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JOURNAL OF INFORMATION SYSTEMS APPLIED RESEARCH

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A Study of Cloud Computing Software-as-a-Service (SaaS) in Financial Firms

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Abstract

Cloud computing is a delivery method of information systems that is being deployed by the financial industry. Software-as-a-Service (SaaS) is the more frequent model of this method in the industry. In this study the authors analyze factors that can enable firms in the financial industry to formulate cloud computing strategy from a foundational investment in SaaS. The authors learn that business and procedural factors are more critical than technical factors as drivers in an implementation strategy. The findings of the study contribute guidance into the formulation of strategy from initial investments in the technology.

Keywords: cloud computing, financial industry, information systems, software-as-a-service (SaaS), strategy.

1. DEFINITIONS OF CLOUD COMPUTING AND SOFTWARE-AS-A-SERVICE (SaaS)

Cloud computing is defined as "a [method that enables] convenient, on-demand network access [by a financial 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" (Walz & Grier, 2010).

This delivery method of information systems enables agility in the deployment of firm initiatives, elasticity and flexibility in the scalability of services, and especially cost investment maintenance (Ahuja & Rolli, 2011) and overhead procurement savings (Nimsoft, 2011) in technology. This method enables productivity savings in the integration of social networking technologies (Boulton, 2011). Most firms in industry have at least one cloud service (Black, Mandelbaum, Grover, & Marvi, 2010).

The method is hyped as one of the leading technologies in 2011 (Luftman, 2011).

Software-as-a-Service (SaaS) is defined as an Application-as-a-Service (AaaS) model:

"The capability [furnished] to the [financial firm] is to apply the [SaaS cloud service] provider's applications running on a cloud infrastructure; the applications are accessible from … client devices through a thin client interface, such as a Web browser (e.g. Web-based e-mail); and the [financial firm] does not control nor manage the underlying cloud infrastructure, including networks, operating systems, servers, storage or even individual application capabilities, with the … exception of limited [financial firm] – specific application configuration settings" (Mell & Grance, 2011, p.1).

2. INTRODUCTION TO STUDY OF FINANCIAL FIRMS AND SOFTWARE-AS-A-SERVICE (SaaS)

Financial firms are deterred frequently from investment in cloud computing delivery methods because of concerns documented in the literature. Cloud computing methods of Software-as-a-Service (SaaS) can be considered black box models in which financial firms may become dependent on a cloud service provider (CSP) but not be knowledgeable of the hosting latency and location of the technology (Streeter, 2011). Cost savings may be elusive on complex migration models of cloud computing (Violino, 2011). Data privacy, regulation and reliability of services may be issues to the firms in the outsourcing of SaaS systems (Rocha, Abreu, & Correia, 2011), evident generally in mishaps and outages of services of Amazon EC2 (Prigge, 2012), Google Gmail (O'Shea, 2011), and Microsoft Azure (Prigge, 2012). Inconsistent portability and security standards of the CSP may be a further issue in precluding firms in the financial industry from investment in SaaS (Ortiz, 2011). The immaturity of the CSP in this particular industry may be an issue in precluding SaaS systems. The information systems departments in this industry may be resistant to SaaS, as they may perceive a loss of management power if systems are proceeding to the cloud (Black, Mandelbaum, Grover, & Marvi, 2010). The forecast for cloud computing methods may be hindered in the financial industry by the issues in the literature.

Firms in the financial industry have however implemented projects in cloud computing. More than 50% of the industry is estimated to have initiated investment in SaaS models in 2011 (Aite Group, 2011). Projects have included collaboration, desktop and e-mail systems (Narter, 2011) and customer relationship management (CRM) systems at 25% of the market (Klie, 2012). CRM SaaS systems have integrated customer service in the firms (Klie, 2011, Gonzalez, 2011, & Adams, 2012). More than 50% of the processing in the institutions is forecasted to be serviced by cloud models in 2015 (Titlow, 2011). This industry market in cloud computing models is forecasted to be $27 billion in 2015 (Cofran, 2011). More of the SaaS systems might be in medium-sized to small-sized initiatives than in large-sized initiatives (Pring, 2010) that have problematic spaghetti systems. Though firms in the financial industry indicate issues in the investment in cloud computing models, they have implemented projects and systems in a frequency higher than might be expected from the issues – "a gold rush of the 21st century" (Kondo, 2011, p.1-6) that might or might not be enabled by a strategy.

In the study the authors attempt to discern factors that are enabling financial firms to formulate or not formulate a cloud computing path from an investment in SaaS, so that managers can replicate a creditable strategy. Exploration of cloud computing technology is facilitated frequently in projects of SaaS (McAfee, 2011). Exploration of SaaS is important in the formulation of strategy as CSP firms in the technology industry furnish perceived holistic Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and SaaS services and technologies (Pring, 2010). Financial firms having a cloud computing strategy may improve the integration of their technologies (Gubala, 2011). How are firms in the financial industry initiating or not initiating a cloud computing strategy from SaaS? Is the hype in front of reality? (Taneja Group, 2011). Neither practitioner nor scholarly literature furnishes a full SaaS framework for granular interpretation of a methodology on cloud SaaS systems. The authors of this study furnish a factor framework for a methodology for a holistic strategy from the best practices on SaaS projects and systems in the financial industry.

3. FACTOR FRAMEWORK IN A CLOUD COMPUTING SAAS STRATEGY – MODEL OF STUDY

The factors for enabling firms in the financial industry to implement projects in a cloud strategy from an investment in SaaS are defined in business, procedural and technical categories. These factors are derived and justified from an earlier model of the authors on cloud computing strategy (Lawler, Barber, Yalamanchi, & Joseph, 2011), from which they analyzed a broad cross-section of firms in industry that had IaaS, PaaS and SaaS. This study expands literature on initial methodology of cloud computing strategy (Peiris, Sharma, & Balachandran, 2011). In this study the authors analyze a closer section of firms in the financial industry that have had SaaS projects and systems. The factors are enhanced by the authors for the functionality of SaaS systems. The framework of the factors is founded on even further models of the authors on Service-Oriented Architecture (SOA) (Lawler & Howell-Barber, 2008) and Web services (Lawler, Anderson, Howell-Barber, Hill, Javed, & Li, 2003), inasmuch as services and SOA are a forefront to cloud technology.

Business Factors in Cloud Computing SaaS Strategy

The business factors of the model on cloud computing SaaS strategy are below:

Agility and Competitive Edge- extent to which improved agility in dealing with competitive markets and customer demands enabled cloud implementation of SaaS;

Cost Benefits – extent to which financial considerations enabled implementation of SaaS;

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

Executive Involvement of Information Systems Organization – extent to which participation of senior managers from internal information systems organization enabled implementation of SaaS;

Organizational Change Management – extent to which organizational change management processes enabled implementation of SaaS;

Participation of Client Organizations – extent to which client organizational staff enabled implementation of SaaS;

Regulatory Requirements – extent to which governmental or industry regulatory requirements enabled implementation of SaaS; and

Strategic Planning – extent to which organizational strategy planning of the cloud enabled implementation of SaaS

Procedural Factors in Cloud Computing SaaS Strategy

The procedural factors of the model on cloud computing SaaS strategy are below:

Education and Training – extent to which cloud methodology skills training enabled cloud implementation of SaaS;

Financial Planning – extent to which client organizational financial planning enabled implementation of SaaS;

Process Management – extent to which client organizational and technological process management, including process responsibilities and roles, enabled implementation of SaaS;

Program and Project Management – extent to which program and project management teams enabled implementation of SaaS;

Risk Management – extent to which processes for review of cloud service providers (CSP), including cloud computing bill of rights and service level agreements (SLA) integrated into organizational risk management processes, enabled implementation of SaaS;

Service-Oriented Architecture (SOA) – extent to which SOA enabled implementation of SaaS;

Standards – extent to which open standards, participation in standards organizations, or processes of standards management enabled implementation of SaaS; and

Technology Change Management – extent to which technology change management, including CSP selection, enabled implementation of SaaS

Technical Factors in Cloud Computing SaaS Strategy

The technical factors of the model on cloud computing SaaS strategy are below:

Business Application Software – extent to which cloud service provider (CSP) software enabled cloud implementation of SaaS;

Cloud Computing Center of Excellence – extent to which a cadre of internal organizational staff, knowledgeable in best practices of cloud computing technology, enabled implementation of SaaS;

Cloud-to-Cloud Hybrid Integration – extent to which integration of the cloud with other internal or external cloud systems enabled implementation of SaaS;

Cloud-to-Non-Cloud Integration – extent to which integration of the cloud with other internal or external non-cloud systems enabled implementation of SaaS;

Continuous Processing – extent to which 24/7/365 processing and scalability of cloud resources of technology enabled implementation of SaaS;

Data – extent to which information management ownership processes and resources enabled implementation of SaaS;

Elasticity of Processing Resources – extent to which resource synchronization enabled implementation of SaaS;

Infrastructure Architecture – extent to which implementation of SaaS integrated with the infrastructure architecture of the internal organization;

Multiple Cloud Service Providers (CSP) – extent to which interactions with multiple CSPs enabled implementation of SaaS;

Networking Implications – extent to which networking infrastructure of the internal organization enabled implementation of SaaS;

Platform of Cloud Service Provider (CSP) – extent to which CSP platform of technology enabled implementation of SaaS;

Privacy and Security – extent to which CSP and organizational privacy and security steps enabled implementation of SaaS;

Cloud System Problem Management – extent to which management and monitoring, including problem management tools, enabled implementation of SaaS; and

Tools and Utilities – extent to which CSP tools and utilities enabled implementation of SaaS

4. FOCUS OF STUDY

The focus of the authors is to evaluate the aforementioned factors of the model of the study in the cloud implementation of Software-as-a-Service (SaaS) projects and systems in financial firms; and to evaluate the projects and systems in the feasibility of initiation of a larger cloud computing strategy. Financial firms have increased investment in cloud innovation (Gubala, 2011) even though there are issues on this computing method, and the frequent investment is in the model of SaaS, which may furnish or not furnish a foundation of a larger strategy. The foundation is crucial for financial firms in pursuing new technologies (Aishawi & Arif, 2011). The authors evaluate the factors of the model of this study as applied or not applied as best practices on projects and systems of SaaS and of strategy. This study contributes input for this industry into the formulation of a practical cloud computing strategy.

5. RESEARCH METHODOLOGY OF STUDY

The research methodology of this study consisted of a sample of 26 financial firms that have had cloud computing Software-as-a-Service (SaaS) projects and systems, as defined in Table 1 of the Appendix. The projects and systems were analyzed by the authors in the following iterative 9 month period of study:

- In the period of September 2011 – March 2012, a graduate student in the Seidenberg School of Computer Science and Information Systems of Pace University, the third author of the study, conducted a literature survey of 21 firms in the financial industry on SaaS projects and systems. The firms were chosen because of aggressive innovation in SaaS cited in credible leading practitioner publications in the industry, such as *Bank Technology News* and *Wall Street and Technology*. From a checklist instrument

defining the 30 business, procedural and technical factors of the model of the study, the student evaluated enablement of the factors on the key SaaS projects and systems in each of the 21 firms. To the factors the student applied a six-point Likert-like rating scale of 5 – very high, 4 – high, 3 – intermediate, 2 – low, 1 – very low and 0, in perceived enablement evidence of the factors in the implementation of the SaaS systems, and the second and fourth authors evaluated the instrument in the context of construct, content and face validity, and content validity was measured in the context of sampling validity;

- In the period of November 2011 – May 2012, an experienced practitioner in the financial industry and in SaaS systems, the first author of the study, conducted a detailed case study based on principles of Yin (Yin, 2003), separate from the limited generic survey, of a further 5 firms in the financial industry on SaaS projects and systems, in order to refute or not refute the findings of the graduate student and second author. The 5 firms were chosen by the first author because of distinguishing first mover innovation and payback in reengineering technology cited by leading consulting organizations, such as Gartner, Inc. and International Data Corporation (IDC) Research Services. From the aforementioned checklist instrument of 30 factors, the first author evaluated enablement of the factors on the key SaaS projects in each of the 5 firms, based on in-depth observations of 13 middle management stakeholders in these firms; on her perceptions of the observation rationale as an industry practitioner of 36 years; and on reviews of secondary studies, such as from IBM, Microsoft and Oracle, as they purely related to the project technologies, but filtered for hype in marketing of these technologies. The first author applied the aforementioned rating scale in perceived enablement evidence of the factors in the implementation of the SaaS systems. This author evaluated further the feasibility of initiation of a future if not larger cloud computing strategy;

- In the period of March – June 2012, the fourth author interpreted the data from the evaluations in the case study and the literature survey, but focusing more on the case study, in the MATLAB 7.10.0 statistics Toolbox in measurements (McClave & Sincich, 2006) for the analysis in the following section.

(The methodology of the study is consistent in creditability and reliability with the methodology employed in earlier studies of the authors (Lawler, Anderson, Howell-Barber, Hill, Javed, & Li, 2003, & Lawler, Howell-Barber, Yalamanchi, & Joseph, 2011) on services strategies.)

6. ANALYSIS OF FINDINGS

Collective Analysis of 21 Financial Firms from Survey

As a precursor to the case study, the firms in the survey emphasized more business factors and procedural factors than technical factors on the projects of SaaS. The findings highlighted the business factor of *agility and competitive edge* (4.05 / 5.00) [Table 2 of the Appendix] as a contributor frequently to the projects, and the enabling factors of *executive involvement of business organizations* (4.05), *executive involvement of information systems organization* (4.52), *participation of client organizations* (4.19) and *regulatory requirements* (4.00) were high on the projects. The procedural factors of *education and training* (4.33) and *process management* (3.95) facilitating methodology were generally high on most projects. The technical factors however of *business application software* (2.86) *coupled to tools and utilities* (0.52), *multiple cloud service providers* (0.43), *platform of providers* (0.29) and *networking implications* (0.10) were generally low on the projects. The factors of *cloud-to-cloud hybrid integration* (0.90) and *cloud-to-non-cloud integration* (1.05), and *infrastructure architecture* (0.95), *organizational change management* (3.00) and *strategic planning* (3.14) relating to SaaS strategy if not integrated PaaS and IaaS strategy, were mixed in the survey.

The findings highlighted that these firms in the survey focused more on an elemental evolving of a foundation for an incremental model of SaaS, in short-term objectives of the projects that inevitably limited strategy.

(Factors analyzed in the survey are collectively summarized in Tables 2 and 3 of the Appendix.)

Detailed Analysis of 5 Financial Firms* from Case Study

Firm 1: Loan Marketing Project: Human Resource SaaS System

Firm 1 is a *large-sized* northeast educational loan marketing organization that focused on a PeopleSoft human resource system. The objective of the project was to discontinue an expensive internal legacy process and system that were not expandable fast enough for further feature functionality; and engage an external cloud service provider (CSP) system that in the future might link to a provider financial system. The project resulted in a new on-demand system that is expandable in functionality in months not years.

The business factors of *executive involvement of business organization* (5.00 / 5.00) [Table 4 of the Appendix] and *executive involvement of information systems organization* (5.00) were contributors to the project. The procedural factors of *process management* (4.00) and *technology change management* (5.00) were a foundation for process management of the project. The procedural factor of *risk management* (4.00) and the technical factor of *privacy and security* (5.00) were important in the management of *data* (4.00) information. The eventual integration of the human resource system with the financial system was important in the *cloud-to-cloud hybrid integration* (5.00). Not evident in importance was *elasticity of processing resources* (1.00) in the future geometric scalability of the new financial system. Not evident in *infrastructure architecture* (0.00) was a foundation for a future SaaS if not PaaS strategy.

Firm 1 was essentially focused more on business and procedural factors than on technical factors, in a cautious and helpful incremental model of SaaS that was limited to short-term objectives that precluded a cloud computing strategy.

Firm 2: Banking Project: Customer Relationship Management (CRM) SaaS System

Firm 2 is a *large-sized* mid-west banking organization that focused on a Salesforce.com system. The objective of the project was to enable disconnected and expensive customer relationship management processes into an integrated system. The project resulted in a new provider solution that integrated the processes of marketing, sales and service into one system, from which the divisions of the firm had a holistic picture of household relationships.

The business factor of *agility and competitive edge* (5.00) was the driver of the project, but *executive involvement of business organizations* (5.00), *executive involvement of information systems organization* (5.00) and *participation of client organizations* (5.00) of the firm were enabling factors. The procedural factors of *process management* (5.00), *program and project management* (4.00) and *technology change management* (5.00) and especially *education and training* (5.00) were a foundation for methodology. The procedural factor of *risk management* (5.00) and the technical factor of *privacy and security* (5.00) were important in the management of *data* (5.00) information, as in Firm 1. More evident in Firm 2 was the importance of the cloud computing skills of the internal staff in an established *cloud computing center of excellence* (5.00). More evident in Firm 2 in *strategic planning* (4.00) and *infrastructure architecture* (4.00) was initiation of a SaaS strategy.

Firm 2 was focused more on business factors than on procedural and technical factors. However the provider furnished help in infrastructure strategy that may be further helpful in project planning of SaaS strategy. Investment in the skills of the internal staff was notable in the study.

Firm 3: Banking Project: Content Management SaaS System

Firm 3 is a medium-sized mid-west banking organization that focused on a CrownPeak content management and optimizer system. The objective of the project was to enhance inefficient content management processes of an extranet Web site that was maintained manually by a few staff. The project resulted in a new provider system that exponentially improved maintenance marketing of new products and resources and publicized searching on the site.

In Firm 3 the business factors of *executive involvement of business organizations* (5.00) and *participation of client organizations* (5.00) were the drivers of the full project, as the client divisions controlled the project and depended largely on the provider. Differing from Firms 2 and 1, the disadvantage was that the internal

systems department was less a player in *executive involvement of information systems organization* (3.00) than the provider. The procedural factor of *process management* (5.00) was important in the methodology of the project, but was not improved in the other procedural factors. Evident in importance as in Firm 2 was cloud computing skills of the internal client department staff in another *cloud computing center of excellence* (5.00). Not evident was future independent planning of projects in *cost benefits* (2.00) and *financial planning* (2.00) or planning of a SaaS strategy in *infrastructure architecture* (0.00) and *strategic planning* (2.00).

Firm 3 was cautiously focused more on business factors than on the other factors, but, by focusing on the provider and not integrating the internal systems staff, was limited to short-term objectives of projects that precluded strategy.

Firm 4: Insurance Project: Homeowner Policy Management SaaS System

Firm 4 is a *small-sized* northeast insurance organization that focused on a EXIGEN homeowner policy management system. The objective of this project was to improve the performance and policy processing of a legacy system that was not current in customer requirements and governmental regulations. This project resulted in a provider system that improved issuance of policies, processing of rates, and self-service through the Web.

The business factors of *agility and competitive edge* (5.00) and *regulatory requirements* (5.00) were the critical drivers of this project, and, in contrast to Firm 3, the internal systems department was more a player in *executive involvement of information systems organization* (5.00). The disadvantage however was the client departments were not as strong in *executive involvement of business organizations* (2.00) and in *participation of client organizations* (2.00). The procedural factor of *process management* (5.00) was also important in the methodology of this project, as it was in Firms 3, 2 and 1, but the other procedural factors were limited in robustness. Skills of the systems staff in *cloud computing center of excellence* (5.00) coupled to *education and training* (3.00) were important on this project, as they were in Firms 3 and 2. Strategy was evident further in *strategic planning* (4.00), but was limited in this study.

Firm 4 was focused more on the business factors as in the other firms of the case study. The internal systems staff was positioned as players in providing a potential SaaS strategy, but they will require the internal client staff stakeholders in a productive strategy. The investment in the SaaS skills of the systems staff was a recurring study theme.

Firm 5: Investment Banking Project: Disaster Recovery SaaS System

Firm 5 is a small-sized western organization that focused on an EVault data protection and disaster recovery system. The objective of this final project of the case study was to initiate a data protection system for information on customers of the firm; and install a faster recovery system of the information by limited Firm personnel. This project resulted in an outsourced storage system that protected the information and provided reliable remote recovery services.

In contrast to Firms 4, 3, 2 and 1, the technical factors were the drivers of this project. *Continuous processing* (5.00), *data* (5.00), *elasticity of resources* (5.00), *infrastructure architecture* (5.00) and *networking implications* (4.00) were the important indices of this project, managed by the information systems division staff in *executive involvement of information systems organization* (5.00). The business factor of regulatory *requirements* (5.00), the procedural factor of *risk management* (5.00), and the technical factor of *privacy and security* (5.00) were the key impetus to this project. The procedural factor of *process management* (4.00) was important in methodology, as it was in Firms 4, 3, 2 and 1. In-house skills of the special staff in the *cloud computing center of excellence* (5.00) of the technology division were important on this project, as they were in Firms 4, 3 and 2. Not evident in *strategic planning* (2.00) was a SaaS project strategy.

Firm 5 was cautiously focused on technical factors of a narrow project that precluded strategy, but the project might furnish the potential of a strategy if further projects of this small-sized organization proceed on the cloud.

*Firms are confidentially identified in the case study because of competitive considerations in the financial industry.

(Factors analyzed in the case study are detailed in Tables 4 and 5; and factors in the consolidated case study and survey are detailed in Tables 6 and 7.)

Collective Analysis of 5 Financial Firms from Case Study – Summary

In further interpretation, the analysis discloses the business factors as a category having the more desirable means (central tendency) and standard deviations (spread) and the technical factors as a category having the less desirable means and deviations. This is evident in the case study and the survey. Though several of the factors – business, procedural and technical – are evaluated higher or lower in the case study than in the survey, the level of the category ratings are largely similar in the overall study. The patterns of the ratings of the factors across the categories of the factors of the firms in the case study and the survey seem to be also similar in the overall study. There are from ANOVA no statistical differences at the 0.05 level of significance between the business, procedural and technical factors or between the firms in the case study and survey, as evidenced by p values and by differences in factor means.

7. IMPLICATIONS OF STUDY

Financial firms analyzed by the authors are clearly clients of the model of Software-as-a-Service (SaaS), not refuting the generic literature (Friedenberg, 2011). The firms chose appropriate projects and systems and considered the impact of departmental experience and organizational performance of SaaS. The projects and systems are contributing benefits to the firms from the model of SaaS, even unanticipated benefits. Even with the benefits, the firms are cautiously, not exuberantly, experimenting in the fundamental model of SaaS, because of cited concerns of control, immaturity of the cloud method and security of the systems, contradicting the literature (InfoWorld, 2011). The enabling experimentation of SaaS as a feature in the implementation of systems in this industry is an implication of this study.

Firms in the case study and survey are examples of an incremental model of SaaS, a finding found by the authors in their 2011 study (Lawler, Howell-Barber, Yalamanchi, & Joseph, 2011). The firms are focused generally on medium-sized and small-sized systems of SaaS that in impact of implementation are perceived by the authors as inevitably sporadic throughout the organizations. Though the authors are cognizant of the cited consensus on the cloud, the firms in the study are not fully leveraging the potential of the cloud as a new opportunity proposition (Overby, 2011). They are not leveraging SaaS towards the platform spectrum of PaaS or IaaS, though they are methodically but slowly (Wittmann, 2012) moving into this spectrum. The implementation of SaaS in an incremental model limiting the myriad potential of the cloud is another implication if the study.

Few of the firms exhibit a larger cloud strategy. The projects and systems exhibit short-term objectives, a finding found in the literature (Nuciforo, 2012), not long-term objectives that may be the foundation for a holistic SaaS, PaaS and IaaS platform strategy. The systems were tactical (Linthicum, 2012). This may impact integration of later systems and modifications preventable if the firms had a strategy. This limits the potential of SaaS as a strategy. The methodology of the study may facilitate however the initiation of a migration strategy, if applied rigorously by the chief information officers (CIO) of the information systems departments to forthcoming implementations of the infrastructure of future systems, and if the information systems departments are not fearful of an inherently outsourcing strategy (Thibodeau, 2011). The implementation of SaaS in meeting short-term objectives but limiting the potential of a strategy is a final implication of the study.

8. CONCLUSION OF STUDY

Cloud computing is continuing to be deployed in industry despite concerns of dependency, organizational politics, privacy, regulation and reliability and security. The emphasis of the study on the model of Software-as-a-Service (SaaS) in the financial industry is disclosing from a case study and a literature survey that technical factors of functionality are less critical than procedural and business factors in the implementation of SaaS projects and systems in this industry. The findings are indicating that a foundational investment in SaaS technology may facilitate the potential of a larger cloud computing strategy, integrating Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS) technologies, if the framework methodology of the study is applied further to future systems. These findings furnish input

into the formulation of an improved cloud computing strategy that may benefit manager practitioners in financial and non-financial industries. This study offers opportunities for new research that will be pursued by the authors.

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APPENDIX

Table 1: Summary of Financial Firms and SaaS Systems

- Financial Firms -			
Financial Industry Sector	**Survey**	**Case Study**	**Total**
Asset Management	1	-	1
Banking	6	2	8
Brokerage	1	-	1
Financial Services	4	-	4
Insurance	4	1	5
Investment Banking	3	1	4
Loan Savings	2	1	3
Total	21	5	26

Graduate Student Survey

Table 2: Collective Detailed Analysis of Factors of 21 Financial Firms from Graduate Student Survey

Factors of Model	**Means**	**Standard Deviations**
Business Factors		
Agility and Competitive Edge	4.05	1.07
Cost Benefits	3.57	1.69
Executive Involvement of Business Organization(s)	4.05	1.24
Executive Involvement of Information Systems Organization	4.52	1.12
Organizational Change Management	3.00	1.64
Participation of Client Organizations	4.19	0.87
Regulatory Requirements	4.00	1.41
Strategic Planning	3.14	0.96
Procedural Factors		
Education and Training	4.33	1.15
Financial Planning	2.76	1.22
Process Management	3.95	1.53
Program and Project Management	2.76	1.79
Risk Management	4.19	1.54
Service-Oriented Architecture (SOA)	1.29	1.45
Standards	0.90	1.70
Technology Change Management	3.76	1.37
Technical Factors		
Business Application Software	2.86	2.03
Cloud Computing Center of Excellence	2.52	1.57
Cloud-to-Cloud Hybrid Integration	0.90	1.61
Cloud-to-Non-Cloud Integration	1.05	1.66
Continuous Processing	0.67	1.28
Data	1.76	1.79
Elasticity of Processing Resources	0.48	1.25
Infrastructure Architecture	0.95	1.47
Multiple Cloud Service Providers (CSP)	0.43	1.36
Networking Implications	0.10	0.30
Platform of Cloud Service Provider (CSP)	0.29	0.78
Privacy and Security	2.38	2.36
Cloud System Problem Management	0.38	0.80
Tools and Utilities	0.52	1.21

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

Table 3: Summary Analysis of Categorical Factors of 21 Financial Firms from Graduate Student Survey

Categorical Factors of Model	Means	Standard Deviations
Business Factors	3.82	0.53
Procedural Factors	2.99	1.32
Technical Factors	1.09	0.91

Industry Practitioner Case Study

Table 4: Detailed Analysis of Factors of 5 Financial Firms from Industry Practitioner Case Study

Factors of Model	Firm 1	Firm 2	Firm 3	Firm 4	Firm 5	Summary	
	Loan Savings	Banking	Banking	Insurance	Investment Banking		
	Means	Means	Means	Means	Means	Means	Standard Deviations
Business Factors							
Agility and Competitive Edge	3.00	5.00	5.00	5.00	3.00	4.20	1.10
Cost Benefits	4.00	4.00	2.00	3.00	5.00	3.60	1.14
Executive Involvement of Business Organization(s)	5.00	5.00	5.00	2.00	0.00	3.40	2.30
Executive Involvement of Information Systems Organization	5.00	5.00	3.00	5.00	5.00	4.60	0.89
Organizational Change Management	1.00	3.00	4.00	1.00	0.00	1.80	1.64
Participation of Client Organizations	4.00	5.00	5.00	2.00	0.00	3.20	2.17
Regulatory Requirements	2.00	5.00	5.00	5.00	5.00	4.40	1.34
Strategic Planning	4.00	4.00	2.00	4.00	2.00	3.20	1.10
Procedural Factors							
Education and Training	2.00	5.00	2.00	3.00	0.00	2.40	1.82
Financial Planning	5.00	1.00	2.00	1.00	4.00	2.60	1.82
Process Management	4.00	5.00	5.00	5.00	4.00	4.60	0.55
Program and Project Management	0.00	4.00	2.00	1.00	0.00	1.40	1.67
Risk Management	4.00	5.00	3.00	3.00	5.00	4.00	1.00
Service-Oriented Architecture (SOA)	1.00	0.00	0.00	0.00	0.00	0.20	0.45
Standards	0.00	0.00	0.00	3.00	0.00	0.00	0.00
Technology Change Management	5.00	5.00	2.00	2.00	0.00	2.80	2.17
Technical Factors							
Business Application Software	5.00	5.00	5.00	5.00	5.00	5.00	0.00
Cloud Computing Center of Excellence	2.00	5.00	5.00	5.00	5.00	4.40	1.34
Cloud-to-Cloud	5.00	0.00	0.00	0.00	0.00	1.00	2.24

Hybrid Integration							
Cloud-to-Non-Cloud Integration	1.00	5.00	0.00	2.00	0.00	1.60	2.07
Continuous Processing	0.00	0.00	0.00	1.00	5.00	1.20	2.17
Data	4.00	5.00	4.00	1.00	5.00	3.80	1.64
Elasticity of Processing Resources	1.00	0.00	0.00	0.00	5.00	1.20	2.17
Infrastructure Architecture	0.00	4.00	0.00	0.00	5.00	1.80	2.49
Multiple Cloud Service Providers (CSP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Networking Implications	0.00	0.00	0.00	0.00	4.00	0.80	1.79
Platform of Cloud Service Provider (CSP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Privacy and Security	5.00	5.00	4.00	1.00	5.00	4.00	1.73
Cloud System Problem Management	0.00	1.00	0.00	0.00	0.00	0.20	0.45
Tools and Utilities	3.00	5.00	5.00	2.00	5.00	4.00	1.41

Table 5: Summary Analysis of Categorical Factors of 5 Financial Firms from Industry Practitioner Case Study

Categorical Factors of Model	Means	Standard Deviations
Business Factors	3.55	0.89
Procedural Factors	2.25	1.65
Technical Factors	2.07	1.78

Graduate Student Survey and Industry Practitioner Case Study

Table 6: Summary Analysis of Categorical Factors of All 26 Financial Firms from Survey and Case Study

Categorical Factors of Model	Means	Standard Deviations
Business Factors	3.76	0.57
Procedural Factors	2.85	1.35
Technical Factors	1.28	1.04

Table 7: Summary Analysis of Factors of All 26 Financial Firms from Survey and Case Study

Factors of Model	Means	Standard Deviations
Business Factors		
Agility and Competitive Edge	4.08	1.06
Cost Benefits	3.58	1.58
Executive Involvement of Business Organization(s)	3.92	1.47
Executive Involvement of Information Systems Organization	4.54	1.07
Organizational Change Management	2.77	1.68
Participation of Client Organizations	4.00	1.23
Regulatory Requirements	4.08	1.38
Strategic Planning	3.15	0.97
Procedural Factors		
Education and Training	3.96	1.48
Financial Planning	2.73	1.31
Process Management	4.08	1.41
Program and Project Management	2.50	1.82
Risk Management	4.15	1.43
Service-Oriented Architecture (SOA)	1.08	1.38
Standards	0.73	1.56
Technology Change Management	3.58	1.55
Technical Factors		
Business Application Software	3.27	2.01
Cloud Computing Center of Excellence	2.88	1.68
Cloud-to-Cloud Hybrid Integration	0.92	1.70
Cloud-to-Non-Cloud Integration	1.15	1.71
Continuous Processing	0.77	1.45
Data	2.15	1.91
Elasticity of Processing Resources	0.62	1.44
Infrastructure Architecture	1.12	1.68
Multiple Cloud Service Providers (CSP)	0.35	1.23
Networking Implications	0.23	0.82
Platform of Cloud Service Provider (CSP)	0.23	0.71
Privacy and Security	2.69	2.31
Cloud System Problem Management	0.35	0.75
Tools and Utilities	1.19	1.86