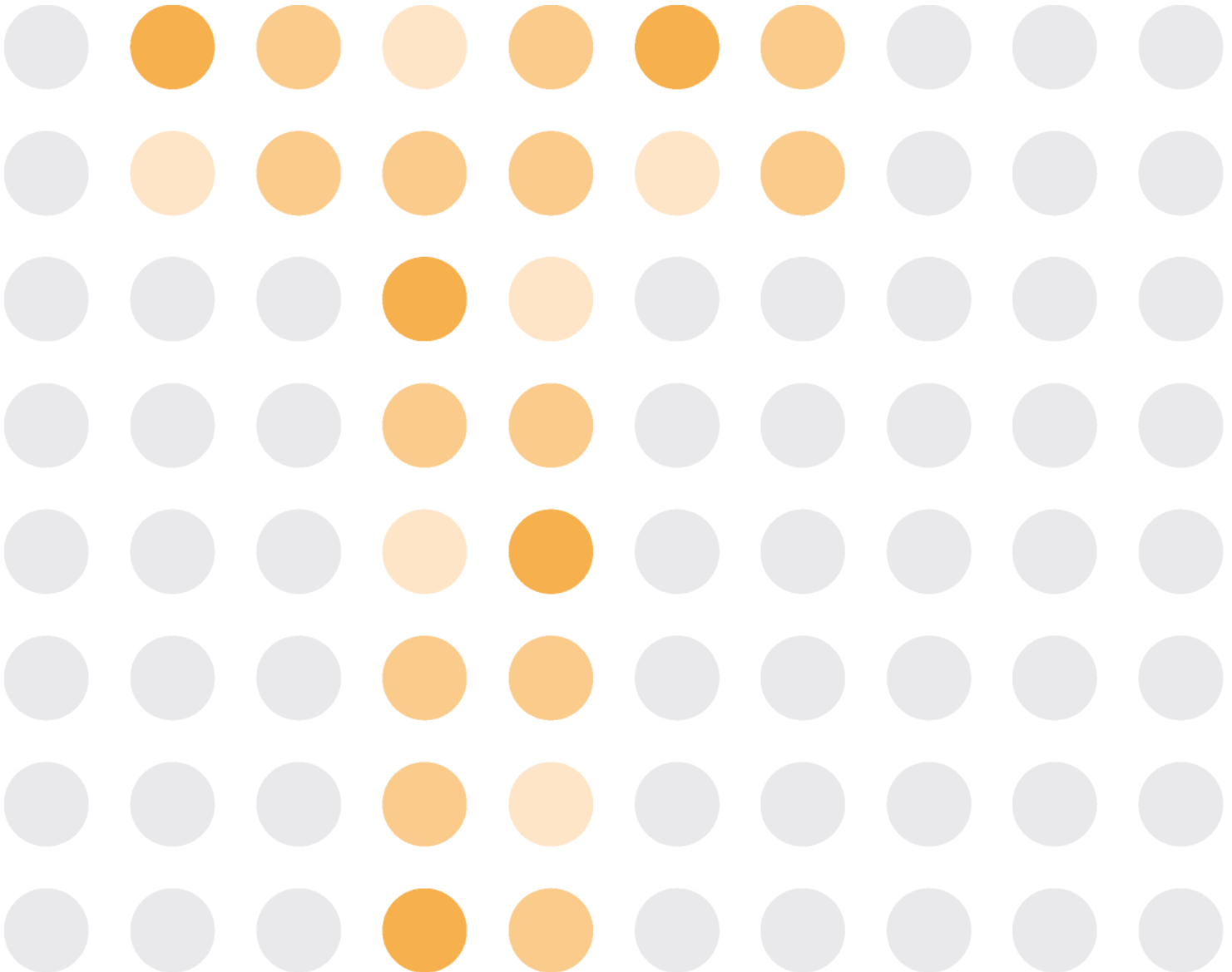


White Paper
TCO Study for SAP on Amazon Web Services (AWS)

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Content

| | | |
|-----|--|----|
| 1 | Executive Summary | 3 |
| 2 | Amazon Web Service (AWS) | 6 |
| | Update of previous study | 6 |
| 3 | Method..... | 7 |
| 3.1 | Background and Approach..... | 7 |
| 3.2 | SAP TCO Model | 8 |
| 3.3 | Reference Groups | 10 |
| | 3.3.1 Forming Profiles..... | 10 |
| | 3.3.2 Profiles for the TCO Study..... | 11 |
| 3.4 | FAQ – Highlights on some typical TCO related questions | 12 |
| | 3.4.1 What’s In – What’s Out..... | 12 |
| | 3.4.2 Pay Only for What You Need | 12 |
| | 3.4.3 The Comparison Base..... | 13 |
| | 3.4.4 Percentages | 13 |
| 4 | Savings by AWS | 15 |
| 4.1 | Level 1 Aggregation | 15 |
| 4.2 | Level 2 Aggregation | 17 |
| 5 | AWS Savings in Detail..... | 18 |
| 5.1 | Hardware/Software Investment..... | 18 |
| 5.2 | Implementation | 19 |
| 5.3 | Hardware/Software Ongoing Costs | 21 |
| 5.4 | Operations | 22 |
| 5.5 | Continuous Improvement Projects..... | 24 |
| 5.6 | Upgrade Projects | 25 |
| 6 | Appendix – Cloud Worthiness Index (CWI)..... | 26 |
| 6.1 | Introduction | 26 |
| 6.2 | Customer-specific Cloud Worthiness Index..... | 27 |
| 6.3 | Cloud-Provider-specific Cloud Worthiness Index | 27 |

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1 Executive Summary

Amazon Web Services (AWS) delivers a set of services that together form a reliable, scalable and inexpensive computing platform “in the cloud”. **VMS AG** is specialized in analyzing and optimizing SAP landscapes (DNA-level Benchmark for SAP) and owns the largest and most detailed database for SAP operation benchmark results worldwide.

In this white paper, VMS presents its research into the Total Cost of Ownership (TCO) of running and using SAP systems and provides in-depth views of costs involved.

The overall result is a Cloud Worthiness Index (CWI) of 59.

In order to derive this Amazon-specific CWI (for an explanation of the CWI calculation see appendix) VMS compared the following four SAP scenarios running in a dedicated environment (on-premise or outsourced) against running them on AWS:

1. A typical large ERP solution with 6,000 users running on-premises,
2. A typical small ERP solution for 300 users running on-premises,
3. The same ERP solution for 300 users outsourced and managed by an authorized SAP partner,
4. An SAP All-in-One system for 100 users running on-premises.

HIGHLIGHTS

- AWS is a public cloud service.
- The platform is certified for running SAP solutions.
- AWS recently extended the capabilities to accommodate large ERP systems on AWS e.g. 6,000 users, 90,000 SAPS.
- Up to 94% savings on storage and server operations.
- 80% savings on servers for large ERP systems.
- Up to 71% savings on the sum of all TCO elements, AWS has an impact on.
- No long-term contract or upfront investment required.
- Cloud advantages in system provisioning, backups and snapshots.

The study provides an overview of costs associated with running SAP systems over a typical platform related life cycle of 5 years. The comparison of on-premise or outsourced environments to an AWS-cloud-based infrastructure reveals substantial savings of using AWS. The study uses the SAP TCO Model and the VMS Benchmarkbase that holds TCO data from over 2,700 measured SAP systems. It carefully analyzes cost items that are affected by AWS and highlights savings in terms of an overall TCO. For a more in-depth view the study also identifies clearly where AWS has an impact on lowering cost and which areas are not affected.

The AWS-specific CWI (Cloud Worthiness Index) aggregates the following detailed calculations:

| Savings (5 Years) | vs. large ERP (on premises) | vs. small ERP (on premises) | vs. small ERP (outsourcing) | vs. SAP All-in-One (on-premises) |
|--|-----------------------------|-----------------------------|-----------------------------|----------------------------------|
| % Savings in overall TCO | 16% | 18% | 15% | 22% |
| % Savings on items that AWS has an impact on | 62% | 63% | 59% | 71% |

The difference between overall TCO and AWS-impacted-TCO needs a bit of explanation:

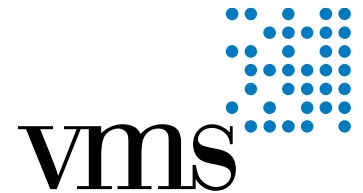
The SAP TCO model includes all hardware, software and service components, needed for an implementation plus a 5 year life cycle of an SAP installation. It includes cost components where using AWS makes a difference, e.g. compute capacity and storage. But it also holds components that are not affected by AWS, e.g. like SAP software licensing costs and maintenance fees.

Our research shows that if only those TCO components that are relevant to AWS are taken into account, such as infrastructure and operational costs, AWS offers savings between 59% and 71%.

Beyond lowering platform and operations cost, AWS turns infrastructure costs from being capital expenses (CAPEX) into variable operational costs (OPEX).

The overall 5-year TCO savings when running SAP on AWS ranges between **16% and 22%**.

The savings in the areas, where AWS has an impact on, range between **59% and 71%**.



Amazon, a Fortune 500 company based in Seattle, Washington, is the global leader in e-commerce. Amazon Web Services, Inc. (“AWS”), an Amazon.com company, offers a completely new way to run virtually any business that uses technology. Since officially launched in 2006, AWS has enabled developers and hundreds of thousands of companies of all sizes across 190 countries easy access to AWS suite of infrastructure web services to build their businesses and run their applications in the cloud. Companies incur no up-front expenses or long-term commitments, turn capital expense into variable operating expense, pay only for what is used, add or shed resources quickly, free up scarce engineering resources from the undifferentiated heavy lifting of running their own infrastructure. AWS helps customers focus on work that truly differentiates their business, rather than worrying about the infrastructure. For more information, visit <http://aws.amazon.com>.

VMS is a service provider based in Heidelberg, Germany. Main service provided is the benchmarking of SAP systems, supported by the VMS Benchmarkbase™, which at this point contains the measured data of more than 2,850 SAP systems, making it the largest and most detailed SAP benchmark database worldwide. For more information, visit www.vms.net.

2 Amazon Web Service (AWS)

AWS for SAP is based on:

- Amazon Elastic Compute Cloud (Amazon EC2), a web service that provides resizable compute capacity in the cloud.
- Amazon Elastic Block Store (EBS), which provides block level storage volumes for use with Amazon EC2 instances.
- Amazon Simple Storage Service (Amazon S3), which is used to store and retrieve any amount of data, at any time, from anywhere on the web.
- Amazon Virtual Private Cloud (Amazon VPC), which lets you provision a private, isolated section of the Amazon Web Services (AWS) cloud where you can launch AWS resources in a virtual network that you define and connect to your existing IT infrastructure using encrypted IPsec VPN.

AWS provides customers the flexibility to place SAP instances and store data within multiple geographic regions worldwide as well as across multiple Availability Zones within each region. Each Availability Zone is designed as an independent failure zone.

Update of previous study

VMS released a first version of this study in April 2012, when only smaller SAP systems could be run on AWS. This has changed now by more powerful servers and enhancements in the AWS infrastructure, like provisioned IOPS. SAP has responded to these efforts with releasing the SAP business suite for the AWS platform.

Today, it is possible to run a single large ERP system on AWS with up to 90,000 SAPS. This extends AWS capabilities as a strong competitor not only as a cloud platform vendor but also in the SAP outsourcing market.

In this update to the previous study, we extend the investigated landscape by a large ERP environment with a production system of 90,000 SAPS and additional development and test systems. The entire landscape has 120,000 SAPS.

Companies enjoy a fierce competition between platform and computing services providers these days. So we have seen prices drops in all aspects of IT platforms over the last six months, which have been incorporated into this update of the study.

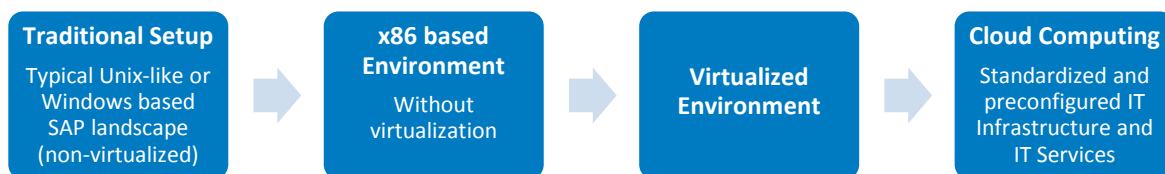
Nevertheless, AWS plays strong here and even improved the savings potential slightly in comparison to other platform offerings.

3 Method

This section outlines the method VMS uses to perform the TCO analysis. In this section we discuss in detail the study's **background** (section 3.1) and introduce the **SAP TCO Model**, the basis of the TCO analysis (section 3.2). An outline of the **reference groups** shows how the reference groups were derived that are later subject to separate cost analysis (section 3.3), followed by **Frequently Asked Questions** (section 3.4).

3.1 Background and Approach

The goal of this study is to investigate the benefits of the cloud computing architecture for SAP environments and understand the *existing* benefits (investments, ongoing costs and operations) and *expected* benefits (for the years of living on an AWS platform to come). The focus is to compare TCO of SAP landscapes running in a traditional setting with same landscapes running in the AWS cloud.



Stages from non-virtualized environments up to cloud computing

The framework for this comparison is the SAP TCO Model (section 3.2); the SAP TCO Model provides a multi-level hierarchy of cost categories. It covers all significant components of a SAP environment (hardware, software, and operations) and considers the complete lifecycle of SAP systems (plan, purchase, roll-out, operate, maintain, fix, change, and improve). By using the SAP TCO Model to calculate the total (and partial) costs of varying scenarios, it is possible to obtain a highly comparable cost overview. The overview allows for the comparison and identification of cost discrepancies in detail, as well as in the total costs.

Although AWS is around for 6 years, SAP deployments on AWS are fairly new and hence the study is limited due to the novelty of the product.

VMS is able to extrapolate the required data from both the features of the product, as well as from the available data of thousands of measured systems in the VMS Benchmarkbase. The VMS Benchmarkbase contains data of more than 2,850 SAP environments, along with their respective costs. VMS analyzes best practices based on detailed measurements along with cost data from the VMS AdaptiveTCO workbench.

3.2 SAP TCO Model

The SAP TCO model covers investment, expenses and activities around running SAP over its entire lifecycle. It is structured hierarchically, consisting of 3 levels originally (levels 1 and 2 are shown in the figure below), each enabling a more detailed view of the subject. To better understand the impact of AWS, VMS provides an even greater level of detail where applicable (*section 5*). The drill-down helps readers to understand their flow of resources when running SAP. The study covers CAPEX (investments) and OPEX (operational costs) elements. This study is based on a 5 year lifecycle.

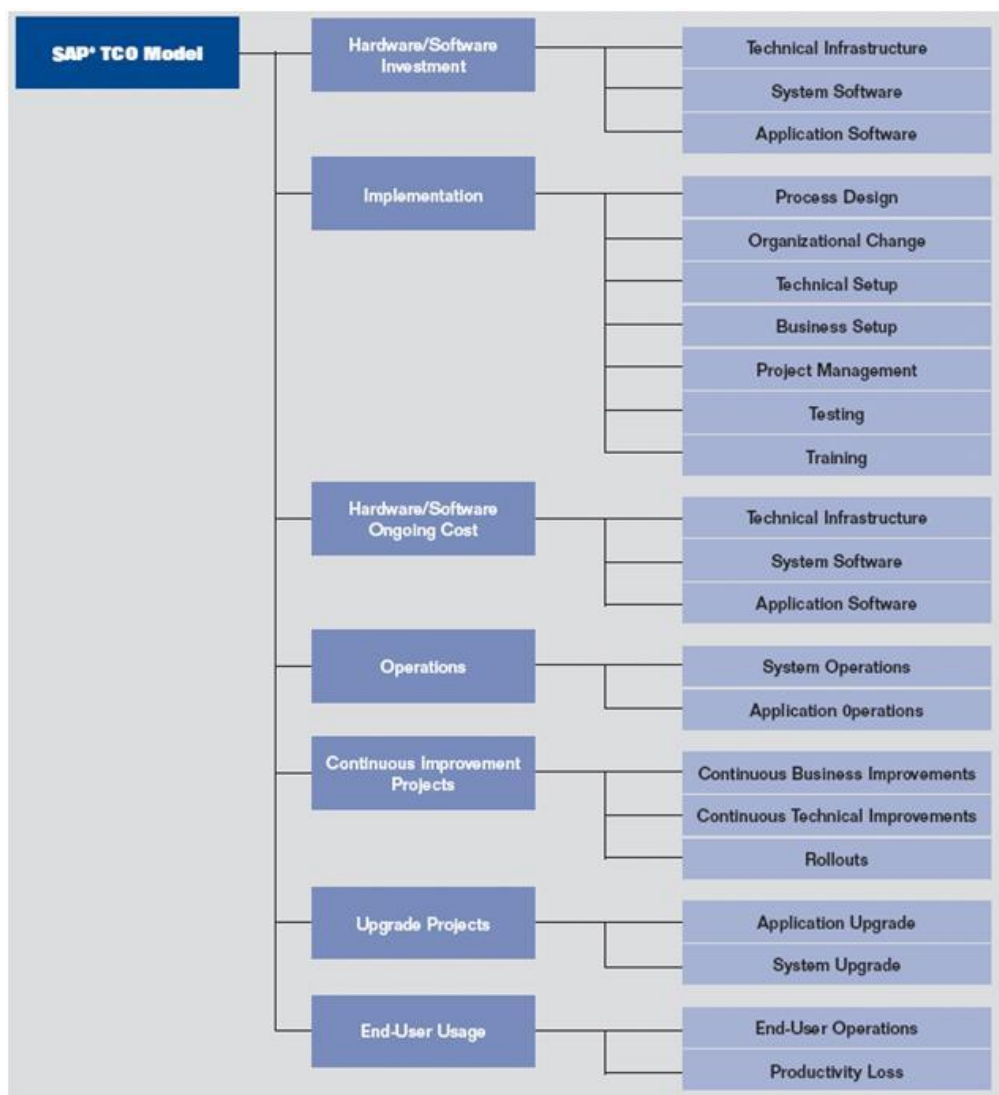


Table 3: SAP TCO Model (Level 1 and 2)

Remarks:

In this study we do not consider the following elements of the SAP TCO model:

End-User related elements like cost of workplace and business process operation is not in the scope for making a computing platform decision.

The End-User usage second-level category “productivity loss” makes ROI studies look randomly good or bad because even a small figure for loss per hour multiplied with a high number of users will lead to savings that look significant. In reality these savings potential will rarely become effective. For that reason, VMS does not take these costs into account when highlighting TCO.

Cost for WAN traffic is excluded, but may play a role when SAP is outsourced (externally or on AWS).

3.3 Reference Groups

The reference group for this study corresponds with SAP’s penetration of these industries. One exception is IT because IT providers appear more likely as customers of VMS in the VMS Benchmarkbase due to their continuous struggle for optimization of running SAP effectively.

| Reference Group | Share |
|-----------------|-------|
| Manufacturing | 36% |
| Utilities | 17% |
| Finance | 10% |
| Services | 12% |
| IT | 12% |
| HealthCare | 9% |
| Others | 4% |

Table 5: Distribution according to the number of systems

3.3.1 Forming Profiles

Starting Point

Although SAP is standard software and the TCO model is universally valid, each single company and each SAP installation is unique.

Solution

For the purpose of the study, VMS defines four different profiles that represent typical SAP customer landscape components and provides criteria to explain the differences between the four profiles.

The TCO model is a quite abstract model that groups different aspects of cost over the SAP project lifecycle. With the help of these four company profiles, readers may find themselves within the model more easily.

3.3.2 Profiles for the TCO Study

| | Large ERP | Small ERP (on-premises) | Small ERP (outsourcing) | SAP All-in-One (on-premises) |
|--------------------------------------|---|-------------------------------|-------------------------------|---|
| Revenue ¹ | \$8,000,000,000 | \$ 300,000,000 | \$ 300,000,000 | \$ 75,000,000 |
| Employees ¹ | 40,000 | 1,000 | 1,000 | 300 |
| Users | 6,000 | 300 | 300 | 100 |
| Daily active users | 3,000 | 250 | 250 | 75 |
| Systems ² | 3-tier ERP system line plus one sandbox | 3-tier ERP system line | 3-tier ERP system line | SAP All-in-One (on premise) with ERP, BI and CRM functionality. 3-tier ERP system line |
| Modules | All modules are used | FI/CO, PS, LO, MM, SD, and HR | FI/CO, PS, LO, MM, SD, and HR | ERP functionality: FI/CO, MM, SD with BI dashboards and CRM functionality: Lead-, Account-, Activity-, Opportunity-, and Order-Management |
| Database, P system only ³ | 2,500 GB | 500 GB | 500 GB | 350 GB |
| SAPS, P system only ⁴ | 90,000 | 3,000 | 3,000 | 1,000 |
| SLA Availability ⁵ | 99.5% | No | 99.5% | No |
| Operation | on-premise | on-premise | outsourcing | on-premise |

Table 6: Prototype Profiles

¹ Reference for quantification purposes only. This can differ depending on the industry.

² 3-tier system line means development, quality assurance and production system

³ Assumption: Q-systems need the same disk space as the P-systems.

⁴ Amount of SAPS offered by AWS, the typical amount of SAPS for a system of this size is lower.

⁵ Service Level Agreement: availability per month.

3.4 FAQ – Highlights on some typical TCO related questions

3.4.1 What's In – What's Out

The SAP TCO model includes all elements necessary to run SAP in the enterprise but excludes end user equipment and WAN network elements to reach them.

The study also excludes initial business process (re)design efforts when implementing SAP for the first time. Those efforts are largely driven by the status and demand of an enterprise but not by the hardware, software, or infrastructure used.

The use of cloud computing, such as AWS, defines a change in landscape architecture. Such a change, especially in business processes, triggers the need for education of IT staff, a one-time effort. Since the steepness of the learning curve is very individual and depends on the individual IT team, it is not considered in this TCO model.

3.4.2 Pay Only for What You Need

With AWS, you can benefit from the economies of scale. You pay a very low rate for the compute capacity you consume. There is no minimum fee and no long-term contracts required. Moving from the capital expenditure (CAPEX) model of an on-premises system to the operational expenditure (OPEX) model of the cloud means that you have operational expenses rather than expenditures of capital assets. So operating statements rather than balance sheet management is used in the calculation of TCO, and this change has a great impact. In addition to providing the flexibility to easily choose the number, size, and configuration of the compute instances you need for your application, AWS provides to SAP customers two different purchasing models that give you the flexibility to optimize your costs.

- **On-Demand Instances** let you pay for compute capacity by the hour with no long-term commitments. This frees you from the costs and complexities of planning, purchasing, and maintaining hardware, and transforms what are commonly large fixed costs into much smaller variable costs. On-Demand Instances also remove the need to buy “safety net” capacity to handle periodic traffic spikes.
- **Reserved Instances** give you the option to make a one-time payment for each instance you want to reserve and in turn receive a significant discount on the hourly charge for that instance. There are three Reserved Instance types (Light, Medium, and Heavy Utilization Reserved Instances) that enable you to balance the amount you pay upfront with your effective hourly price.

3.4.3 The Comparison Base

We compare AWS against typical scenarios of systems in use today, including various Unix, Linux, and Windows-based implementations with a variety of database products running on dedicated servers. The base for the comparison is provided by the VMS Benchmarkbase. The Benchmarkbase contains the real-life usage, quality, and cost data of more than 2,850 SAP environments. It covers a broad variety of industries and geographies and accurately reflects the current dissemination of SAP's products in use.

The distribution of the reference groups is presented on the following pages. The comparison group does not include any mainframe-based installations. From a CAPEX point of view this would lead to even more significant savings when a company switches from mainframe to cloud computing. VMS acknowledges this as a reasonable, albeit rare, step. The focus of this study, however, remains on mainstream elements and attempts to avoid special cases such as this.

3.4.4 Percentages

VMS shows savings as precise percentages (e.g., 22% savings on implementing SAP) rather than as a range (e.g., 15%-30%).

The VMS TCO model allows the calculation of typical savings for the specific defined profile, which VMS doesn't want to dilute by showing ranges. Of course a new AWS user might come up with slightly different percentages in the end, because the real-world implementation will not be exactly identical to the prototyped profile.

| Level 1 | Global players | Local players |
|--------------------------------|----------------|---------------|
| Hardware/Software Investment | 23% | 14% |
| Implementation | 22% | 24% |
| Hardware/Software Ongoing Cost | 5% | 3% |
| Operations | 4% | 3% |

How to read the following TCO Level tables

Within the details (section 5), the savings potential is shown on level 3. There are cost elements where using AWS (background light blue/darker) allows SAP to pass on cost savings, but there are also elements that has no influence due to use of AWS, e.g., SAP licenses (background light grey/more light color). On the bottom line, the consolidated savings are shown for each company profile.

| SAP TCO Model | | | VMS | Weight | AWS triggered Savings | | | |
|--------------------------------------|-----------------------------|-----------------------|-----------------------|--------|-----------------------|------------------|-------------------|----------------|
| Level 1 | Level 2 | Level 3 | Details | | Large ERP | ERP (on premise) | ERP (outsourcing) | SAP All-in-One |
| Hardware/ Software Investment | Technical Infrastructure | Computing Hardware | Application Server | W1% | AA% | BB% | CC% | DD% |
| | | Computing Software | Operating System | W2% | - | - | - | - |
| Consolidated Level 1 Savings: | | | | | WW% | XX % | YY% | ZZ% |

In this example, AWS allows customers to reduce their required investments in the area of Application Server, but not for Operating System. Each cost element has a different weight within its category. Therefore the consolidated savings: WW%, XX%, YY%, and ZZ%, are lower in comparison to Application Server related savings: AA%, BB%, CC% and DD%. Please do not simply add up percentages since this will give you wrong results. Percentages multiplied by weight might be added.

4 Savings by AWS

4.1 Level 1 Aggregation

Overall TCO savings of the SAP Application Lifecycle for the three scenarios is as shown below:

| SAP TCO model | | Savings by AWS in % | | | |
|---------------------------------|--------|---------------------|------------------|-------------------|----------------|
| Level 1 | Weight | Large ERP | ERP (on premise) | ERP (outsourcing) | SAP All-in-One |
| Hardware/Software Investment | 11% | 22% | 15% | 2% | 29% |
| Implementation | 9% | 26% | 39% | 36% | 39% |
| Hardware/Software Ongoing Cost | 12% | 19% | 9% | 19% | 17% |
| Operations | 33% | 2% | 2% | 1% | 2% |
| Continuous Improvement Projects | 20% | 22% | 37% | 35% | 45% |
| Upgrade Projects | 15% | 23% | 38% | 33% | 45% |
| Consolidated | | 16% | 17% | 15% | 22% |

Table 7: Level 1 Aggregation

As you can see, the major savings are in the area of infrastructure investment and implementation. This is because, when you use the cloud, you don't need any capital investments except the license cost for SAP and the database.

The second major area of savings is around projects. Here the advantage is that AWS capacity can be added or released right as you need it.

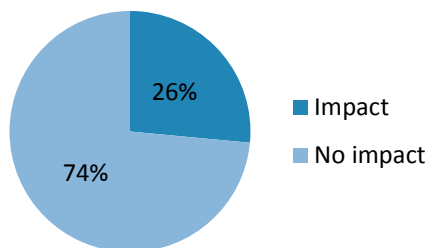
Operations (application management and support) remain the biggest cost driver in SAP environments. Systems and application management widely exceed more obvious and directly measurable costs such as infrastructure investments. AWS does not have a direct impact on application operations and hence the savings seem low. However, because they have a very high impact on TCO, the potential savings (savings percentage multiplied by weight) are huge.

On the following pages savings up to level 3 of the SAP TCO model will be detailed and combined with arguments that look at the AWS solution. Looking at different TCO elements, similar reasons for cost reduction will re-occur.

Taking a second view with only the elements that are relevant to AWS, the picture looks different:

| EXTRACT | | EXTRACT: AWS triggered savings | | | |
|---|--------|--------------------------------|------------------|-------------------|----------------|
| Level 1 <i>Only elements, where the operational model has an impact on</i> | Weight | Large ERP | ERP (on premise) | ERP (outsourcing) | SAP All-in-One |
| Hardware/Software Investment | 6% | 100% | 100% | 100% | 100% |
| Implementation | 16% | 56% | 63% | 59% | 63% |
| Hardware/Software Ongoing Cost | 10% | 88% | 71% | 83% | 76% |
| Operations | 4% | 94% | 70% | 60% | 58% |
| Continuous Improvement Projects | 31% | 52% | 58% | 56% | 65% |
| Upgrade Projects | 34% | 52% | 57% | 52% | 64% |
| Consolidated | | 62% | 63% | 59% | 71% |

When considering only the items that are relevant to AWS, you can see significant savings over on-premises deployments.



Impact: a variety of different hardware investments; planning and setup of infrastructure; ongoing costs for hosting and operating servers and storage; implementation of test and training systems.

No impact: license cost and maintenance fee; business tasks and project management during implementation, upgrade or continuous improvement; incident and problem management, change management, process design.

4.2 Level 2 Aggregation

| SAP TCO Model | | | AWS triggered savings | | | |
|---------------------------------|----------------------------------|--------|-----------------------|------------------|-------------|----------------|
| Level 1 | Level 2 | Weight | Large ERP | ERP (on premise) | ERP (outs.) | SAP All-in-One |
| Hardware/Software Investment | Technical Infrastructure | 2% | 100% | 100% | - | 100% |
| | System Software | 2% | 27% | 13% | - | 16% |
| | Application Software | 8% | - | - | - | - |
| Implementation | Process Design | 1% | 45% | 45% | 37% | 45% |
| | Organizational Change | 1% | - | - | - | - |
| | Technical Setup | 1% | 90% | 90% | 88% | 90% |
| | Business Setup | 2% | - | - | - | - |
| | Project Mgt. | 1% | - | - | - | - |
| | Testing | 1% | 35% | 35% | 35% | 35% |
| | Training | 2% | 35% | 35% | 35% | 35% |
| Hardware/Software Ongoing Cost | Technical Infrastructure | 1% | 96% | 64% | 82% | 73% |
| | System Software | 2% | 32% | 14% | - | 17% |
| | Application Software | 7% | - | - | - | - |
| Operations | System Operations | 5% | 24% | 35% | 15% | 16% |
| | Application Operations | 32% | - | - | - | - |
| Continuous Improvement Projects | Continuous Business Improvement | 15% | 18% | 31% | 30% | 42% |
| | Continuous Technical Improvement | 1% | 90% | 90% | 90% | 90% |
| | Rollouts | 2% | 40% | 40% | 40% | 40% |
| Upgrade Projects | Application Upgrade | 12% | 18% | 31% | 30% | 42% |
| | System Upgrade | 2% | 55% | 55% | 55% | 55% |

Table 8: Level 2 Aggregation

5 AWS Savings in Detail

5.1 Hardware/Software Investment

| SAP TCO Model | | | VMS | | AWS triggered savings | | | |
|--------------------------------------|-----------------------------|-----------------------|-----------------------|--------|-----------------------|------------------|-------------|----------------|
| Level 1 | Level 2 | Level 3 | Details | Weight | Large ERP | ERP (on premise) | ERP (outs.) | SAP All-in-One |
| Hardware/ Software Investment | Technical Infrastructure | Computing Hardware | Application Server | 2% | 100% | 100% | - | 100% |
| | | | Database Server | 2% | 100% | 100% | - | 100% |
| | | | Storage | 7% | 100% | 100% | - | 100% |
| | | | Backup Hardware | 2% | 100% | 100% | - | 100% |
| | | Network | | 0% | 100% | 100% | - | 100% |
| | System Software | Computing Software | Operating System | 0% | 100% | 100% | - | 100% |
| | | | Database | 16% | - | - | - | - |
| | | | Tools | 2% | 100% | 100% | 100% | 100% |
| | | | Backup Software | 4% | 100% | 100% | 100% | 100% |
| | Application Software | Licenses | | 65% | - | - | - | - |
| Consolidated Level 1 Savings: | | | | | 22% | 15% | 2% | 29% |

Table 9: Hardware/Software Investment

Where are the potential savings of between 2% and 29% in the Hardware/Software Investment category coming from?

This answer is very simple: When AWS is used there are no required up-front costs, except for the SAP and database license. The server, storage, data center, and software tools are included in the monthly price of AWS. Therefore, the savings compared to on-premises solutions are high.

Since AWS is a type of outsourcing, the comparison with “traditional” outsourcing doesn’t show big effects.

Considering the TCO for AWS, we note that 81% of the implementation costs for AWS are independent of the operation mode. These costs are for the SAP license and database.

5.2 Implementation

| SAP TCO Model | | | VMS | | AWS triggered savings | | | |
|-------------------------------------|-----------------------|---|---------|--------|-----------------------|------------------|-------------|----------------|
| Level 1 | Level 2 | Level 3 | Details | Weight | Large ERP | ERP (on premise) | ERP (outs.) | SAP All-in-One |
| Implementation | Process Design | Planning of Infrastructure | | 5% | 90% | 90% | 87% | 90% |
| | | Blueprint/ Conceptual Design | | 3% | - | - | - | - |
| | Organizational Change | Change Management | | 6% | - | - | - | - |
| | Technical Setup | Installation, Technical Configuration, Technical Operation, Technical Conceptual Design | | 14% | 90% | 90% | 88% | 90% |
| | Business Setup | All level 3 elements | | 31% | - | - | - | - |
| | Project Management | All level 3 elements | | 12% | - | - | - | - |
| | Testing | Testing | | 14% | 35% | 35% | 35% | 35% |
| | Training | Training | | 15% | | | | |
| Consolidated Level 1 Savings | | | | | 26% | 39% | 36% | 39% |

Table 10: Implementation

Process Design is limited here to the technical components (infrastructure and landscape blueprint). This model does not include business process such as the design and redesign efforts of the company when it starts to implement SAP.

Where are the potential savings of between 36% and 39% in the Implementation category coming from?

Using AWS, the technical implementation is already done. If you have your own IT, then your IT needs to complete the set ups. Even with outsourcing, you have to pay an installation fee, but usually the installation fee can be negotiated with the outsourcer. Here, VMS shows an average of reality and there are companies paying that fee. Additionally, there are costs for approving the technical design of the outsourcer, because even if the IT is outsourced, the corporate CIO is responsible for planning,

blueprint, and conceptual design of the SAP infrastructure. Only the planning for the integration into the existing IT landscape is required.

The provisioning and management of SAP training and test systems can be simplified and accelerated by cloning and recovery functions.

Surrounding systems of a SAP landscape (e.g., middleware and Add-Ons) can be hosted and operated on AWS as well.

Companies with large ERP systems have a higher effort for change management or business setup. Installing and running such a system on AWS does not change these costs. Therefore the saving potential with 26% is lower than those of smaller companies.

5.3 Hardware/Software Ongoing Costs

| SAP TCO Model | | | VMS | | AWS triggered savings | | | | |
|--|-----------------------------|-------------------------|-----------------------|---------------------|-----------------------|------------------|-------------|----------------|------|
| Level 1 | Level 2 | Level 3 | Details | Weight | Large ERP | ERP (on premise) | ERP (outs.) | SAP All-in-One | |
| Hardware/ Software Ongoing Cost | Technical Infrastructure | Computing Hardware | Application Server | 2% | 79% | 28% | 60% | 37% | |
| | | | Database Server | 2% | 81% | 28% | 60% | 37% | |
| | | | Storage | 9% | 80% | 85% | 93% | 92% | |
| | | | Backup Hardware | 2% | 87% | 56% | - | 56% | |
| | | Network | | 1% | 100% | 100% | 100% | 100% | |
| | | System SW | Computing SW | Operating System | 0% | 100% | 100% | 100% | 100% |
| | Database | | | 12% | - | - | - | - | |
| | Tools | | | 2% | 100% | 100% | 100% | 100% | |
| | | | Backup Software | | 3% | 100% | 100% | 100% | 100% |
| | | Application Software | Maintenance Fees | | 67% | - | - | - | - |
| Consolidated Level 1 Savings | | | | | 19% | 11% | 20% | 22% | |

Table 11: Hardware/Software Ongoing Costs

Where are the potential savings of between 11% and 22% in the Hardware/Software Ongoing Costs category coming from?

There is an effect similar to the one in the investments category. When we consider TCO, most of the AWS costs are independent of the operation model (maintenance cost for the SAP license and database).

The flexibility of AWS in providing computing and storage resources prevents immediate additional investments due to typically slighter changes in hardware needs by individual systems. If needed, AWS offers easy scalability as it is possible to expand the capacity of the AWS infrastructure without re-arranging existing landscape elements. Considering only server and storage, the savings by AWS are huge. Especially storage has a potential of over 80% for all SAP systems. For the large ERP with 120,000 SAPS in total the advantage of Cloud computing is much more visible than for small installations.

5.4 Operations

| SAP TCO Model | | | VMS | | AWS triggered savings | | | | |
|---------------|-------------------------------------|---------------------------|--|--------|-----------------------|------------------|-------------|----------------|-----------|
| Level 1 | Level 2 | Level 3 | Details | Weight | Large ERP | ERP (on premise) | ERP (outs.) | SAP All-in-One | |
| Operations | System Operations | System Monitoring | Storage, Server, OS | 0% | 89% | 55% | 53% | 23% | |
| | | | Database | 0% | - | - | - | - | |
| | | | SAP Basis | 1% | - | - | - | - | |
| | | System Administration | Storage, Server, OS | 1% | 100% | 100% | 100% | 100% | |
| | | | Database | 1% | - | - | - | - | |
| | | | SAP Basis | 2% | - | - | - | - | |
| | | | Backup | 1% | 86% | 44% | 20% | 33% | |
| | | | User Administration | 2% | - | - | - | - | |
| | | System Problem Management | Storage, Server, OS | 0% | 89% | 55% | 53% | 23% | |
| | | | Database | 0% | - | - | - | - | |
| | | | SAP Basis, Early Watch | 1% | - | - | - | - | |
| | | | Software Change Management | - | 1% | - | - | - | - |
| | | | System Service Desk & Incident Mgt. | - | 1% | - | - | - | - |
| | | | General/ Administrative Costs | - | 1% | - | - | - | - |
| | | Application Operations | Monitoring, Administration, Problem Mgt., Software Change Mgt., Service Desk, General Administration | - | 88% | - | - | - | - |
| | Consolidated Level 1 Savings | | | | | 2% | 3% | 1% | 2% |

Table 12: Operations

Where are the potential savings of up to 3% in the Operations category coming from?

The largest part of operations is Application Support (Incident & Problem Management), which mainly belongs to Application Operations. This part is independent of the operational model, so there are no savings. So the overall savings are low, between 1% and 3% due to the technical part.

5.5 Continuous Improvement Projects

| SAP TCO Model | | | VMS | | AWS triggered savings | | | | |
|-------------------------------------|---------------------------------|----------------------------------|----------------------------------|--------|-----------------------|------------------|-------------|----------------|-----|
| Level 1 | Level 2 | Level 3 | Details | Weight | Large ERP | ERP (on premise) | ERP (outs.) | SAP All-in-One | |
| Continuous Improvement Projects | Continuous Business Improvement | Process Design | | 4% | - | - | - | - | |
| | | Organizational Changes | | 5% | - | - | - | - | |
| | | Technical Setup | | 10% | 90% | 90% | 90% | 90% | |
| | | | Business Setup | | 30% | - | - | - | - |
| | | | Interfaces | | 5% | - | - | - | - |
| | | | Project Management | | 13% | - | - | - | - |
| | | | Testing | | 14% | 35% | 35% | 35% | 35% |
| | | | Training | | 9% | | | | |
| | | Continuous Technical Improvement | Continuous Technical Improvement | | 3% | 90% | 90% | 90% | 90% |
| | Rollouts | Rollouts | | 7% | 40% | 40% | 40% | 40% | |
| Consolidated Level 1 Savings | | | | | 22% | 37% | 35% | 45% | |

Table 13: Continuous Improvement Projects

Where are the potential savings of between 22% and 45% in the Continuous Improvement Projects category coming from?

Business effort will stay the same independent of running SAP on AWS, but the technical setup on AWS is much easier. When AWS is used, you just add another resource that you need. The simple expansion and scaling of SAP instances, in the case of higher demand due to an increasing number of users or new functions, is based on the ability to expand the capacity of AWS infrastructures. The AWS architecture is very flexible and extensible. The provisioning and management of SAP training and test systems can be simplified and accelerated using cloning and recovery functions.

Fallback scenarios (return to original state in case of failure) are available right out of the box. Here we see again the difference between a large and a small company: Small companies have a much lower share of business related effort within their projects, so the technical share is higher, leading to the fact that the relative saving potential is higher than that of a larger company.

5.6 Upgrade Projects

| SAP TCO Model | | | VMS | | AWS triggered savings | | | |
|-------------------------------------|---------------------|------------------------|---------|--------|-----------------------|------------------|-------------|----------------|
| Level 1 | Level 2 | Level 3 | Details | Weight | Large ERP | ERP (on premise) | ERP (outs.) | SAP All-in-One |
| Upgrade Projects | Application Upgrade | Process Design | | 3% | - | - | - | - |
| | | Organizational Changes | | 5% | - | - | - | - |
| | | Technical Setup | | 10% | 90% | 90% | 90% | 90% |
| | | Business Setup | | 28% | - | - | - | - |
| | Interfaces | | 5% | - | - | - | - | |
| | Project Management | | 13% | - | - | - | - | |
| | Testing | | 14% | 35% | 35% | 35% | 35% | |
| | Training | | 9% | | | | | |
| | System Upgrade | System Upgrade | | 13% | 55% | 55% | 55% | 55% |
| Consolidated Level 1 Savings | | | | | 23% | 38% | 33% | 45% |

Table 14: Upgrade Projects

Where are the potential savings of between 23% and 45% in the Upgrade Projects category coming from?

Business effort will stay the same independent of running SAP on AWS, but the technical setup is much easier on AWS. When AWS is used, you just add another resource that you need. The simple expansion and scaling of SAP instances, in the case of higher demand due to an increasing number of users or new functions, is based on the ability to expand the capacity of AWS infrastructures. The AWS architecture is very flexible and extensible.

The provisioning and management of SAP training and test systems can be simplified and accelerated using cloning and recovery functions.

Fallback scenarios (return to original state in case of failure) are available right out of the box.

6 Appendix – Cloud Worthiness Index (CWI)

6.1 Introduction

Everybody “knows” that one of the key benefits of the cloud is its – perceived or real – economic value. But virtually nobody can actually quantify the economic value of the cloud in financial terms. Nobody knows how many dollars could be generated by leveraging the cloud for their SAP environment.

Thus VMS AG has decided to make the economic value of the cloud easily quantifiable and comparable. Based on our insights of more than 2,700 SAP systems we have derived the so-called Cloud Worthiness Index (CWI).

The CWI can be characterized as follows:

- True indicator of the economic value of cloud platforms.
- Easily understandable and comparable simple number between 1 and 10.
 - For Cloud Providers the cloud-platform-specific CWI ranges from 10 to 100.
- Expressing the customer-specific cost savings potential in Dollars/Euros.
 - For Cloud Providers it is the cloud-platform-specific cost savings potential.
- Leveraging best practices of more than 2,700 SAP systems.
- Applicable to all leading cloud platforms.
- Applicable to Private AND Public Cloud platforms.
- Applicable to SAP HANA.
- Independent of VMS.

We know that there is a public interest in quantifying the economic value of cloud platforms. Hence we have donated our vast benchmarking intelligence in the form of the CWI to the community of interested SAP customers and partners. In order to foster the usage of the CWI we would be more than happy to answer any questions regarding the CWI as fast as possible.

6.2 Customer-specific Cloud Worthiness Index

The primary usage of the CWI is for individual customers.

The formula as derived from our benchmarking business intelligence is:

$$CWI_{CU} = 35 \Delta_T \max(\Delta_{WO}, \Delta_W)$$

Definitions:

CWI_{CU} : Customer Specific CWI

$$\Delta_T = \frac{TC_{WO} - BP_W}{TC_{WO}}$$

$$\Delta_{WO} = \frac{BP_{WO} - BP_W}{BP_{WO}}$$

$$\Delta_W = \frac{TC_{WO} - TC_W}{TC_{WO}}$$

TC_{WO} : Customer TCO Without Cloud

TC_W : Customer TCO With Cloud

BP_{WO} : Best Practice TCO Without Cloud

BP_W : Best Practice TCO With Cloud

(Special cases handled separately.)

6.3 Cloud-Provider-specific Cloud Worthiness Index

The secondary usage of the CWI is for cloud platforms. The CWI for Cloud Providers is a special case of the customer-specific CWI.

The formula as derived from our benchmarking business intelligence is:

$$CWI_{CP} = 900 \left(\frac{BP_{WO} - BP_W}{BP_{WO}} \right)^2$$

Definitions:

CWI_{CP} : Cloud Provider Specific CWI

BP_{WO} : Best Practice TCO Without Cloud

BP_W : Best Practice TCO With Cloud

(Special cases handled separately.)

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