Assessing Cloud Readiness: Introducing the Magic Matrices Method Used by Continental AG

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Abstract. Whereas recently cloud computing has gained enormous interest in research and practice, the deployment of cloud computing in larger companies and multi-nationals is still in its infancy. Practice often lacks a sufficiently specific, yet applicable method to determine a company's cloud readiness and to identify and assess IT services to be taken to the cloud. This paper introduces such a field-tested method for assessing a multi-national's cloud readiness. Beginning with Continental's expectations towards cloud computing, the paper presents the Magic Matrices Method applied by Continental. The paper discusses the suitability of the method for research and practice. It concludes that the trend towards cloud computing may lead to easing assessment regarding the most critical stumbling blocks along the lines of compliance, security, and hence user control.

Keywords: Cloud Computing, Cloud Readiness, Assessment Method, Practitioner Experience, Compliance Risks

1 INTRODUCTION

Cloud computing recently has gained enormous interest in research and practice (e.g., Armbrust et al. 2010, Erdgomus 2009; European Commission 2010; Ramireddy

et al. 2010; Weinhardt et al. 2009). Even the lack of a generally agreed upon definition and at the best imprecise delineations from related concepts such as off-shoring and internal sourcing have not slowed down the growth of companies such as salesforce.com, who very successfully ride the cloud computing wave. However, the deployment of cloud computing among larger companies and even multi-nationals is still in its infancy. For this to change, companies look for clear assessments methods concerning the appropriateness of cloud computing for their IT services.

Any significant cloud computing diffusion into the corporate world requires potential user companies to evaluate the value and opportunities as well as the challenges and threats of cloud computing. User companies need a method to assess cloud-readiness. The method needs to be simple enough to make its application feasible in parallel to ongoing business activities. It also needs to be sufficiently complex in order to take into account the multitude of a company's IT services and the various types of cloud computing.

Here this paper aims to make a contribution. It offers a practitioner experience report of a large cloud user company, who has developed a method for assessing a multi-national's readiness for cloud computing, or – in brief – it offers *a method for assessing a multi-national's cloud readiness* helping to answer "what company specific conditions have to be created for which form of cloud computing fulfilling the expectations for which precisely defined application field?" (Thomas, Ullrich 2011).

After outlining the concept of cloud computing, the paper introduces the Magic Matrices Method for assessing a company's cloud readiness as it has been applied by Continental AG, one of the world's leading automotive suppliers. The paper concludes with a short discussion of the applicability of the method and closes with an outlook to further research at the edge between scientific rigor and practitioners' relevance.

2 COMPANY OVERVIEW: CONTINENTAL AG

Continental AG, founded in 1871 in Hanover, Germany, is a leading global automotive supplier and the second largest in Europe. In 2010, Continental counted approximately 149,000 employees at nearly 190 locations in 46 countries for research and development as well as production. The company achieved sales of about € 25.5 Billion with an adjusted Earnings Before Interest and Taxes (EBIT) margin of about 9.5 %.

With its six divisions – Chassis & Safety, Powertrain, Interior, Passenger and Light Truck Tires, Commercial Vehicle Tires, and ContiTech – Continental is a driving force for future mobility concepts, in the automotive industry and beyond. Most of its business units hold leading competitive positions. For example, they are number one worldwide for hydraulic brake systems, driver assistance systems, sensor technology, airbag control units, air suspension systems, telematics, vehicle instrumentation, and fuel supply systems; and they are number two for electronic brake systems and brake boosters. In the tire sector, Continental ranks fourth worldwide and is the market

leader in Europe in passenger and light truck tires and industrial tires. With the acquisition of Motorola's automotive-electronics unit in 2006, Continental added telematics to its portfolio and strengthened its position. In 2007, the acquisition of 'Siemens VDO Automotive AG' led the company into the global top five of automotive suppliers.

The Chief Technical Officer (CTO) and the Chief Security Officer (CSO) leading the cloud readiness project are responsible across divisions and located on corporate-level, from where they reach into all business units and govern company-wide IT decisions.

In the past, about 40,000 IT users coming from the Siemens VDO acquisition had to be integrated among others into a common e-mail system. They were familiar with Outlook Exchange whereas Continental has been using Lotus Notes Domino. Would mailbox services 'from the cloud' have allowed for smooth and cost-efficient integrated mailbox services, as cloud service providers promise?

3 CLOUD COMPUTING: CONTINENTAL'S DEFINITION AND UNDERSTANDING

According to Wikipedia (Feb. 2011), cloud computing refers to "location-independent computing, whereby shared servers provide resources, software, and data to computers and other devices on demand, as with the electricity grid. Details are abstracted from consumers, who no longer have need for expertise in, or control over, the technology infrastructure 'in the cloud' that supports them." Whereas this definition is rather vague and certainly only one of many[1], it serves first communication needs of practice. Continental uses a similarly broad approach and conceptualizes cloud computing by what it demands from 'the cloud', that is, Continental requires services coming from the cloud *as highly standardized, automatically provisioned, and on-demand available IT services in a clearly defined and measurable quality, with any options for up- and downscaling and usage dependent charging from more than one provider*. Continental stresses the two-sided phenomenon 'on demand'. It understands 'on demand' as 'pay per use', which also implies no payment if not used or in more system oriented terms, the option to scale down service use on short term notice.

While such broad definition helps to motivate further discussions on the pros and cons of cloud computing, assessing a company's cloud readiness requires a more precise understanding of the kind of cloud services under consideration. To that end, Figure 1 shows three relevant dimensions of cloud computing that Continental feeds into its cloud readiness assessment. Almost any combination of Location Model,

[1] Gartner Group (e.g., www.gartner.com/technology/initiatives/cloud-computing.jsp) defines cloud computing as a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service to external customers using Internet technologies. Forrester Research (e.g., Staten 2009) defines cloud computing as a standardized IT capability (services, software, or infrastructure) delivered via the Internet in a pay-per-use and self-service way.

Deployment Model, and Service Model is possible and likely leads to different assessments regarding the cloud readiness of specific Continental IT services.

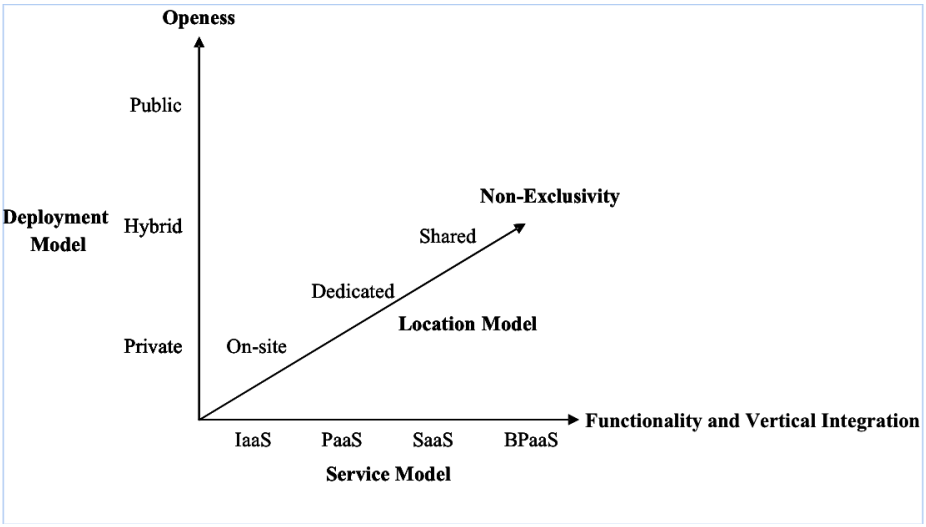

Fig. 1. Dimensions of Cloud Computing (Source: Thomas; Ullrich 2011)

In Figure 1, the dimension *'Location Model'* should be self-explanatory; obviously, some locations are bound to the deployment model chosen.

On the dimension *'Deployment Model'* (Figure 1), the Economies of Scale (EoS) increase from a Private Cloud via a Hybrid Cloud to a Public Cloud, whereas the adaptation options and the controllability decrease.

- *A Private Cloud* relates standardized, virtualized, and effective manageable IT environment based on cloud design criteria which offers services for defined user groups, typically within an organization or organizational unit, under customer control.
- *A Hybrid Cloud* points to the interconnections between on-premise IT, private deployments models, and public ones. The overall responsibility stays with the customer; the responsibility for the operations is typically shared.
- *A Public Cloud* denotes the offering of highly standardized and scaleable services on a pay-per-use model. The same infrastructure, accessed via Internet technology, is used in parallel by users from different organizations. Exclusive or dedicated delivery models are typically organized using logical segmentation methods like multi-tenancy. Owner and operator are external service providers.

Table 1 depicts Continental's comparison of the three different cloud deployment models – private, hybrid, and public – according to nine criteria, namely security (archiving and privacy), degree of integration, cost-benefit analysis, risk transparency, financial / investment needs, transparency (data storage and access), control over data, scalability, and flexibility.

This rough assessment demonstrates that any subsequent 'cloud readiness assessment of specific IT services in the end also need to be evaluated specifically in the context of the delivery model chosen. However, most of the cloud readiness assessment at this stage is centered on the concept of the 'public cloud'.

Table 1. Exemplary Assessment of Deployment Options per IT Service (Source: Thomas; Ullrich 2011)

	Private Cloud	**Hybrid Cloud**	**Public Cloud**
Security (Archiving, Privacy)	++	+	O
Degree of Integration	++	+	O
Cost-Benefit Analysis	O	+	++
Risk Transparency	++	+	O
Financial / Investment Needs	O	O	++
Transparency (Data Storage, Data Access)	++	+	O
Control Over Data	++	+	O
Scalability	O	+	++
Flexibility	O	+	++

The dimension *'Service Model'* (Figure 1 and Figure 2) has been conceptualized to integrate an always larger scope of service.

- *Infrastructure as a Service (IaaS)* refers to on demand provisioning of computing power and storage resources, delivered from highly standardized and mostly virtualized infrastructure with automated systems management. Amazon.com would be an example provider.
- *Platform as a Service (PaaS)* points to shared development and runtime platforms, programming, testing, and management environments, which are provided as an integrated or optional service for the system integrated collaboration of system architects and software developers. Google would be an example provider.
- *Software as a Service (SaaS)* denotes shared software services, including all necessary IT resources (e.g., infrastructure, systems management, application management and maintenance), accessible by Internet technology and network connection, and accounted for billing unit. A prominent provider would be salesforce.com.
- *Business Processes as a Service (BPaaS)* relates to business process operations as a combination of software services and functional services - prevailing for HR processes.

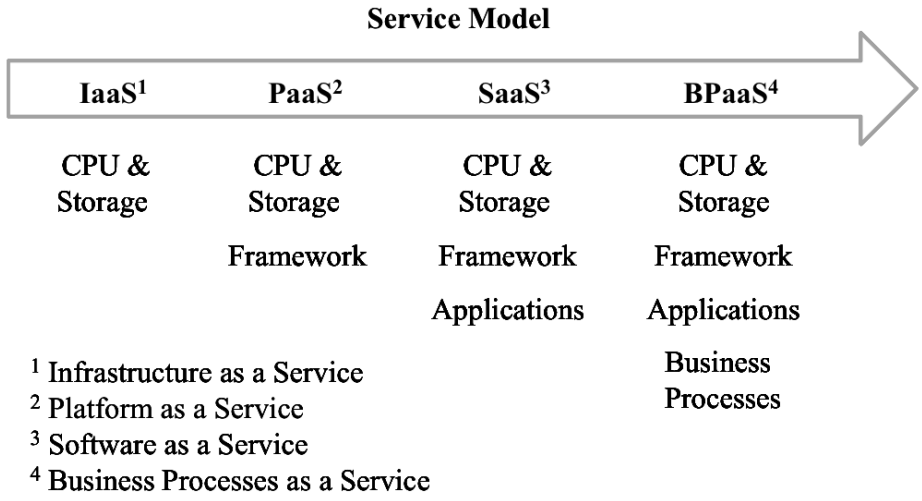

Fig. 2. The Service Model Dimension of Cloud Computing

This conceptualization of cloud computing serves Continental's needs. Alternatively one could also assess cloud readiness for individual services, i.e., exclude CPU and applications when taking business processes from the cloud. Continental's understanding of cloud computing, which stresses the need for IT services and applications to be available in a flexible and on-demand manner and in a clearly defined and measurable quality, requires comparing cloud computing with other delivery models. Continental lists commonly – and often similarly – named delivery characteristics of cloud computing and grouped those characteristics according to their perceived importance to Continental (Table 1, column 2).

It then checked whether other traditional delivery modes would promise similar performance characteristics (Table 1, columns 3, 4, and 5). It made the case for further pursuing cloud computing and specifying a method for assessing its IT services regarding cloud readiness. Being aware that such brief analysis can only provide rough estimates rather than detailed comparisons, which would require detailed definitions, service requirements, and contracts, it serves Continental's upfront need to gain insights into the potential of cloud computing.

Table 2. Comparison of Cloud Computing to other Delivery Modes and Attractivity Profile (Source: Continental AG)

Cloud Delivery Characteristics	**Importance of Charac-teristics for Continental**	**Cloud Delivery Characteristics Shown by Other Traditional Delivery Models**		
		Out-Tasking Models	**Off-Shoring**	**Internal Sourcing**
Service Level Quality	++	x		
On-Demand	++	(x)		
Pay per Use	++	(x)		
Always-on Availability	+	x	(x)	(x)
Scalable w/ Growth and Reduction	+	(x)	x	
Supplier Market	+	x		
Easy to Obtain	+			x
Fast Availability	+			(x)
Standardized	+			
Dynamic	O	x	(x)	x
Customer Market	O			
Flexible	O			

Legend: ++ = very important, + = important, O = neutral
x = shows characteristic; (x) = barely shows characteristic

4 THE MAGIC MATRICES METHOD FOR ASSESSING CLOUD REDINESS

In December 2010, Continental started its 'Cloud Readiness Project' in order to develop and apply a customized assessment method for investigating selected, but rather specific IT services, applications, and processes (in the following just 'IT services') with respect to their cloud readiness. The resulting Magic Matrices Method is based on the persuasion that the IT landscape in no larger company will be completely 'cloud ready'.

The method consists of three main steps, Identification, Screening, and Categorization. The novelty lies in the approaches to screening and categorization. In the following, we will briefly outline the main steps.

Identification. Continental organized several workshops with management, employees, technology providers, and an external service provider in order to increase the internal motivation for cloud computing and to subsequently identify some IT services for further investigation. It has become obvious that mainly commodity like IT services and applications would be at the core of early cloud computing initiatives. The first Identification phase ended with 29 IT services to be investigated in the light of cloud promises.

Screening. Continental has identified seven overall criteria to assess the cloud readiness of an IT service. The seven criteria are (1) Core Business / Competitive Position, (2) Importance / Availability, (3) Standardization, (4) Degree of Distribution within Continental, (5) Network Connectivity, (6) Identity Management, and (7) Compliance. For each criterion, Continental has developed a 'Magic Matrix' (Figure 3), which allows digging deeper into two major parameters of any criterion (Figure 4). All seven Magic Matrices are designed so that the upper right area within a matrix is the most cloud promising one.

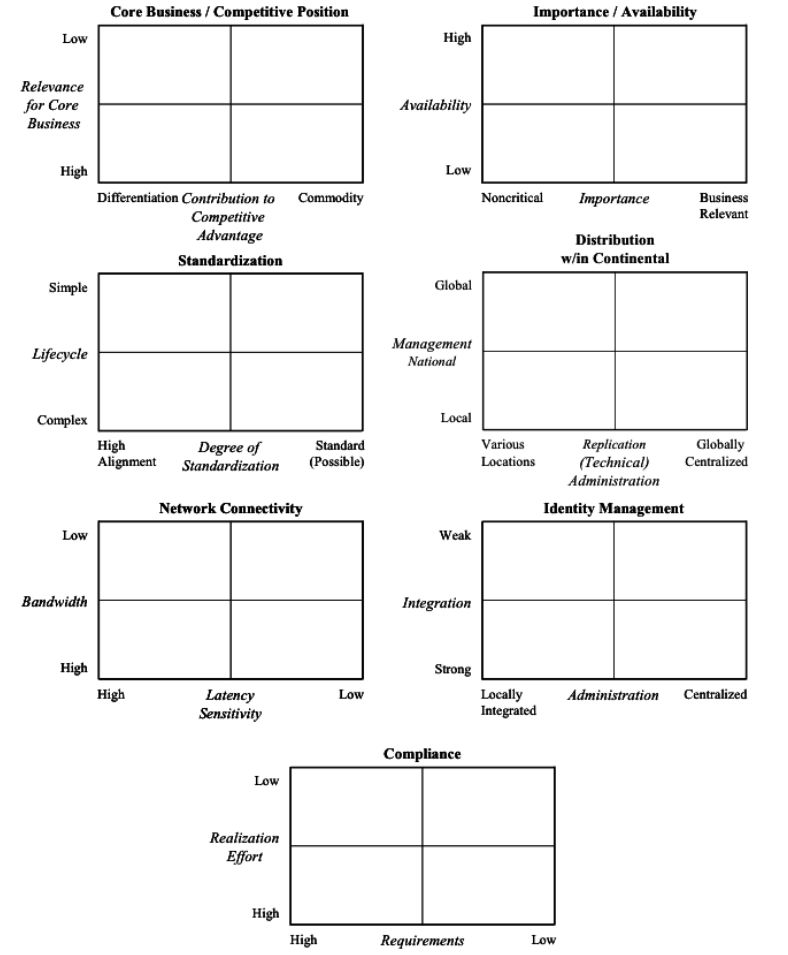

Fig. 3. Cloud Computing Assessment Criteria - Magic Matrices Details

Core Business / Competitive Position

Relevance for the Core Business (high – low). Relevance of an IT service is high if the service (significantly) contributes turnover and rents.

Contribution to the Competitive Position (differentiation – commodity). Contribution is high if an IT service helps differentiating in terms of innovations, business process speed, and agility.

Tendency for Cloud Readiness. An IT service with low relevance for the core business and a low contribution to the competitive position (differentiation) is likely to be cloud ready.

Importance / Availability

Importance (non-critical – critical). Importance is critical if core processes cannot run if the IT service is not available.

Availability (low – high). Availability is high if the IT service can be used 365/24 without interruptions.

Tendency for Cloud Readiness. An IT service that requires high availability and is of critical importance for core business processes is likely to be cloud ready.

Standardization

Lifecycle (complex – simple). An IT service with strong integration into other systems and many dependencies to other processes is complex. Its actualization requires intense planning and coordination.

Standardization (high alignment – standard). Standardized IT services are not adapted to the company needs.

Tendency for Cloud Readiness. A standardized IT service with simple lifecycle is likely to be cloud ready.

Degree of Distribution within Continental

Management (local – global). Locally organized management tasks related to an IT service have no central administrative structures. Roles and rights differ among locations.

Replication (Technical) Administration (various locations – globally centralized). Hard- and software are centrally provided and configured.

Tendency for Cloud Readiness. An IT service with global management and global technical administration is likely to be cloud ready.

Network Connectivity

Bandwidth (high – low).

Latency / Sensitivity (high – low).

Tendency for Cloud Readiness. An IT service with low bandwidth requirements and low latency / sensitivity is likely to be cloud ready.

Identity Management

Integration (strong – weak). Integration is low if an IT service has its own identity management and is independent of the identity directory of the company / enterprise.

Administration (locally integrated – centralized). Administration is centralized if the provisioning and de-provisioning of users follows central guidelines including conventions for naming and security.

Tendency for Cloud Readiness. An IT service with weakly integrated and centrally administrated identity management is likely to be cloud ready.

Compliance

Realization Effort (high – low). Realization efforts are high if extensive organizational and technical provisioning is to be fulfilled.

Requirements (high – low). Requirements are high if the processed data need to match strict legal and regulatory standards. Company-specific standards also increase requirements.

Tendency for Cloud Readiness. An IT service with low realization efforts and low compliance requirements is likely to be cloud ready.

Fig. 4. Assessment Criteria: Two parameters and General Tendency for Cloud Readiness (After: Thomas, Ullrich 2011).

Having designed the seven Magic Matrices, all IT services under consideration are placed in each of the Magic Matrices. Figure 5 provides an idea of ten IT services in the Magic Matrix of Standardization.

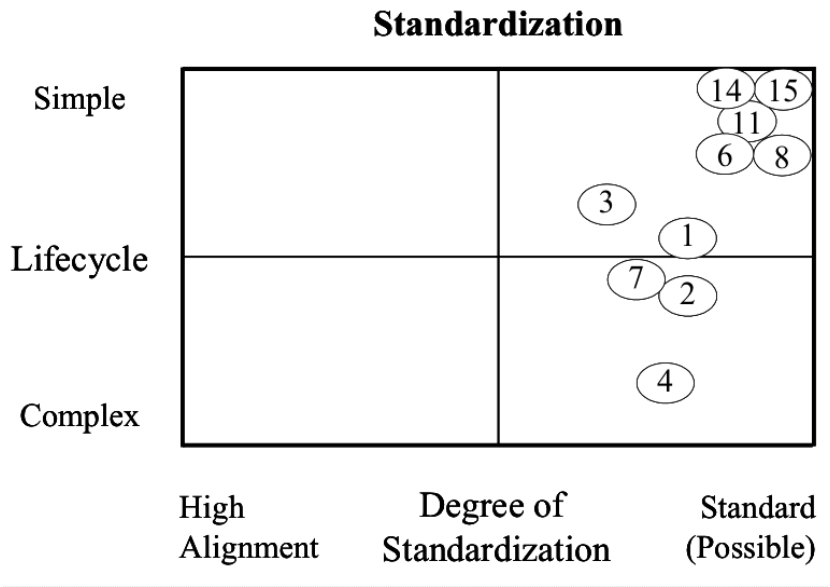

Fig. 5. Positioning of IT Services and Applications in a Magic Matrix (Example)

Continental then aggregates the assessment for each of the seven assessment criteria (Magic Matrices) in the resulting Criteria Assessment Framework (Figure 6). To enhance readability, the diagram of the Criteria Assessment Framework shows a rather general labelling of the two axes. Each criterion is assessed across all IT services based on its specific parameters shown in Figure 3 in order to the adequate position in the Criteria Assessment Framework.

Starting with one criterion, for instance Standardization (C), Continental adds up the assessments of the Magic Matrix of Standardization in Figure 3 across all services and applications. Thus it determines the positioning of Standardization (C) in Figure 6. It then repeats the procedure for the other six criteria, and positions all of them together in one Criteria Assessment Framework.

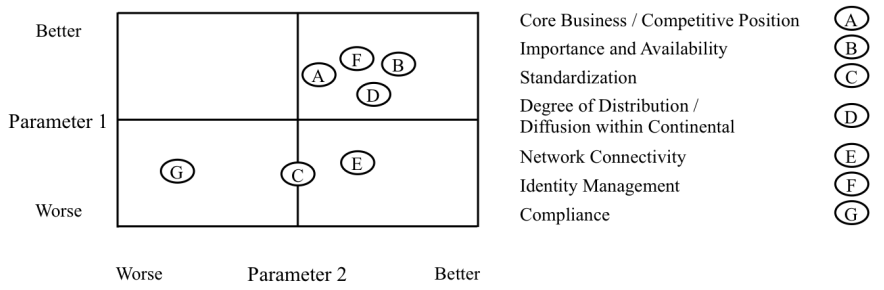

Fig. 6. Cloud Computing: Criteria Assessment Framework

At the end of the Screening phase, Continental found the criteria 'Compliance' and 'Distribution within Continental' to be most frequently (i.e., for 9 and 8 services respectively of 29 services screened) in the critical area of the matrices. 'Standardization' and 'Network Connectivity' ended up in the critical areas for six and five services respectively, and finally 'Importance / Availability', 'Identity Management' and 'Core Business / Competitive Position' for four or three of 29 services.

Categorization. Refocusing on the cloud readiness of Continental's IT services, Continental builds on the Screening Phase, i.e., on the assessed criteria for cloud readiness. It investigates all 29 identified IT services according to the seven criteria. It takes into account the relative importance of the criteria as determined in the Screening phase and categorizes the 29 IT services into A (likely could ready), B (not yet cloud ready), and C (unlikely to be assessed as cloud ready in the next years).

Fifteen of 29 IT services resulted as 'likely cloud ready' (Thomas, Ullrich 2011). These IT services are (1) Intranet (CMS), (2), Internet (CMS), (3) Messaging, (4) Online Collaboration, (5) Office, File Viewer, (6) Internet Access Gateway, (7) DMZ[2] Service, (8) Internet Mail Gateway, (9) Managed Server, (10) Archiving, (11) Managed User Workstation, (12) Patch Management, (13) Virus Protection Management, (14) Vulnerability Management, (15) IT Service Manager Tool

5 DISCUSSION AND OUTLOOK

As a large multi-national, Continental acts in global, competitive markets where IT services have been the backbone for most distributed business processes. Many IT services have reached commodity status; hence, they should be assessed in light of a 'cloud movement' gaining speed across business sectors and countries. Just pointing to the commonly accepted trade-off between resource allocation and cost-benefit

[2] A DMZ, or demilitarized zone, is the physical or logical sub-network that exposes Continental's external services to the Internet.. It adds an additional security layer to Continental's internal network.

advantages on the one hand and still open compliance and security issues on the other hand does not contribute to moving in any direction.

The Magic Matrices Method introduced in this paper has served as effective eye-opener, especially as numerous IT services under investigation have come out in the 'no-cloud' area. Typically, compliance issues drive such positioning. The CIO and the IT department as well as division managers fear that hosting crucial data or key IT services in the 'cloud' would make them vulnerable to external threats or data corruption. For Continental, compliance issues complemented with concerns regarding security and process control and availability issues are the greatest obstacles to a more extensive move towards the cloud.

The Magic Matrices Method for assessing the cloud readiness of a user company's IT services certainly has conceptual weaknesses and open ends. Assessment criteria partially overlap and there are no ex-ante assigned weights to the different criteria. However, those shortcomings foster the application of the method in the real world towards properly assessing cloud readiness and then selectively adopting cloud computing. Thus the proposed method may trigger company-wide discussions and change initiatives on the path to cloud readiness.

At first sight, the Magic Matrices method may resemble Gartner's Magic Quadrants (Blechar 2008; Elliot, Blood 2009, Smulders 2011, www.gartner.com/it/products/mq/mq_ms.jsp). The design of the figures and graphs may seem familiar. However, Gartner's Magic Quadrants are typically applied for evaluating providers (vendors) to deliver a specific service to a specific company. With the proposed Magic Matrices Method instead, we assess IT services – potentially to be 'procured' from cloud vendors.[3] Selecting the most suitable provider or providers for 'likely cloud ready' IT services follows the application of the Magic Matrices Method. To that end, a company may use a version of Gartner's Magic Quadrants. The purpose, the criteria, and the parameters would be different, though.

In the first half of 2011, ongoing work at Continental covers exactly that issue. For each or all of the selected IT services, Continental needs to find a 'cloud service provider' that is 'ready for Continental' – this could be where Gartner's Magic Quadrants may come into play, adding another x matrices or quadrants to the picture.

The future will show whether current rather 'cloud critical' assessments in the real user world will remain dominant and whether the diffusion of cloud computing will remain limited. Alternatively, laws and regulations as well as a company's perception of compliance requirements may change. Perhaps, rather sooner than later, procuring IT services from the cloud will be as 'normal' as it is for energy and communication services. We hope that the presented method and any subsequent debate will stimulate further research into the problem.

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[3] In addition to consultancy white papers and reports, one also finds quadrants and matrices in the scientific IS literature. Two-by-two matrices are far from rare. For instance, Farbey et al. (1992) suggest a method for evaluating IT investments, which contains several 'matrices' (pp. 117-119). Further, the phenomenon of the wide-spread use of Gartner's Magic Quadrants has entered the IS literature. Pollock and Williams (2009) investigate the role that industry analysts like Gartner, with such widely used tools such as the Magic Quadrants, have on developing and mobilizing technology procurement markets.

REFERENCES

Armbrust, M., Fox, A., Griffith, R., Joseph, A., Katz, R., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., Stoica, I., Zaharia, M. 2010. "A View of Cloud Computing", Communications of the ACM, 53(4), 50-58.

Blechar, M. 2008. "Magic Quadrant for Business Process Analysis Tools", Gartner Report, ID G00161090.

Erdogmus, H. 2009. "Cloud Computing – Does Nirvana Hide behind the Nebula?", IEEE Software, 26(2), 4-6.

Elliot, B., Blood, S. 2009. "Magic Quadrant for Unified Communications", Gartner Report, ID G00169996.

European Commission 2010. The Future of Cloud Computing: Opportunities for European Cloud Computing Beyond 2010, Expert Group Report, Jeffery, K., Neidecker-Lutz, B. (eds.).

Farbey, B., Land, F., Targett, D. (1992) "Evaluating Investments in IT", Journal of Information Technology, 7, 109–122.

Pollock, N., Williams, B, (2009) "The Sociology of a Market Analysis Tool: How Industry Analysts Sort Vendors and Organize Markets", Information and Organization, 19(2), 129-151.

Smulders, C. 2011. "Magic Quadrants and Market Scopes: How Gartner Evaluates Vendors within a Market", Gartner Report, www.gartner.com/DisplayDocument?doc_cd=154752, accessed on May 05, 2011

Ramireddy, S., Chakraborthy, R., Raghu, T. 2010. "Privacy and Security Practices in the Arena of Cloud Computing", in Proceedings of the 16th Americas Conference on Information Systems (AMCIS 2010), August 12-15, Lima, Peru.

Staten, J. 2009. "Cloud Computing for the Enterprise", Forrester Research Presentation, www.forrester.com/imagesV2/uplmisc/CloudComputingWebinarSlideDeck.pdf, accessed on May 05, 2011.

Thomas, B., Ullrich, T. 2011. Cloud-Readiness – Continental IT Corporate Infrastructure & Security Strategy (based on Cloud Readiness at Continental AG Presentation developed by Krings, K., Dalbert, U., Workshop 'eco – Verband der deutschen Internetwirtschaft e.V.', Cologne, Germany, February.

Weinhardt, C., Anandasivam, A., Blau, B., Borissov, N., Meinl, T., Michalk, W., Stoesser, J. 2009. "Cloud Computing – A Classification, Business Models, and Research Directions", Business & Information Systems Engineering, 1(5), 391-399.

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