



making business sense

THE CLOUD DIVIDEND: Part Two

**The economic benefits of cloud computing to
business and the wider EMEA economy**

**Comparative analysis of the impact on
aggregated industry sectors**

Report for EMC²

February 2011

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Authorship and acknowledgements

This report has been produced by the Cebr, an independent economics and business research consultancy established in 1993, providing forecasts and advice to City institutions, government departments, local authorities and numerous blue chip companies throughout Europe. The study was led by Oliver Hogan, Cebr Managing Economist, with modelling and analytical support provided by Shehan Mohamed, Cebr Economist.

This study was commissioned by EMC and has utilised a combination of data that are available in the public domain and of proprietary data provided by EMC, based on the its own research and on its joint research with business and research partners. However, the report does not necessarily reflect the views of EMC.

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Executive summary

This is a summary of Part Two of Cebr's report, The Cloud Dividend. The research involved an independent study to quantify the economic benefits of cloud computing to business and to Europe's five largest economies' (in alphabetical order, France, Germany, Italy, Spain and the UK). The study was undertaken on behalf of EMC, a global commercial technology company, providing systems, software and services to business clients.

Part One of Cebr's report found that, across the five economies as a whole, widespread adoption of cloud computing has the potential to generate over **€763 billion of cumulative economic benefits over the period 2010 to 2015**. The shares of these aggregate cumulative benefits that are attributable to each of the industry sectors are the subject of this report, and are shown in Table 1 below for the EMEA area as a whole and for each of the EMEA economies.

Table 1

EMEA: Cumulative Economic Benefits 2010-2015							
Industry sector	France	Germany	Italy	Spain	UK	EMEA	Jobs
	€ mil	€ mil	€ mil	€ mil	€ mil	€ mil	('000s)
Banking, financial & business services	43,949	58,503	32,073	18,836	30,204	183,566	207
Government, education & health	25,783	31,838	20,759	14,704	19,455	112,539	801
Distribution, retail & hotels	45,901	55,540	51,688	40,125	40,162	233,418	355
Manufacturing	16,013	39,305	19,735	12,093	11,358	98,504	514
Other sectors ¹	31,103	36,052	26,515	24,792	16,810	135,271	519
Total Economic Benefit	162,749	221,239	150,770	110,550	117,989	763,297	2,396
Direct and Indirect employment ('000s)	469	789	456	392	289	2,396	

¹ Other sectors include agriculture, forestry & fishing, energy & utilities, construction, transport, communications & storage, and all other activities

Source: Cebr analysis

As the table shows, the greatest share of the EMEA-wide benefits of cloud computing are expected to flow through the distribution, retail & hotels sector. This is also the case at the national level, except in Germany, where the largest share of the benefits is expected to flow through the banking, financial & business services sector. At the EMEA-wide level, the banking, financial & business services sector ranks second in terms of aggregate cumulative benefits. The government, education & health sector and the manufacturing sector are also important contributors. The remainder is accounted for by the aggregate contributions across the other relatively less important sectors of the EMEA economy.

In what follows, we summarise the drivers of the results for each of the four largest sectors and for the catch-all other sectors.

Banking, financial & business services

Following the economic crisis, bankers are constructing a new business model and it is clear that capital balances will need to be much higher to pay for this without greatly adding to overall cost. This implies the need for comprehensive assessments of where cost savings can be achieved to fund this new business model. Cloud computing, with its focus on avoiding capital expenditures, provides

at least one such opportunity for banking, financial and business services firms to reduce overall costs.

The predicted €183 billion of EMEA-wide cloud computing benefits for this sector constitute a 24% share of the total EMEA benefits. This is broadly equivalent to, but slightly less than, the contribution of the sector to EMEA-wide GDP. The drivers of these predicted benefits include the macroeconomic basis, including its size and importance in the broader macroeconomy and its future growth prospects, the projected rates of cloud adoption and by the sector-level drivers of the constituent economic benefits of cloud computing.

Table 2

Finance & Business Services							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	7,809	10,240	5,362	2,921	9,526	8,129	35,858
Business creation	17,696	22,647	12,882	7,403	6,831	5,829	67,458
Net total cost savings of which:	1,688	4,151	1,571	1,279	1,716	1,464	10,405
-IT CapEx savings	4,262	4,902	2,840	1,390	4,777	4,076	18,171
-IT OpEx savings	2,795	3,411	1,861	965	3,166	2,702	12,198
-IT OpEx savings (power and cooling)	2,303	2,809	1,533	795	2,241	1,912	9,681
-Additional cloud expenditure (PAYG)	-7,671	-6,971	-4,664	-1,871	-8,468	-7,225	-29,645
Indirect GVA	16,756	21,465	12,259	7,234	12,131	10,351	69,844
Total Economic Benefit	43,949	58,503	32,073	18,836	30,204	25,773	183,566
Direct and indirect employment (000s)	37.17	55.85	29.98	29.00	54.72		206.73

Source: Cebr analysis

The key macroeconomic drivers of the benefits predicted to flow through this sector are:

- the fact that the sector is the largest contributor to GDP in all five EMEA economies;
- a future outlook for the banking industry that has turned positive but remains subdued due to the continued risk of sovereign debt crises, uncertainty over regulatory measures and concerns about the competitiveness of the EMEA economies as global financial centres;
- a positive future outlook for business services, where the recovery of private investment and net exports and the likelihood that IT service providers in particular stand to gain disproportionately, effects which are counter-balanced by fiscal consolidation, weak property markets and low levels of corporate transactions.

The sector is widely believed to be one of the most aggressive adopters of cloud computing over the next five years, reaching anywhere between 60% and 80% of all businesses within the sector. These predicted high levels of future adoption are important drivers of the magnitudes of the benefits presented above. A key driver of adoption in this sector is the move towards joint accountability and responsibility for Europe's financial stability. Such an integrated European financial stability framework will be built on integrated crisis management and resolution and integrated supervision.

A crucial element will be cross-border information sharing, not only by European and national supervisory bodies but also by the banks themselves. Cloud computing solutions present themselves as a sensible solution where there are heavy data-sharing requirements.

The key drivers of the constituent benefits include:

- *Business development*: these are driven by mid to high levels of achievable output and productivity enhancements through better management of seasonal demand peaks, faster time-to-market and IT scalability;
- *Business creation*: these are driven by the efficiency of SMEs, which varies widely across the EMEA economies. This is reflected, in particular, in the significantly higher business creation benefits predicted for the French and German banking, financial & business services sector;
- *Net total cost savings*: these are relatively modest because, while the sector has a high IT-intensity, the CapEx share (where some of the biggest savings from cloud are available, tends to be relatively small. This is also driven by low levels of hybrid and public cloud adoption where, again, some of the biggest cost savings are available;
- *Multiplier impacts*: these are driven largely by the business creation benefits. While the UK, for example, was the poorest performer on the business creation front, the relatively low household savings rate assumed for the UK (5.3%, as opposed to an average of about 15% on the continent) appears to go some way to making up for poor business creation performance.

Government, health & education

Government spending is being slashed in Europe and throughout the world in order to deal with current budget deficits. Governments are likely to struggle to deliver the same levels of service with lower expenditure levels, so they will need to find ways of achieving cost savings in ways that minimise the potential for deteriorating service levels. IT spending and cloud computing in particular, provides at least one such opportunity for Governments to reduce overall costs.

The predicted €112 billion of EMEA-wide cloud computing benefits for this sector constitute a 15% share of the total EMEA benefits. This is broadly equivalent to, but again slightly less than, the contribution of the sector to EMEA-wide GDP. The key drivers of these predictions are outlined as follows.

The key macroeconomic drivers of the benefits predicted to flow through this sector are:

- the fact that the sector is the second largest contributor to GDP in all five EMEA economies;
- a future outlook for the sector that remains subdued due to fiscal consolidation measures and even negative in some countries facing the largest budget deficits, namely Spain and the UK.

This is another sector in which it is widely believed will see the most aggressive adoption of cloud computing. However, the range of adoption rates by governments is wider than in the banking, financial & business services sector at 40% to 80% of all businesses and agencies within the sector. Much like the banking sector, a key driver of cloud adoption by the government sector could be the challenge of tougher EU-level fiscal surveillance and sovereign debt crisis management, the sharing of fiscal burdens and, thus, the sharing of responsibility for fiscal policy. Again, one can easily imagine that a crucial element will be cross-border information sharing, not only by national

Governments with the EU, but also amongst national Governments. Cloud computing solutions seem like a sensible solution where there are heavy data-sharing requirements.

The constituent benefits of the predicted cloud computing benefits for this sector are shown in Table 3 below.

Table 3

Government, Education & Health							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	2,255	2,613	2,463	1,609	3,379	2,883	12,319
Business creation	10,699	13,394	7,562	5,531	4,591	3,917	41,776
Net total cost savings of which:	2,754	3,191	2,565	1,615	4,418	3,770	14,544
-IT CapEx savings	2,873	3,329	3,405	2,232	5,129	4,377	16,968
-IT OpEx savings	1,481	1,716	1,711	1,118	2,527	2,156	8,553
-IT OpEx savings (power and cooling)	1,166	1,352	1,347	881	2,264	1,932	7,011
-Additional cloud expenditure (PAYG)	-2,766	-3,206	-3,897	-2,616	-5,502	-4,695	-17,988
Indirect GVA	10,075	12,640	8,168	5,949	7,067	6,031	43,900
Total Economic Benefit	25,783	31,838	20,759	14,704	19,455	16,601	112,539
Direct and indirect employment (000s)	173.98	269.86	143.01	124.10	90.47		801.43

Source: Cebr analysis

The key drivers of these constituent benefits are outlined below. Because the business creation impacts were based on assumptions that could only be generated at the national level, we have refrained from mentioning them again here and in the analysis of the other sectors below. This applies equally to the multiplier impacts, which are driven mainly by these business creation impacts, but also by the national-level household savings rate assumptions. The key drivers of the other constituent benefits include:

- *Business development*: these are modest by comparison with the banking sector, driven by only low- to mid-level opportunities to increase output and productivity through better management of seasonal demand peaks, faster time-to-market and IT scalability;
- *Net total cost savings*: these are more substantial than in banking, financial & business services. While the sector has a mid-level IT-intensity and a mid-level CapEx share, high levels of hybrid and public cloud adoption, where bigger cost savings are available, are predicted for the government sectors.

Distribution, retail & hotels

For the distribution, retail and hotels sector, the consumer spending boom which has fuelled Europe's growth in the last 20 years has now been suppressed. Future profitability will depend on efficiency rather than volume growth. Cloud computing, as in the other sectors above, provides at least one such opportunity for businesses in this sector to reduce overall costs.

The predicted €233 billion of EMEA-wide cloud computing benefits for this sector constitutes a staggering 31% share of the total EMEA benefits. This is the largest sector-level share of the cloud computing benefits and means that, from this sector is expected to flow a disproportionately large share of the benefits relative to the importance of the sector to the national economies, the maximum for which is about 17% in Spain.

The key macroeconomic drivers of the benefits predicted to flow through this sector are:

- the fact that the sector is either the third or fourth largest contributor to GDP in the five EMEA economies;
- a future outlook for the sector that remains subdued but that is slightly more optimistic than for the sectors in the preceding analysis.

This is another sector where cloud adoption is expected to be strong, with the range of future adoption predicted to reach anywhere between 50% and 75% of all businesses in the sector depending on the country.

Table 4

Distribution, Retail & Hotels							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	8,495	10,013	10,175	7,816	11,653	9,943	48,151
Business creation	7,328	9,333	7,322	5,708	2,399	2,047	32,091
Net total cost savings of which:	16,830	19,840	19,594	14,909	14,181	12,101	85,354
-IT CapEx savings	14,298	16,855	16,999	14,374	20,584	17,565	83,112
-IT OpEx savings	5,974	7,042	7,281	5,773	8,273	7,059	34,344
-IT OpEx savings (power and cooling)	5,365	6,325	6,539	5,186	4,355	3,716	27,770
-Additional cloud expenditure (PAYG)	-8,808	-10,383	-11,225	-10,425	-19,031	-16,239	-59,872
Indirect GVA	13,249	16,355	14,597	11,693	11,929	10,179	67,822
Total Economic Benefit	45,901	55,540	51,688	40,126	40,162	34,270	233,418
Direct and indirect employment (000s)	65.27	118.44	63.97	68.14	38.97		354.79

Source: Cebr analysis

The key drivers of these constituent benefits are outlined below:

- *Business development*: these are substantial and analogous to the results for the banking, financial & business services sector. While businesses in this sector were found to have only low-level potential to expand output by better managing seasonal peaks, SMEs in this sector stand to achieve relatively high productivity benefits from faster time-to-market and IT scalability etc. and other business development opportunities. Large firms could also see productivity benefits, albeit at lower levels;
- *Net total cost savings*: this sector has a relatively high level of total IT spend and a high IT CapEx to total IT budget ratio. As such, it shows the highest total net cost savings from cloud computing than any other sector, which is also driven by current and expected high rates of hybrid cloud adoption.

Manufacturing

The challenge for the manufacturing sectors of the EMEA economies will be to compete with global competition from the emerging economies. While some of this will happen through exchange rate fluctuations and differences in inflation, the EMEA economies will still have to work hard to counteract Europe's high wages. Cloud computing provides at least one such opportunity for businesses in this sector to reduce overall costs and close at least some of the wage gap between Europe's manufacturers and those of the emerging economies.

The predicted €98 billion of EMEA-wide cloud computing benefits for this sector constitutes a 13% share of the total EMEA benefits. Manufacturing is also either the third or fourth largest sector in the five EMEA economies, so the cloud computing benefits flowing through this sector pale in comparison to distribution, retail & hotels. The 13% share compares well, however, with the importance of the sector to the national economies.

The key macroeconomic drivers of the benefits predicted to flow through this sector are the weak outlook for the sector, especially in Italy and Spain, where internal competitiveness remains a significant issue. The outlook for the other countries is relatively positive but all depends on an export-led recovery.

The baseline cloud adoption rates predicted for this sector are broadly similar across countries, sitting within a narrow high range of between 65% and 75% of businesses within the sector. Adoption is predicted to be dominated by hybrid and public cloud models.

The key drivers of the constituent benefits shown in Table 5 below are:

- *Business development*: manufacturing businesses were found to have the possibility to achieve relatively high increases in total output through the better seasonal demand management provided by cloud computing. Mid-level productivity gains for SMEs were found to be possible from faster time-to-market, IT scalability and other business development opportunities;
- *Net total cost savings*: businesses in the manufacturing sector have relatively mid-sized IT budgets and low IT CapEx to total IT budget ratios. The sector shows modest total net cost savings as a result. This is despite the shift away from private cloud to high levels of hybrid and public cloud adoption by 2015.

Table 5

Manufacturing							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	€M	€M
Business development opportunities	3,171	6,672	3,821	2,510	2,923	2,494	19,098
Business creation	4,899	12,222	6,353	3,505	2,200	1,877	29,178
Net total cost savings of which:	1,982	6,792	2,135	1,689	2,742	2,339	15,340
-IT CapEx savings	3,362	7,200	4,341	2,542	2,954	2,521	20,398
-IT OpEx savings	1,830	4,099	2,392	1,373	1,651	1,409	11,346
-IT OpEx savings (power and cooling)	1,290	2,888	1,686	968	1,074	916	7,906
-Additional cloud expenditure (PAYG)	-4,500	-7,394	-6,285	-3,194	-2,938	-2,507	-24,311
Indirect GVA	5,961	13,619	7,426	4,389	3,494	2,982	34,889
Total Economic Benefit	16,013	39,305	19,735	12,093	11,358	9,692	98,504
Direct and indirect employment (000s)	92.35	187.64	118.64	76.12	39.53		513.81

Source: Cebr analysis

Other sectors

The predicted €135 billion of EMEA-wide cloud computing benefits for the combination of the other sectors constitutes an 18% share of the total EMEA benefits. At the national level, this contribution ranges from between 14% in the UK to as high as 22% in Spain. A disproportionately smaller share of the benefits is expected to flow through these sectors than their combined importance to the EMEA economy would suggest. This ranges from about 18% to 28% of EMEA-wide GDP.

Of the others sectors, cloud adoption is expected to be highest (at around 60% to 65%) in the energy & utilities sector and the transport, storage & communications sector. However, the benefits that flow from this are countered by low adoption in the agriculture, forestry & fishing and the construction sectors.

The key drivers of the constituent benefits shown in Table 6 below are:

- *Business development*: we found that businesses in these sectors can only hope to achieve mid-level increases in output due to better unexpected peak demand management and mid-level productivity gains due to faster time-to-market, IT scalability etc. As such, the business development benefits flowing through these sectors are modest relative to the other constituent benefits;
- *Net total cost savings*: businesses in these other sectors have relatively low IT budgets, except perhaps transport, storage & communications, and only mid-level IT CapEx to total IT budget ratios. These factors, combined with the size and importance of these sectors and the projected lower levels of cloud adoption produce relatively modest (yet not insignificant) total cost savings.

Table 6

Total other sectors							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	2,870	3,103	2,173	2,010	2,075	1,770	12,231
Business creation	10,754	11,912	9,186	8,792	4,005	3,418	44,650
Net total cost savings of which:	3,069	3,766	2,598	2,517	3,149	2,687	15,098
<i>-IT CapEx savings</i>	3,859	4,091	2,876	2,475	2,732	2,331	16,033
<i>-IT OpEx savings</i>	1,738	1,870	1,288	1,166	1,326	1,131	7,388
<i>-IT OpEx savings (power and cooling)</i>	983	971	715	680	632	540	3,980
<i>-Additional cloud expenditure (PAYG)</i>	-3,510	-3,166	-2,281	-1,804	-1,542	-1,316	-12,304
Indirect GVA	14,410	17,272	12,557	11,472	7,581	6,469	63,292
Total Economic Benefit	31,103	36,052	26,515	24,792	16,810	14,343	135,271
Direct and indirect employment (000s)	100.68	157.59	100.73	95.12		65.31	519.42

Source: Cebr analysis

1 Introduction and background

Centre for Economics and Business Research Ltd (Cebr) was appointed by EMC to undertake a study to quantify the economic benefits of cloud computing. What follows is the report on Part Two of the independent analysis conducted by Cebr, which focused on the results of our quantification exercise at the industry sector level.

This is the first ever study of the economic impact of cloud computing in the EMEA area.¹ This second report complements the Part One report by providing an indication of the sectors in which EMEA economies could concentrate, through cloud computing, some of their efforts to revive and emerge from the economic crisis.

1.1 Purpose of this report and of the wider study

The purpose of the study, as outlined in “The Cloud Dividend: Part One” report, was to robustly quantify the potential value of cloud computing to the businesses that adopt it and how the aggregate contribution of cloud computing to the wider economy can be expected to increase (on an annual and cumulative basis) over the next five years as rates of adoption increase as anticipated. The Part One report presented the results of this analysis at the national level for each of the five EMEA economies (France, Germany, Italy, Spain and the United Kingdom) and at the aggregate EMEA level.

The purpose of Part Two of the report is to present the results at the individual industry sector level. Quantifying the national-level macroeconomic impacts of cloud computing was based on modelling the economic benefits of cloud computing for each of nine aggregated industry sectors into which we divided the entire range of economic activities that constitute the EMEA economies. This report provides the sector-level disaggregation of the results presented in Part One of the report.

The basis for the sector-level quantifications is the same suite of national-level spreadsheet models on which the Part One report was based. Each of these models was designed to aggregate the national-level impacts of cloud computing from the impacts calculated for each of the industry sectors. This part of the study involved a deeper examination of the results and trends produced by these sector-level components of the national models.

1.2 Recap of background and methodology

Cloud computing is, as outlined in Part One of the report, becoming an increasingly viable option for IT decision-makers looking to find ways to reduce infrastructure costs in the context of the economic recovery and their ageing base of server installations. Businesses in all sectors of the economy are being forced to scrutinise their entire cost base, not only to survive in the market but also to secure the borrowing required to finance investment and working capital requirements. This includes pressure to reduce IT costs and improve IT efficiency, particularly in IT-intensive industry sectors.

Cloud computing offers the prospect of this and more. The ‘cloud’ offers reduced IT environment complexity by packaging traditionally separate components into converged solutions that arrive pre-integrated and ready-to-use. This is why IT managers, in spending less time and budget on

¹ EMEA, as used in this report, is the acronym used by EMC Corporation to refer to France, Germany, Italy, Spain and the UK, a subset of the company’s global presence.

maintaining or renewing current IT infrastructure, are finding ways to reduce costs and improve business value through cloud computing.

The macroeconomic quantifications presented in this and Part One of the report are based on an aggregation of the benefits to the individual businesses in all sectors of the economy that adopt cloud computing. These benefits are widely accepted to include lower costs, faster time-to-market and opportunities for the creation of new sources of value. Furthermore, by reducing the fixed costs associated with business set-up and increasing corporate profitability, cloud computing raises the incentives for new business creation, thus boosting entry into and competition in and for markets throughout the economy.² This can result in high margins being competed away and an expansion of economy-wide output.

The culmination of these benefits, in turn, drives investment through the re-investment of retained profits and stimulates domestic demand, through the spending of greater amounts of shareholder dividends and wages in the wider economy - further supporting growth and employment. (These are the 'multiplier' impacts, including indirect and induced benefits.)

For each of the aggregate industry sectors, the quantification of the macroeconomic benefits involved the same three stages outlined in Part One of the report (subsection 1.3). These stages were:

1. *Identify and quantify the benefits of cloud computing to business:* we developed an understanding of the benefits of cloud computing benefits at the level of individual business activities and processes. The task then was to place a value on these benefits by understanding their impact on opportunities for a business to: (i) enhance their sources and levels of revenues; and (ii) achieve greater efficiencies and cost savings. The manner in which we approached the valuation of the various benefits of cloud computing was explored in Section 3 of Part One of the report;
2. *Determine current and prospective rates of adoption of cloud computing:* involving the development of appropriate cloud computing adoption forecasts by understanding, at the sector and national level, the major drivers and inhibitors to achieving widespread adoption. We did not develop our own forecasts. Rather our assumptions were based on a review of the data and forecasts produced by technology specialists through expert reviews and analyst reports. This was explored in detail in Section 4 of Part One of the report;
3. *Calculate the aggregate sector- and economy-wide benefits of cloud computing:* involving the use of the information from the first two stages to model the aggregate benefits of cloud computing using Cebr's suite of macroeconomic spreadsheet models developed for the purposes of the study. The methodology on which the macro models were based is detailed in section 2 of Part One of the report. The models were set up to calculate the benefits of cloud computing separately for each of the nine industry sectors that were assumed to constitute the five EMEA economies.³ Part One examined the national and EMEA-level results. Part Two examines the results at the industry sector-level and compares the sector-level results across the five countries.

² Competition in the market refers to the situation where two or more firms compete on price and / or quality for market share. Competition for the market refers to the situation where supply by two or more firms in competition with one another is not feasible, but where firms can instead compete for the exclusive right to supply the market. This is a common feature of business process outsourcing, but also of rail franchising in the UK, for example.

³ The aggregated industry sector breakdown corresponds with the breakdown used as the basis for reporting official statistics on the UK economy by the UK Office for National Statistics (ONS).

1.3 Structure of this report

This report is structured as follows:

- Section 2 provides a recap of the national- and EMEA-level results of our macroeconomic modelling (the subject of Part One of the report), including a recap on the constituent benefits of cloud computing and an analysis of the main drivers of differences in the national-level results. We re-visit our identification in Part One of the report of the UK as an outlier because it is expected to perform poorly on the business creation benefits of cloud computing. We explain the basis for this and, subsequently, we outline the additional key macro and sector-level drivers of the other constituent benefits. Section 2 closes with the high-level basis for our central, upside and downside adoption scenarios;
- Sections 3 to 7 examine the cloud computing benefits calculated for the various aggregate industry sectors that make up the EMEA economies. We examine the drivers of these benefits, incorporating a comparative analysis of the sector-level results across the five economies. Specifically,
 - section 3 examines the results for the banking, financial & business services sector;
 - section 4 examines government, health & education (public services);
 - section 5 examines retail (including wholesale), distribution & hotels (incl. others involved the provision of leisure-related services);
 - section 6 examines the manufacturing sector;
 - section 7 is a catch-all examination of the relatively less important sectors, less important in the sense that they contribute much smaller proportions of national GDP than the sectors examined in sections 3 to 6. These other sectors include: (a) agriculture, forestry & fishing; (b) energy & utilities; (c) construction; (d) transport, storage & communications; and (e) other activities unidentified by the national statisticians.

Sections 3 to 7 are structured as follows. We begin by reviewing the size and importance of the sector, as well as its future prospects given the current and projected economic climate, which provides the fundamental macroeconomic basis for the sector-level benefits presented. We then review the sector-level prospects for cloud adoption and the implications in terms of the forecasts built into our model. For each sector, we then review the cloud computing benefits flowing through each of the cloud computing service models, at the individual country level and the EMEA level. This is followed by a comparative cross-country analysis of the constituent benefits of cloud computing.

The illustrations in Sections 3 to 7 are presented in a different format to Section 2 to distinguish the sector-level from the national-level analysis.

2 A recap of the EMEA & country results and their drivers

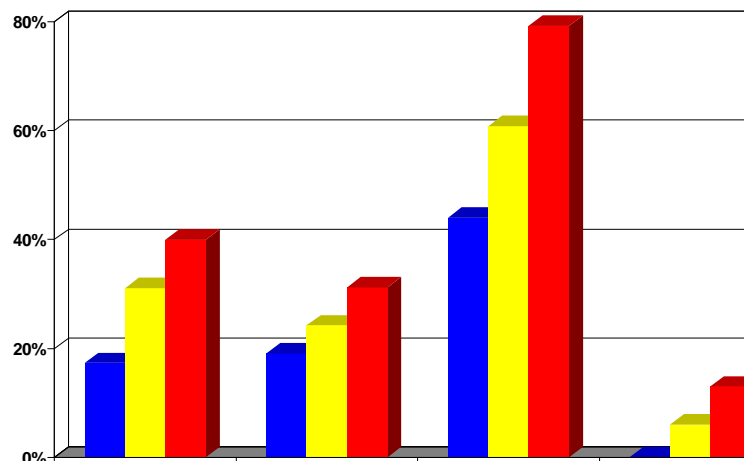
This section provides a recap of the manner in which cloud computing benefits business and the wider economy and summarises, based on Part One of the report, the national and EMEA-level results of the macroeconomic modelling and the main drivers of differences in the results across the five EMEA economies.

2.1 The sources of cloud computing benefits

We assume that the benefits of cloud computing to business and the wider economy have four broad categories of source. These are:

1. *Business development*: the elastic scalability of cloud computing solutions, where cost is incurred based on actual resource usage, fulfils business objectives like shorter time-to-market and responsiveness to unpredictable short-term demand peaks. This, in turn, offers significant opportunities for enterprises to drive growth and profitability in new and existing revenue streams;
2. *Business creation*: the ‘pay-as-you-go’ (or ‘utility’) model of cloud computing means that small- and medium-sized enterprise (SMEs) avoid the large up-front costs associated with ICT hardware and software. By drastically reducing the fixed costs of IT investments, cloud computing raises the incentives for new business creation, thus boosting entry into and competition in and for markets throughout the economy, but especially in sectors where fixed IT spending is important. These effects are important to consider for the EMEA nations because SMEs are the less well-publicised engine of most, if not all of the area’s economies;
3. *Net total cost savings*: we assume three methods by which a company can make cost savings through cloud computing, including: (i) IT CapEx and asset maintenance– the elimination of server and storage costs and their replacement with utility-type cloud computing capabilities; (ii) IT operations – the reduction of IT headcount, through the effective outsourcing of IT services, and their re-deployment in more productive areas of IT (such as applications development); and (iii) the reduction of IT power & cooling costs and the resulting savings on energy bills. Figure 1 below illustrates each of these cost savings as proportions of the relevant component parts of enterprise IT budgets under each cloud model. Each of the private, public and hybrid models was assumed to have different levels of cost saving potential, with public ranking the highest, followed by hybrid and then private. However, cloud computing adoption will require new IT spend on cloud services, particularly when the hybrid or public cloud model is involved, which are represented as percentages of total IT budgets in Figure 1. When these incremental expenditures are taken into account (to give net cost savings), the highest ranking changes from public to hybrid clouds, with public taking second position.

Figure 1: Savings as a % of component parts of IT budgets



Source: Cebr analysis

2.2 The EMEA and national-level macroeconomic benefits of cloud computing

Part One of Cebr’s report presented our finding that cloud computing has the potential to generate, across the five economies as a whole, a **cumulative total of €763 billion of economic benefits over the period 2010 to 2015**. The sources of these benefits is summarised in Table 7 below for the EMEA area as a whole and for each of the five economies that make up the area.

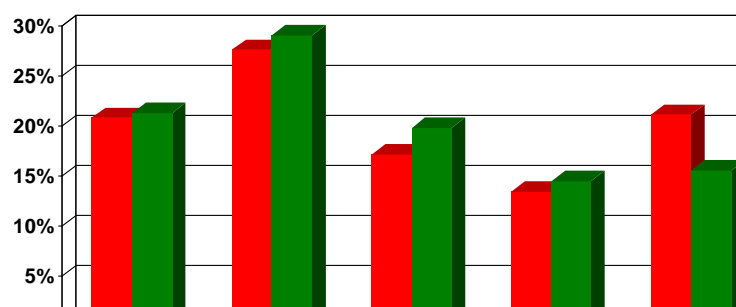
Part One of the report also revealed our finding that the smallest of the five economies, Spain is set to be the biggest beneficiary of cloud computing in relative terms. Spain was, on this measure, followed by Italy, then Germany, France and the UK. The UK was the only country to show a disproportionately smaller share of the EMEA-wide cloud computing benefits than the size of its economy might suggest. This is illustrated in Figure 2 below.

Table 7

EMEA: Aggregate cumulative economic benefits 2010-2015							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	24,599	32,642	23,995	16,866	29,555	25,219	127,657
Business creation	51,377	69,507	43,305	30,939	20,026	17,088	215,153
Net total cost savings of which:	26,323	37,740	28,463	22,008	26,206	22,361	140,740
-IT CapEx savings	28,653	36,378	30,461	23,013	36,176	30,868	154,682
-IT OpEx savings	13,818	18,139	14,533	10,396	16,943	14,458	73,829
-IT OpEx savings (power and cooling)	11,107	14,345	11,821	8,510	10,566	9,016	56,349
-Additional cloud expenditure (PAYG)	-27,255	-31,122	-28,353	-19,910	-37,481	-31,982	-144,120
Indirect GVA	60,450	81,351	55,007	40,737	42,202	36,011	279,747
Total Economic Benefit	162,749	221,239	150,770	110,550	117,989	100,679	763,297
Direct and indirect employment (000s)	469.45	789.39	455.85	392.49		289.00	2,396.17

Source: Cebr analysis

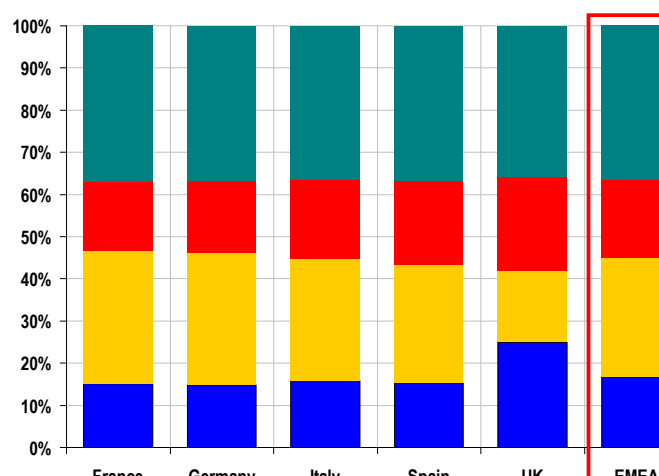
Figure 2: Percentage national shares of EMEA-wide cloud computing benefits relative to national shares of EMEA GDP



Source: Cebr analysis

Figure 3 illustrates another interesting finding outlined in Part One of the report. The greatest share of the EMEA-wide cumulative macroeconomic benefits flow from the business creation and multiplier impacts of cloud computing. This was found to be the case for the individual countries except in the UK, where business development produced a larger share of the benefits than business creation.

Figure 3: Percentage contributions of the individual categories of cloud computing benefits, EMEA and individual countries



Source: Cebr analysis

The UK was, thus, the outlier in our analysis, due to its poor performance on business creation (as opposed to a stronger performance on business development), which Part One of the report identified as being driven largely by the productivity of UK SMEs, which lags significantly behind France and even further behind Germany. The strong business creation results for Italy and Spain were identified as being attributable to high levels of diffusion of SMEs, which were sufficient to counteract low productivity amongst Italian and Spanish SMEs. See Table 8 below.

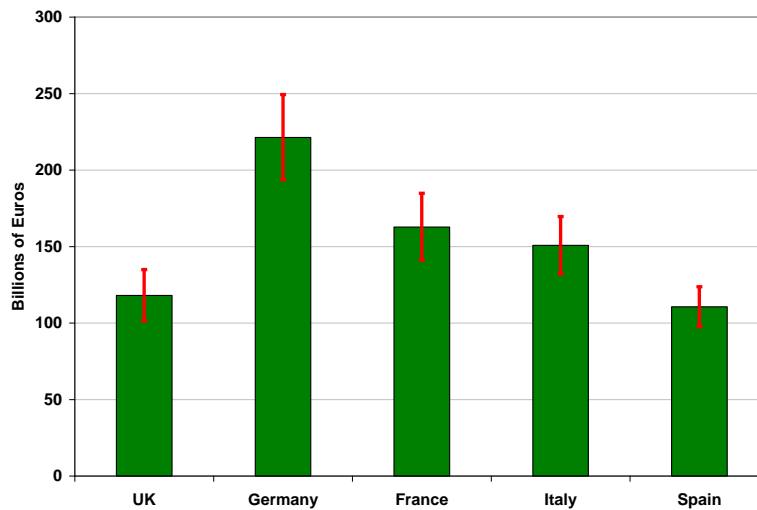
Table 8: SME productivity pre- and post-cloud computing adoption

Country	Productivity index pre-cloud computing	Productivity index post-cloud computing
France	205.0	205.4
Germany	340.6	341.3
Italy	102.7	102.8
Spain	108.5	108.8
United Kingdom	130.7	131.2

Source: Cebr analysis

We carried out sensitivity analyses by testing the impact of the potential realisation of the upside or downside risks to achievement of the assumed cloud computing adoption rates. These upside and downside risks were discussed in Section 4 of Part One of the report. Figure 4 illustrates the impact of decreasing and increasing adoption rates by 5% across the board. The downside scenario had the effect of reducing the aggregate cumulative benefits by anywhere between 13.3% in Spain to 16.4% in the UK, while the upside (a 5% increase in cloud adoption) increased the benefits, by between 10.6% in Spain and 12.5% in the UK.

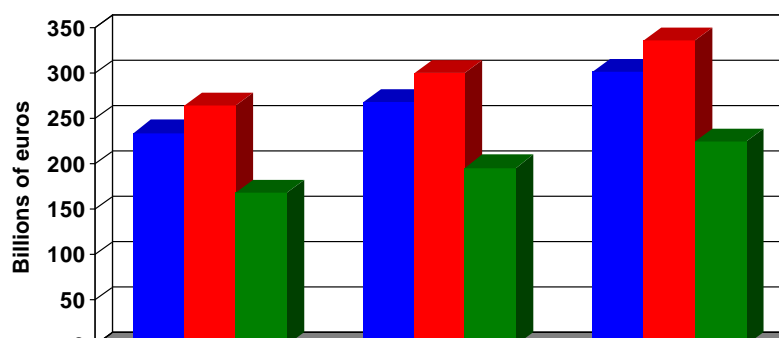
Figure 4: Scenario-testing at the national level



Source: Cebr analysis

The Part One report also considered the benefits across the three broad categories of cloud computing ‘service models’ considered, namely the aforementioned private, hybrid and public cloud models. The set of bars in the centre of Figure 5 shows the allocation of the aggregate EMEA benefits of €763 billion between the alternative cloud service models under the central case cloud adoption assumptions. The sets of bars on the left and right are a further illustration of the aforementioned downside and upside adoption scenarios.

Figure 5: Differences in cloud computing benefit levels by cloud model after upside and downside adoption scenarios, relative to the base case, have been applied



Source: Cebr analysis

We also found that, under the central case adoption assumptions, cloud computing has the potential to support significant direct and indirect job creation which, across the five economies, we predict to be in excess of **2.3 million net new jobs on a cumulative basis over the period 2010 to 2015**.

These jobs can, at least in the short run, be considered as a net impact. The extent to which they would constitute a net long term impact depends on the extent to which cloud computing can reduce the types of distortion that prevent the economy reaching its full productive capacity. Such distortions

include things like imperfect competition, significant economies of scale, imperfect and incomplete information etc. However, if the structural features of the economy lead employment back to its (pre-cloud) equilibrium level, then any temporary boost in the workforce will vanish over time.

2.3 Other macro- and sector-level assumptions

Calculation of the aggregate benefits presented in Table 7 above required certain other macro- and sector-level assumptions to drive them. These are presented below for each of the business development, cost saving, multiplier and employment benefits of cloud computing. The key drivers of the business creation benefits have been covered above.

Business development opportunities

The business development gains of cloud computing can be captured through more effective management of seasonal peaks and other fluctuations in demand during the financial year. By being able to respond readily to upturns in economic activity, firms can increase their revenues and profitability. Using cloud computing technology to rapidly scale the business up or down allows firms to grow or shrink organically without the need to invest in additional IT capital. Furthermore, cloud technology will reduce the time-to-market for firms' products and services, thereby removing at least some of the barriers to entry for existing firms seeking new markets.

Calculating the aggregate economy-wide value of these business development opportunities involved establishing macro indicators that could be used as proxies for the revenue opportunities provided to firms by cloud computing. We decided on two macroeconomic indicators, one capturing the improved responsiveness to unpredictable short-term demand peaks that result from cloud computing and the other capturing the shorter time-to-market and elastic scalability benefits.

Differences between countries in the business development benefits of cloud computing are driven principally by high levels of cloud adoption in the sectors that hold the greatest potential gains from more effective seasonal demand management and from efficiency improvements from IT scalability. The more important these sectors are to national economies and the brighter their future outlook, the greater these benefits can be expected to be. Our macroeconomic indicators were:

- (i) *For short term demand peaks:* a measure of potential incremental output that could be captured through efficient management of seasonal peaks, using non-seasonally adjusted leading economic indicators of output for each industry sector to analyse where seasonal peaks in demand occur. Sectors like manufacturing and banking, finance & business services typically experience volatile spikes in economic activity throughout the financial year and, therefore, show the greatest potential for benefits in this area.
- (ii) *For shorter time-to-market and elastic scalability benefits:* a measure of the productivity gaps that could be closed by SMEs and large firms in each of the nine industry sectors. The greatest potential benefits are available in banking, financial & business services and in distribution, retail & hotels. Both sectors are highly important contributors to the economies of all five countries, so early adoption in these sectors should generate bigger scalability benefits earlier.

The proportion of the total incremental revenues achievable from these improvements is assumed to be proportionate to the size of the fractions that IT budgets are of total turnover. This may not be representative, at least in some cases, of the importance of IT in rapidly responding to opportunities to earn more revenue. In other cases, IT may be a relatively insignificant factor. If we underestimated the general importance of IT in the ability of business to respond rapidly to new revenue

opportunities, we are very likely to have underestimated the magnitude of the business development benefits arising from cloud computing.

The assumptions resulting from this analysis are summarised in Table 9 below.

Table 9: Business development benefits, percentage of annual sector-level output

Industry	Potential seasonal output gain	SME productivity benefits of IT scalability	Large enterprise productivity benefits of IT scalability
Agriculture, Forestry & Fishing	0.07%	0.13%	0.0%
Energy & Utilities	0.07%	0.14%	0.0%
Manufacturing	0.15%	0.20%	0.0%
Construction	0.05%	0.10%	0.0%
Distribution, Retail & Hotels	0.06%	0.27%	0.1%
Transport & Communications	0.07%	0.20%	0.2%
Finance & Business Services	0.11%	0.28%	0.1%
Government, Education & Health	0.04%	0.17%	0.0%
Other Services	0.05%	0.20%	0.0%

Source: Cebr analysis

Cost savings

Cost savings were modelled as percentage savings on firms' IT budgets, which were monetised as percentage shares of total turnover. The principal drivers of differences between countries were:

- (i) *IT-intensity*: different industry sectors have different IT requirements and thus different-sized IT budgets relative to total turnover. Countries where IT-intensive industry sectors achieve high levels of cloud adoption can be expected to achieve higher levels of cost savings. For example, banking, financial & business services is one of the highest IT-spenders, so high adoption in this sector, such as is expected in the UK, will produce greater levels of benefits. The sector-level IT intensity assumptions are shown in Table 10 below;

Table 10: IT spend as a % of revenues and implied 2010 IT budgets for individual UK aggregated industry sectors

Industry	IT budget (% of revenue)
Agriculture, Forestry & Fishing	2.4%
Energy & Utilities	2.6%
Manufacturing	3.9%
Construction	1.8%
Distribution, Retail & Hotels	5.2%
Transport & Communications	3.9%
Finance & Business Services	5.4%
Government, Education & Health	3.1%
Other Services	3.8%

Source: Cebr analysis

- (ii) *IT capital-labour ratios*: the potential savings in IT CapEx far outweigh the labour cost savings under both the hybrid and public cloud models. While public cloud delivers more than the hybrid model in terms of IT investment, maintenance and operational cost savings, the additional 'pay-as-you-go' spend is predicted to be of sufficient size to outweigh this. To allow for these differences, our models incorporated the sector-level assumptions presented in Table 11 for the structure of businesses' IT budgets. Countries with important industry sectors that achieve high levels of hybrid cloud adoption could, therefore, expect to achieve greater levels of total net cost savings than countries that achieve high levels of public or private cloud adoption.

Table 11: IT capital expenditure and labour costs as a % of total IT budgets

Industry	IT CapEx (% of IT budgets)	Labour cost share of IT budgets
Agriculture, Forestry & Fishing	36.9%	59.1%
Energy & Utilities	47.0%	49.0%
Manufacturing	31.0%	65.0%
Construction	36.9%	59.1%
Distribution, Retail & Hotels	47.0%	49.0%
Transport & Communications	42.0%	54.0%
Finance & Business Services	19.0%	77.0%
Government, Education & Health	35.5%	60.5%
Other Services	36.9%	59.1%

Source: Cebr analysis

In summary, therefore, because different industry sectors assume greater importance to national economies than others, countries where very important sectors achieve high levels of cloud adoption can also be expected to achieve higher levels of cost savings, savings which are further increased if

these sectors are also: (i) IT-intensive; and (ii) have high levels of CapEx to labour ratios built into IT budgets. Countries with important sectors that achieve high levels of hybrid cloud adoption can also be expected to generate greater levels of cost saving benefits. Finally, different countries and sectors within them have different future prospects for growth. Economic growth drives turnover which, in turn, drives the monetary value of IT budgets to which the assumed (percentage) rates of cost savings are applied.

Multiplier benefits

This required assumptions about the proportions of total revenues that different industry sectors tend to spend on intermediate inputs, on salaries and wages and that they tend to allocate to retained profits for future investment or to pay shareholders in the form of dividends. These were calculated at the aggregate industry sector level but were assumed to be common across the five economies. Differences in the multiplier impacts across countries are, consequently, driven largely by the extent to which the other business development, business creation and cost saving benefits are different. But, of these three, business creation appears to be the principal driver of the multiplier benefits.

The assumed household savings rate will also have played a role in determining the relative importance of multiplier benefits, with a lower rate driving greater multiplier impacts through greater household spending.

Employment benefits

Like multiplier benefits, differences in relative country performance can be related back to the culmination of the drivers of the differences that arise in the cost saving, business development and business creation benefits of cloud computing.

2.4 Cloud adoption assumptions underlying the macro benefit predictions

Cebr is not, as we attempted to establish in Part One of the report, a 'technology specialist' and can only rely, for its adoption rate assumptions, on the opinions and research of experts in the IT / cloud computing field. While our assumptions have been through a number of iterations arising from Cebr's engagement with various technical teams from EMC² Corporation, they may well be too cautious or overly optimistic. The extent to which they are will determine whether our predictions will, by 2015, constitute under- or over-estimates. What we hope to have provided, however, is a basis on which the economic sensitivities can be understood should cloud computing not, for example, take-off as quickly as expected.

The current and prospective cloud computing adoption rates used in our baseline predictions do not appear out of line with present levels of adoption of virtualisation technologies (viewed as the stepping stone to cloud computing, particularly for larger businesses) or with the fact that cloud computing service offerings have been in existence for over ten years, largely through the software-as-a-service model. However, there is an in-built assumption about levels of internal adoption of cloud services once the business as a whole has decided to adopt it. We assume a progressive shift of business workloads into cloud infrastructure, beginning with a 20% shift of workloads in 2010 and moving to a 100% shift by 2014.⁴

⁴ As far as we could make out, these assumed rates of internal adoption are not inconsistent with current or prospective rates of adoption of virtualisation technologies.

The key downside risks to the achievement of our baseline predictions relate to the potential realisation of a number of developments, including:

- deteriorating perceptions about the security and resilience-related aspects of cloud computing solutions;
- reduced or slower than expected adoption of virtualisation as the stepping stone to cloud computing;
- country-specific inhibitors such as a lack of adequate growth and development of national infrastructure;
- industry sector-specific inhibitors such as the new Basel requirements, which could affect adoption in the banking, financial & business services sector; or
- continued skills shortages in terms of the ability of enterprise IT staff to take on virtualisation or cloud computing adoption projects.

The key upside risks include:

- greater realisation by or convincing of potential cloud adopters of the cost saving benefits of cloud computing, particularly if the economic recovery turns out to be slower than expected;
- greater willingness on the part of potential cloud adopters to engage in hardware resource pooling and to relinquish control of IT assets;
- dramatic improvements in the perception of the service quality and security levels associated with cloud computing;
- more pressing needs to enhance enterprise flexibility and agility (again potentially in response to a slower than expected economic recovery);
- reduced IT management complexity and the potential to free up valuable strategic resources; or
- a healthy investment climate for cloud computing that drives innovations to address cloud security issues.

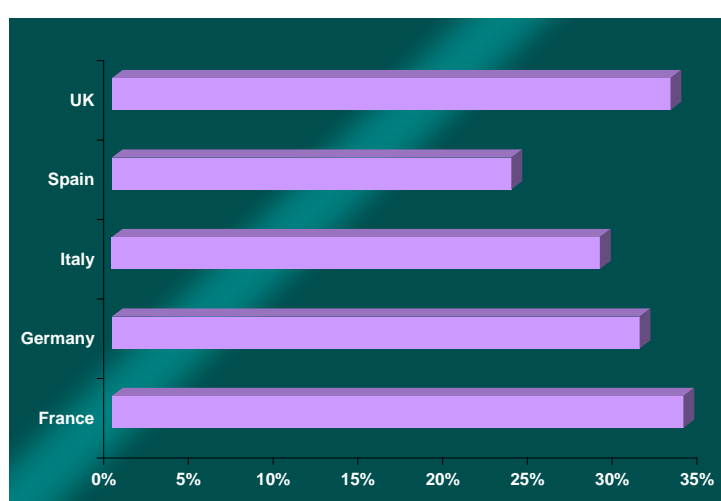
3 Vertical breakout 1: Banking, financial & business services

This section presents the results of our first vertical breakout, in which we quantified the benefits of cloud computing that are likely to flow from adoption in the banking, financial & business services sector. The section is structured as outlined in subsection 1.3 above.

3.1 Size & importance of and prospects for the sector

The banking, financial & business services aggregate industry sector is the largest contributor to GDP in all five of the EMEA economies. These contributions are illustrated in Figure 6 below.

Figure 6: Percentage of GDP contributed by the banking, financial & business services aggregate industry sector in each of the five EMEA economies



Source: UK ONS, Eurostat and Cebr analysis

The importance of the sector is most prevalent in France, Germany and the UK, where it contributes 33.7%, 31.1% and 33.0% of these countries' GDP respectively. The sector is relatively less important in Italy, albeit not by much, contributing 28.8% to GDP. Although the sector contributes less to Spain's GDP at 23.6%, it is still Spain's largest.

The European banking sector is still heavily reliant on government support and ECB financing facilities and remains highly exposed to risky sovereign debt. As such, the sector continues to face challenges which must be met to secure its stability.⁵

The Committee of European Banking Supervisors has conducted stress tests, which have improved disclosure on the real condition of banks and clarity on recapitalisation and restructuring requirements and on the measures required to resolve vulnerable banks. However, in this respect, some countries have made more progress than others in tackling weak banks. Specifically, according to the IMF, Spain has made more progress in this regard than Germany. The situation in France has been contained by a strong and far-reaching policy response, including unprecedented liquidity and credit support.

⁵ See IMF, "World Economic Outlook: Recovery, risk and rebalancing", October 2010.

European banking and financial sectors also remain vulnerable to real economy deterioration, sovereign shocks and funding strains. With a looming wall of maturing bank debt requiring refinancing, an adverse funding scenario may well be realised. In this regard, Cebr anticipates problems for Spain arising from funding needs during 2011. Through cross-border bank flows, this could lead to serious problems for the banking sectors of the other EMEA economies.

The stability of the EMEA banking sector is vital for the overall economic recovery, given the importance of bank lending in funding the investment and operations of firms in all sectors of the economy. Resolving uncertainty about regulatory reforms will be vital in helping to increase the willingness of the sector to supply credit and support the overall economic recovery. In this respect, UK Government policy measures are expected to constrain the country's financial sector growth in the coming years. These measures include the new 50% rate of income tax, immigration quotas and the levy on banks' profits, which are stirring fears of an 'anti-bank' signal and the potential for this to trigger the flight of some London financial firms to more favourable tax and regulatory regimes.

The Z/Yen Global Financial Centres Index, a measure of the competitiveness of world financial centres, has shown a gradual decline in the City of London's competitiveness over the last three years. The aforementioned Government policy measures are unlikely to help this situation. This, and similar concerns elsewhere, increase the risk of decline of traditional western financial sectors and speed the ascent of Eastern centres. Shanghai in particular has become relatively much more competitive since the global economic downturn.

On a more positive note, the UK nationalised banks have experienced higher than expected profits and consequent share price rises and, consequently, look well-placed to yield the Government a profit from the bank bailouts.

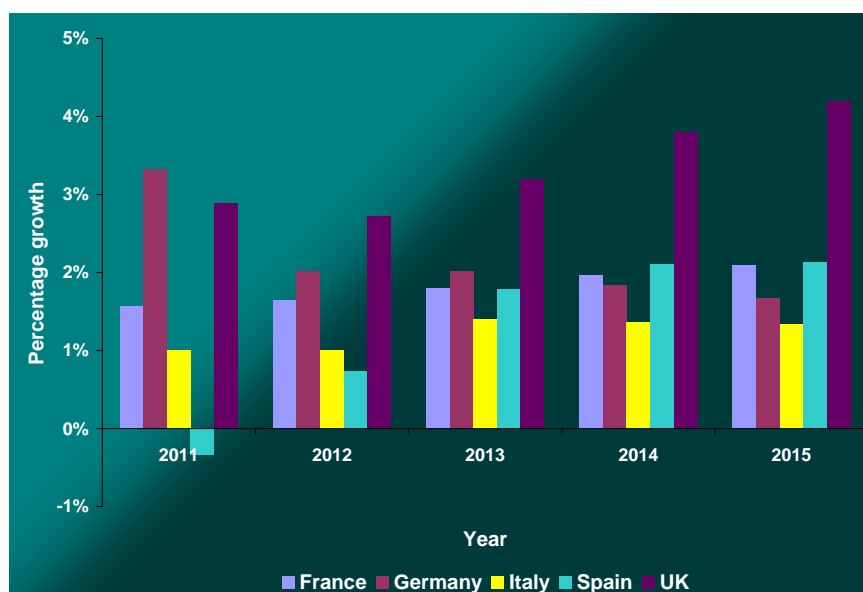
Meanwhile, the business services industries have not been immune from the recession either.⁶ Growth in output and employment has now resumed, albeit at much lower levels and not before a dramatic shrinkage in the 2008-2009 period. This growth is being driven by private investment and net exports beginning to pick up. Cebr forecasts average year-on-year growth in business investment of about 5.0% in the period 2011-2015. Business services providers, such IT service providers, which tend to be more dependent on this investment can be expected to benefit disproportionately.

Conversely, fiscal consolidation measures will hinder business services that are heavily dependent on public spending, such as R&D. Business services providers that support the property market are also expected to post below trend performance. Subdued growth in legal services is being driven by two opposing forces – on one hand, below-par levels of M&A activity and housing transactions and, on the other hand, greater regulatory scrutiny of the deals that are taking place. Meanwhile, accounting services output has been sustained by increased demand for bankruptcy and restructuring services. However, both legal and accountancy services will experience some exposure to the Government's budget cuts.

These recent and forward-looking trends have contributed to our growth outlook for the sector across the five EMEA economies, which are illustrated in Figure 7 below.

⁶ Business services incorporates transactional activities related to real estate, IT services, research & development, legal activities, accountancy, market research and business & management consultancy, architectural, engineering & technical activities, advertising and a collection of other relatively minor activities.

Figure 7: Expected percentage growth in the banking, financial & business services sectors of each of the five EMEA economies, 2011-2015



Source: Cebr analysis

Our forecasts for the UK banking, financial & business services sector are optimistic relative to the other EMEA economies, except for Germany in 2011. This largely reflects the better than expected profitability of UK banks in 2010 and the general recovery in financial and business services. The forecasts for the other EMEA economies are less optimistic, reflecting the aforementioned weaknesses of these countries' banking sectors and the less favourable environment for business investment due to higher interest rates.

3.2 Current and prospective levels of cloud computing adoption

Following the economic crisis, bankers are constructing a new business model and it is clear that capital balances will need to be much higher to pay for this without greatly adding to overall cost. This implies the need for comprehensive assessments of where cost savings can be achieved to fund this new business model. Cloud computing, with its focus on avoiding capital expenditures, provides at least one such opportunity for banking, financial and business services firms to reduce overall costs.

IDC's expectation is that, over the next one to three years, SMEs' adoption of cloud will be lower, largely due to a lag in the development of cloud-savvy players and SME-targeted solutions. But, as these develop and the cloud model overcomes traditional SME barriers, such as cost and complexity, the SME proportion of cloud markets will grow. SMEs represent primary IT market expansion zones, due largely to the emergence of the cloud model as a more efficient way to reach this market. IDC expected early SME penetration to be focused on a number of specific vertical markets, banking and finance being one.

Gartner believes that the financial services industries will be one of the most aggressive cloud adopters and that technology and service providers should be accelerating their initiatives aimed at bringing cloud service offerings to their customers in this sector. Other relevant developments include:

- An estimated 90% of display advertising (a business service) inventory is sold through cloud services, accounting for 30% of total display advertising revenues (the spots come at much cheaper prices than advertising sold directly to publishers. Internet advertising tends to show greater resilience in an economic downturn because of its superior sales accountability, and the efficiencies and scale of cloud-based advertising platforms is expected to spread to other formats and devices such as online video, mobile and digital set-top boxes;
- Over 30% of the HR business process outsourcing (BPO) market is effectively delivered as a cloud service, with penetration even higher among the more mature HR sub-processes like payroll. This is expected to grow to 43% by 2014. Highly automated HR processes such as benefits administration and recruitment process outsourcing are being added incrementally means HR business processes are progressively evolving towards cloud-based provision;
- Cloud-based payment acquiring services, such as those provided by PayPal, are trending towards the development of a global merchant acquiring market through cross-border consolidation, with banks choosing external service providers for their merchant processing. The size of the cloud payment market is expected to grow faster than online retail commerce due to the expansion in the number of SME merchants using these services, these being more profitable due to the large volume discounts associated with the high volumes of payments generated by large merchants;
- Other business processes, such as CRM, finance & accounting, administration services and procurement supply / management, as well as banking-specific business processes are also all evolving towards cloud-based provision. Cloud-enabled outsourcing solutions include, for example, all types of "managed" services solutions that are developed, bundled and packaged as components of outsourcing offerings, where the IT service provider (usually an outsourcer but may be any type of vendor) leverages one or more cloud computing technologies within the solution's overall architecture (either in the business process, applications or infrastructure layer). The clear trend, according to Gartner, is that an overwhelming number (estimated to exceed 60%) of enterprises (both large and small) will evaluate and pilot some type of cloud-enabled outsourcing offerings within the next 18 months. However, the level of investment and long-term impact will vary by offering.

The baseline cloud adoption rates that are used in our macroeconomic models are, with a few exceptions, expected to be highest in the banking, financial and business services sectors. Overall cloud adoption by 2015 in this sector is assumed to reach anywhere between 60% and 80% of all businesses, based on the results of a proprietary survey by IDC (made available to Cebr by EMC²). From the above, it is clear that these businesses will begin to shift ever-increasing workloads onto the cloud over the next few years.

The progressive scaling of the baseline adoption assumptions that we derived from the IDC survey results, in which we assume the gradual shift of workloads into the cloud, may well be conservative for this sector. As outlined in Part One of the report, this is modelled by assuming that present-day cloud adopters have shifted 20% of their workloads into cloud in 2010, rising to 40% in 2011, 60% in 2012, 80% in 2013 and 100% by 2014.

3.3 Sector-level macroeconomic economic benefits of cloud computing

The sector-level macroeconomic benefits of cloud computing for the banking, financial & business services sector are shown in Table 12 below, for each country (and EMEA in aggregate) and for each cloud model.

Table 12: Sector-level macroeconomic benefits of cloud computing by cloud model and by country, cumulative 2010-2015

Finance & Business Services							
Cloud Model	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Private	16,488	25,845	11,665	7,904	12,959	11,058	74,861
Hybrid	15,866	18,358	12,281	6,251	11,601	9,899	64,357
Public	11,595	14,301	8,128	4,681	5,644	4,816	44,348
Total	43,949	58,503	32,073	18,836	30,204	25,773	183,566

Source: Cebr analysis

At the EMEA level, the predicted €183 billion of benefits predicted for this sector constitutes a 24% share of the total EMEA benefits. The sector contributes varying proportions of the national-level totals, ranging from 17% in Spain to 27% in France and 26% in Germany and the UK. This is broadly consistent with the importance of the sector to the national economies, as outlined in Figure 6 above.

The cloud-model results are variable but not entirely inconsistent across the countries. Private and hybrid models dominate the not insignificant share expected to be attributable to public models. Public clouds do, however, appear to assume less significance, in relative terms, in Germany than in any other country.

3.4 Comparative analysis across the five EMEA economies

The breakdown of the aggregate sector benefits into the constituent benefits are shown for each country in Table 13 below.

The key drivers of cross-country differences in each of the constituent benefits are outlined as follows:

- *Business development opportunities:* we used the trading volumes indicator from the London Stock Exchange to estimate that the banking, financial & business services sector could achieve a relatively mid-level increase in total output through the better seasonal demand management provided by cloud computing. Based on our productivity analysis, we found that SMEs in this sector could achieve relatively high productivity benefits through things like faster time-to-market and IT scalability, while large firms (which are more efficient anyway) could achieve mid-level productivity benefits. While these percentages are small, they translate into significant monetary amounts, as can be seen in Table 13 above. The differences in these benefits between the countries is driven by the size, importance and prospects for the sector in those countries and the adoption rates achieved;
- *Business creation benefits:* the assumptions underlying the calculation of the business creation benefits were all necessarily made at the country level, rather than at the sector level, and were outlined in Section 2 above. France and Germany's banking, financial & business services sector scores well on business creation benefits. This is driven by the high efficiency levels achieved by the country's SMEs. The sector in Italy and Spain performs well, which is attributed to high levels of diffusion of SMEs throughout their sectors. The UK's banking sector is the worst performing on this constituent benefit;

Table 13: Sector-level macroeconomic benefits of cloud computing by constituent benefit and by country

Finance & Business Services							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	7,809	10,240	5,362	2,921	9,526	8,129	35,858
Business creation	17,696	22,647	12,882	7,403	6,831	5,829	67,458
Net total cost savings of which:	1,688	4,151	1,571	1,279	1,716	1,464	10,405
-IT CapEx savings	4,262	4,902	2,840	1,390	4,777	4,076	18,171
-IT OpEx savings	2,795	3,411	1,861	965	3,166	2,702	12,198
-IT OpEx savings (power and cooling)	2,303	2,809	1,533	795	2,241	1,912	9,681
-Additional cloud expenditure (PAYG)	-7,671	-6,971	-4,664	-1,871	-8,468	-7,225	-29,645
Indirect GVA	16,756	21,465	12,259	7,234	12,131	10,351	69,844
Total Economic Benefit	43,949	58,503	32,073	18,836	30,204	25,773	183,566
Direct and indirect employment (000s)	37.17	55.85	29.98	29.00	54.72		206.73

Source: Cebr analysis

- *Net total cost savings:* our research suggested that, although the banking, financial & business services sector has a relatively high total IT spend, the CapEx share, where some of the biggest savings are available from cloud, tends to be a relatively small proportion of that total at about 19%. The labour cost share is much more significant at 77%. The relatively small IT CapEx to labour ratio in this sector explains, at least in part, why the sector's share of the total benefits of cloud computing are smaller than the sector's aggregate contribution to the national and EMEA economies;
- *Multiplier and employment impacts:* the principal result for these constituent benefits was the poor performance of the UK. Cross-country differences in this constituent benefit are largely driven by the extent to which the other cost-saving, business development and creation benefits are different. The UK's poor business creation performance, from which the greatest multiplier impacts derive, is the main driver. The relatively low household savings rate assumed for the UK (5.3%) appears to go some way to making up for the poor business creation performance. We note, for example, that the UK's banking etc. sector's multiplier benefits of cloud computing are twice as large as its business creation benefits, whereas in France and Germany, where the savings rates are assumed to be around 15%, the multiplier impacts are smaller than the business creation impacts.

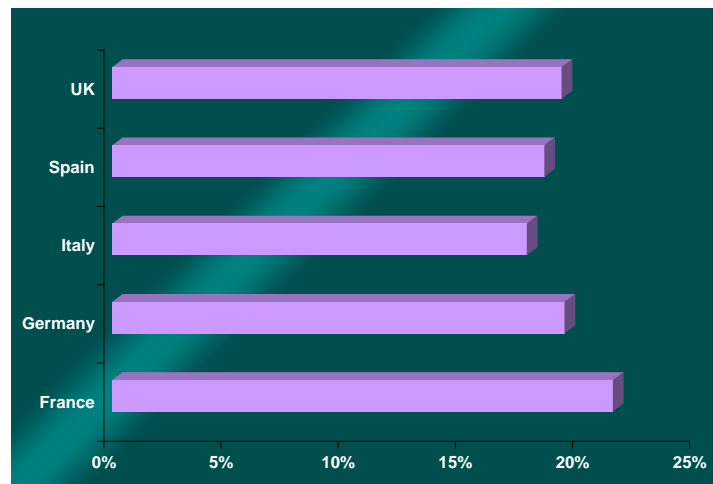
4 Vertical breakout 2: Government, education & health

This section presents the results of our second vertical breakout, in which we quantified the benefits of cloud computing that are likely to flow from adoption in the government, education & health sector. The section is also structured as outlined in subsection 1.3 above.

4.1 Size & importance of and prospects for the sector

Government, education & health is the second largest aggregate industry sector in all five of the EMEA economies. The contribution of this sector to national GDP is illustrated in Figure 8 below for each economy.

Figure 8: Percentage of GDP contributed by the government, education & health aggregate industry sector in each of the five EMEA economies



Source: UK ONS, Eurostat and Cebr analysis

The importance of the sector is most prevalent in France, where it contributes 21.4% of the country's GDP. The sector is almost as important to the German and UK economies, contributing 19.2% and 19.1%, respectively, to these countries' GDP. The sector contributes less to Italy and Spain's GDP, with respective contributions of 17.7% and 18.5%.

Fiscal consolidation, with a view to establishing public debt sustainability, is a top priority for most European governments. Those facing market pressures or severe external financing constraints, such as Spain, are engaging in larger and more front-loaded fiscal adjustments. The IMF predicted that the overall fiscal stance will remain broadly neutral in 2010, which it deemed appropriate given the still fragile nature of the recovery. However, there is broad consensus that medium-term fiscal adjustments need to be strengthened in order to deliver the permanent savings that will be necessary to fund the expected increases in age-related spending.

France and Italy have taken steps to reform entitlement spending which means credibility in the financial markets and obviates the need for more painful reforms in the future with minimal impact on economic growth. Key issues being addressed include raising the retirement age to reflect increased life expectancy, more efficient healthcare spending and social security reforms that reduce distortions in the labour market.

Fiscal consolidation programmes must be viewed in the wider context of the long-standing problems exposed by the financial crisis. Fiscal, structural and financial stability policy imbalances have resulted in cross-border impacts on even relatively healthy economies. Stronger roles for EU-level fiscal surveillance and sovereign crisis management, while sharing responsibilities for fiscal burdens and fiscal policy amongst nations, are being advocated. This, according to the IMF, requires a strengthening of the Stability and Growth Pact.

Had Euro-area national governments been more cognisant of the principles underlying the Pact, they would have built up sufficient buffers during the good times to counteract the effects of a recession. However, the incentives to do so were lacking and there was also the misguided perception that the 'boom and bust' nature of the economic cycle was a thing of the past. As well as encouraging the building up of buffers during the good times, there is also a requirement (as part of a strengthened Pact) to establish credible procedures for enforcement of the common fiscal rules and to strengthen the centralised crisis management capability of the EU.

Meanwhile, the UK has embarked on a budget deficit reduction plan that aims to put its public services and welfare system on a sustainable long term footing. The focus of the 2010 Spending Review is the reduction of welfare costs and wasteful spending, with departmental budgets other than health and overseas aid being cut by an average 19% over four years, while prioritising the NHS, schools and the capital investments necessary to support long term economic growth. The ultimate aim is to accelerate the reduction of the structural current budget deficit, eliminating it over a five year rolling horizon and returning public spending as a share of the economy to a level closer to its historical average.

More specifically, the Spending Review binds the Coalition Government to several commitments, including the following (which are relevant for this report):

1. The provision of health services that are free at the point of use and available to everyone based on need (not ability to pay), with total NHS spending increasing in real terms in each year of the current Parliament. This includes funding for priority hospital schemes including St Helier, Royal Oldham and West Cumberland;
2. An increase in the schools budget every year in real terms;
3. The reform of public services to build the so-called Big Society in which everyone plays their part, shifting power away from central government to the local level and getting the best possible value for taxpayers' money.

These recent and forward-looking trends have contributed to our growth outlook for the sector across the five EMEA economies, which are illustrated in Figure 9 below.

Figure 9: Expected percentage growth in the Government, health & education sectors of each of the five EMEA economies, 2011-2015



Source: Cebr analysis

Our forecasts for the UK government, education & health sector are pessimistic relative to the other EMEA economies. This reflects the fact that the UK's fiscal position is one of the most challenging in the world, with Britain's deficit in 2009 being the largest in its peacetime history. The Euro-area countries, bar Spain in 2011, are all expected to see modest increases in the size of this sector over the forecasting horizon, reflecting the necessary balance between fiscal consolidation and avoiding stymieing the recovery by depressing domestic demand.

4.2 Current and prospective levels of cloud computing adoption

Government spending is being slashed throughout the world and in Europe in order to deal with current budget deficits. Governments are likely to struggle to deliver the same levels of service with lower expenditure levels, so they will need to find ways of achieving cost savings in ways that minimise the potential for deteriorating service levels. IT spending and cloud computing in particular, provides at least one such opportunity for Government to reduce overall costs.

The rebalancing of Europe's economies towards private-sector led growth will spur Governments' interest in promoting a policy environment conducive to private-sector outsourcing and public-private partnerships (P3). As such, the importance of achieving value for money for public services tendered to the private sector and quasi-public organisations, for example, NHS Trusts which form part of the UK's National Health Service (NHS), will be a top priority over the next few years.

The size of the public sector in European economies enables Governments to benefit from significant cost savings through large-scale purchases which provide economies of scale and lower marginal costs for their inter-departmental organisations. In many respects, increased elasticity and scalability of Governments' IT infrastructure through internal inter-departmental private clouds could reduce IT asset redundancy and be able to respond to seasonal changes in public sector provision. Public sector private clouds which can be deployed across the full spectrum of government departments will therefore provide significant value for money for Governments and taxpayers. Furthermore, the requirement for security, privacy and compliance across all public-sector organisations dovetails

neatly with the characteristics of certain multi-organisational models of the public cloud i.e. the community cloud.

Gartner believes that the public sector will be one of the most aggressive adopters of cloud from 2011 to 2014. Recent developments in this industry sector include:

1. *Strong interest in cloud services from public-sector organisations* – growing levels of usage of public and private cloud services. The deployment of public cloud services in the government sector is and will be facilitated by commercial service providers, whilst private cloud services are being deployed internally through either “behind the firewall” deployments of public cloud services or by purchasing the technologies behind public cloud services and deploying them internally. Gartner believes that Governments’ overall worldwide market share of all cloud services will climb from 14% to 15% over the next five years. This compares to the public sector’s contribution to GDP falling from 19.2% to 19.0% over the same period amongst all five EU economies;
2. *Governments are one of the leading sectors in the development of cloud computing* – the UK Government has made the creation of a “G-cloud” a strategic priority⁷, which is to be a government-wide cloud computing network. An important aspect of UK Government IT policy is to improve IT infrastructure and allow for more services to migrate online. To support this, the UK’s IT procurement efforts will be focused on enabling the Government to become a leading user of cloud computing. All Governments are large customers of IT service providers, and as the owner of numerous national data systems, it has enormous influence on the market in education, health and defence.

Specific EU government initiatives to set up cloud computing environments are underway in Sweden, France and Spain.⁸ These include setting up internal, private cloud environments - currently favoured in Spain, and the use of cloud-based computing in the following areas:

- Public sector housing;
- Transportation service networks;
- Sustainable economic development;
- National censuses;
- Health and educational services;
- Contracting.

On an EU-wide level, there is increasing cooperation between member states, which Gartner believes will lead to the creation of a cloud-based common infrastructure for IT in the Member States.⁹

3. *Governments’ security requirements will drive “public-sector friendly” clouds* - Gartner believes that enterprises that have high security needs (federal government agencies, financial services, etc.)

⁷ Department for Business, Innovation and Skills (BIS) and the Department for Culture, Media and Culture, “Digital Britain Report”, June 2009.

⁸ The World Bank, “Financial Crisis and Cloud Computing – Demystifying cloud computing as an enabler of government transformation”, June 2009.

⁹ Gartner, “Is there a European government in the cloud?”, May 2009.

will stay with private or community cloud services where custom security capabilities can be delivered. Enterprises with lower security needs (universities and small businesses) will find the security built into cloud services sufficient. This should enhance the security of cloud-based applications and services in general;

4. *Deployment of the “community cloud” within the public sector* – the “community cloud” refers to a shared environment that is targeted to a limited set of organisations (e.g. government agencies). Members of the “community cloud” share similar security, privacy and compliance requirements. The concept is similar to a public cloud, in that it delivers shared services to multiple organisations, and can therefore achieve larger economies of scale spread across the community and further reduce IT asset redundancy. Elimination of redundancy is particularly relevant to the public sector where demand will vary according to seasonal patterns observed in the wider economy. Indeed, the requirement for elasticity and scalability of IT infrastructure is pertinent to the public sector which frequently has to respond to shocks observed in the wider economy;
5. *The outsourcing of business processes* - other business processes, such as CRM, finance & accounting, administration services and procurement supply / management for business process outsourcing (BPO) are also all evolving towards cloud-based provision.

The baseline cloud adoption rates that are used in our macroeconomic models are, with a few exceptions, expected to be as high, at least in one country, as in the banking, financial and business services sectors. Overall cloud adoption by 2015 in this sector is assumed to reach anywhere between 40% and 80%. In the countries where adoption by this sector is expected to be at the lower end of this range, the growth of hybrid adoption is a common feature. Where adoption is expected to be higher, hybrid adoption is already well-established and expected either to maintain its position or to decline (with public and private cloud adoption taking up the slack).

4.3 Sector-level macroeconomic economic benefits of cloud computing

The sector-level macroeconomic benefits of cloud computing for the government, education and health are shown in Table 14 below, for each country (and EMEA in aggregate) and for each cloud model.

Table 14: Sector-level macroeconomic benefits of cloud computing by cloud model and by country, cumulative 2010-2015

Government, Education & Health							
Cloud Model	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Private	8,990	11,127	6,721	4,712	5,145	4,391	36,696
Hybrid	9,487	11,699	7,570	5,336	8,128	6,935	42,220
Public	7,306	9,011	6,468	4,655	6,182	5,275	33,623
Total	25,783	31,838	20,759	14,704	19,455	16,601	112,539

Source: Cebr analysis

At the EMEA level, the predicted €112 billion of benefits predicted for this sector constitutes a 15% share of the total EMEA benefits. The sector contributes varying proportions of the national-level totals, ranging from 13% in Spain to 16% in France and the UK. This is broadly consistent with the importance of the sector to the national economies, as outlined in subsection 4.1 above.

The benefits appear to be more evenly distributed between the categories of cloud model than in the banking, financial & business services sector. Notably, hybrid clouds are expected to deliver the highest of the three in all five countries' government, education & health sectors. In all countries except the UK, private clouds just dominate the dividend from public clouds.

4.4 Comparative analysis across the five EMEA economies

The breakdown of the aggregate sector benefits into the constituent benefits are shown for each country in Table 15 below.

Table 15: Sector-level macroeconomic benefits of cloud computing by constituent benefit and by country

Government, Education & Health							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	2,255	2,613	2,463	1,609	3,379	2,883	12,319
Business creation	10,699	13,394	7,562	5,531	4,591	3,917	41,776
Net total cost savings of which:	2,754	3,191	2,565	1,615	4,418	3,770	14,544
-IT CapEx savings	2,873	3,329	3,405	2,232	5,129	4,377	16,968
-IT OpEx savings	1,481	1,716	1,711	1,118	2,527	2,156	8,553
-IT OpEx savings (power and cooling)	1,166	1,352	1,347	881	2,264	1,932	7,011
-Additional cloud expenditure (PAYG)	-2,766	-3,206	-3,897	-2,616	-5,502	-4,695	-17,988
Indirect GVA	10,075	12,640	8,168	5,949	7,067	6,031	43,900
Total Economic Benefit	25,783	31,838	20,759	14,704	19,455	16,601	112,539
Direct and indirect employment (000s)	173.98	269.86	143.01	124.10	90.47		801.43

Source: Cebr analysis

The key drivers of cross-country differences in each of the constituent benefits are outlined as follows:

- *Business development opportunities*: we used UK Central Government expenditure indicator from the Office for National Statistics to estimate that the government, education & health sector could achieve a relatively low-level increase in total output through the better seasonal demand management provided by cloud computing. Based on our productivity analysis, we found that SMEs in this sector could achieve relatively mid-level productivity benefits, while larger firms could not hope to achieve any productivity benefits;
- *Business creation benefits*: see the same part of subsection 3.4 above;
- *Net total cost savings*: our research suggested that the government, education & health sector has a relatively mid-level total IT spend, and relatively mid-level IT CapEx as a percentage of that total. The UK public services industries are expected to perform well due to high levels of public and hybrid cloud adoption. The net cost savings are more modest elsewhere, where growth is largely anticipated in the hybrid segment;
- *Multiplier and employment impacts*: as with banking, financial & business services, cross-country differences in the multiplier and employment benefits of cloud computing are largely driven by the extent to which the other cost-saving, business development and creation benefits are

different. Differences in assumed national household savings rates, and in how the sector balances the interests of its intermediate suppliers, its employees, shareholders and customers.

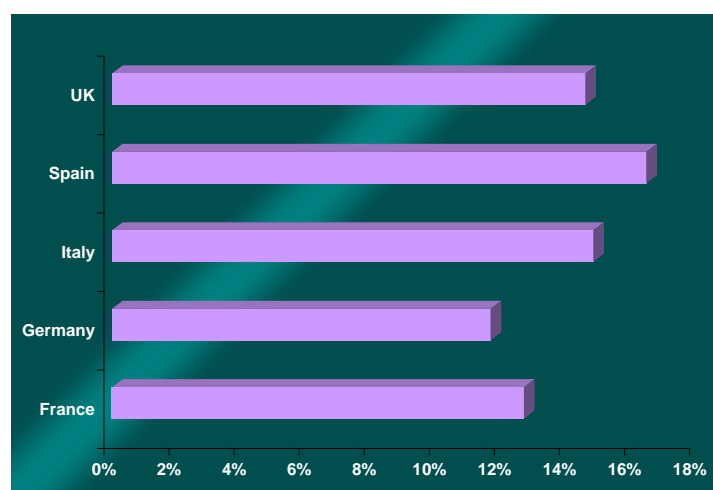
5 Vertical breakout 3: Distribution, retail & hotels

This section presents the results of our third vertical breakout, in which we quantified the benefits of cloud computing that are likely to flow from adoption in the distribution, retail & hotels sector. The section is also structured as outlined in subsection 1.3 above.

5.1 Size & importance of and prospects for the sector

Distribution, retail and hotels constitute the third largest aggregate industry sector in France, Spain and the UK and the fourth largest in Germany and Italy. The contribution of this sector to national GDP is illustrated in Figure 10 below for each of the five EMEA economies.

Figure 10: Percentage of GDP contributed by the distribution, retail & hotels aggregate industry sector in each of the five EMEA economies



Source: UK ONS, Eurostat and Cebr analysis

The importance of the sector is most prevalent in Spain, where it contributes 16.4% of the country's GDP. The sector is almost as important to the Italian and UK economies, contributing 14.8% and 14.6%, respectively, to these countries' GDP. The sector contributes less to France and Germany's GDP, with respective contributions of 12.7% and 11.6%.

Eurozone retail sales fell by 0.8% between October and November 2010, a sign of continued weak consumer confidence following a turbulent year in the single currency area, especially in light of the consensus expectation of a 0.2% increase. Growth in the year to November 2010 was only 0.1% reflecting the general softening in consumer spending in 2010. France and the UK were among the best performers, however, with retail sales growing by 0.9% and 0.6% respectively between October and November. Retail sales in Spain fell, however, by 0.3%.

While a recent European Commission survey suggests mounting optimism in France and Germany in December 2010, resulting in increased general Eurozone confidence, the picture remains mixed. Weak consumer spending in the single currency area's peripheral states, troubled by large national debts, restrictive borrowing and unemployment remaining uncomfortably above the 10% level, is expected to persist throughout 2011. Consumer confidence in Spain, for example, remains well below pre-recession norms, with overall consumer spending slumping by 1.1% in Q3 2010 (on a quarterly basis). The sovereign debt crisis and market pressures have forced the Spanish Government into crippling

fiscal austerity measures, so domestic demand is likely to remain heavily constrained, with economic growth expected to struggle to reach an annual average of 1.0% over the period to 2015.

Nonetheless, France recorded year-on-year growth in retail sales volumes of 3.3% in October 2010, while Germany recorded an increase of 1.1%. The UK performed less well but still recorded a 0.5% increase over the year to October and growth of 1.1% in the year to November 2010. However, the retail sales value data produced by BRC-KPMG suggest a 0.3% decline in December 2010 compared with December 2009. This suggests that the exceptionally cold weather and snow in December 2010 has likely offset any boost to sales from households making large purchases before the VAT rate rise on January 4th.

While the UK economy continued its recovery in the last quarter of 2010, unemployment is likely to continue rising in 2011, causing take home pay to remain weak, while, at the same time, elevated inflation will reduce consumer spending power. The timing of the VAT hike to 20% was fixed before it had become clear that commodity price rises would also feed through into a higher cost of living this year. This intense squeeze on household purchasing power has resulted in Cebr forecasting a real-terms fall in overall consumer spending of 0.7% in 2011.

The cost inflation due to commodity price rises will leave distributors, retailers and hoteliers (as well as other leisure and personal services retailers) with a difficult trade-off between margins and sales. With the combination of this and the negative outlook for consumer spending, Cebr expects growth in the sector to slow in 2011 and to pick up only slowly thereafter. The exception to this is Germany and, to a lesser extent, France.

Figure 11: Expected percentage growth in the distribution, retail & hotels sectors of each of the five EMEA economies, 2011-2015



Source: Cebr analysis

5.2 Current and prospective levels of cloud computing adoption

For the distribution, retail and hotels sector, the consumer spending boom which has fuelled Europe’s growth in the last 20 years has now been suppressed. Future profitability will depend on efficiency

rather than volume growth. Cloud computing, as in the other sectors above, provides at least one such opportunity for businesses in this sector to reduce overall costs.

Over the last two years, the interplay between the retail and information technology sectors has strengthened substantially. In the UK, online retail sales as a percentage of total retail sales grew from 6.4% in 2009 to 7.5%¹⁰ in 2010. The prominence of the internet in the retail sector has accelerated during the UK's fragile recovery, which has been characterised by rising food and energy prices and weak household income growth. A fall in household spending power has forced consumers to seek bargains online which are usually forthcoming, due to the lower fixed costs of online retail businesses. The trend towards internet shopping can be facilitated by e-commerce cloud service companies, which can put the necessary IT infrastructure into place in order for businesses to meet growing demand.

Addressing seasonal peaks in the retail calendar through the increased elasticity and scalability that the cloud affords can increase businesses' revenues significantly. The average weekly value for UK retail sales in 2010 was £5.6 billion, whilst the average weekly value for December 2010 was £7.3 billion. Using a pay-as-you-go cloud service model that precludes up-front capital investment in existing IT infrastructure can therefore lead to a significant return on investment for business retailers. The latest developments in the sector include:-

1. *E-commerce cloud services makes business affordable for smaller retailers* – According to Gartner, for smaller retailers, affording or justifying the cost in-house e-commerce technology is challenging e-commerce cloud enablement services such as eBay and Amazon have arisen to fill the need¹¹. E-commerce cloud service providers remove the complexity and scale cost over many users, making technology available to the smallest merchants.
2. *Development of supply-chain based community private clouds*¹² – Whilst some organisations will have sufficient resources into community private clouds, many others will pool their computing resources into community private clouds, in which closed user groups composed of many organisations will use a single cloud. A large retailer may create a cloud infrastructure that is available to all members of the provider's supply chain, including manufacturers, authorised service centers and contractors, as well as being available to the retailer. One potential concern with an industry-based community cloud is that members have similar seasonal resource demands (e.g. retail with large demand spikes around Christmas) that limit the ability of the community cloud to elastically satisfy all members at peak times¹³.
3. *Bespoke cloud services platforms for retailers* – Retail businesses need to maximise their technology budgets in order to deliver better value for their customers and generate returns. Bespoke cloud-based services such as the Azure Services Platform, allow retailers to plan better for seasonal peaks without requiring to provision for higher availability through increased investment in existing IT architecture. Cloud services enable businesses to create Web, mobile or hybrid applications with on-premise applications with the option of a pay-as-you-go model. The overall effect is to improve the customer experience by reducing the time-to-market, and effective relationship management through responsive and customisable CRM systems.

¹⁰ Office for National Statistics - Retail Sales Bulletin (December 2010)

¹¹ Gartner – Forecast: Public Cloud Services, Worldwide and Regions, Industry Sectors, 2009-2014 (June 2010)

¹² Cloudscape – Cloud Codex (October 2009)

¹³ Gartner - Hype Cycle for Cloud Computing (July 2010)

4. *Cloud e-mail* – Cloud-email describes a vendor-offered, multi-tenant, internet-delivered e-mail service that is fully scalable and flexible. According to Gartner, over 10% of enterprise e-mail users would be employing a cloud-based e-mail service. Organisations with large populations that currently do not heavily rely on e-mails services, such as in the retail sector – can immediately benefit from cloud e-mail services.

The baseline cloud adoption rates that are used in our macroeconomic models are expected to be as high, at least in one country (namely the UK), as in the banking, financial and business services sectors. Overall cloud adoption by 2015 in this sector is assumed to reach anywhere between 50% and 75%. In Spain, up to two-thirds of total cloud adoption is expected to be in the hybrid model while, in France, about 80% of total adoption is expected to be shared equally amongst private and hybrid clouds. In the UK distribution, retail & hotels sector, where adoption is expected to be the highest of the EMEA economies, hybrid and public clouds are expected to dominate.

5.3 Sector-level macroeconomic economic benefits of cloud computing

The sector-level macroeconomic benefits of cloud computing for the distribution, retail & hotels sector are shown in below, for each country (and EMEA in aggregate) and for each cloud model.

Table 16: Sector-level macroeconomic benefits of cloud computing by cloud model and by country, cumulative 2010-2015

Distribution, Retail & Hotels							
Cloud Model	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Private	15,968	19,357	22,104	9,945	10,426	8,896	77,710
Hybrid	21,093	25,386	15,284	20,512	20,248	17,278	102,522
Public	8,840	10,797	14,391	9,669	9,488	8,096	53,185
Total	45,901	55,540	51,688	40,126	40,162	34,270	233,418

Source: Cebr analysis

At the EMEA level, the predicted €233 billion of benefits predicted for this sector constitutes a staggering 31% share of the total EMEA benefits. The national-level contributions vary from 25% in Germany and 28% in France to 34% in Italy and the UK and 36% in Spain. From this sector, therefore, is expected to flow a disproportionately large share of the benefits of cloud computing relative to the importance of the sector to the national economies, the maximum for which is about 17% in Spain.

For this sector again, the benefits are heavily weighted towards the hybrid cloud model, at least in France, Germany, Spain and the UK. Italy is the only country for which private clouds dominate the benefits flowing through this sector. Private cloud benefits are also prominent in all countries, while the public model is also relatively significant in Italy, Spain and the UK.

5.4 Comparative analysis across the five EMEA economies

The breakdown of the aggregate sector benefits into the constituent benefits are shown for each country in Table 15 below.

Table 17: Sector-level macroeconomic benefits of cloud computing by constituent benefit and by country

Distribution, Retail & Hotels							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	8,495	10,013	10,175	7,816	11,653	9,943	48,151
Business creation	7,328	9,333	7,322	5,708	2,399	2,047	32,091
Net total cost savings of which:	16,830	19,840	19,594	14,909	14,181	12,101	85,354
-IT CapEx savings	14,298	16,855	16,999	14,374	20,584	17,565	83,112
-IT OpEx savings	5,974	7,042	7,281	5,773	8,273	7,059	34,344
-IT OpEx savings (power and cooling)	5,365	6,325	6,539	5,186	4,355	3,716	27,770
-Additional cloud expenditure (PAYG)	-8,808	-10,383	-11,225	-10,425	-19,031	-16,239	-59,872
Indirect GVA	13,249	16,355	14,597	11,693	11,929	10,179	67,822
Total Economic Benefit	45,901	55,540	51,688	40,126	40,162	34,270	233,418
Direct and indirect employment (000s)	65.27	118.44	63.97	68.14	38.97		354.79

Source: Cebr analysis

The key drivers of cross-country differences in each of the constituent benefits are outlined as follows:

- *Business development opportunities*: we used Distribution, Retail & Hotels Index of Output from the UK Office for National Statistics to estimate that the sector could achieve a relatively low-level increase in total output through the better seasonal demand management provided by cloud computing. Based on our productivity analysis, we found that SMEs in this sector stand to achieve relatively high-level productivity benefits, while larger firms could only hope to achieve relatively low-level productivity benefits.
- *Business creation benefits*: see the same part of subsection 3.4 above.
- *Net total cost savings*: the distribution, retail & hotels sector has a relatively high level of total IT spend, as well as a high IT CapEx to total IT budget ratio. The sector shows the highest total net cost savings for any sector examined so far, which is driven by the latter and by current and future high rates of hybrid cloud adoption by the sector. There is also expected to be high levels of future private cloud adoption from a current mid-level base and mid-levels of public cloud adoption from a low base.
- *Multiplier and employment impacts*: as with the other sectors analysed, multiplier and employment impacts are largely driven by the extent to which the other cost-saving, business development and creation benefits are different. However, the much higher total net cost savings expected to be available in this sector is clearly an important driver in this case. Differences in assumed national household savings rates, and in how the sector balances the interests of its intermediate suppliers, its employees, shareholders and customers also plays a role.

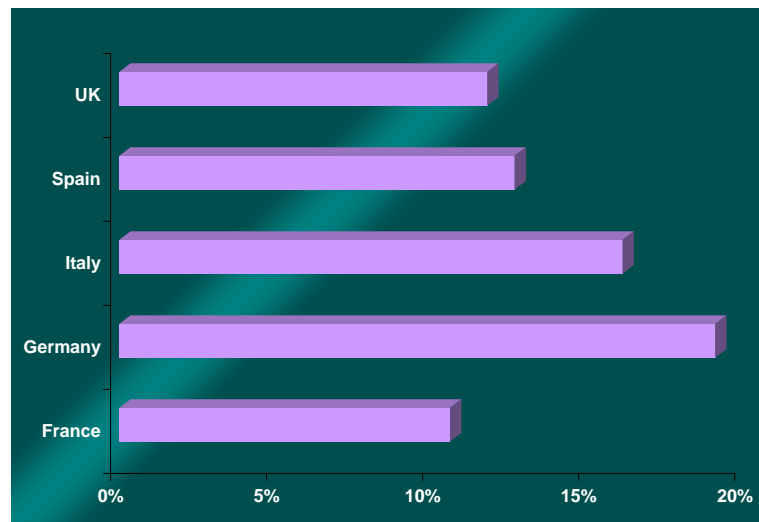
6 Vertical breakout 4: Manufacturing

This section presents the results of our fourth vertical breakout, in which we quantified the benefits of cloud computing that are likely to flow from adoption in the manufacturing sector. The section is also structured as outlined in subsection 1.3 above.

6.1 Size & importance of and prospects for the sector

Manufacturing constitutes the third largest aggregate industry sector in Germany and Italy and the fourth largest in France, Spain and the UK. The contribution of this sector to national GDP is illustrated in Figure 12 below for each of the five EMEA economies.

Figure 12: Percentage of GDP contributed by the manufacturing aggregate industry sector in each of the five EMEA economies



Source: UK ONS, Eurostat and Cebr analysis

The importance of the sector is most prevalent in Germany, where it contributes 19.1% of the country's GDP, followed by Italy, where it contributes 16.1% of that nation's economic output. The sector contributes less to the French, Spanish and UK economies, with respective contributions of 10.6%, 12.7% and 11.8%.

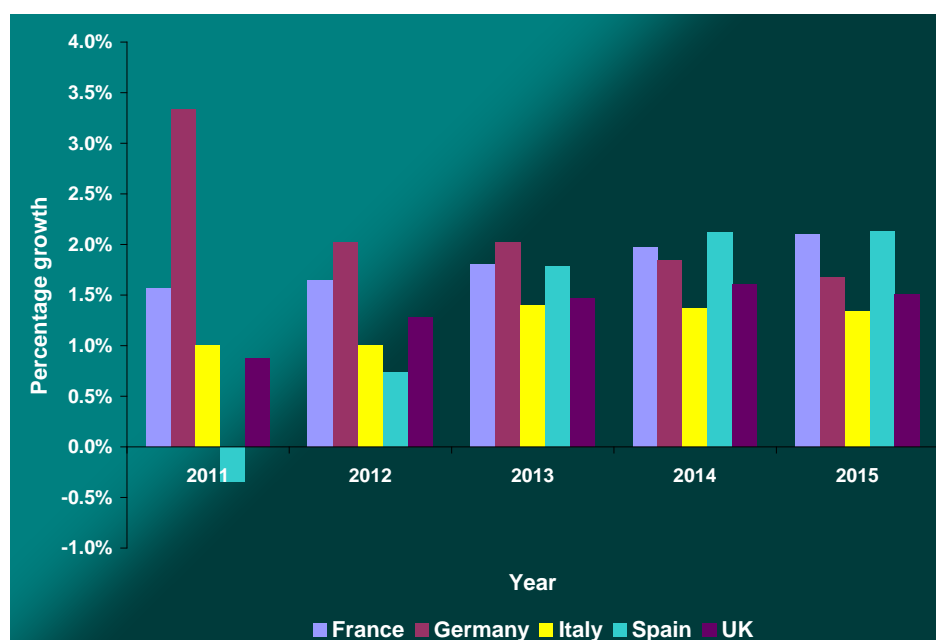
Cebr's outlook for UK manufacturing is positive, with the sector projected to grow steadily, but contingent on steady export growth. This comes off the back of renewed confidence in the strength of the sector following the Markit/CIPS purchasing manager's index (PMI) reaching a 16-year high in December 2010. Cebr's expectation is of consistently positive growth over the next five years, bolstered by lower interest rates and a structurally lower value of sterling vis-à-vis the currencies of the UK's major trading partners. However, the key risk to this outlook is weak growth in the Euro area, which would damage the UK's key export markets.

In France, manufacturing output declined in 2010 which, combined with the increase in imports, was sufficient to offset the rises in consumer spending reported in Section 5 above. However, rising consumer confidence should support a more positive outlook going forward. Similarly, rising confidence in Germany, as well as Germany's continued export competitiveness, supports the most optimistic national outlook for manufacturing.

Things look less positive for manufacturing in Italy, where a persistent competitiveness problem limits the scope for export growth and fiscal consolidation weakens private demand. Similarly, fiscal and competitiveness imbalances in Spain have resulted in a weak outlook for the country's manufacturing sector, especially in 2011 and 2012. Thereafter, as labour market and other structural reforms feed through the system and begin to address competitiveness issues, the outlook is a bit more positive.

The outlook for emerging Europe is significant for the five EMEA economies' export markets and, hence, for their manufacturing sectors. Growth in economies that experienced the mildest downturns, such as Poland, and in others that faced the crisis with relatively strong household and bank balance sheets, such as Turkey, is expected to continue to gain strength. But those that experienced unsustainable domestic booms, such as Bulgaria and Latvia, or that have vulnerable private and public sector balance sheets, such as Hungary and Romania, can be expected to recover more slowly.

Figure 13: Expected percentage growth in the manufacturing sectors of each of the five EMEA economies, 2011-2015



Source: Cebr analysis

6.2 Current and prospective levels of cloud computing adoption

The challenge for the manufacturing sectors of the EMEA economies will be to compete with global competition from the emerging economies. While some of this will happen through exchange rate fluctuations and differences in inflation, the EMEA economies will still have to work hard to counteract Europe's high wages. Cloud computing provides at least one such opportunity for businesses in this sector to reduce overall costs and close at least some of the wage gap between Europe's manufacturers and those of the emerging economies.

The potential productivity benefits to Europe's ailing manufacturing sector could be an underlying motivator for adoption over the next five years. According to Gartner, the manufacturing sector will

be one of the largest early adopters of cloud services¹⁴. The pay-as-you-go cloud model, which enables firms to purchase computing resources as and when required, will cut up-front capital costs in the sector – where currently around 3.7% of total annual turnover is spent on the IT budget, compared to a economy-wide average of 3.4%¹⁵. Recent developments in the sector include:-

1. *Synergies with the “Just-In-Time” business model* - cloud computing has the potential to revolutionise the sector in a similar vein as the “Just-In-Time” (JIT) inventory strategy did for the car manufacturing industry during the 1970s. Under the JIT inventory strategy, the manufacturing process is streamlined to reduce inventory costs by decreasing the time to market – and therefore reducing up-front storage costs. Toyota Motor Corporation is known as the “master and pioneer” of “Just-In-Time”, its core business strategy is in delivering customised vehicles with minimal wait. Toyota has spent the last two decades revamping its ordering, manufacturing and distribution to make it easier for dealers and customers to make changes right before production. By reducing the average time between dealer order and delivery, customer satisfaction increases and dealer inventory costs fall. Cloud computing technologies have the potential to facilitate execution of a “Just-In-Time” business strategy by increasing flexibility of firms’ IT architectures, decreasing time-to-market, lowering fixed costs and providing state-of-the-art CRM systems which strengthen manufacturers’ relationships with their suppliers and customers.
2. *Development of supply-chain based community private clouds* – whilst some organisations will have sufficient resources into community private clouds, many others will pool their computing resources into community private clouds, in which closed user groups composed of many organisations will use a single cloud. Hewlett-Packard has launched a cloud platform specifically for the manufacturing sector which allows greater transparency between businesses in the supply chain. The platform can be deployed in the foods, aeronautical and car manufacturing sectors, where product recalls must be executed fast and effectively.
3. *Cloud e-mail* – cloud-email describes a vendor-offered, multi-tenant, internet-delivered e-mail service that is fully scalable and flexible. According to Gartner, over 10% of enterprise e-mail users would be employing a cloud-based e-mail service. Organisations with large populations that currently do not heavily rely on e-mails services, such as in the manufacturing sector – can immediately benefit from cloud e-mail services.

The baseline cloud adoption rates predicted for the manufacturing sector are broadly similar across countries, with a narrow range of between 65% and 75%, with the highest overall adoption predicted for Spain and the lowest predicted in Germany. In the UK, adoption is dominated by the hybrid model, with virtually no public cloud adoption. Hybrid clouds are also expected to be dominant in France and Spain, while public clouds are expected to dominate in Italy and private clouds are expected to dominate in Germany.

6.3 Sector-level macroeconomic economic benefits of cloud computing

The sector-level macroeconomic benefits of cloud computing for the manufacturing sector are shown below, for each country (and EMEA in aggregate) and for each cloud model.

¹⁴ Gartner – Forecast: Public Cloud Services, Worldwide and Regions, Industry Sectors, 2009-2014 (June 2010)

¹⁵ PwC – Why Isn’t IT Spend Creating More Value (June 2008)

Table 18: Sector-level macroeconomic benefits of cloud computing by cloud model and by country, cumulative 2010-2015

Manufacturing							
Cloud Model	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Private	4,958	14,201	6,744	3,491	3,752	3,201	33,146
Hybrid	6,276	15,695	5,993	5,475	5,849	4,991	39,288
Public	4,778	9,409	6,998	3,127	1,758	1,500	26,069
Total	16,013	39,305	19,735	12,093	11,358	9,692	98,504

Source: Cebr analysis

At the EMEA level, the predicted €98 billion of benefits predicted for this sector constitutes a 13% share of the total EMEA benefits, which ranges from 10% to 18% at the national level. From this sector, therefore, is expected to flow a proportionately equal share of the benefits of cloud computing relative to the importance of the sector to the national economies.

For this sector, the benefits are heavily weighted towards the hybrid cloud model, at least in France, Germany, Spain and the UK. Italy is the only country for which private and public clouds dominate the benefits flowing through this sector.

6.4 Comparative analysis across the five EMEA economies

The breakdown of the aggregate sector benefits into the constituent benefits are shown for each country in Table 19 below.

Table 19: Sector-level macroeconomic benefits of cloud computing by constituent benefit and by country

Manufacturing							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	3,171	6,672	3,821	2,510	2,923	2,494	19,098
Business creation	4,899	12,222	6,353	3,505	2,200	1,877	29,178
Net total cost savings of which:	1,982	6,792	2,135	1,689	2,742	2,339	15,340
-IT CapEx savings	3,362	7,200	4,341	2,542	2,954	2,521	20,398
-IT OpEx savings	1,830	4,099	2,392	1,373	1,651	1,409	11,346
-IT OpEx savings (power and cooling)	1,290	2,888	1,686	968	1,074	916	7,906
-Additional cloud expenditure (PAYG)	-4,500	-7,394	-6,285	-3,194	-2,938	-2,507	-24,311
Indirect GVA	5,961	13,619	7,426	4,389	3,494	2,982	34,889
Total Economic Benefit	16,013	39,305	19,735	12,093	11,358	9,692	98,504
Direct and indirect employment (000s)	92.35	187.64	118.64	76.12	39.53		513.81

Source: Cebr analysis

The key drivers of cross-country differences in each of the constituent benefits are outlined as follows:

- *Business development opportunities:* we used the Manufacturing Output Index from the UK Office for National Statistics to estimate that the sector could achieve a relatively high increase in total output through the better seasonal demand management provided by cloud computing. We found mid-level productivity gains to be achievable by SMEs through faster time-to-market, IT scalability and other business development benefits. We did not find any productivity gains to be achievable by large businesses in this sector.
- *Business creation benefits:* see the same part of subsection 3.4 above.
- *Net total cost savings:* we found that businesses in the manufacturing sector have relatively mid-sized IT budgets and low IT CapEx to total IT budget ratios. The sector shows modest total net cost savings as a result. This is despite the projected shift away from private cloud to high levels of hybrid and public cloud adoption by 2015.
- *Multiplier and employment impacts:* the multiplier and employment impacts for this sector are largely driven by the magnitudes of the business development and creation benefits. Differences in assumed national household savings rates, and in how the sector balances the interests of its intermediate suppliers, its employees, shareholders and customers also plays a role.

7 Vertical breakout 5: Summary results for the other sectors

This Section presents the results of our fifth and final vertical breakout, in which we quantified the benefits of cloud computing that are likely to flow from adoption in all the other relatively less important sectors of the EMEA economies. These other sectors are:

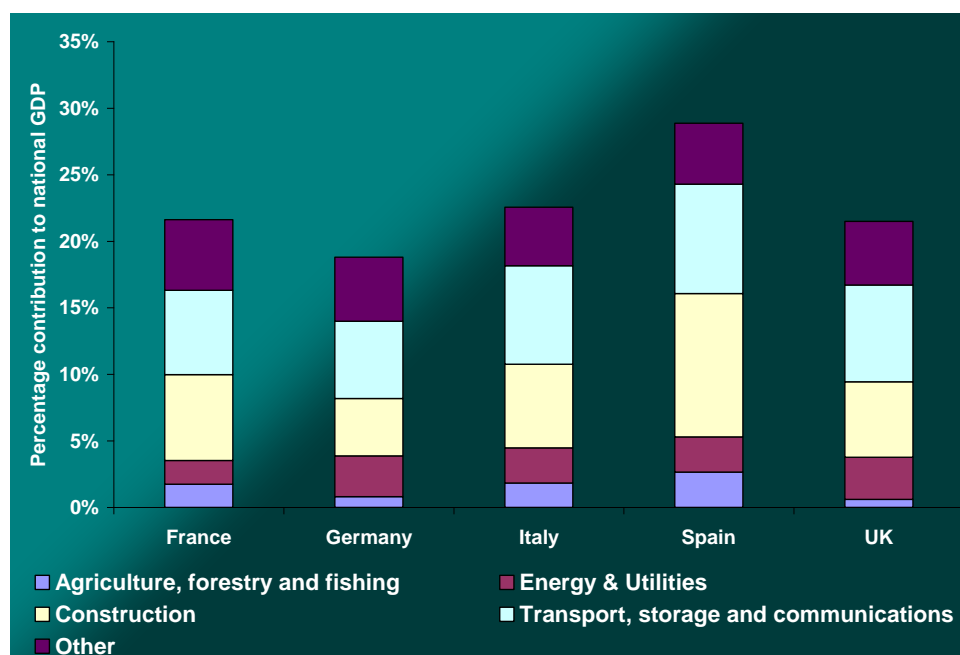
1. Agriculture, forestry & fishing;
2. Energy & utilities;
3. Construction;
4. Transport, storage & communications;
5. Other – a catch-all for other areas of the economy not captured by the broad sector breakdown.

The Section is also structured as outlined in subsection 1.3 above.

7.1 Size & importance of and prospects for the sector

The combined contribution of the other sectors to national GDP is illustrated in Figure 14 below for each of the five EMEA economies. The combined importance of these other sectors varies widely across the five EMEA economies, ranging from 18.8% in Germany to 28.9% in Spain. The contribution in France and the UK is 21.5% and slightly larger in Italy at 22.5%.

Figure 14: Percentage of GDP contributed individually and by the combination of the other aggregate industry sectors in each of the five EMEA economies, including breakdowns



Source: UK ONS, Eurostat and Cebr analysis

Figure 14 also illustrates the breakdown between these smaller sectors in each of the five economies. This shows that the construction and transport, storage & communications sectors are the largest contributors to national GDP of this subset of aggregate industry sectors. However, the energy & utilities sector is not an insignificant contributor, especially in Germany and the UK.

As most European governments seek to balance their budget deficits over the coming years, the outlook for these other sectors will be mixed.

Construction across Europe has received a temporary boost since the end of the recession in the fourth quarter of 2009, as projects delayed by liquidity constraints during the credit crunch were started once again. In the UK, construction contributed outperformed the manufacturing industry over the third and quarters of 2010, showing robust quarter-on-quarter growth of 7.0% and 3.9% respectively. However, the strong growth in the sector is unlikely to be sustainable as public spending cuts across all EU economies are phased in. The largest risk to the sector is the strength of the commercial and residential property market recovery which has been hampered by uncertainty surrounding fiscal consolidation and constraints in mortgage lending. This is particularly relevant to the Spanish economy, which experienced a significant property bubble which saw prices rise by an average of 189% between 1997 and 2007¹⁶. Spanish mortgage debt totals 103% of GDP, this compares to 84%¹⁷ in the UK, 39%¹⁸ in France, 25%¹⁹ in Italy and over the third quarter of 2010.

The latest construction output data show that the UK and Germany have recovered from the effects of the recession, growing year-on-year by 10.1% and 3.5% respectively over the third quarter of 2010²⁰. However, construction output in France and Spain remains weak as activity shrunk by 1.9% and 34.9% respectively. The prospect of interest rate hikes by both the Bank of England and the European Central Bank in response to commodity-price fuelled inflation may deal a significant blow to construction, as credit to procure and finance construction projects becomes scarce.

In the wake of the 2008 financial crisis, most households in Europe are continuing to reign in consumer spending in favour of making debt repayments on mortgages and bank loans. Weak consumer spending will inevitably lower growth in these other services, particularly in the **energy and utilities, and agriculture sectors** which have thus far benefited from rising energy and food prices. In the UK, food and energy prices have contributed 0.6 percentage points to the overall annual rate of inflation of 3.7% for December 2010. In the Eurozone, food and energy prices have added 1.0 percentage points to the overall annual rate of inflation of 2.2% for December 2010. The fairly subdued outlook for energy & utilities is illustrated in Figure 15 below.

¹⁶ Spanish Ministry of Housing (2007)

¹⁷ Bank of England – Lending to Individuals (November 2010)

¹⁸ Banque De France (October 2010)

¹⁹ Banco D'Italia (November 2010)

²⁰ Eurostat (January 2011)

Figure 15: Future outlook for energy & utilities



Source: UK ONS, Eurostat and Cebr analysis

We expect the increase in commodity and energy prices to mitigate as the emerging markets begin to increase monetary tightening through more capital controls and borrowing restrictions. As such, growth in the energy and utilities, and agricultural sectors will normalise over the course of the next few years – as commodity price growth eases and consumer spending remains weak.

Prospects in the **transport, storage and communications industry** are mixed, as major transport infrastructure projects continue to be funded, although maritime, rail and air passenger and freight volumes are only marginally higher than pre-recession levels. According to IATA, the International Air Transport Association, air passenger demand amongst Europe's carriers grew year-on-year by 7.3% in November 2010, however passenger volumes are only slightly ahead of recession levels of early 2008²¹. Air freight volumes remain significantly below pre-recession levels, as global trade has yet to fully recover from the 2008 financial crisis. European air freight volumes remain 12% below pre-recession levels. According to ATOC, the Association of Train Operating Companies, rail passenger volumes increased by 5.1% over the first six months of 2010 compared to the same period in 2009. Looking ahead, we expect passenger volumes to continue to increase as more rail and airport infrastructure projects are rolled out across Europe over the next few years – this will serve to support growth in the transport sector.

Specific government policy measures to increase competitiveness within the transport sector will play an important role in driving future economic growth in this sector. Specific policy measures include the UK Government's support of second-generation High-Speed Rail infrastructure projects, and funding of £560 million worth of local transport schemes which promote a low-carbon economy, and underpin sustainable economic growth²². The liberalisation of the European rail market in 2010 has opened up many opportunities for sustainable growth, as high-speed rail services between London, Frankfurt and Amsterdam serve to integrate markets and drive growth.

²¹ International Air Transport Association (December 2010)

²² Department for Transport - Local Transport White Paper (January 2011)

Overall, we expect Germany to have the strongest rate of growth, equal to 2.3% per year between 2011 and 2015, as a robust export mix and strong domestic demand have lessened exposure to cuts to fiscal consolidation. We expect UK growth to fall in 2010 and 2011, as the construction boom loses momentum, and weak consumer growth and public spending cuts weigh in on growth. The UK other services industry is forecast to grow at an annual rate of 1.3% between 2011 and 2015.

Spanish growth is expected to fall in 2011 as central and regional government spending cuts are implemented. Growth in other services in Spain is expected to be 1.9%. Italian growth in other services is expected to be lower than Spain average 1.6% between 2011 and 2015.

7.2 Current and prospective levels of cloud computing adoption

A period of fiscal consolidation and persistently high unemployment - averaging 10% across Europe, has suppressed the traditional consumer-led recovery post recession. The challenges for these other sectors lie domestically, rather than abroad – the financial services and manufacturing industries' fortunes are linked to the wider global economy.

Prospects for the transport, storage and communications industry look the most promising as the industry is already leveraging the cloud in significant volumes.²³ Recent developments in the transport sector include:-

- *“Other” business processes* – Other business processes refer to those in CRM, finance and accounting and procurement/supply management domain for BPO (Business Process Outsourcing). In response to the Emergency June 2010 Budget, the UK's Department for Transport has announced £90m of efficiency savings. A total of around 50% of the efficiency savings will be from outsourcing back office functions across finance, HR and procurement. The adoption of cloud technologies
- *Bespoke travel cloud service platforms* – Transport for London (TfL) and Microsoft have launched the TfL TrackerNet – an online Developers' Area containing free travel information for mobile phone apps producers on a Windows Azure Cloud platform. The technology enables users to update existing and produce new apps to give passengers a selection of methods to check their journeys whilst in transit. Scalable and strategic cloud service platforms within transport have the potential to be adopted by many developers who service a passenger market of millions every day.

Prospects for the energy and utilities sector are as favourable as in the transport sector. Recent developments in both the energy and utilities, and transport sector include:-

- *Green cloud computing* – According to Gartner, cloud computing can potentially reduce energy consumption by as much as 80% through the online migration of data centers. In the UK, the transport and communications sector has overtaken the manufacturing sector as the second-largest emitter of CO₂ after the energy and utilities sector. The transport sector accounts for around 25% of all CO₂ emissions, emitting around 131 million tonnes of CO₂ every year²⁴. In addition, cloud computing can develop platforms which help passengers and operators efficiently manage transport networks and the associated CO₂ emissions, of which road transport accounts for around 90%. The Government's Carbon Emissions Reduction Target (CERT), seeks to reduce greenhouse gas emissions 80% below 1990 levels by 2050, cloud computing adopted at a

²³ Gartner – Forecast: Public Cloud Services, Worldwide and Regions, Industry Sectors, 2009-2014 (June 2010)

²⁴ Department for Energy and Climate Change (March 2009)

nationwide level could contribute significantly to reducing businesses carbon footprint over a short period of time.

The following potential developments are relevant to the energy and utilities sector only:-

- *Closed private clouds* – Closed private clouds are used by a single organisation exclusively. Organisations with highly proprietary or regulated data will require extremely high computing and storage requirements²⁵. These would include large government agencies, financial and pharmaceutical firms, and major energy companies.

In comparison to the transport and energy sectors, prospects in the construction and agriculture are not so favourable. Both construction and agriculture have the lowest IT spend as a share of total annual turnover at 1.8% and 2.3% in the UK respectively, this compares to an economy-wide average of 3.4%²⁶. However recent developments in these sectors worldwide have included:-

- *Business administration and farm management solutions* – Fujitsu have recently launched a set of cloud computing services to support businesses in Japan’s agricultural industry²⁷. The services seek to improve business management, farm production and customer relations. The cloud services’ farm management solution tracks productivity and assists with food safety. A similar approach to farming can be taken in the Europe, where the EU’s Common Agricultural Policy (CAP) currently subsidises producers in order to ensure food security.
- *Construction project management solutions*– Investing in the cloud allows contractors to improve communication with project participants. Cloud computing, through Software-as-a-Service (SaaS) has allowed the construction industry to efficiently manage projects and reduce costs. SaaS allows project participants to have access to real-time changes – which are particularly apt for construction project teams that make non-fungible capital outlays based on the information to hand.

7.3 Sector-level macroeconomic economic benefits of cloud computing

The sector-level macroeconomic benefits of cloud computing for the remaining aggregate industry sectors are shown below, for each country (and EMEA in aggregate) and for each cloud model.

²⁵ Cloudscape – Cloud Codex (October 2009)

²⁶ PwC – Why Isn’t IT Spend Creating More Value (June 2008)

²⁷ Fujitsu - <http://www.fujitsu.com/global/news/pr/archives/month/2010/20100405-02.html> (April 2010)

Table 20: Sector-level macroeconomic benefits of cloud computing by cloud model and by country, cumulative 2010-2015

Aggregate total for the other sectors							
Cloud Model	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Private	9,735	12,225	8,217	8,627	6,654	5,678	45,458
Hybrid	11,909	13,811	10,672	9,093	6,109	5,213	51,595
Public	9,459	10,017	7,625	7,071	4,047	3,453	38,218
Total	31,103	36,052	26,515	24,792	16,810	14,343	135,271

Source: Cebr analysis

At the EMEA level, the predicted €135 billion of benefits predicted for this sector constitutes a 18% share of the total EMEA benefits. This ranges from between 14% in the UK to as high as 22% in Spain. From these sectors, therefore, are expected to flow a disproportionately small share of the benefits of cloud computing relative to the aggregate importance of the sectors to the national economies.

For these sectors, the benefits are fairly evenly distributed between the cloud models. Benefits flowing through hybrid clouds are expected to be highest in all countries, except the UK, where private clouds generate the greatest dividend.

7.4 Comparative analysis across the five EMEA economies

The breakdown of the aggregate benefits across this collection of sectors into the constituent benefits is shown for each country in Table 21 below.

Table 21: Sector-level macroeconomic benefits of cloud computing by constituent benefit and by country

Total other sectors							
Benefits	France	Germany	Italy	Spain	UK		EMEA
	€M	€M	€M	€M	€M	£M	€M
Business development opportunities	2,870	3,103	2,173	2,010	2,075	1,770	12,231
Business creation	10,754	11,912	9,186	8,792	4,005	3,418	44,650
Net total cost savings of which:	3,069	3,766	2,598	2,517	3,149	2,687	15,098
-IT CapEx savings	3,859	4,091	2,876	2,475	2,732	2,331	16,033
-IT OpEx savings	1,738	1,870	1,288	1,166	1,326	1,131	7,388
-IT OpEx savings (power and cooling)	983	971	715	680	632	540	3,980
-Additional cloud expenditure (PAYG)	-3,510	-3,166	-2,281	-1,804	-1,542	-1,316	-12,304
Indirect GVA	14,410	17,272	12,557	11,472	7,581	6,469	63,292
Total Economic Benefit	31,103	36,052	26,515	24,792	16,810	14,343	135,271
Direct and indirect employment (000s)	100.68	157.59	100.73	95.12		65.31	519.42

Source: Cebr analysis

The key drivers of cross-country differences in each of these constituent benefits are outlined as follows:

- *Business development opportunities:* we used similar macroeconomic indicators from the UK Office for National Statistics and other sources to estimate what these sectors could achieve in terms of unexpected peak demand management and through productivity enhancements. For example, for energy & utilities, we used the Electricity, Gas & Water supply index of output. Each of these sectors were found to have achievable mid-level increases in total output through better seasonal demand management and mid-level productivity gains due to faster time-to-market, IT scalability etc. As such, the business development benefits flowing through these other sectors are modest relative to the other constituent benefits.
- *Business creation benefits:* see the same part of subsection 3.4 above.
- *Net total cost savings:* we found that businesses in these other sectors have relatively low IT budgets as a proportion of total turnover, except perhaps transport, storage & communications. These sectors have mid-level IT CapEx to total IT budget ratios, where the greatest savings from cloud adoption are to be had. These factors, combined with the size and importance of these sectors and the projected lower levels of adoption, produce relatively modest (yet not insignificant) net total cost savings.
- *Multiplier and employment impacts:* the multiplier and employment impacts for this sector are largely driven by the magnitudes of the creation benefits. Differences in assumed national household savings rates, and in how the sector balances the interests of its intermediate suppliers, its employees, shareholders and customers also play a role.

Appendix – Breakdown of sectors

Industry verticals for France, Germany, Italy, Spain and the United Kingdom have been constructed using the United Kingdom Standard Industry Classification (SIC 2003) of Economic Activities and EUROSTAT System NACE. The table below provides a breakdown of each industry vertical into each of its constituent sectors and summarises the economic activities related to each specific industry.

Banking, financial & business services

Financial Intermediation

- Banking*
- Insurance and Pension Funding*
- Activities Auxiliary to Financial Intermediation*

Real Estate, Renting and Business Activities

- Real Estate Activities*
- Renting of Machinery and Equipment Without Operator and of Personal and Household Goods*
- Computer and Related Activities*
- Research and Development*
- Other Business Activities including accounting, legal and management consultancy activities*

Government, education & health

Public Administration and Defence; Compulsory Social Security

- Administration of the State and the economic and social policy of the community*
- Provision of services to the community as a whole*
- Compulsory social security activities*

Education

- Primary education*
- Secondary education*
- Higher education*
- Adult and other education*

Health and Social Work

- Human health activities*
- Veterinary activities*
- Social work activities*

Distribution, retail & hotels

Wholesale and Retail Trade

- Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Automotive Fuel
- Wholesale Trade And Commission Trade, Except Of Motor Vehicles And Motorcycles
- Retail Trade, Except of Motor Vehicles and Motor-cycles; Repair of Personal and Household Goods

Hotels and Restaurants

- Hotels
- Camping sites and other provision of short-stay accommodation
- Restaurants
- Bars
- Canteens and catering

Manufacturing

Manufacturing Subsections

- Manufacture of Food Products, Beverages and Tobacco
- Manufacture of Textiles and Textile Products
- Manufacture of Leather and Leather Products
- Manufacture of Wood and Wood Products
- Publishing, Printing and Reproduction of Recorded Media
- Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel
- Manufacture of Chemicals, Chemical Products and Man-made Fibres
- Manufacture of Rubber and Plastic Products
- Manufacture of Other Non-metallic Mineral Products
- Manufacture of Basic Metals and Fabricated Metal Products
- Manufacture of Fabricated Metal Products, Except Machinery and Equipment
- Manufacture of Electrical and Optical Equipment
- Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks
- Manufacture of Other Transport Equipment
- Manufacturing Not Elsewhere Classified

Other sectors

Agriculture, forestry & fishing

- Agriculture, Hunting and Related Service Activities
- Fishing

Energy & Utilities

- Electricity, Gas, Steam and Hot Water Supply
- Collection, Purification and Distribution of Water
- Mining and Quarrying of Energy Producing Materials

Construction

- Site preparation
- Building of complete constructions or parts thereof; civil engineering
- Building installation
- Building completion
- Renting of construction or demolition equipment with operator

Transport, Communications & Storage

- Land Transport; Transport Via Pipelines
- Water Transport
- Air Transport
- Supporting and Auxiliary Transport Activities; Activities of Travel Agencies
- Post and courier activities
- Telecommunications

Other Community, Social and Personal Service Activities

- Sewage and Refuse Disposal, Sanitation and Similar Activities
- Activities of business, employers and professional organisations
- Recreational, Cultural and Sporting Activities
- Other Service Activities