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A Study of Cloud Computing Infrastructure-as-a-Service (IaaS) in Financial Firms

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Abstract

The cloud continues to be a delivery method of information systems deployed frequently by financial firms. Infrastructure-as-a-Service (IaaS) is an evolving model of this method in industry. In this study, the authors evaluate critical few factors that can enable financial firms to formulate a generic strategy from investment in IaaS. The authors find procedural factors more evident than technical and business factors on projects of IaaS, but also find implementation methods more limiting in strategy. The findings of this study contribute a framework for investment in this maturing method of cloud computing.

Keywords: cloud, cloud computing, cloud deployment models, financial industry, information systems, infrastructure-as-a-service (IaaS), strategy

1. DEFINITIONS OF CLOUD COMPUTING AND INFRASTRUCTURE-AS-A-SERVICE (IaaS)

The cloud is defined in the literature as “a [method]:

enabling convenient, on-demand network access[by a business firm] to a shared pool of configurable computing resources ... that can be provisioned rapidly and released with minimal

management effort or [cloud] service provider [CSP] interaction” (National Institute of Standards and Technology [NIST], 2009).

Business firms benefit from the cloud in elasticity and flexibility in the dynamic scalability of services and especially from hardware procurement and productivity by renting technology; and firms benefit from consolidating data centers into fewer servers from multiple physical servers, having overhead savings

(Kulkarni, Sutar, and Gambhir, 2012) benefiting especially financial firms. The cloud is evident in services of technology in almost all firms in Industry (Black, Mandelbaum, Grover, and Marvi, 2010). The cost of investment in the cloud is declining and driving its force as a justified proposition to firms (Koulopoulos, 2012). The cloud computing method is considered a business evolution (Hossain, 2013), but is also defined as a "disruptive" (Messmer, 2013), "dominant" (Luftman, 2011) and essentially "exponential element" in impact (Koulopoulos, 2012) in industry, if not "the most significant technique in the 21st century" (Prasanth, 2012).

The Infrastructure-as-a-Service (IaaS) is defined in the literature as a data center-as-a-service model (Linthicum, 2009):

enabling "the capability ... [for a business firm for] provision[ing] fundamental computing ..., network[ing], processing and storage, where the [business firm] is able to deploy and [operate] arbitrary software, which can include applications and operating systems... the [firm] does not control or manage the underlying cloud infrastructure but ... controls deployed applications, ... limited control of ... networking ..., operating systems, and storage" (National Institute of Standards and Technologies, 2010) – a virtual data center (Gartner Report, 2012) for financial firms and an infrastructure for cloud computing Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) in industry (Hossain, 2013).

2. INTRODUCTION TO STUDY OF FINANCIAL FIRMS AND IaaS

Despite the benefits, firms in general are cautious about the cloud because of difficulties cited in the literature (Sunyaev and Schneider, 2013). Firms doing projects may not have a framework for the implications of cloud systems in contrast to non-cloud systems (Alvarez, 2012, and Leavitt, 2009). For financial firms, data processing regulatory requirements and restrictions, and data privacy protection and security (Cronin, Pauli, and Ham, 2012), may be an issue on IaaS systems (Hay, Nance, and Bishop, 2011 and Pal, 2013); and international privacy requirements may be an issue on shared systems. Interruptions in provider service (Perkins, 2013) may be an issue (Sunyaev and Schneider, 2013) on IaaS systems. Providers managing the infrastructures may limit

responsibilities for their services and limit the rights of the firms (Baldwin, 2012). Savings may not be realized by the firms (Violino, 2011). Though firms benefit from the cloud, they are fearful of the risks (F5 Networks, 2009). They have to be cautious about investment in cloud models (Ditmore, 2013) of outsourced services and frequently limit investment to hybrid (private and public) or private cloud IaaS models (Forrester Report, 2011) on non-critical systems. The hesitation in implementation of the cloud computing method may limit investment in this paradigm of technology.

Estimates however are clear that firms are engaged in the cloud, including IaaS (Krigsman, 2012). Firms have had an investment of \$110.3 billion in the cloud in 2012 (Gartner Forecast Overview Report, 2013), and the investment is forecasted to be \$206.6 billion in 2016 (Gartner Report, 2012). Estimates forecast a further 62% of processing, or 4.3 zettabytes, to be in the cloud in 2016 (Pushp, 2012). Financial firms have increased investment in the cloud (MacSweeney, 2013), as 23% have aggressively initiated projects, and 43% have modestly initiated them, in 2013 (Honore, 2013). Financial firms have increased investment on IaaS projects, as 42% have initiated hybrid (private and public) systems, and 38% have initiated private systems, as early as 2011 (Forrester Report, 2011). The IaaS investments have involved production systems. Though financial firms have initiated investment in cloud systems in a frequency higher than might be expected from the issues (Kondo, 2011), the literature indicates that they may not have a framework for the implications of IaaS systems (Alvarez, 2012 and Leavitt, 2009). The lack of planning projects in a strategy may be a problem, as the firms proceed on the systems (Forrester Report, 2011).

In this study, the authors conduct an evaluation of cloud factors on IaaS projects that may enable financial firms to formulate an evident generic strategy for IaaS systems. Evaluation of IaaS is important in the field, as financial firms have diverse options from a growing number of providers (Babcock, 2012 and Babcock, 2013) pushing solutions that may not be proper to the requirements of the firms (Linthicum, 2012a). Financial firms having a holistic IaaS requirements and roadmap strategy (Sharma, 2012) – not an easy initiative (HP Report, 2013) – may improve the performance and security of their IaaS systems and technologies (Gubala

and Sprague, 2011). How are financial firms engaging in IaaS projects initiating or not initiating a strategy? How are financial firms integrating or not integrating private and public IaaS services, including information protection services, on production systems in a strategy? How are financial firms focusing or not focusing on internal implications of IaaS projects and systems? Neither practitioner nor scholarly literature furnishes a full framework (Rimal, Choi, and Lumb, 2009) for a generic IaaS strategy. Therefore, this study furnishes a factor framework for a methodology for an IaaS cloud computing strategy in the financial industry.

3.0 CLOUD FACTOR FRAMEWORK in IaaS STRATEGY – MODEL OF STUDY

The critical few factors for enabling financial firms engaging in investment on projects in an IaaS strategy are defined in business, procedural and technical categories. These factors are founded and justified from earlier models of the authors on cloud computing strategy (Lawler, Howell-Barber, Yalamanchi, and Joseph, 2011 and Howell-Barber, Lawler, Desai, and Joseph, 2012), from which they evaluated IaaS, Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) broadly and SaaS individually in industry. The definitions of these factors are created by the authors and customized by them to IaaS. This study expands a recent survey (Wang, He and Wang, 2012) focusing on enterprise requirements for services in the cloud.

Business Factors in a Cloud IaaS Strategy

The business factors on an IaaS strategy are below:

Agility – Extent to which an edge in dealing with competitive markets and customer demand for improved products and services enabled IaaS;

Cost Benefits – Extent to which financial considerations enabled IaaS implementation;

Executive Involvement of Business Organization – Extent to which participation of senior managers from business organization(s) enabled IaaS implementation;

Executive Involvement of Information Systems Organization – Extent to which participation of

senior managers from internal technology organization(s) enabled IaaS implementation;
Globalization – Extent to which international dimensions enabled IaaS implementation;

Organizational Change Management – Extent to which internal organizational change management processes enabled IaaS implementation;

Participation of Business Organization – Extent to which participation of internal organizational staff enabled IaaS implementation;

Regulatory Requirements – Extent to which governmental or industry regulatory requirements enabled IaaS implementation; and

Strategic Planning and Cloud Computing – Extent to which implementation of IaaS was enabled or included in organizational strategic planning.

Procedural Factors in a Cloud IaaS Strategy

The procedural factors on an IaaS strategy are below:

Education and Training – Extent to which internal cloud education and training enabled IaaS;

Planning and Procurement – Extent to which organizational costing and planning of procurement techniques enabled IaaS implementation;

Process Management – Extent to which internal process improvement responsibilities, roles and techniques enabled IaaS implementation;

Program and Project Management – Extent to which program and project management teams enabled IaaS implementation;

Risk Management – Extent to which provider reviews, including cloud computing bill of rights for financial firm and service level agreements (SLA) with provider(s), integrated into internal risk management techniques enabled IaaS implementation;

Service-Oriented Architecture (SOA) – Extent to which SOA enabled IaaS implementation;

Standards – Extent to which open standards, participation in standards organizations or

processes of standards management enabled IaaS implementation of the technologies; and

Technology Change Management – Extent to which technology change management, including provider selection, enabled IaaS implementation.

Technical Factors in a Cloud IaaS Strategy

The technical factors of the model on an IaaS strategy are below:

Cloud Computing Center of Excellence – Extent to which cadre of internal organizational staff, knowledgeable in best-of-class practices of cloud computing technologies, enabled IaaS;

Cloud-to-Cloud Interoperability – Extent to which IaaS integration with other internal or external cloud systems or technologies enabled IaaS implementation;

Cloud-to-Non-Cloud Interoperability – Extent to which IaaS integration with other internal or external non-cloud systems enabled IaaS implementation;

Continuous Processing – Extent to which 24/7/365 resource availability enabled IaaS implementation;

Data – Extent to which information governance enabled IaaS implementation;

Elasticity of Processing Resources – Extent to which resources synchronization with processing requirements enabled IaaS implementation;

Infrastructure Architecture – Extent to which IaaS implementation integrated into internal organizational infrastructure;

Multiple Providers – Extent to which multiple providers enabled IaaS implementation;

Networking Implications – Extent to which internal organizational networking infrastructure enabled IaaS implementation;

Platform(s) of Provider(s) – Extent to which provider platform(s) enabled IaaS implementation;

Privacy and Security – Extent to which organizational and provider privacy and security techniques enabled IaaS implementation;

Problem Management – Extent to which problem management and monitoring tools enabled IaaS implementation; and

Tools and Utilities – Extent to which provider tools and utilities enabled IaaS implementation.

In this study, the authors improve the factors for IaaS projects from the factors for the SaaS systems in their earlier model (Howell-Barber et. al., 2012). The factors are largely the same as those in the previous study of SaaS systems, as the implementation of IaaS and SaaS (and even PaaS) systems is enabled in the cloud similarly by this methodology model. The conceptual framework for IaaS projects and systems, depicted in Figure 1 of the Appendix, is even founded generically on a larger model of the authors on service-oriented architecture - SOA (Lawler and Howell-Barber, 2008), as the services of SOA were the forefront to the services of the cloud.

4. FOCUS OF STUDY

The focus of this study is an evaluation of the aforementioned cloud framework on IaaS projects, as initiated or not initiated in a generic strategy for IaaS systems. The cloud and IaaS are highly important investments in the production systems of financial firms in 2013 (Yurcan, 2012). The foundation of the investment in a model of strategy is important to firms, as established providers as Amazon, Bluelock, CSC, IBM and Rackspace, and insurgent providers as Google, HP and Microsoft, expect further migration to IaaS and introduce numerous options for production workloads (Knorr, 2012) that necessitate review (Flood, 2013). The frequent hype from practitioner sources on cloud and IaaS necessitates reality reviews from a scholarly study (Sriram and Khajeh-Hosseini, 2010). Therefore, this study contributes a formidable framework for investment in a cloud computing IaaS strategy.

5. RESEARCH METHODOLOGY OF STUDY

The research methodology of this study comprised 5 financial firms from industry, chosen by the authors because of evident high innovation and payback in Infrastructure-as-a-Service (IaaS). The firms were cited frequently in credible consulting papers and leading practitioner publications in June – August 2012. The projects and systems of IaaS in the firms were evaluated by the first and second authors

in the August 2012 – April 2013 period, from a checklist instrument defining the 30 business, procedural and technical factors of the framework model of this study. The enablement of the factors on the key projects and systems, if not on strategy, were evaluated by the authors on a six-point Likert-like rating scale: 5 – very high, 4 – high, 3 – intermediate, 2 – low, 1 – very low, and 0, in evidence of the factors. The evaluations were founded on in-depth observations of senior management stakeholders in the firms; perceptions of observation rationale by the second author, an experienced industry practitioner; and reviews of secondary technology industry studies by the third and first authors, which were filtered first for hype by the second author.

The checklist instrument was evaluated in the context of construct, content and face validity, and content validity measured in the context of sampling validity, by the fourth and first authors. The methodology was in conformance with principles of Yin (Yin, 2013). The methodology of this study was consistent in credibility and reliability with that included in the previous studies of the authors (Lawler et. al., 2011 and Howell-Barber et. al., 2012).

The data from the evaluations were interpreted in MATLAB 7.10.0 Statistics Toolbox measurements (McClave and Sincich, 2006) by the fourth author, for presentation in the following section.

5. ANALYSIS OF FINANCIAL FIRMS OF STUDY

Detailed Analysis and Discussion of Firms*

Firm 1: National Banking Institution

Firm 1 is a large-sized national banking institution that emphasized a consolidated cost-efficient hybrid infrastructure from its different IaaS providers. The objective of the project was to customize the commercial contracts of the providers to the on-demand processing requirements of the firm; cut dependence on individual providers in order to facilitate flexible platforms for portability; and design and implement an environment for services controlled more by the firm. The project resulted in a greatly improved infrastructure integrated for the provisioning of systems.

The business factors of *agility* (5.00) and *cost benefits* (5.00) were the drivers of the project.

The procedural factors from *education and training* (5.00) to *technology change management* (5.00), including the factor of *program and project management* (5.00) was evident fully on the project. The procedural factors of the framework model were highly important in provider standardization. The technical factors from *cloud computing center of excellence* (5.00) to *tools and utilities* (5.00) were evident highly on the project, similar to the technical factors. To ensure the future of the improved infrastructure, *strategic planning and cloud computing* (5.00) was evident highly on the project.

Firm 1 was focused methodically on a full IaaS resource strategy that furnished success.

Firm 2: Consultative Trading Institution

Firm 2 is a small-sized northeast trading institution that emphasized a faster public Euronext infrastructure from a provider. The objective of the project was to furnish high-frequency processing for mathematical models for specialist traders. The project resulted in an improved infrastructure for real-time trading.

The business factors of *agility* (5.00) and *cost savings* (5.00) were evident highly on the project, and *executive involvement of the information systems organization* (5.00) was evident in negotiating with the provider. The procedural factors were evident highly on the project, similar to those in Firm 1, including *risk management* (5.00) of the infrastructure for high-frequency volatility. The technical factors from *cloud computing center of excellence* (5.00) to *problem management* (5.00) were evident largely on the project, but in one provider were simplified than in Firm 1.

Firm 2 was focused on a simplified solution that on future projects will serve as an initial IaaS strategy.

Firm 3: Securities Trading Institution

Firm 3 is a large-sized securities trading institution that emphasized a public Amazon Web Services (AWS) infrastructure for information retention. The objective of the project was to furnish improved methods for record retention; increase services to other securities trading institutions at lower costs; and to integrate mandated regulatory requirements for increased transparency. The project resulted in an improved platform for scalability of storage.

The business factors from *agility* (5.00) to *executive involvement of the technology organization* (5.00) were evident highly on this project, especially the factor of *regulatory requirements* (5.00). Except largely for *risk management* (5.00), procedural factors were not as evident on this project as on the projects in Firms 2 and 1, as Firm 3 focused on a narrow niche of reporting requirements of the Commodity Futures Trading Commission and the Securities and Exchange Commission (SEC). The *participation of the business client organizations* (2.00) was not even as evident as in Firms 2 and 1. The technical factors, including *privacy and security* (5.00), were as evident highly on this project as on the projects in Firms 2 and 1. The business, procedural and technical factors strengthened *strategic planning and cloud computing* (4.00) in a limited but strong strategy.

Firm 3 was focused on the public provider retention service of infrastructure, not other services, as an IaaS strategy.

Firm 4: Commercial and Consumer Lending Organization

Firm 4 is a medium-sized north-central commercial and consumer lending organization that focused on hardware integration onto a private VMware platform. The purpose of this project was to lessen data center server sprawl of subsidiary systems; and to lessen data center staff. The result of this project was an infrastructure integrated for processing requirements throughout the organization with less purchasing and less staff.

The business factor of *cost benefits* (3.00) was evident on the project, but not as highly as on the projects in Firms 3, 2 and 1. The procedural factors of *planning and procurement* (5.00), *process management* (5.00), *program and project management* (5.00) and *technology change management* (5.00) were highly notable on the project, in order to ensure the infrastructure migration from public to private provider systems. The procedural factor of *education and training* (5.00) and the technical factor of *cloud computing center of excellence* (5.00) were notable similarly, for internal skills were needed for integration of the systems. The technical factors of *cloud-to-non-cloud interoperability* (5.00), *continuous processing* (5.00), *infrastructure architecture* (5.00) and *tools and utilities* (5.00) were notable too. The

factors of the framework model were largely subordinate to *strategic planning and cloud computing* (5.00) in a semblance of strategy.

Firm 4 was focused on an IaaS resource and staffing plan that furnished success as in Firm 1 and was furnished a foundation for other resources and systems to migrate to IaaS with this strategy.

Firm 5: International Financial Services Organization

The final firm of the case study, Firm 5, is a large-sized international financial services organization that focused on integration of private Rackspace resources for internal development staff. The purpose of this project was to move localized resources to infrastructure of UNIX and Windows platforms, so that services were sharable at lower costs with more staff. The result of this project was a infrastructure integrated at lower costs for services throughout the organization.

The business factor of *cost benefits* (5.00) was evident highly on the project, as on the projects of the other firms. Inasmuch as the information systems project was on services of software technologies, *executive involvement of the technology organization* (4.00) was evident almost as highly as on the other projects, but *executive involvement of the business client organizations* (1.00) was not as evident on this project as on almost all of the other projects, nor was *participation of the client organizations* (2.00). Other than the procedural factor of *service-oriented architecture* (5.00) the procedural factors were not evident highly in an immediate intention for project results. The technical factors of *cloud-to-non-cloud interoperability* (4.00), *elasticity of processing resources* (5.00), *platform of provider* (5.00) and *tools and utilities* (5.00) were evident highly in the infrastructure integration on this project. Though productive, this project was not subordinate to *strategic planning and cloud computing* (2.00) and was without a strategy for other resources and services.

Firm 5 was focused on a project that furnished a service solution on IaaS but was without a strategy for furnishing future success of IaaS systems.

*Firms are classified as confidential because of competitive considerations in the industry.

Collective Analysis and Discussion of Firms

The case study on IaaS discloses procedural (3.75) factors more frequent than technical (3.65) and business (3.60) factors, detailed in Table 1.

In detail the case study discloses the business factors of *agility* (3.80) and *cost savings* (5.00) as drivers on the projects, enabled more by *executive involvement of the information systems organizations* (4.80) than by *executive involvement of the business organizations* (3.60). The factor of *regulatory requirements* (3.60) was enabling the financial industry projects. The procedural factors of *planning and procurement* (4.00), *process management* (3.80), *program and project management* (3.80), *risk management* (4.60) and *technology change management* (4.60) were evident in governance on most of the projects; and the technical factors of *cloud-to-non-cloud interoperability* (4.80), *infrastructure architecture* (4.80), *platforms of providers* (3.80), *privacy and security* (5.00) and *tools and utilities* (4.20) were evident on most of them, enabled by *education and training* (4.20) and *cloud computing center of excellence* (4.00), detailed in Table 2. Though almost all of the projects were investing limited services on IaaS and not critical few objective systems, most of them were involving a planning, program and project management and risk management methodology that furnished a foundation for incrementally migrating other services to IaaS in a strategy.

In short, the narrow project services in this study furnished the potential of a productive IaaS strategy.

(The correlations and the frequency of ratings from the case study are furnished in Tables 3 and 4 for review.)

6. IMPLICATIONS OF STUDY

The financial firms in the case study are benefiting from cost savings of Infrastructure-as-a-Service (IaaS). However, the firms are cautious about investing in critical few objective systems on IaaS, due to constraints of increasing industry regulation. They are focused on investment in limited systems not integrated with other systems that may be on IaaS or on other Platform-as-a-Service (PaaS) or Software-as-a-Service (SaaS) systems, more than in the previous SaaS study (Howell-Barber et. al.,

2012). They gain a competitive edge in the industry in investment in provider services, but the investment is marginal if they are hesitant about integration of potential systems with IaaS technologies. The implication is that these firms benefit from IaaS but may benefit further from a cohesive plan for a strategy.

The firms in most of the study are also benefiting from fundamental governance of the IaaS projects. Planning, process management and project management are enabling the implementation of most of the projects, if not facilitating IaaS infrastructure standardization (Pande, 2012). Risk management is facilitating regulation sensitivity. These factors of the framework of the study are furnishing a foundation for an incremental integrative migration of other systems on to IaaS provider technologies. The implication is that these firms may eventually formulate a plan so that infrastructure systems are subordinate to an IaaS, if not a larger PaaS, SaaS and IaaS strategy.

Finally, the information technology organizations of the firms are clearly the drivers of the IaaS projects in the study. The enterprise architects of the organizations are enabling the IaaS projects at higher involvement than the client organizations of the firms, as IaaS systems are inherently technical. These firms are fortunate in having in-house technologists not only passionate but skilled to move them on to the cloud and IaaS provider technologies – a requirement (Linthicum, 2012b) for which shortages are cited frequently in the literature (Adams, 2012 and McDougall, 2012). The intricacies of the cloud IaaS projects in networks, servers and systems, as they related to non-cloud organizational systems, had to be managed not by the provider staff but by these technologists. The implication is that these firms have an opportunity to pursue other projects and systems on the cloud with their own technologists and to hopefully pursue a strategy.

7. LIMITATIONS AND OPPORTUNITIES IN RESEARCH

The study is limited to a few firms in the financial industry initiating innovation in the cloud. The study is further limited by the inherent immaturity and limited number of IaaS projects and systems in the industry, and the purposes of the projects and systems in the

firms of the study are specific to these firms, which may be a limitation. Moreover, the hesitation of senior management in fully informing on the intricacies of IaaS systems is a limitation of external studies. Nevertheless, this study furnishes good indications of factors facilitating initiatives of managers in the technology. This study furnishes a framework for investment in this method of cloud computing technology for the financial sector if not non-financial sectors that may be helpful to future researchers.

8. CONCLUSION OF STUDY

The cloud computing model of Infrastructure-as-a-Service (IaaS) is benefiting financial firms, despite the immaturity of the model. The findings on the firms in the study indicate that procedural factors are more frequent than technical and business factors on projects of IaaS. The focus on less impact and less larger systems found in the study indicates that IaaS is in its adolescence in the industry, as investment in provider services is for largely localized low rate-of-return systems. The hesitation is from generally issues of privacy, regulation and security on IaaS systems, cited often in the literature. The investment is largely limited to non-integrated small systems. However, the management process for implementation of the systems is indicated in the study to be rigorous and sensitive with qualified technologists. Nevertheless, neither non-technical nor technical senior management of the firms in the study is interested in planning a robust strategy with the technology. Still, this study furnishes a flexible methodology that will be helpful to senior management and practitioner staff, as more systems integrating onto IaaS would benefit from a strategy. The model of this study will be helpful as a utility to researchers studying IaaS in the financial sector and other sectors.

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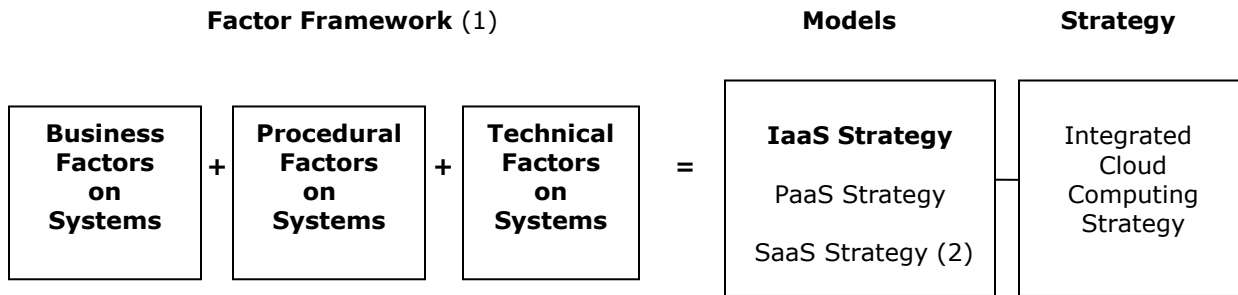
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APPENDIX

**Figure 1: Cloud Factor Framework for Cloud Computing Strategy
 - Conceptual Model of IaaS Study**



Note: Factors are enhanced for individual IaaS, PaaS and SaaS models.

Sources: (1) Lawler et. al., 2011
 (2) Howell-Barber et. al., 2012

Table 1: Collective Analysis of Categorical Factors of 5 Financial Firms of IaaS Study

Categorical Factors of Models	Means	Standard Deviation
Business Factors	3.60	1.59
Procedural Factors	3.75	1.61
Technical Factors	3.65	1.91

Legend: 5 – Very High, 4 – High, 3 – Intermediate, 2 – Low, 1 – Very Low and 0 in Enablement Evidence in Implementation of IaaS systems.

Table 2: Detailed Analysis of Factors of 5 Financial Firms of Iaas Study

Factors of Model	Firm 1 Means	Firm 2 Means	Firm 3 Means	Firm 4 Means	Firm 5 Means	Summary Means	Standard Deviations
Business Factors							
Agility	5.00	5.00	5.00	3.00	1.00	3.80	1.79
Cost Benefits	5.00	5.00	5.00	5.00	5.00	5.00	0.00
Executive Involvement of Business Organization	3.00	5.00	5.00	4.00	1.00	3.60	1.67
Executive Involvement of Information Systems Organization	5.00	5.00	5.00	5.00	4.00	4.80	0.45
Globalization	2.00	2.00	1.00	0.00	2.00	1.40	0.89
Organizational Change Management	4.00	2.00	2.00	4.00	2.00	2.80	1.10
Participation of Business Client Organization	3.00	5.00	2.00	4.00	2.00	3.20	1.30
Regulatory Requirements	4.00	5.00	5.00	4.00	0.00	3.60	2.07
Strategic Planning and Cloud Computing	5.00	5.00	4.00	5.00	2.00	4.20	1.30
Procedural Factors							
Education and Training	5.00	5.00	3.00	5.00	3.00	4.20	1.10
Planning and Procurement	5.00	4.00	4.00	5.00	2.00	4.00	1.22
Process Management	5.00	4.00	3.00	5.00	2.00	3.80	1.30
Program and Project Management	5.00	4.00	3.00	5.00	2.00	3.80	1.30
Risk Management	5.00	5.00	5.00	3.00	5.00	4.60	0.89

Service-Oriented Architecture (SOA)	5.00	0.00	4.00	0.00	5.00	2.80	2.59
Standards	5.00	4.00	1.00	0.00	1.00	2.20	2.17
Technology Change Management	5.00	5.00	5.00	5.00	3.00	4.60	0.89
Technical Factors							
Cloud Computing Center of Excellence	5.00	5.00	3.00	5.00	2.00	4.00	1.41
Cloud-to-Cloud Interoperability	4.00	0.00	0.00	0.00	0.00	0.80	1.79
Cloud-to-Non-Cloud Interoperability	5.00	5.00	5.00	5.00	4.00	4.80	0.45
Continuous Processing	2.00	5.00	5.00	5.00	1.00	3.60	1.95
Data	2.00	5.00	5.00	1.00	5.00	3.60	1.95
Elasticity of Processing Resources	5.00	3.00	5.00	4.00	5.00	4.40	0.89
Infrastructure Architecture	5.00	5.00	5.00	5.00	4.00	4.80	0.45
Multiple Providers	5.00	0.00	0.00	0.00	0.00	1.00	2.24
Networking Implications	3.00	5.00	5.00	1.00	4.00	3.60	1.67
Platform(s) of Provider(s)	5.00	5.00	5.00	0.00	4.00	3.80	2.17
Privacy and Security	5.00	5.00	5.00	5.00	5.00	5.00	0.00
Problem Management	5.00	5.00	4.00	5.00	0.00	3.80	2.17

Tools and Utilities	5.00	3.00	3.00	5.00	5.00	4.20	1.10

Legend: Refer to Legend in Table 1.

Table 3: Correlations between Pairs of Financial Firms of IaaS Study

	Firm 1	Firm 2	Firm 3	Firm 4
Firm 1				
Firm 2	0.5056			
Firm 3	0.1715	0.6840		
Firm 4	0.0850	0.4321	0.5646	
Firm 5	0.1620	0.0658	-0.0082	0.2893

Note: The correlations between Firm 2 and Firm 1, Firm 3 and Firm 2, Firm 4 and Firm 2 and Firm 4 and Firm 3 are significant statistically relative to zero at the 5% level of significance.

Table 4: Frequency of Ratings across Factors of IaaS Study

Ratings	Firm 1	Firm 2	Firm 3	Firm 4	Firm 5
0	13.33%	6.67%	10.00%	20.00%	---
1- Very Low	13.33%	6.67%	---	6.67%	---
2-Low	26.67%	6.67%	6.67%	---	10.00%
3-Intermediate	6.67%	6.67%	6.67%	6.67%	10.00%
4- High	16.67%	13.33%	13.67%	16.67%	10.00%
5- Very High	23.33%	50.00%	63.33%	50.00%	70.00%