Current and Future Impact of Infrastructure-as-a-Service on Professionals
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Executive Summary

One of the major IT trends is the movement towards cloud computing. Recently, the cloud has become a major buzzword that is often used interchangeably with the term “Internet”. However, cloud computing is actually a complex term that have several service models. In cloud computing, the service provider manages and maintains computing resources such as data and software, which the clients have access to via the Internet. The three service models include Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS). This report will focus on IaaS and analyze its impacts on accounting professionals as well as the business world.

Unlike SaaS and PaaS, IaaS allows clients to access to the entire IT infrastructure in the cloud, which include hardware, processing power, and storage (the Wall Street Journal, 2014). Its growth rate is expected to increase significantly in the next few years (Appendix A) because of cost efficiency, scalability, and allowing clients to focus on core business value (Boritz, 2005). It is also contributing towards the phenomenon of invisible computing (Clark, 2012) where there is a separation of computing hardware and software, which allows for the safeguard of asset in the case of lost or destroyed devices. However, C-Suites must also be aware of the risks imposed by IaaS, such as security breaches, loss of availability, lack of control over IT operations, compatibility issues, and compromise of data integrity. Fortunately, there is a list of tools that can assist organizations in mitigating these risks, including PIPEDA, SOC reports, SLAs, and IaaS Pricing Codex, which will be explained in detail in this report. Nevertheless, IaaS will have significant impacts on organizations, requiring accounting and finance professionals to become knowledgeable in IaaS. CA/CPAs and CMA/CPAs should especially understand IaaS because IaaS will have significant impacts on revenue recognition assertions. This is due to the complex pricing model of IaaS, which may impact timing and valuation of revenue recognition. Current accounting standards do not currently provide specific guidance in recognizing IaaS revenue for cloud providers; however it can be expected that guidance will eventually be provided in this area due to the expanding cloud market.

Emerging trends in IaaS include the video gaming industry’s initiative to incorporate IaaS in building a “supercomputer” to replace traditional gaming consoles. This new gaming architecture will be able to create a real-world game experience and solve performance lags in the current gaming structure. Other trends include combining IaaS and big data to stop counterfeiting, the rise of green IT, and using cloud to commit fraud. These trends show that accounting professionals will be in relied upon to assist with these risks.

With the growth of IaaS, expected future impacts include invisible computing, convergence of cloud providers, new generation of CIOs, green IT, and more innovation. These will have major impacts in the accounting industry, in the aspects of internal control, internal audit, performance management, external audit, and tax planning. Therefore, professionals practicing in these areas are expected to become knowledgeable in IaaS.
Introduction: Infrastructure-as-a-Service

Infrastructure-as-a-service (IaaS) is one of the three service models of cloud computing. It provides customers with access to processing power, storage, network bandwidth, and many other resources through the Internet. The cloud provider is responsible for managing and maintaining the infrastructure, which is run on a multitude of servers and networks. It is forecasted that the growth of IaaS will exceed those of both Software-as-a-Service (SaaS) and Platform-as-a-Service (Appendix A). This because IaaS is a major breakthrough that allows clients to access strong computing resources in a virtualized environment – the cloud. This report will identify its benefits and risks relevant to the C-Suites, impact on professionals, impact on accounting guidelines, and a future forecast of IaaS impact on the overall market. Overall, it can be concluded that IaaS is an area that professionals should be interested in because IaaS is expected to have pervasive effects in the accounting and financial management sector.

Why C-Suites should invest in IaaS

Managing the IT infrastructure is typically the largest expense within an organization, thus effective IT management will ensure a ROI that can greatly influence firm profitability. IaaS can assist C-Suites in this role due to the following benefits.

IaaS and Cost

Executives are often cost sensitive regarding IT acquisitions, making cloud computing an attractive choice for them. Cloud computing is known for its pay-as-you-go model, which allows organizations to manage data volumes more easily and efficiently by only paying for the usage that they need (StateTech Magazine, 2014). Another cost saving aspect includes less initial setup cost since the computing resources are available upon subscription (Rackspace, 2013). There is less maintenance cost such as system upgrades since these processes are managed by the cloud provider (StateTech Magazine, 2014). Overall, it is estimated that an average organization can be expected to save 29% of the cost of a traditional IT environment (Appendix B). This is possible due to economies of scale achieved by cloud vendors (Appendix C). In a research conducted by Jon Moore, it is found that an organization would have to deploy between 5000 and 15000 servers to get the per-server marginal cost to a similar level enjoyed by cloud computing vendors (Rackspace Support Service, 2013).

IaaS and Scalability

The other major benefit of IaaS that may interest executives is scalability, which allows quick provision and de-provision of IT infrastructure at low cost (StateTech Magazine, 2014). This is important when executives wish to engage in new or temporary projects or initiatives in a timely manner, which is not possible with the traditional fixed infrastructure system (Rackspace, 2013). As seen in Appendix D, Walmart’s high-peak usage amount to 500% of that required during off-peak. Organizations will be able to meet peak demands without paying for idle infrastructure (Billingsley, 2014), which addressed C-Suites’ capacity planning dilemma mentioned earlier.
Other major benefits of IaaS
In a traditional IT infrastructure system, many executives expressed difficulty with IT infrastructure decisions (Billingsley, 2014). IaaS may solve this problem by allowing infrastructure to be provided as a service, eliminating the negative consequences of improper infrastructure decisions such as IT fragmentation, redundant expenditures, overcapacity of hardware, etc (Rackspace, 2013). Cloud providers also generally have better IT knowledge and more access to IT resource (StateTech Magazine, 2014), thus improving IT performance. This also allows clients to dedicate their resources to delivering business core value (Boritz, 2005). If implemented correctly, IaaS could also potentially protect data because computers will no longer store data, but be a means to access it (the Wall Street Journal, 2014). In the case of computer theft or destruction, the data can still be accessed through the cloud.

IaaS could help promote market growth because small companies would no longer be constrained to budget and space limitations of traditional data centres, allowing them to compete with larger firms (the Wall Street Journal, 2014). It could also increase competition because developing countries without strong existing IT infrastructure may also take advantage of outsourcing infrastructure (the Wall Street Journal, 2014).

Chief Concerns about IaaS
C-Suite executives in the technology, financial services, and professional services industry especially should pay attention to the following risks because these sectors are the top adopters of cloud computing (Boritz, 2005).

Does IaaS Align with Company Strategy?
In order to realize the IaaS benefits mentioned, the CEO, CIO, and CFO should work closely with the IT Steering Committee to perform at a minimum the following analysis.

1. Executives should determine if IaaS aligns with company strategy and provide oversight to acquisition. Up to 60% of IT projects fail, with the main reason due to lack of oversight (Boritz, 2005).
2. Prepare financial forecast analysis and compare the cost-benefit analysis of an IaaS.
3. Communicate IaaS initiatives with all departments to incorporate their feedback
4. Allow for a transitional testing period to switch over to IaaS to avoid loss of data (eg. Parallel testing) (Billingsley, 2014).

Security and Availability Threats
Outsourcing a company’s IT infrastructure impose risks such as availability threats, less controls over assets, breach of confidentiality or privacy, incompatibility (Boritz, 2005) etc. This may impact companies’ data integrity, which impose negative publicity, customer dissatisfaction, litigations, and privacy standard violations such as PIPEDA (Boritz, 2005).
1. Cloud computing services are often hacking targets because all IT services are placed under a single management domain (Boritz, 2005), which would have pervasive effects across a wide range of customers. The “cloud multiplier effect” estimates that for every one percent increase in use of cloud services, there is a three per cent higher risk of a data breach (Netscope, 2013). Therefore, it is necessary to establish policies regarding which information should be stored on cloud and to determine if cloud vendors have effective internal controls to prevent such breaches (Boritz, 2005). These methods are described more details in the next section.

2. If the cloud is unable to maintain availability (Boritz, 2005), IaaS customers would be unable to access their infrastructure, leaving companies without basic computer processing required for the business to function.

3. Insecure interfaces and APIs may result in authorized access to clients’ cloud systems (Checklist for Cloud Model), threatening data integrity.

4. Due to the IT infrastructure being outsourced, it may be difficult for customers to control how assets processes are managed. Clients have no control over the acquisition of assets, HR hiring policies, employee monitoring, or internal control processes to prevent and catch errors (Checklist for Cloud Model). Lack of control over these activities may result in confidentiality and privacy breach, loss of data, or manipulation of data.

5. There may be compatibility issues between a provider’s IaaS with a client’s applications and software. It is important to discuss compatibility with the vendor and to include compatibility guarantee in the Service Level Agreement (SLA) (Boritz, 2005). A private cloud may improve compatibility because it offers customization and client service (Rackspace, 2013), whereas the public cloud is treated more like a commodity.

6. IaaS is scalable through the sharing of infrastructure, with virtualization hypervisor mediating the access between guest operating systems and the physical compute resources. As a result, it is possible that one client’s usage may negatively impact another client’s actual or residual data, network traffic, etc (Checklist for Cloud Model).

7. Due to the sharing of infrastructure, accidental co-mingling of client data might occur, leading to breach of confidentiality (Checklist for Cloud Model).

Tools and frameworks that could mitigate these risks are included in the following section.

**Tools and Frameworks for Assessing IaaS Providers**

Selecting a reliable IaaS vendor may be a complicated and difficult process for many organizations. The major IaaS providers are included in Appendix E. This section list some tools and resources that will assist C-Suites in determining if a vendor is reliable and can satisfy the client’s requirements.

First of all, it is recommended for executives to carefully review and draft Service Level Contracts (SLA) which establishes responsibilities and penalties relating to system downtime, service costs, contract duration, compatibility guarantee, and system maintenance responsibilities (Checklist for Cloud Model).
Establishing a thorough SLA helps minimize unpleasant surprises and places pressure on cloud providers to maintain good service quality (Boritz, 2005). The SLA should be stored in a secure location, and be accessible in case of emergencies.

Another way to determine if the vendor has strong controls is the use of Service Organization Control (SOC) reports (Boritz, 2005). In the case with IaaS, a SOC 2, type 2 report (reports on controls at a service organization), is recommended to ensure the attributes of security, availability, process integrity, confidentiality, and privacy (Boritz, 2005). The report contains the service auditor’s test procedures and results in detail over a period of time. If financial data will be stored on the cloud, a SOC 1, type 2 report is recommended (Boritz, 2005). A service auditor performs these assurance services with a cost. A more general SOC 3 report, trust services report for service organization, may also be requested at less cost (Boritz, 2005).

Because clients may be storing confidential and private data on cloud providers’ services, it may be necessary to understand various privacy and confidentiality policies. Personal Information Protection and Electronic Documents Act (PIPEDA) outline requirements regarding collection, storage, safeguard and destruction of private and personal information (Boritz, 2005). Generally Accepted Privacy Principles (GAPP) also establishes principles regarding privacy (CPA Canada). Lastly, it is important to review major IT frameworks in order to understand and mitigate security risks. ISO 27001/27002 is a widely used standard which highlights the importance of security (Boritz, 2005).

The number one reason companies choose IaaS is its cost reduction opportunity (theguardian.com). Unfortunately, IaaS is known for its complex and diversified accounting models (PR Newswire, 2013), which most companies have difficulties understanding. One of the tools that can help simplify this process is named the “IaaS Pricing Codex” (Appendix F). It classifies IaaS pricing models into seven categories, which helps companies to understand the associated benefits and risks (TechRepublic). Companies can then use this taxonomy and choose the best model that aligns with their own core values.

Regardless of the IaaS price model, clients need to maintain a good audit trail in order to track its usage. One tool companies may choose is that cloud Service Broker (CSB) solution, which creates an independent audit trail of its cloud service consumption (Cloud Service Broker). This would help address billing discrepancies, assist external auditors, and help conduct data usage trend analysis.

**IaaS Impacts on Accounting Professionals**

**IaaS Impacts on Financial Management**

A major accounting impact of the use of IaaS is the shift from capital investment (CapEx) to operating expenses (OpEx) (Rackspace, 2013). The classification change of IT infrastructure from CapEx to OpEx has no inherent benefits or drawbacks by itself, because it is solely an accounting metric. However, company may prefer one structure compared to another depending on their unique situations. As shown in table 1 below, cash restricted companies that values flexibility has preference for switching to OpEx.
Therefore, an important responsibility of Financial Management professional is to determine which model is most compatible for the firm.

**Table 1: Comparison of CapEx vs. OpEx** content retrieved from http://www.diffen.com/difference/Capex_vs_Opex

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>CapEx</th>
<th>OpEx</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Characteristics</strong></td>
<td>Company has ownership and responsibility for asset with useful life extending beyond one period. Asset is fixed</td>
<td>Company typically incurs OpEx as an ongoing cost. Companies who value flexibility would prefer this method.</td>
</tr>
<tr>
<td><strong>Timing of payment</strong></td>
<td>Lump-sum near beginning of purchase, with financing options.</td>
<td>Monthly payments, or as determined in contract. Cash-restricted firms may prefer this method.</td>
</tr>
<tr>
<td><strong>Financial Statement item</strong></td>
<td>PP&amp;E on balance sheet, with corresponding amortization and depreciation expenses</td>
<td>Classified on income statement as operating expenditure</td>
</tr>
<tr>
<td><strong>Tax impacts</strong></td>
<td>Deductible overtime as CCA</td>
<td>Deductible in period incurred. Cash restricted companies may prefer receiving their tax deductions sooner.</td>
</tr>
</tbody>
</table>

**IaaS Impacts on Internal Auditor**

Internal audit staff should analyze business processes and identify any weaknesses and inefficiencies that could benefit from the implementation of IaaS. This analysis is very important to the C-Suites in their decision of whether to implement IaaS in the first place (Boritz, 2005). After the implementation of IaaS, the Internal Audit staff should continuously monitor business activities to identify improvements. They should also assist upper management in developing controls and risk management programs in order to address the various security and availability risks mentioned earlier in this report.

**IaaS Impacts on Corporate Tax Professionals**

IaaS services may complicate the tax reporting process for cloud vendors. This is because in some cases, it is difficult to distinguish the service provided between a service, a sale, license, or lease transaction (TaxAnalysts, 2011). Each of these revenue categories are subject to different tax treatment, therefore cloud vendors have opportunities for tax manipulation and planning. To comply with tax standards and to avoid litigations, it is important for tax professionals to understand the nature of the IaaS service being provided in order to classify it properly and apply the appropriate tax treatment.

**IaaS Impacts on Internal Controls**

Other impacts include the need for a more powerful Accounting Information System that could track IT usage in order to determine the service fee (Cloud Service Broker). If companies cannot accurately track their usage, then there would likely be issues regarding service fees and trend analysis and forecast. There are also cases where employees are over recording data usage because they are bribed by third-part cloud...
With IaaS, companies are increasingly outsourcing confidential and private data to third party providers. These providers may then further outsource these services to another sub-service provider (DevCentral). As such, it may be difficult to map out a company’s IT infrastructure or determine who actually has access to company data. Therefore, effective vendor hiring analysis policies are required to ensure data integrity.

IaaS Impacts on Performance Management and Company Politics

As mentioned earlier, IaaS may cause a shift from CapEx or OpEx. An unexpected and often-ignored consequence is its effects on company politics and performance management (Merchant Van Der Steel). Two simplified scenarios are provided below to illustrate this.

**Scenario 1:** Company A’s departments are set up as partial profit centres where each department is only responsible for their OpEx. CapEx is not taken into consideration when evaluating department performance.

**Scenario 2:** Assuming nothing else has changed, Company A now switched to IaaS. As a result, each department is now fully responsible for their IT infrastructure expenses because the accounting classification of IaaS is OpEx. Department heads would likely be unhappy towards the new system because their bonuses and performance evaluations is now negatively impacted.

This political impact shown above is often ignored in IaaS literature, but may affect an organization’s most valuable assets: its employees. Therefore, it is important to adjust HR policies and corporate structure in order to minimize damaging employee morale and culture.

IaaS Impacts on Accounting Guidelines

The price model, billing process, and delivery of cloud services are fundamentally different from the traditional computing environment, which would require a different revenue recognition model. Accounting standards currently do not include specific revenue recognition guidelines for the cloud computing industry. As a result, most firms follow a service revenue recognition model (PwC). The general consensus is that stand-alone services such as installation fees, service activation fees, and other up-front activities are not separable deliverables if they have no stand-alone value, and will be deferred over the period when the service is performed (PwC). Another general guideline is that direct expenses associated with the IaaS service such as customer origination cost, sales commissions, and solicitation cost will be expensed directly or amortized over a period (KPMG).

However, cloud vendors are increasingly beginning to develop new and more complex pricing models with clients (PR Newswire, 2013), which complicate the recognition of revenue for cloud vendors. These complexities may create opportunities for cloud vendors to manipulate revenue recognition, choosing either to accelerate or defer revenue. Therefore, the IASB and FASB are expected to introduce a new revenue recognition model to incorporate the pricing models in the cloud sector.
Critic of Current Accounting Measure in Respect to Cloud Industry

To provide an example of the inadequacy of current revenue recognition policy in respect to the increasingly complex price mode in the cloud sector, IBM’s new Data Consumption Model will be examined in this section (please refer to model below in blue box).

IBM recently developed a new price model named the Data Consumption Model. Under this model, clients may purchase cloud storage usage for only a fraction of the price upon installation. The full balance of the IaaS storage would only be charged when the system reaches a predetermined capacity threshold, at which point a second storage system is deliverable for only one dollar. The cycle continues with each additional unit of storage costing one dollar, and full payment is made only when capacity threshold is reached (IBM Newsroom, 2014).

In the pricing model mentioned above, it may be difficult to predict when the threshold will be reached, therefore complicating the timing and valuation of revenue recognition. Firms implementing the new Data Consumption Model would face the following challenges, which would allow them to manipulate revenue recognition.

1. Under IAS 18, revenue should be recognized only when the amount of revenue can be measured with reliability (Deloitte). This complicates the timing of revenue recognition because under the new IaaS Pricing Model described above, the IaaS service may have already been delivered to the client, but the revenue cannot be reliably measured because client are not obligated to pay the full price depending on whether the clients reach a data usage threshold. This scenario is slightly different from the traditional contingent revenue issue because in this case, the timing of the contingent event is not fixed. In fact, the contingent event may not occur until several periods after the service has been provided.

2. It may be argued that the IaaS fee can be reliably measured if the vendor knows the clients’ usage pattern. For instance, if the vendor knows through extrapolation that a particular client will eventually meet the threshold usage amount, then the amount of revenue can be measured because the fee is based on attainment of threshold usage. However, this is only true for clients with predictable usage patterns such as Walmart (Appendix D). It would be difficult to predict usage pattern for clients with erratic usage patterns. Also, projections may be subject to errors, and it would be difficult to adjust previous revenue once projection is proved to be wrong.

3. Under the Data Consumption model, revenue may become uneven and unpredictable. This is because even as the cloud service is delivered to the client, the vendor cannot determine how much the client will pay for the service since service fee is contingent on whether the client will reach their usage threshold (either one dollar or the full service fee).

IBM currently records its cloud revenues using the services model (IBM, 2014), which does not provide guidelines on the above issues posed by IBM’s creative pricing models. However, IBM’s annual report identified that in May 2013, SEC is conducting an investigation into how exactly IBM reports cloud revenue
(IBM, 2014). This signifies that the dynamic IaaS pricing models are starting to pose a problem to revenue recognition, and SEC is starting to investigate into these issues.

Prediction of Accounting Guidelines Changes in Response to IaaS

As shown above, there is a trend of increasingly complex price models in the cloud industry, mainly due to the industry’s unique business model. As this trend continues, current accounting policies may be unable to properly capture the actual economic effects of the cloud service, resulting in inconsistencies in how revenue is recognized. Therefore, the IASB and FASB are expected to introduce a new revenue recognition model to incorporate the pricing models in the cloud sector. Aspects that is expected to be included in the new guidelines include

1. **Timing of revenue recognition:** Recently, more cloud providers’ prices are beginning to depend on whether a client will reach a data usage threshold: contingent revenue. Therefore, the selling price may not be able to be measured reliably even though the vendor is already providing the service. Hence it is important to establish guidelines regarding “in which situation is cloud service prices considered to be reliably measurable”. For instance, is trend analysis a reliable measure of how much data usage a client is expected to use in the future?

2. **Methods for estimating the contingency:** IASB would likely provide several acceptable methods for estimating the amount of computing resources that a client will use. This is because more and more cloud vendors are basing service fees on whether clients will achieve a usage threshold (IBM Newsroom, 2014). Therefore, it is important to estimate how much usage a client is expected to use in order to determine the approximate price of service. In order to reflect accurate revenue, guidelines regarding methods for adjusting revenue in the case that estimation of client data usage was incorrect are also expected to be provided.

3. **Guidelines regarding cut-off of revenue recognition:** More cloud vendors are basing selling price on whether clients will reach a data usage threshold, which may not occur until a few years after the current reporting period. Therefore, it is important to establish guidelines regarding which portion of revenue should be recorded in each period. IASB could either require revenue to be estimated and recorded in the first period when it is earned, or it could require revenue to be recorded in the period when the threshold is reached, because technically the incremental revenue is only collectible due to the fact that the threshold is reached.

Emerging IaaS Trends Professionals Should be Aware of

Transformation of the Video Game Industry through IaaS

Currently, the video game industry's implementation of cloud has mostly been constrained to SaaS (J. R. Brook, 2010). However, the sheer volume of computing resources demanded by the software causes performance lags (J. R. Brook, 2010). IaaS could be the key to solving this problem because it IaaS could “replace game consoles with cloud supercomputer” (Edwin Eavaas-Thirlwell, 2013). Gamers could access stronger computing processing power via the cloud, transforming the video gaming experience by creating
“a real living world” (Kollar, 2014). It will allow every player to play on a single server rather than split into shards like in current MMOs (Kollar, 2014). It also allows for a fully dynamic, deformable and modifiable world without the need for patches or updates (Kollar, 2014). Hacking and cheating would no longer be possible (Kollar, 2014). If successful, it can be expected that IaaS would be the new game architecture. Therefore, professionals should pay attention to the gaming industry because this major transformation to IaaS would increase the demand for cloud service auditors, accountants (to determine pricing model for this new game architecture), and consulting services related to the cloud.

**Cloud Providers could become Hosts for Fraudulent Activities**

IaaS’s benefits are appealing to criminals, who could for example take advantage of the online computing resources to set up Denial-of-Service attacks to overload victims’ systems. In 2012, a cloud-based banking fraud was discovered, which defrauded an estimated $78 million from account holders (Scarpatti, 2013). The scheme relied on the resource availability and automation of the cloud, which was not possible through a single host computer (Scarpatti, 2013). As shown, cloud providers could be exposed to legal liabilities, negative publicity, or become blacklisted. Therefore, there is a great reliance on professionals and consultants to help develop fraud detection policies in the cloud, while at the same time maintaining client confidentiality.

**IaaS and Green IT**

IaaS may also help contribute towards the trend of Green IT. It is estimated that data centres typically produce up to 100 times more energy than normal offices (Kavur, 2009); therefore consolidation of data centres through virtualization and IT outsourcing can be expected to save overall energy. Currently, Hydro Toronto is contributing towards this initiative by paying clients to reduce power from data centres (Kavur, 2009). These initiatives are expected to increase IaaS adoption rate.

**The Machine: Data Analysis and Management**

As more data is moved to the cloud, it becomes difficult to analyze and interpret the data. Recently, HP has developed a new computing architecture named the Machine which could process more data using less energy and space (Fitzgerald). This new computing architecture could make the cloud more sustainable by reducing the energy and time required to analyze and manage the large volume of online data. Therefore, there may be a demand for professionals who are knowledgeable with this new technology because the Machine could become a major part of a company’s data processing and management function.

**IaaS Integrated with Big Data**

IaaS can also be integrated with other technological tools to add value to businesses. For instance, a new tool called digitalDNA combines IaaS with Big Data to help secure a company’s supply chain (Harris). This tool assigns all products a unique DNA signature code (Harris). Each time the product is received from a supplier, the code is scanned, and the data is analyzed by a cloud database to identify possible theft or counterfeiting (Harris). This allows companies to instantly reject counterfeit or stolen products and to identify high-risk vendors. It can also be used for trend analysis for forecasting and budgeting purposes.
Predictions of Future Impacts of IaaS

IaaS is cost-effective, flexible, and with the market’s focus on cost management, IaaS can be expected to become a prominent service in about 20 years. “Between now and 2020, the fastest-growing sector of the market is going to be cloud service providers” – Frankovsky, VP of hardware design, Facebook

1. **Invisible Computing**: Almost all IT infrastructures would be consumed as a service; therefore the client would only require a platform to access the infrastructure (CloudTweaks). This could positively impact business continuity because physical destruction of devices does not necessarily result in loss of data. Issues such as availability, security, and SLAs will become especially important, and professionals would be relied upon to consult in these areas.

2. **The new generation of CIOs**: The new CIOs would have greater reliance on service providers and be unable to map out the company’s IT infrastructure (Muller, 2013). However, there may even be cases where the company’s cloud provider outsources some components to another cloud provider (DevCentral). Therefore, it will become important for CIOs to understand how their services are provided in order to identify availability, privacy, or security issues.

3. **Convergence of cloud providers**: since IaaS and cloud computing is based on the concepts of economies of scale, it is possible that cloud vendors will begin to merge their resources together until only one monopoly remains (Clark, 2012). Clients will have fewer choices, but the remaining cloud providers should be well known and highly reliable. Unfortunately, this may mean less demand for service auditors because clients will rely less on SOC reports due to the monopolistic characteristics of cloud.

4. **Green IT**: Companies that still operate their own IT infrastructure will be pressured to reduce power consumption through data centre consolidation and using low-power processors. For instance, HP is currently developing a low-power ARM chips to allow companies to cut their electricity bills (PC World).

5. **Increased innovation**: Strong computing power achieved through IaaS allows companies to conduct complex financial models and business transactions in real-time, which would increase business efficiencies and rate of innovation in the future (Menegrez, 2013). Examples mentioned in this report include the video gaming industry and supply management process.

**Conclusion: Professionals Should Stay Up-to-Date with IaaS**

As shown through this report, IaaS is expected to become a prominent trend in future computing, which will increase demand for accounting professionals. First, CMA/CPAs must stay up-to-date with IaaS in order to provide financial reporting that captures the economic realities of this unique service. CA/CPAs are expected to provide strong assurance of cloud vendors’ financial statements, especially in the management assurance of revenue cut-off and valuation. Internal auditors must also have clear understanding of IaaS and its benefits and risks in order to improve company efficiencies and cost structure. Lastly, service auditors are also in demand to provide SOC reports which is the primary factor in which clients determine if a vendor is reliable. Overall, the use of IaaS can be expected to increase in the future and accounting
professionals will be in great demand to assist them with this unique service, making it a profitable and important service that accounting professionals should be involved in.
Appendix

Appendix A: Growth of IaaS Expected to exceed those of SaaS and PaaS

![Public Cloud Services Five-Year CAGRs, by Segment](image)


Appendix B: cloud computing expected to save up to 29% of cost

<table>
<thead>
<tr>
<th></th>
<th>Internal IT</th>
<th>Managed Services</th>
<th>The Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Investment</td>
<td>$40000</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Setup Costs</td>
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<td>$5000</td>
<td>$1000</td>
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<tr>
<td>Monthly Services</td>
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<td>Monthly Labor</td>
<td>$3200</td>
<td>$0</td>
<td>$1000</td>
</tr>
<tr>
<td>Cost over Three Years</td>
<td>$149000</td>
<td>$129000</td>
<td>$106000</td>
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<tr>
<td>Savings gained</td>
<td>0%</td>
<td>13%</td>
<td>29%</td>
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[Estimated costs of infrastructure for two application servers, two database servers and a load balancer across internal, managed and cloud deployment models. Source O'Reilly Media, George Reese].

Appendix C: Economies of Scale achieved by cloud Providers

This experience curve graph shows why private organizations are unlikely to beat the marginal cost of Cloud Computing infrastructure.


Appendix D: Example of Computing Usage Volatility

Traffic history of Walmart.com

Appendix E: Market Share of Major IaaS/PaaS Providers

Graph generated in Tableau 8.2   Data retrieved from https://www.computenext.com/blog/hot-air-in-the-clouds/

Appendix F: IaaS Price Codex

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<th>COMMITMENT</th>
<th>METERING</th>
<th>UNIT PRICE VARIABILITY</th>
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Bibliography


