german_internet_industry_2009-2012_eco_adl.pdf

2. Model of the Internet Industry

The layer model of the Internet industry[2], based on the value chain and developed for the first study conducted by eco and Arthur D. Little, forms the basis of the comprehensive market model that was developed to make the calculations for chapter 3, "The German Internet Industry in Figures".

The illustration format chosen in the first study, however, had the disadvantage that dependencies and economic interconnections between the individual segments/layers could not be adequately demonstrated. In order to better illustrate them, the radially symmetrical illustration format seen opposite was selected (see Figure 1).

The inner color ring shows the four layers, Network/ Infrastructure & Operation, Services & Applications, Aggregation & Transactions, as well as Paid Content. The outer ring shows the individual segments respectively. The segments Security and Consulting Services, which apply to every layer, are illustrated by continuous circles in the centre of the diagram.

In the middle, between layers and segments, is an intensity scale to illustrate the direct service relationships between a segment and a layer. The scale goes from 1 = no or minimal direct service relationship, to 5 = highly intensive service relationships.

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2   see: eco / Arthur D. Little: The German Internet Economy 2009 -2012 − Review, Trends, and Drivers

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FIG. 1

Model of the Internet Industry
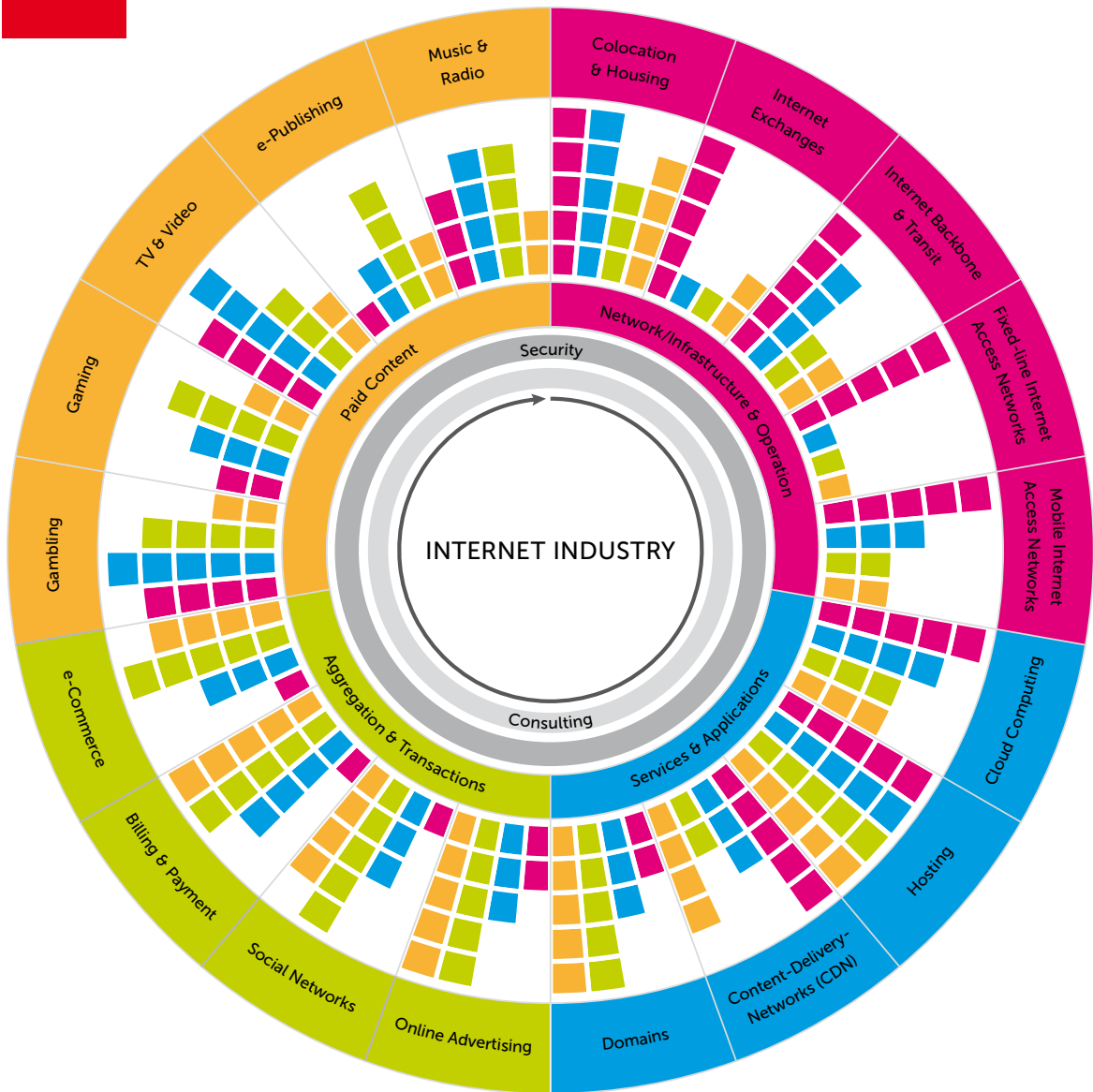
Layer 1: Network/Infrastructure & Operation

Layer 2: Services & Applications

Layer 3: Aggregation & Transactions

Layer 4: Paid Content

The number of boxes
represents the service
relationship to the
corresponding layer:

5 ◀ intensive
   service relationship
4
3
2
1 ◀ no or minimal
   service relationship

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FIG. 2

Overall Market
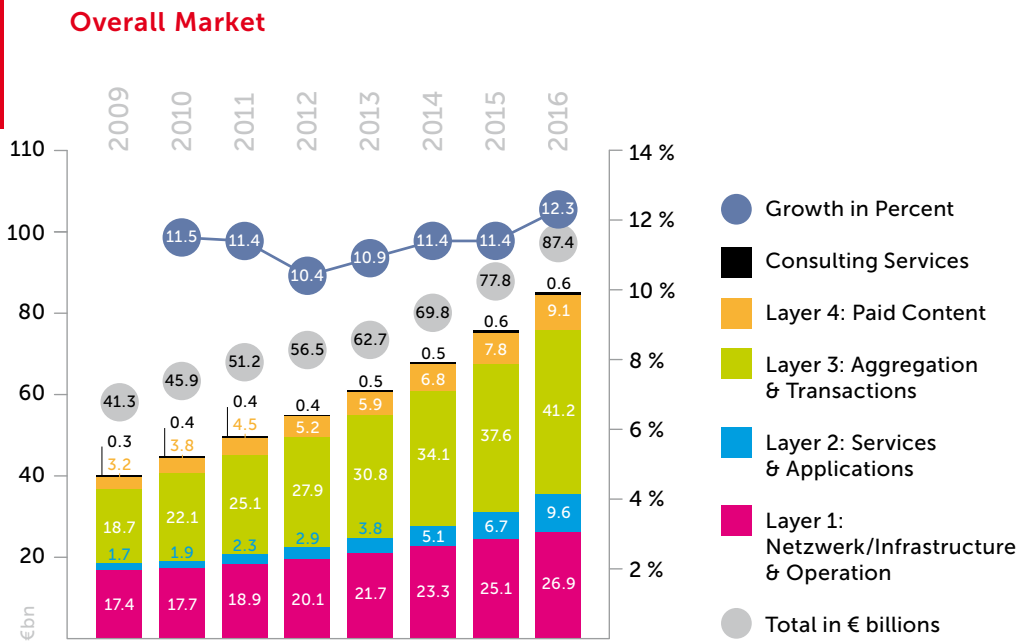
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3. The German Internet Industry in Figures

3.1 General Trends and Developments

3.1.1 Development of the German Internet industry 2012 to 2016

The German Internet industry is maintaining strong growth in all market segments. The overall market progress continues to look vibrant into the future – we are expecting annual growth of over 11 percent for 2012 to 2016, which is quite similar to previous years. As Figure 2 shows, the forecast is for relatively even growth that will increase towards the end of the time period examined.

The forecast for the German Internet industry is based on a base case which uses the actual figures for 2010-2011-2012 (extrapolated) to project to 2016. The forecasts are based on a comprehensive trend analysis.
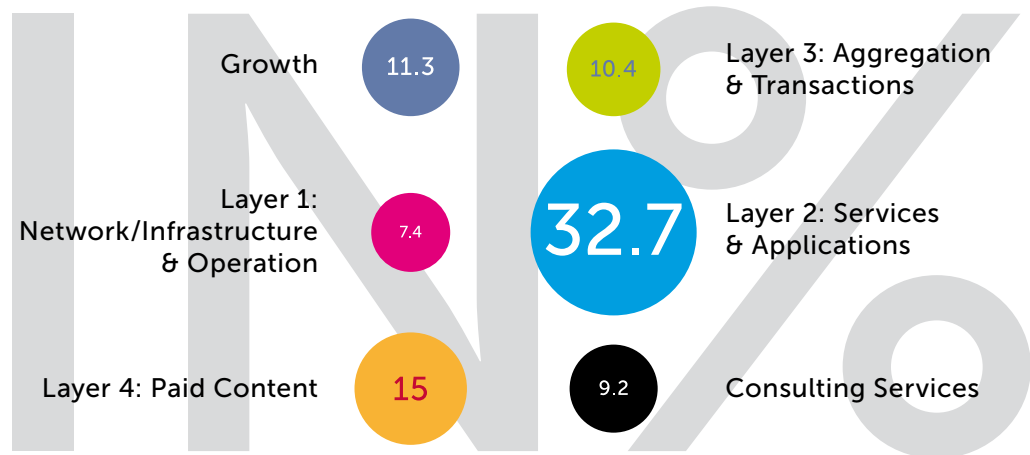
Total revenues for the Internet industry in Germany for 2011 was 51.2 billion euros. As a result of the growth, revenues will rise to 87.4 billion Euros by 2016 – an increase of 71 percent within only 5 years. That means the Internet industry will continue to be one of the most dynamic industries in Germany.

Between and within the layers, both the revenue distribution and the forecast revenue distribution vary significantly. The highest revenues are generated in the layer Aggregation & Transactions. With annual growth of over 10 percent (see Figure 3), it is safe to assume that this layer will continue to generate the most revenue from 2012 to 2016. For 2016 we are predicting a total volume of 41.2 billion euros. This corresponds to 47 percent of the total revenue generated by the German Internet industry. The volume in this layer is primarily due to the revenue from the large segments e-Commerce and Online Advertising. Another strong revenue layer is the segment Network/Infrastructure & Operation.

The share of the industry held by this layer, however, will more likely shrink because its annual growth rate of 7.4 percent is less than the average overall growth (see Figure 3).

FIG. 3

Average Annual Growth Rate 2012 – 2016

Growth — 11.3

10.4 — Layer 3: Aggregation & Transactions

Layer 1: Network/Infrastructure & Operation — 7.4

32.7 — Layer 2: Services & Applications

Layer 4: Paid Content — 15

9.2 — Consulting Services

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The Consulting segment is only a small part of the overall industry. The volume for 2011 was around 400 million euros, around 0.8 percent of the overall market. Due to the slightly below-average growth in this segment, its share of the market will probably decrease. The demand for consulting for the most part continues to be evenly distributed across the layers.

3.1.1.1 Internet industry drivers

The development of the Internet industry is dependent on a range of drivers. These can be classified as macro-economic drivers such as the GDP or ICT expenditures, supply-side drivers such as fixed network and mobile broadband availability and demand-side drivers such as user penetration and the expected data volume per user. In particular, the macro-economic factors have an influence on the overall Internet industry. For instance an increase in the GDP or the ICT expenditures has a positive impact on almost all segments. The factors relating to supply and demand also have an impact on several segments of the industry. Moreover, there are negative reciprocal dependencies of individual segments: For example, an increase in user penetration for cloud

services is leading to a decrease in colocation & housing customers.

The model is based on the growing availability of broadband Internet and the expected increase in data volume via fixed and mobile broadband from 2012 to 2016 of in total about 26 percent annually, which will have an especially large impact on the industry. The growth of cloud services, for instance, depends on the extensive availability of fast Internet. The increase in data volume will also lead to revenue growth from network infrastructure and content delivery networks.

FIG. 4

Figure 4 Model Representation of the Influence of the Increase of 1% in Broadband Internet for the Segments IaaS, as well as Layer 1 and Layer 4 as a whole
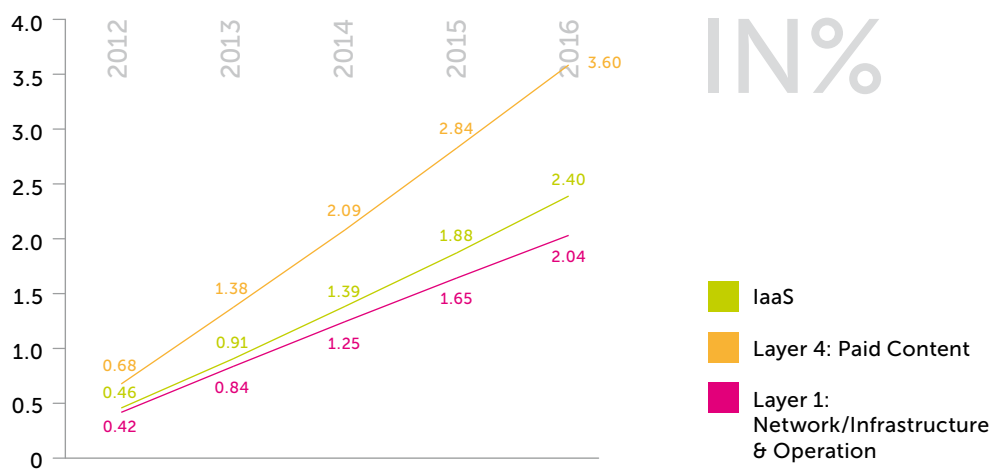
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A further significant influence can be seen in the strong increase in the circulation of apps. This can be seen as a megatrend and functions as a driver for numerous segments. Apps do not have their own segment within the layers examined; rather they form an intersection of other segments such as Paid Content, Cloud Services and e-Commerce. The impact of apps is therefore illustrated in the development of these segments.

3.1.1.2 Dynamics of individual layers and segments

In the following section, several pronounced trends will be dealt with in more detail.

We expect the highest growth rates to occur in Internet related Services & Applications. This includes cloud services, hosting services, domains, as well as content delivery networks. We expect an average growth of 32.7 percent in the Services & Applications layer for the time frame 2012 to 2016. The sharp increase is a result of the cloud services Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). In 2012, these cloud services made up about 2 percent

of companies' ICT expenditures, whereas the value will increase to about 8 percent by 2016. This will lead to a growth in the segment Cloud Services of around 55 percent in the years to 2016.

The prerequisite for this growth and at the same time the most important and influential factor is the availability of broadband Internet for both fixed and mobile networks. Should the mobile phone providers in Germany manage to expand the LTE network faster, it will also drive the cloud services market. Were the availability of fixed and mobile broadband to grow annually by one percentage point more than expected in coming years, this would lead to an increase of 0.5 percent annually for the IaaS services in regards to the market volume (see Figure 4).

Broadband Internet availability also influences the operation of networks and infrastructure. Consequently, to some extent, the increased data volume will lead to higher revenues for Internet Exchanges and transit providers. An increased broadband availability of one percentage point annually would only cause a market volume increase of less than 0.4 percent annually. The reason for this is that the increased data volume does not

directly reflect higher revenues. Customers are not overly willing to pay for more bandwidth. Sales for transported data volume will therefore decrease markedly.

These circumstances, together with a certain market saturation in regards to the number of Internet connections, are leading to a situation where the Infrastructure Provider segment will not be able to maintain the trend seen in the overall Internet industry. In comparison to previous years, we are expecting a slight increase in growth; however, the annual rate of 7.4 percent is less than the industry growth overall. The fact that we are expecting growth in this layer at all is due to the segment Mobile Internet Access Networks, which alone will grow by 16.5 percent annually until 2016. In contrast, for the segment Internet Backbone & Transit we are expecting a drop in sales of up to 5 percent annually, since a smaller portion of data volume will be handled through private peering, in other words through transit agreements, in the future.

The layer Paid Content will become increasingly attractive, driven especially by the segment TV & Video, which we predict will see an annual increase in revenue of 64

percent by 2016. Consequently, this layer's market share will also see a marked increase. Moreover, Paid Content is the segment that profits most strongly from broadband availability. Figure 4 shows that an increased availability of one percentage point annually would result in an increase of sales of 0.7 percent annually across all segments in this layer. In particular, very data intensive content like TV & video are particularly sensitive to broadband availability.

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Growth of the Internet Industry 2010 – 2012
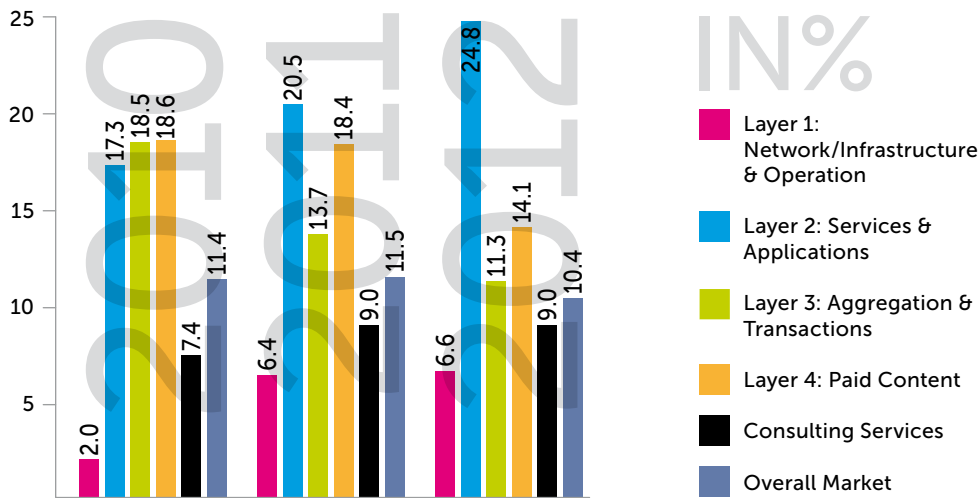
Legend:
- Layer 1: Network/Infrastructure & Operation
- Layer 2: Services & Applications
- Layer 3: Aggregation & Transactions
- Layer 4: Paid Content
- Consulting Services
- Overall Market

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3.1.2 Actual developments and comparison to 2009 study

The current study has largely confirmed the growth trend predicted in the 2009 study for the years 2009 to 2012. The estimations provided by surveyed industry experts regarding the development of the market segments corresponds to today's market size in many areas. Markets that had been classified as particularly attractive were able to maintain a continual strong growth even through the difficult years of 2009 and 2010, and predictions of dramatic changes, for instance in layer 1 (Network/Infrastructure & Operation), have proved to be correct.

Figure 5 shows that, despite the previous year's crisis, the market as a whole clearly grew considerably again in 2010. A detailed look at the individual layers, however, shows slow growth especially in layer 1 during 2010. It is clear that this layer in particular, which is not primarily consumer driven, was more impacted by the crisis than other segments. This development was already apparent in the 2009 study. The study valued the volume of the layer for 2008 at 17 billion euros. This volume remained unchanged for the most part up to 2010.

The layer Services & Applications generated 1.7 billion Euros in revenue in 2008. The following year, revenue dropped slightly to around 1.6 billion euros. However, in 2010 the market recovered, and the annual growth rate has been growing steadily since then.

In retrospect we consider the volume in the layer Aggregation & Transactions to be lower than the estimation in the outlook of the 2009 study. The reason for this is not only the decline in growth during the crisis but mostly a more detailed assessment and market delineation within the framework of the current study.

In the layers 3 (Aggregation & Transactions) and 4 (Paid Content) the effects of the economic crisis had already been overcome in 2010. Growth in these areas was especially high in 2010 but slowed down slightly in 2011. The decline in growth can be explained through a certain market saturation resulting from the very high increase in the previous year. Both a slowing of the average revenue per user and the already high user penetration, which is no longer growing so rapidly, have led to a slight weakening in annual growth.

FIG. 6

Turnover and growth in Layer 1: Network/Infrastructure & Operation
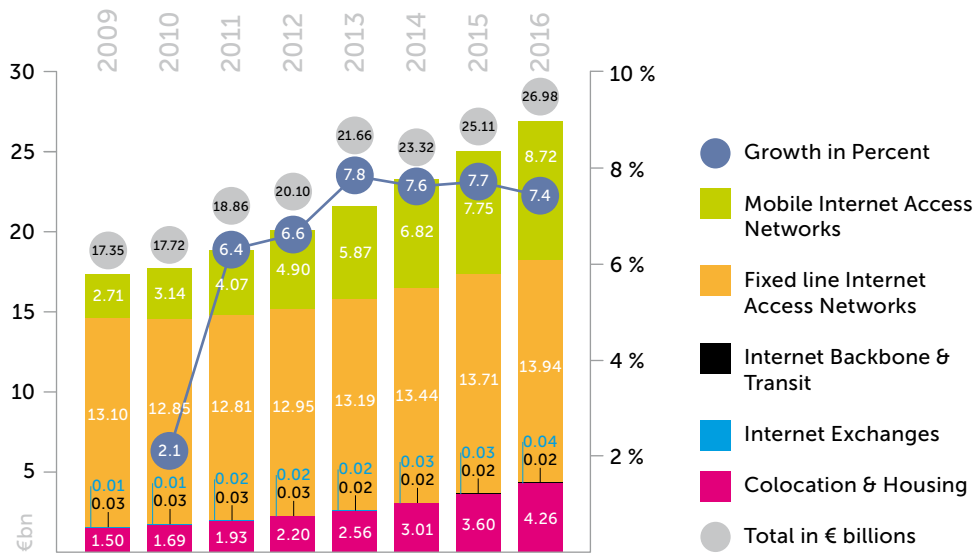
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In general, the outlook given by experts for the individual segments within the framework of the 2009 study proved to be correct in almost all areas. Only in the segment Hosting did the market develop less dynamically than expected, due to an increased use of cloud services.

3.2 Market Layers and Segments in Detail

3.2.1 Network/Infrastructure & Operation

The market for network and infrastructure operators is growing more slowly than the Internet industry in Germany as a whole. However, we expect the currently slower growth to pick up in the coming years and reach a growth rate of between 7 and 8 percent.

The development differs greatly in the individual segments within the layer Network/Infrastructure & Operation. The largest segment by far is the Fixed Internet Access Networks segment, with a turnover of about 13 billion Euros in 2012. Due to the already high saturation, future growth is limited. For the period 2012 to 2016 we are only expecting a growth rate of 1.7 percent, putting the market

size in 2016 at 14 billion euros. Compared to the Internet industry as a whole, this market is stagnating. A driving force for growth is the expected broadband expansion, the costs of which, however, will not be completely covered by end consumers.

We are expecting strong development in the segment Mobile Internet Access Networks. We forecast around 20 percent growth for 2013. Thereafter we expect a reduction to around 13 percent annually. The expected revenue in 2016 is estimated at 9 billion euros. Correspondingly, the share of this segment in layer 1 will increase markedly. Colocation & Housing services are also expecting two digit growth, and the growth rate will increase. Overall, for 2012 to 2016 we are expecting an annual growth of 17 percent.

A less positive development can be seen with providers of transit networks. Although the data volume in their networks will constantly increase, the obtainable revenue from this could decline. As a result, we expect to see a decline in market volume of 5 percent annually by 2016, meaning that the segment Internet Backbone & Transit will continue to have only a small share of layer 1.

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FIG. 7

Turnover and Growth in Layer 2: Services & Applications
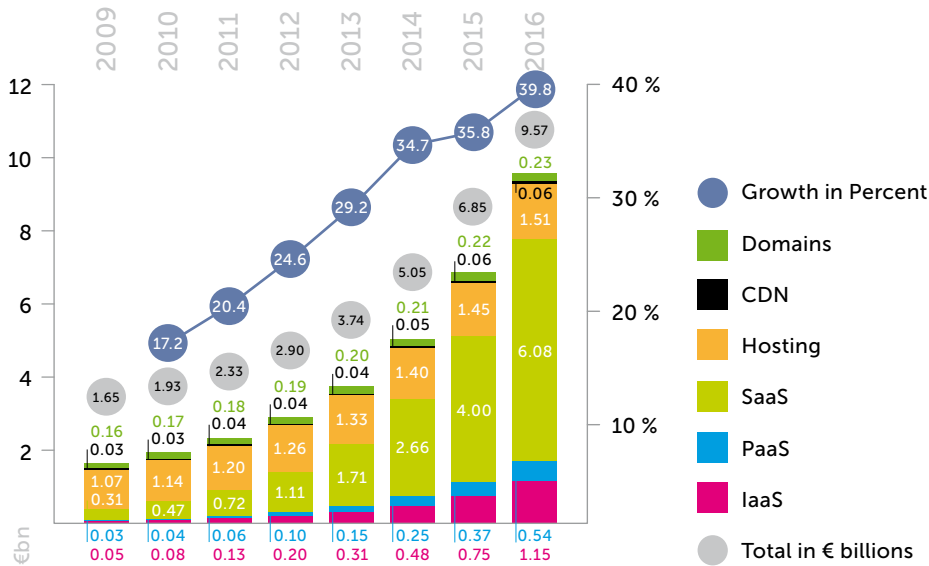
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3.2.2 Services & Applications

Layer 2 is expected to develop more strongly between 2012 and 2016 in comparison to the German Internet industry as a whole. Providers of Internet based services and applications can count on very positive developments for their German markets in the coming years.

In particular, operators of cloud-related services will target the German market in the coming years. The German market is becoming very attractive to them. After a restrained startup phase in recent years, the increasing acceptance of the services is reflected in an above-ave-rage upward trend. We are expecting high two digit annual growth rates for both B2C and B2B. Among other things, this growth is the result of growing numbers of apps for mobile devices that access cloud services at least partially.

In the coming years SaaS will establish itself as the most important segment of the layer. Whereas the market volume for SaaS is similar in size to the hosting market for 2012, average annual growth rates of 53 percent will ensure that the market grows to over 6 billion Euros by

2016. We expect that the IaaS segment will also exceed the one billion mark in 2016, with sales of 1.1 billion euros. Comparable in growth but markedly smaller in absolute figures is the segment PaaS. By 2016 the market volume of 98 million Euros (2012) will increase to almost 540 million euros.

For the segment Hosting we are expecting a much slower development. A certain saturation in demand can be seen here, which explains the lower annual growth rate of 4.7 percent. The situation is similar in the Domain market, where the growth rate of 5.1 percent is only a little higher. On the other hand, the growth of 12.6 percent annually in the Content Delivery Networks market is markedly higher than the segments Hosting and Domains. As far as the volume is concerned, this market is clearly behind the other segments, reaching around 64 million Euros in 2016.

FIG. 8

Turnover and Growth in Layer 3: Aggregation & Transactions
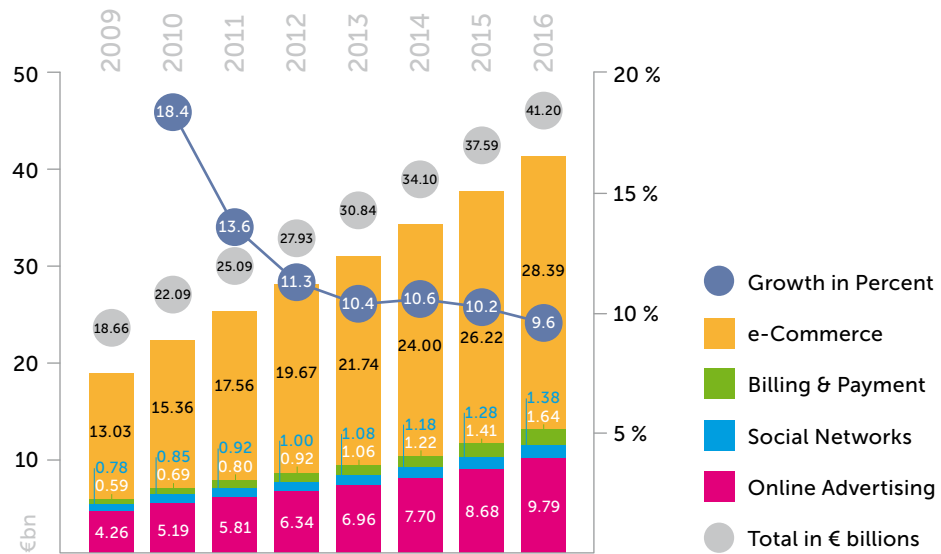
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3.2.3 Aggregation & Transactions

The segments in layer 3 experienced a particularly marked growth spurt after the economic crisis. Overall, a clear upward trend can be seen for the near future in the development of the layer Aggregation & Transactions, even though the growth percentage has reduced slightly since 2011. This number will stay around the 10 percent mark in the coming years. Figure 8 shows the developments of this layer. The overall size was almost 28 billion Euros in 2012 and the volume can be expected to reach 41.2 billion Euros by 2016. This makes the layer Aggregation & Transactions the layer with the highest revenue figures in the German Internet industry.

The segment e-Commerce is an especially large growth driver in this layer. We expect growth rates of well above 10 percent, which will take the 2012 annual market volume of almost 20 billion Euros to over 28 billion Euros by 2016. The segment e-Commerce remains by far the segment with the highest revenue in layer 3. Consequently, the performance of the layer significantly reflects the e-Commerce segment.

The highest growth can be seen in the segment Billing & Payment. The average market volume for digital payment is growing by 15.4 percent annually and will reach a volume of 1.6 billion Euros by 2016. The Online Advertising market also went through a growth phase in the recovering market of the previous years. With annual growth at 11 percent, this segment is developing very strongly and will reach a size of around 9.8 billion Euros by 2016. A similar trend can be seen in the segment Social Networking, Portals and Platforms. The average growth there is above 8 percent annually, and the volume is expected to increase to almost 1.4 billion Euros during the forecast period.

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FIG. 9   **Turnover and Growth in Layer 4: Paid Content**
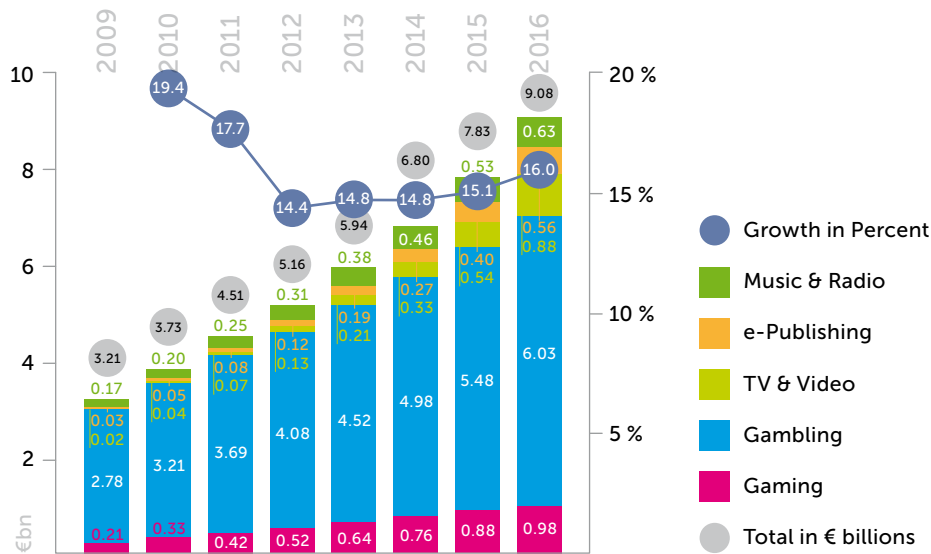
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3.2.4 Paid Content

Paid Content has been slow to establish itself in Germany, but with a growing acceptance of paid online content, layer 4 will also see strong growth in the coming years. As can be seen in Figure 9, we expect the market to reach a volume of 9 billion Euros by 2016.

The largest market by far in the Paid Content segment is Gambling. Unlike many other sectors that took a hit during the years of the economic crisis, this segment experienced strong growth and will see further positive developments in the coming years. The annual revenue increase of around 10 percent will enable the market volume of the Gambling segment to grow from 4 billion to 6 billion Euros.
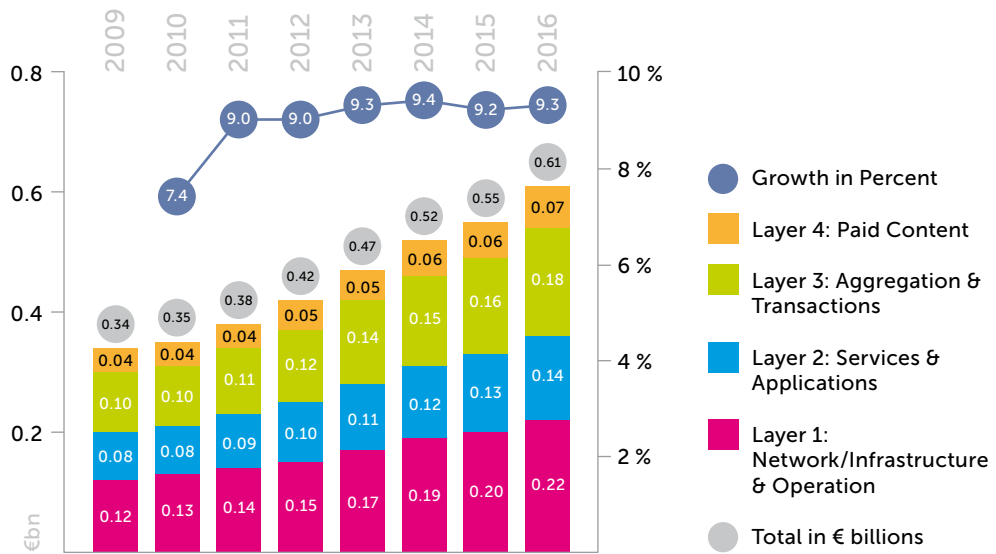
The strongest growth spurt is being experienced by the TV & Video market due to the growing interest of German consumers in buying streaming products and digital videos, which is continuing the trend of the previous years and is leading to an annual increase of 64 percent. As a result, the market volume will be at about 880 million Euros in 2016.

Similarly, e-Publishing is profiting from an increasing willingness to pay for online print articles. This shows not only a growing acceptance of e-books, but also an interest in purchasing online newspapers and magazines. Apps are one easy way to offer this content on mobile terminal equipment. The growth in this area was above 60 percent in 2011 and will stabilise at almost 50 percent annually between 2011 and 2016. Consequently, the market volume of a modest 122 million Euros in 2012 will increase to a significant 564 million Euros in 2016.

The segments Music & Radio and Gaming will also record strong growth in the coming years. The market segment Music & Radio is growing by over 20 percent annually so that for 2016 we expect an overall market of 630 million euros. So too, the Gaming segment will mark a positive trend with an annual growth of 18.6 percent. By 2016 the market will reach a size of 978 million euros, approaching the billion Euro mark.

FIG. 10

Turnover and Growth in Segment Consulting Services

●	Growth in Percent	
●	Layer 4: Paid Content	
●	Layer 3: Aggregation & Transactions	
●	Layer 2: Services & Applications	
●	Layer 1: Network/Infrastructure & Operation	
●	Total in € billions	

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3.2.5 Consulting Services

The market for Internet related Consulting Services will again see more positive developments in the years to 2016. During the economic crisis, spending in the Internet consulting market - as in the entire consulting market - was conservative and resulted in weaker growth. However, in the coming years we are expecting an increase to over 9 percent, although this number is slightly under the overall market growth.

Revenue will increase to about 600 million euros by 2016. Layer 2 has a disporportionately high share of Consulting Services. In our forecast we predict this market will encompass 140 million euros, making up 23 percent of the consulting services, although layer 2 itself will have a markedly smaller share of the Internet industry overall. Given the slow growth in layer 1, the consulting services segment of this layer will focus on the development of new business models.

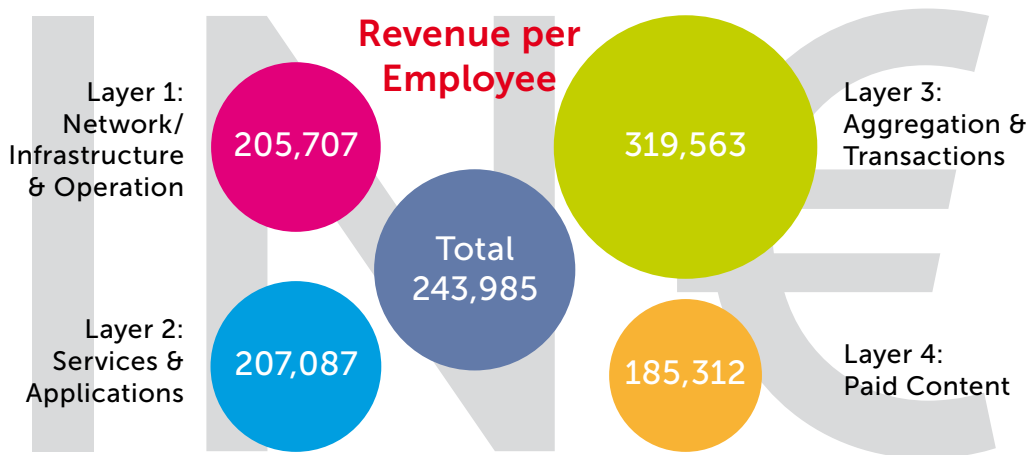## 3.3 The impact of the Internet industry on the German employment market

The Internet industry is not only an especially high-grossing and fast growing economic sector in Germany, it is also an essential job creation engine. Today, there are already 210,000 people employed in the German Internet industry. We are expecting a growth of 38 percent for the period of 2012 to 2016, which corresponds to 80,000 new jobs.

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FIG. 11 **Productivity of Employees in each Layer**

Layer 1:
Network/
Infrastructure
& Operation

205,707

Revenue per Employee

319,563

Layer 3:
Aggregation &
Transactions

Total
243,985

Layer 2:
Services &
Applications

207,087

185,312

Layer 4:
Paid Content

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3.3.1 The Influence of productivity and market maturity on the number of employees

The Internet industry differs from other more traditional industries especially due to its relatively high productivity and, at least in some segments, a relatively low market maturity.

Productivity is the revenue generated per individual employee on average in a representative company. This value varies within the layers and segments examined. Taking the industry as a whole into account, an employee generated on average 244,000 euros in 2011 (see Figure 11). The value for the layer Aggregation & Transactions is almost 320,000 euros and lies above the productivity of all other layers. In the layer Paid Content the productivity of an employee is on average 185,000 euros. This value, too, is very high in comparison to other industries – it exceeds the average per capita GDP in Germany by about a factor of 4.

The already high productivity of the Internet industry will continue to grow significantly in the coming years. In particular the new markets, such as the segments Cloud

Computing and TV & Video, are still in a very early phase of their life cycle. Consequently we are expecting an above average high level of professionalization and market consolidation in the coming years. Productivity will also continue to grow with increasing market maturity and advancing consolidation. Especially high productivity growth is expected in the layers Services & Applications and Paid Content. The segment e-Commerce will profit from many small startup companies which will significantly increase their productivity.

The segments in the layer Network/Infrastructure & Operation, on the other hand, are already very mature and the market is shared by few established providers. Consequently, a very strong increase in revenues generated per employee is no longer expected.

20

FIG. 12

Employment Growth in the Overall Industry
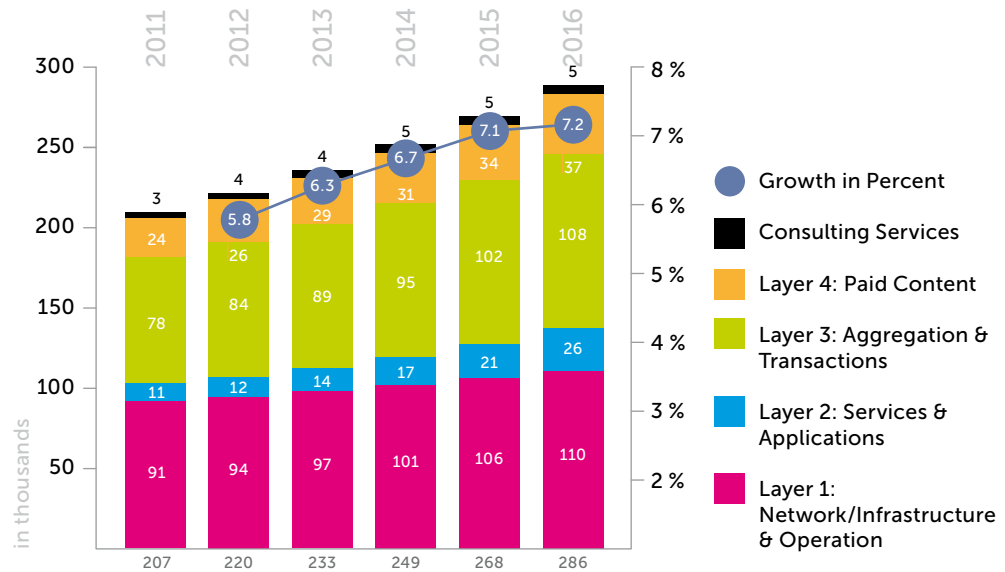
The German Internet Industry 2012 – 2016: Figures, Trends and Hypotheses
eco – Association of the German Internet Industry/Arthur D. Little, 2013

3.3.2 Employment forecast to 2016

Based on the calculated average productivity we can deduce a number of 210,000 employees for the year 2011 for the entire German Internet industry. Of this number, 44 percent are allocated to the layer Network/Infrastructure & Operation, and approximately 37 percent to Aggregation & Transactions. The remaining 19 percent are distributed among the remaining layers – this number will grow to 24 percent by 2016, as we expect stronger growth in these areas.

The number of employees is growing steadily in all of the layers investigated. The annual growth rate between 2011 and 2016 for the entire Internet industry is approximately 6.6 percent. This value is lower than the growth in revenue because productivity is increasing. Nevertheless, the industry proves to be an engine for the creation of new jobs and will employ almost 290,000 people by 2016. That equals an increase of 38 percent overall over a period of 5 years.

We expect the biggest employment growth to be in the layer Services & Applications, at a rate of 18.7 percent

annually. This is where the drivers are, especially the fast growing cloud segments. Another segment that has a significant impact on job growth is Online Advertising. By 2016 it will employ about 41,000 people, which corresponds to an annual growth of 10 percent. In the e-Commerce segment, the number of jobs within the same time frame will rise to 58,000, a 4.6 percent annual increase.

The layer Network/Infrastructure and Operation shows the slowest job growth among all investigated layers. In spite of this, we are expecting yearly job growth of 3.8 percent and envision this layer to still be at the top of employee numbers in 2016, with around 110,000 employed people

4. Security

4.1 Framework Conditions and the Economic Environment

The Internet, as an omnipresent and cost efficient infrastructure, has become indispensable to all modern economies. Originally used as a communications system, the global network quickly became a platform for all manner of business exchange. Today, e-commerce brings together supply and demand in real time, transport logistics being the only limitation on the speed of merchandise turnover. In the fast growing digital goods market (music, video, apps) even this obstacle ceases to be an issue, as the products are delivered via download.

As inarguable as the advantages of this extensive digitalization may be, they come at a price: This is the existential dependency on hardware, software, and technical know-how. Securing the efficiency and availability of these infrastructures is more important than ever and this is clearly reflected in the broad involvement of business and politics resolutely supporting the shift to a modern Internet society.

The framework conditions for the market are also developing favorably, promising an above average growth in the future. However, the competitive pressure is high, since IT security spending is not always adequately assessed. One reason for this is the rising complexity of the IT systems, often overburdening small businesses, and the other reason is that the current economic crisis is forcing budget cuts due to low domestic demand and declining export earnings. Security providers therefore continue to see themselves doing business in a highly dynamic and demanding market despite the stable demand situation. The increasing standardization of technical components promotes a rapid decrease in prices and short life cycles for many products. In particular,

smaller providers have to consistently differentiate themselves and avoid unprofitable business areas.

There are great opportunities for suppliers who are specialised in profitable niche markets, as well as service providers who offer qualified support and consulting, or businesses with value added concepts. German companies doing business in the attractive but highly competitive IT security solutions market should consistently aim for a product strategy that focuses on competition on quality, as it is successfully practiced by other industries. Due to global cost pressure, standard products are often dominated by large companies from Asia and the USA that profit from economies of scale and easier access to the money market.

In order to remain successful in this environment long term, the ability to be innovative and flexible is as important as are sustainable location policy and stable legal framework conditions. The high standard of German data protection regulations in comparison to international ones can be used as a selling point in order to market trustworthy products and services. The development of complex security solutions requires a highly qualified workforce. Here, German companies can profit from locational advantages - such as the education system, the density of higher education establishments, and the support of research – in comparison to their competitors from abroad.

Even during the difficult recession and consolidation phase of the European markets, there are opportunities for the primarily medium-sized suppliers from Germany if they use their proximity to their clients as a selling point when competing with global competitors.

This does not only present logistic advantages, but also an increasingly important role played by the harmonization of norms and regulations within the EU in regards to security and compliance.

4.1.1 Market expectations in regards to IT security

Companies regard information concerning their investments in IT security as sensitive, and correspondingly limit access to such information. This makes a realistic evaluation more difficult. The individual estimation of security needs, and the resulting investment behavior, are primarily dependent on financial performance and professional competence, which is why, as a rule, the willingness to spend increases relative to the size of the company. On average, German SMEs currently budget around 14 percent of their IT budgets for IT security, but a good third of them recognize there is room for improvement[3].

In addition to private-sector demand, public spending also stimulates market development. For example, by the beginning of the year 2012, 221.4 million euros alone had been spent from the IT investment program of the IT security stimulus package[4].

Besides its momentum within this segment, the IT Security market also profits from the above average growth expectations of the rest of the Internet industry. Estimates predict a clear expansion in the market potential for IT security solutions in Germany to about 10.64 billion euros in 2015[5].

The visible trend in cloud computing should break new ground for more transparency, synergies, and cooperation for the purpose of common security measures. Such a paradigm shift could not only speed up the propagation of secure technologies but also enliven the market for IT security and promote cost efficient solutions.

4.1.2 Status quo

The Internet, with its multifaceted innovative opportunities, has revolutionized our modern society, and will continue to cause changes into the future. This includes the dangers of new IT security problems, and with them the risk of damage for both users and providers.

German companies, branded with "German Engineering" or "Security made in Germany", are known for their reliability and are valued for the quality of their products. German providers and users have far greater awareness of IT security and data protection than the American market leaders, like Google, Facebook, Microsoft and Amazon, do. This is apparent time and again in the international, but also political, discussions about the requirements in the areas of data protection and security.

Furthermore, the German Federal Government – be it the Ministry of the Interior, the Ministry of Economics and Technology, or the Federal Office for Information Security – is very active, for example in the form of awareness campaigns, security initiatives, standardization and promotion of exports.

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3   see WIK-Consult GmbH (2012): IIT-Sicherheitsniveau in kleinen und mittleren Unternehmen (Studie), pg. 44

4   see. BMI PG-Invest (2012): Abschlussbericht IT-Investitionsprogramm, pg. 25

5   see VDI/VDE Innovation+Technik GmbH (2008): Marktpotenzial von Sicherheitstechnologien und Sicherheitsdienstleistungen, pg. 11

4.2 SWOT-Analysis

Strengths in the area of IT security in Germany are clearly the availability of particularly secure and trustworthy products and services. Besides this, the quality of higher education in IT and Internet security is well developed in Germany in comparison to other countries. The highly developed research environment at universities and research institutions generates necessary innovations.

Weaknesses in the area of IT security in Germany are, for example, the fact that small and medium-sized businesses have difficulty positioning themselves in the international market. IT security products are not as well marketed in comparison to their American competitors. Added to this, the use of German IT security products, as a result of their high quality and complexity, is sometimes complicated for the average user.

Opportunities in the area of IT security in Germany include gaining a better and more international position especially in the growing IT and security market and building new markets abroad. Moreover, there is a need to update IT security in most companies today, and in some companies there are still no appropriate security solutions implemented.

German companies should try to integrate innovative IT security technologies as "hidden champions" into the products and solutions from US market leaders. Trustworthy cloud services have very good chances to position themselves successfully, not only in Germany, but also worldwide.

Risks in the area of IT security in Germany exist at a range of levels. American market leaders head-hunt very well-educated IT security experts in Germany, but they do not shop for the innovative IT security products and solutions offered by German IT security sellers. The medium-sized IT security companies run the risk of being taken over by foreign corporations.

Perspectives

As a result of the constantly increasing penetration of the Internet into all aspects of life and work, IT security will continue to maintain its high relevance. The cloud can result in a paradigm shift: IT security technology will become invisibly integrated into the cloud. The user gets a secure cloud.

4.3 Technology Trends and Paradigm Shifts

The growing number of attacks on the Internet and the resulting damage show that appropriate protection is not always ensured and many are demanding a paradigm shift in the approach to IT security.

The vulnerabilities of IT and Internet technology are becoming more diverse and considerably larger due to more complex software and more complicated connections between protocols, services and infrastructure. The attacks against the increasingly valuable data in IT systems and its availability are becoming more refined and more wide-spread. Cybercrime is undergoing a growing industrialisation, and is as a result developing greater professionalism and criminal energy.

Vulnerabilities in software, insufficient protection against malware, hardly any international solutions for identification and authentification, unsecured websites, low email security, and also new dangers from mobile devices (smartphone, tablet, etc.) make it easier for criminals to infiltrate IT systems and networks.

Added to this, we are currently experiencing a radical development and change in IT and the Internet, for example through social networks like Facebook and Twitter, cloud computing, and the advancing penetration of critical infrastructures with Internet technologies.

Due to new operating systems, new IT concepts, new attack strategies and new players in the IT market, circumstances and boundary conditions are changing, which requires a prompt reaction. Further challenges result from the cross-border use of technologies and services and the associated changes in legal and political framework conditions. Different legal systems and levels of legal awareness must be taken into account, as in many countries there are no or insufficient possibilities to prosecute cybercriminality.

Added to this are new trends, like "Industry 4.0", "embedded systems" or "smart metering". The Internet is penetrating more and more new industries and areas, such as power grids, and automotive and mechanical engineering. Naturally, this leads to new challenges for IT security, in order to maintain the functionality of our society in the event of Internet attacks.

4.3.1 Paradigm shift – proactive versus reactive IT security solutions

IT security solutions like Anti-Spam, Anti-Malware and Intrusion Detection Systems are reactive. This means that when they detect an anomaly or an attack with a specific signature, they try to protect the IT system as quickly as possible, in order to minimise damage. The increasing variety and complexity of our IT devices, however, demands significantly more reliable, more robust and more effective IT security concepts. The path of development could lead from exclusively reactive IT security systems to modern proactive systems that are able to prevent the execution of intelligent malware (one of the biggest problems currently). Such proactive IT security systems work with a small security core and virtualisation; they can make software measurable, and, with strong isolation, can separate applications with their data, and provide adequate and sustainable security.

For proactive IT security systems to function, however, the software architecture of IT devices needs to be fundamentally differently constructed than it has been until now. In addition to this, security infrastructure components must be transformed in parallel with the software, so that the IT security and trust technology can be used comprehensively within and across organisations. From the perspective of research, the advantages of proactive IT security systems have long been proven and demonstrated. The first IT security companies are already offering mature solutions, which industry and public administration have been hesitant to introduce, although the implementation of these systems can result in an essential higher level of security and trustworthiness for the IT devices.

4.3.2 Paradigm shift – object security versus perimeter security

Perimeter security should, through the assistance of, for example, firewalls and VPNs, prevent the internal company network from being accessed, and company data from being read an manipulated by outsiders. Due to the fact that more and more mobile devices access the Internet via alternative communication paths such as mobile phone networks and hotspots, bypassing the central company firewall, perimeter security is losing its effectiveness and significance.

With object security and information flow control, the objects are assigned rights that define who may use them in which IT environment. The objects are thereby secure throughout their lifecycle.

The prerequisite is that, with the help of proactive IT security systems, policies can be implemented on external IT systems as well. Furthermore, international IT security infrastructures are needed here as well so that, in principle, anyone can exchange objects with anyone, safely and reliably.

4.3.3 Paradigm shift – cooperation versus isolation

Unsecured and poorly integrated technology, along with a widely-seen lack of Internet competence among users, result in, among other things, damage caused by attacks. If a company has fallen prey to an attack, it usually tries to solve the problem alone or with the help of an IT security service provider. Medium-sized companies, in particular, struggle with, and are sometimes overwhelmed by (professional) IT attacks. Here, it is recommendable to share more information over the attacks, the modus operandi of the attacker, the scope of the damage, and the effectiveness of the countermeasures. Also advisable is to contact the Federal Office for Information Security.

Modern IT and the Internet can enrich private and work life. IT security must, however, not be ignored – it has a central cross-sectional function. The paradigm shift described here offers the possibility to reduce IT security risks decisively.

5. Trends and Hypotheses Regarding the Internet Industry

In the following part, we will outline the most important trends in the Internet industry as we see them. We have not included cloud computing, as it is no longer a trend, but has rather become an integral part of the IT landscape. It is a strong driver with an enormous potential for growth.

5.1 Mobile

Hypothesis: „Mobile is increasingly driving the Internet"

The innovation thrust that was activated by mobile Internet in the previous years will continue to define the development of the industry in the future as well. The first development cycles of terminal equipment and operating systems were still primarily geared towards the needs of the end consumer market, which may also explain the "Bring Your own Device" (BYOD) trend, but now the tracks are being laid for professional use scenarios. This change opens the doors to more supply and to a more intensive use of mobile Internet solutions across industries, but needs target-oriented and sustainable change-management.

The slogan "Mobile First" is spreading across the Internet industry and will cause a more significant change than ever before, for example, in the automotive, logistics, payment, health and service industries. In the payment sector, NFC as an alternative payment method still has a difficult course to follow due to the lack of consumer acceptance. It should be easier for systems like Square, iZettle and payleven, which lower the cost for points of

sale while at the same time increasing their number, and enable a new shopping and consultation experience in retail stores, in the service sector and for the private exchange of money. As far as logistics are concerned, there are still better and more precise tracking systems related to RFID and IPv6 in the starting blocks; Not only to make sustainable changes in the industry and the B2B sector, but also to optimize real time information and delivery results.

"Made in Germany" is recognized worldwide as standing for quality, security and reliability. It is in precisely this area that the German Internet industry can claim a locational advantage. From the smartphone to the mobile data network and cloud computing, to APIs and HTML5, the interaction of an abundance of key technologies is responsible for the success of mobile Internet. Germany can play a leading role, especially in the cloud computing sector. The strong data privacy legal framework conditions in Germany, which currently work against the German Internet industry in the cost-oriented end-consumer sector, could work as the decisive location advantage for business solutions. In order to make use of this advantage, local companies must manage to adapt to the low-threshold integration capability of consumer applications and to transfer them to the business client segment.

A prerequisite for all mobile developments is a massive expansion of mobile broadband supply. A prerequisite for this, in turn, is extensive investment in stable and modern fixed-network supply. The goal of the "ubiquitous Internet" remains one of the most important tasks of our economy. Many applications and user scenarios which are currently in the starting blocks are not coming onto the market, as network availablility does not have sufficient coverage, and the Internet is still "not quite here".

Excellent network coverage on the outskirts and in rural areas is also a prerequisite for modern work models, allowing the work-life balance to be individually cont-

rolled. Companies hope to be more attractive as employers, hope for more satisfied employees and also hope to ease the reintegration of employees after parental leave. Many businesses are pushing forward in this regard and are gaining useful experience. Still, both employers and employees will have to deal with the problems brought forth by removing the border between life and work.

Next to the technical and societal hurdles, there are the regulatory hurdles such as the issue of duty of care that affects a broad availability of mobile access points in public spaces, hurdles that will have to be overcome. The lack of skilled workers within the Internet industry continues to be negatively apparent. The education and continuing education market is still not able to adjust the teaching material fast enough to match the pace of economic and technical development. At the same time the Internet industry itself is required to invest in the education of its employees and to train skilled workers for its own market.

5.2 Content

Hypothesis: "Content continues to be a can of worms"

The consumption of media content and information is seamlessly shifting to the Internet and will put the traditional distribution paths of the classic media industry under even more pressure. This growing pressure for change, evident in debates regarding, for instance, ancillary copyright, Internet neutrality, and copyright law, will continue to spark discussions about the Internet.

The influence of the Internet on all areas of life will awaken even stronger interest in regulation in the future. There is a danger of transferring the inherited media regulations to innovative business models functioning within international competition. For the Internet industry, overregulation not only has the effect of limiting innovation and being internationally isolating, it also damages the reputation of Germany as a good location.

In the medium term, the branch in Germany can only gain in strength and become less dependent on other countries if the state and federal governments participate more strongly in global discussion about the Internet, create structures for Internet policy within or parallel to the parliament, and foster specialist politicians with an orientation towards Internet policy.

Several nations, including some within the European Union, have, for social and economic reasons, written net neutrality into law. In this way, they ensure the maintenance of an open Internet as the basis for a provider-neutral marketplace, while working against attempts to monopolise. Through this they provide investment security for the local Internet industry and ensure their flexibility and capacity to innovate. Added to this, as an incidental effect, they improve the situation of the freedom of opinion and also freedom of the press, as well as the diversity of the media. Through the curtailing of net neutrality in Germany and in the EU, a local technological vacuum is created, in which there is no longer an incentive to generate innovations ripe for the world market.

In the field of video, offers like Netflix, AppleTV and maxdome have been proving for years that reliability, convenience and performance in the provision and distribution of media content can, and must, be ensured on the provider side. The legal situation – both nationally and internationally – requires clarity and needs to be simplified in order to establish a more dynamic market.

The German print publishers have been unable to develop a more sustainable economic model. Instead, they want the enforcement of ancillary copyright laws that will be limiting even for their own innovative capacity. Such aspirations have – rightly – not been implemented in any other nation. The development funds of 60 million euros, agreed between Google and France for the online activities of French publishers, will possibly give these a

decisive advantage over German publishers in the medium term. The French publishers are investing in their future capacities, while the German publishers want to maintain the status quo through ancillary copyright law.

A cross-sectional trend in the area of content, crowd mechanisms are becoming more established than ever before. Successful examples from recent years demonstrate that in particular economic project ideas can prosper with the help of co-creation, crowd-funding and curated crowd-sourcing.

The use of second screens (smartphones and tablets) parallel to the running television program will increase. The television broadcasters are themselves stimulating this trend through the integration of viewers via Twitter, Facebook, chats and program-related blogs, as well as through the insertion of QR codes with links to further information.

5.3 M2M

Smart grid, connected car, home automation and the Internet of Things. These terms appear in the media almost daily and a great future has been foretold for them. They stand for one of the greatest trends and an important area of economic growth in the next few years – machine to machine communication, M2M for short. The market researchers from Harbour Research forecast a worldwide total market volume of 353 billion dollars by 2014 with growth rates above 20 percent. Figure 13 illustrates the different players in the Internet industry that form a part of the value chain.

The term M2M stands for the interconnection of fixed or movable objects with each other or with a central control center. The transfer of information takes place automatically via fixed cables or mobile connections. The usage scenarios and fields of application are numerous and affect nearly all areas of daily life and work. M2M

FIG. 13   **M2M Value Chain**
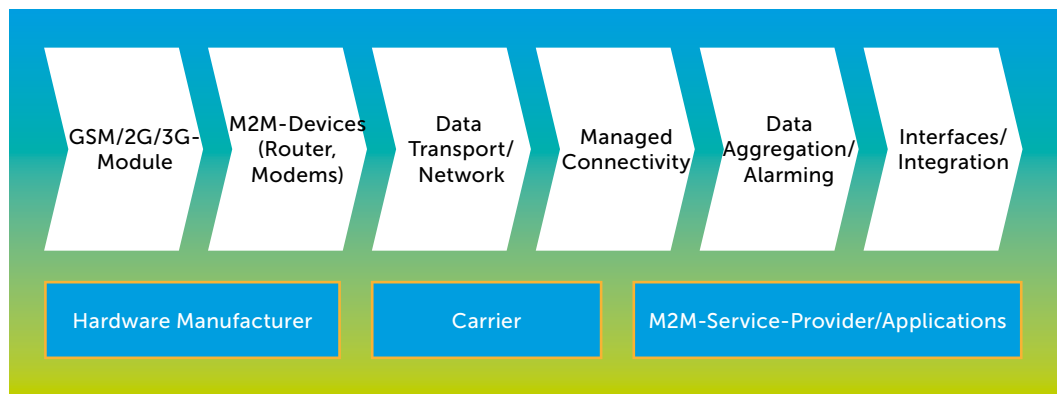
Source: Eisel, M.: Machine-Talk: Potenzialträger M2M, in: Wirtschaftsinformatik und Management, 01.2012, p. 34

solutions can be used, for instance, in the following segments: Power supply, telematics, transport and logistics, commerce, health, machine and plant construction, the public sector and the automotive sector.

The versatile fields of application will be explained in more detail below, with the help of some examples.

Hypothesis: "Internet technologies and standardization in plant and machine construction will strengthen the future capacities of German industry."

A traditionally very strong segment of German industry is machine and plant construction. Here, the optimization of service, and maintenance and support processes are in the foreground. While it has already long been possible to control and manipulate certain parameters of fixed, installed plants, there have often been problems with decentralized or mobile units. These problems could be overcome with the use of mobile Internet technologies. Being able to control and permanently transfer the most important function and system parameters of industrial machines will make it possible to identify problems early

and, if need be, initiate automated processes for error removal. Moreover, maintenance intervals can be planned more easily. The manufacturer will be able to collect more exact information on frequency and intensity of use and to use this information for a continuous product improvement and new product development. Furthermore, based on this data, innovative service offers based on Service Level Agreements (SLAs) can be conceived. Joining together several decentralized units into self regulating clusters will be within the realm of possibility or feasible at much lower cost.

In the power supply industry such clusters, in which energy producers, storage, and power consumers are networked with each other, are designated smart grids. Using "intelligent measuring devices" (smart meters) usage values can be read in real time and transferred over the Internet to the provider, who can use the data to optimize power production and absorb unpredictable peak loads or avoid them altogether. This is extremely important, for example, for the integration of generally de-centralised alternative energy generators, such as off-shore wind generators. Against the backdrop of the planned withdrawal from atomic energy, there is an

increased need, especially in Germany, for such solutions. Given the fact that Germany is going its own way in regards to energy policy, the experience gained using this technology could give the participating companies an enduring competitive edge, at least in comparison to the rest of Europe.

Hypothesis: "Internet in the car to enable non-security features will push standardization and network expansion."

In the future, M2M applications will increasingly gain more importance in the automotive sector. Here, we certainly do not mean the wireless exchange of information and data between the mobile phone and the car's infotainment systems, which has almost become a standard feature in today's cars. The European Commission's guideline that all new cars are required to feature the automated emergency call system eCall, should further accellerate the trend of permanently connecting the car to the Internet. It also opens the above-mentioned opportunities for remote diagnosis and maintenance. What is much more important, though, would be the applications in regards to traffic safety and route planning which will arise from the interconnection of cars, the so called Car2Car communication.

The spread of M2M solutions means new challenges for carriers and providers. The requirements profile for the industrial application of the technology differs drastically from that of the consumer sector. First and foremost it is imperative to be able to offer highly available connections with a fixed bandwidth and low latency periods which are guaranteed by binding SLAs.

Apart from that, a fundamental success factor is widespread Internet availability, regardless of the transmission path. Should the necessary capacity be lacking, appropriate partnerships must be formed and appropriate payment models found for the special

requirements. Especially in the mobile sector, high roaming charges, which have been standard for the usage of other networks, should be minimized and alternatives should be found for the volume-based individual SIM-card pricing, and moving in the direction of developing a needs-oriented cluster-based approach.

What is of vital importance for a continued penetration and spread of M2M solutions is the new development and harmonization of standards worldwide. Targeted support of R&D projects in this area could result in opportunities for German companies to set standards and gain a competitive edge. The participation of Germany in international standardization committees should also be, within the bounds of possibility, promoted and pushed forward.

5.4 Security

**Hypothesis: IT–security is becoming a critical compo-
nent of business**

There has been an increase in the awareness of IT security
issues, not only through numerous initiatives, but also
through incidents. Despite this, IT security aspects that go
beyond basic protection still play a subordinate role. In
particular, small and medium-sized companies and private
users have a great need to bring themselves up to date.
Measures are necessary, in the first place, to sensitise this
target group, in oder to facilitate the development of a
security culture, and to bring providers and consumers
together.

At the same time, the risks for IT infrastructure, along
with the business models based on it, are rising. One cause
of this is undoubtedly the growing number of vulnerabili-
ties and the ever-increasing complexity and interconnec-
tedness of IT products and IT systems. Their utilization is
no longer limited to classic client and server solutions.
Rather, we are observing an expansion – firstly, in the area
of mobile devices, and secondly, through applications of
all kinds – and as a result a much higher level of vulnera-
bility. Together with the dependency of IT supported
business processes on reliable Information Technology, IT
security has become a more critical business component
than ever before.

The protection of goodwill through the safe-guarding of
integrity, authenticity and availability is becoming
increasingly important. Cybercriminals adapt to the
changing conditions in the market significantly faster the
defenders do. While reactive mechanisms are readily
available, there remain deficits in the area of preventative
measures.

As a result of the changing landscape of attacks, there is a
growing need for a paradigm shift in IT security. Reactive
concepts, which merely cushion the effects of an attack,
need to be supplemented by proactive security measures.
As a consequence of changing user-behaviour, protection
at the perimeter is no longer sufficient.

Instead, IT security must become a fundamental aspect in
the design stage of an application, rather than bandaged
on in the post-development phase. Identity and authenti-
fication management should become an integral compo-
nent of all applications. The development of new concepts
for this is also necessary.

5.5 Big Data

Hypothesis: „Big Data Is Big Money"

Never before in human history has so much data been
produced and stored as today. As a result of continuing
rapid growth of the Internet and the progressing digitali-
zation of business processes, businesses accrue enormous
amounts of data internally and externally. IDC market
researchers estimate that this amount will double annually
until 2020, although only a fraction is gainfully evaluated.
It is not surprising that the issue "Big Data" and its more
intensive usage has come into the focus of companies.

What drives this development is firstly the almost
ubiquitous availability of the Internet and the growing
mobile use. In particular, due to the now self evident use
of social media platforms and user generated content,
data is amassing. Added to this, businesses are creating
new sources of data by using more M2M solutions and
cloud computing.

The resulting data mass is growing so fast that even
specially designed Business Intelligence Systems are not
able to process it. "Big Data" does not only stand for pure
data mass; in many cases it exists in an unstructured
format.

FIG. 14

Data Sources for Big Data
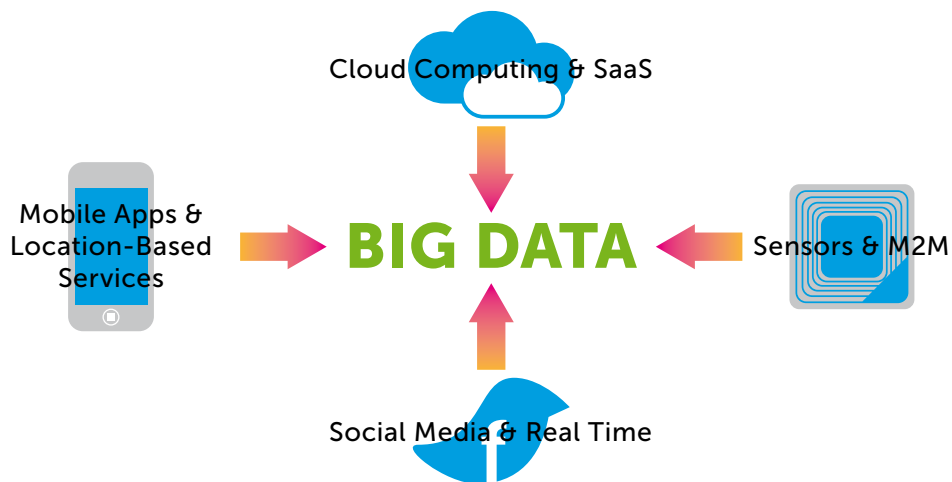
Source: Datenexplosion in der Unternehmens-IT, Expert Group (2012), p. 5

Although a recognized definition of the term "big data" has not yet crystallized, common usage of the term covers three characteristics:

- Velocity: Speed of data accumulation
- Volume: Amount of data
- Variety: Extreme data diversity due to increase of different data sources

When all three characteristics can be applied at the same time, the result is "big data". In order to master the technical challenges that are presented by each of the characteristics, there are, of course, applicable solutions. However, "big data" demands an integrated solution for all three problem fields. The goal is to consolidate, link, and evaluate differing, polystructured data sources, if possible in real-time, against the backdrop of improving and optimizing business processes or creating economic value in general.

The application possibilities are numerous and concern almost all segments and business processes, a few examples being, for instance, financial services (fraud protection), commerce (shopper behavior analysis and customer satisfaction through web monitoring) and logistics (route planning, optimization in the supply chain management area).

Although the obvious beneficiaries of the "big data" trend are storage providers and the makers of the corresponding software solutions, carriers and providers who have to transport the respective amounts of data also need to be counted. Another growth impulse will surely come from cloud computing, with its increasing demand for storage and resource-intensive applications.

In Germany especially, though, the comparably restrictive data confidentiality law must be respected when using "big data", as combining and re-evaluating data arbitrarily is not permitted. The issue here is that lawmakers will have to provide clear guidelines and to react to the changed demands in order to make the great chances arising from "big data" usable for German companies

6. Conclusion and Outlook

The economic future is on the Internet. These are the closing words of the last study by eco and Arthur D. Little, conducted four years ago. This has proven true, as the digitalization of society is advancing unchecked and the innovative strength of the Internet industry will open up new paths of development.

This was reason enough for eco and Arthur D. Little to analyse the branch anew. This study, "The German Internet Industry 2012 – 2016: Figures, Trends and Hypotheses" is based on a base case and a comprehensive trend analysis. It forecasts continuous growth in all market segments: In 2012 the German Internet industry had revenues of 56.5 billion euros. By 2016 the revenues will grow to an estimated 87.4 billion euros. The Internet industry therefore remains one of the most dynamic industries in Germany and is generating a quarter of the national economic growth. Through this, the employment level is also developing positively, with the number of employees in the branch growing on average 6.6 percent per year to almost 290,000 in the year 2016. At the same time, the productivity of the Internet industry will rise significantly from a per-capita GDP of just under 244,000 euros in 2011.

Expansion of broadband will have an especially strong influence on the future of the Internet industry. Its progress determines the availability of many services and shapes the individual industry sectors. Five trends will aid the positive development of the Internet industry:

Mobile: Increasing mobile broadband supply and stronger penetration of the market by Internet-capable mobile devices are an attractive basis for enhancements and new developments in mobile Internet solutions.

Content: The consumption of media content and information will be seamlessly transferred to the Internet, facilitating new distribution channels and new business models.
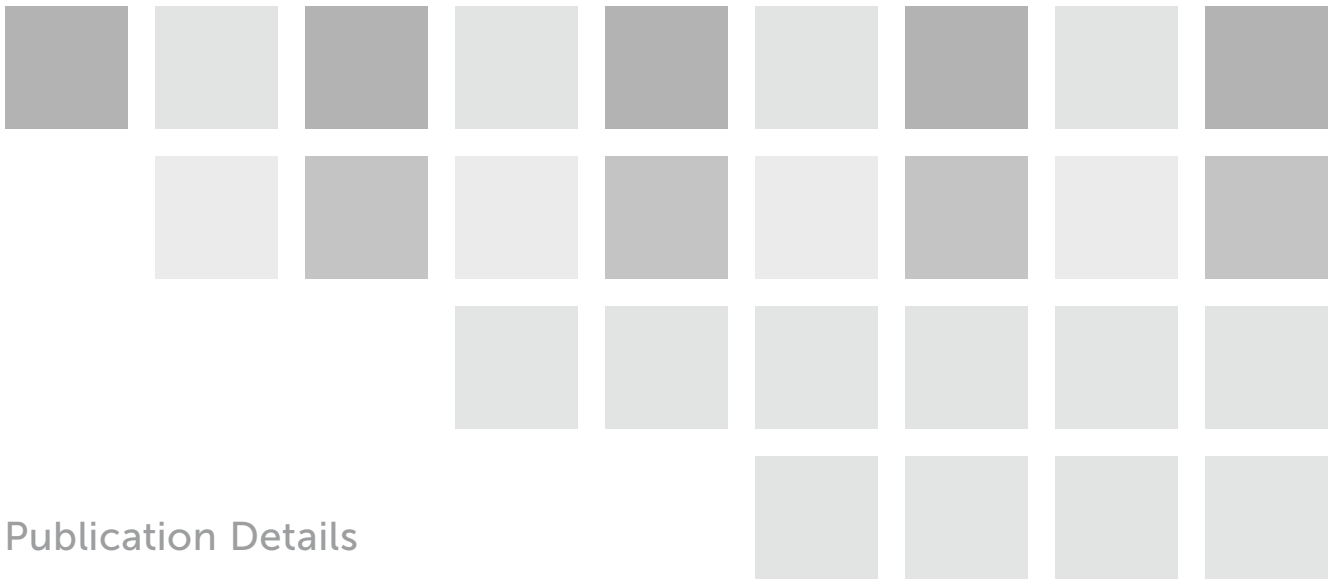
M2M: A continuously growing proportion of online communication will occur machine to machine. The fields of application touch almost all areas of daily life and work.

Security: More and more business processes are supported by IT or have been moved to the cloud. Thus, IT security is becoming a more critical business component than ever before.

Big Data: Through the omnipresence of the Internet, larger and larger data-masses are accumulating. These can be gainfully employed for the optimization of company processes or for new business models.

The sustained boom is perceptible in all areas of the Internet industry: In 2016, the strongest revenues of the industry, at 41.2 billion euros, will be generated in the sector Aggregation and Transactions. Above all, growth here will be provided by e-commerce and billing and payments. Services and applications like hosting, domain administration and cloud computing will grow significantly more strongly than the overall market. The average annual growth rate is estimated at an impressive 32.7 percent, with a volume of 9.6 billion euros by 2016. Paid content will also evolve into a strong growth sector and will grow to 9.1 billion euros by 2016. Here, streaming and digital video will experience the greatest boost. The expansion and operation of the technical infrastructure is already well advanced in Germany, resulting in its lower annual growth rate of 7.4 percent and an expected volume of 26.9 billion euros.

The second study by eco and Arthur D. Little demonstrates that the Internet will, also in the coming years, be one of the most important economic motors, and not only for its own branch. It will be a growth driver for the entire German economy.

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Publication Details

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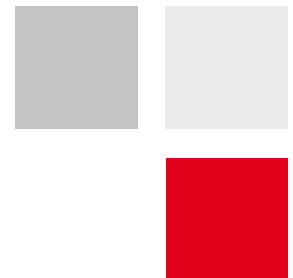Peter-Julian Koller
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