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CLOUD IMPLEMENTATION IN EMERGING MARKET BANKS: THE IMPORTANCE OF SERVICE QUALITY

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Abstract:

Cloud computing is emerging as key a technology platform for banking operations globally. In Asia, the progress of cloud application is relatively slow. This paper considers the major factors which influence a bank's decision to contract with a technology service provider to implement a cloud based strategy. This research study identifies the trends in applying cloud computing in global banking with a focus on banks in Thailand. It will analyze the criteria IT executives in banks use to decide on the selection of technology service providers. Banks require the service provider to meet specific requirements for a cloud implementation project in a bank. A survey approach was used to identify the important criteria IT executives in banks use to select an IT technology provider for cloud applications. The sample included 367 bank IT executives and professionals in Thai and international banks based in Bangkok. SEM was used to analyze the data. Interviews were conducted with 21 IT executives for insights into their decision criteria. Service quality which is based on the conventional SERVQUAL indicators strongly influence the decision to choose a technology service provider. This selection is also influenced by the capability of service provider, their technical capability and the cloud application features. There are few studies in the literature on the decision criteria that banks use to select a provider for cloud computing application.

Keywords: Cloud Computing; Banks; Decision Criteria; Service Quality.

1. Introduction

Cloud computing used in this study refers to the cloud applications that are hosted and managed within bank's own data center, the on-premise private cloud or the enterprise cloud. In this regard, the cloud computing infrastructure and cloud application are managed by a bank's IT department through the utilization of computer hardware (server and storage), O/S, and applications in the infrastructure as a service (IaaS) that provide virtualized computing resources over the Internet including process as a service (PaaS) applications. A bank requires a cloud computing implementation and maintenance service from an IT technology provider to maintain these systems for the bank on a 24x7 basis.

Cloud technology offers secure deployment options for banks to develop new customer experiences, enable effective collaboration, improve speed to market and increasing IT efficiency (IBM, 2013). Cloud computing increases flexibility and streamlines operations. It gives higher growth and profit with better leverage and reduces fixed IT costs (IBM, 2013).

Figure 1 shows the potential business models related to the application of the cloud to banking. The cloud facilitates a bigger scale of service operations. Bank services can be more innovative and faster to the market. Bank products are more advanced and easier for the customers to use. The products can be adapted to a variety of different customers. For the bank there are new sources of value added and business opportunities from cross-selling. The use of the cloud also has a positive impact on cost management.
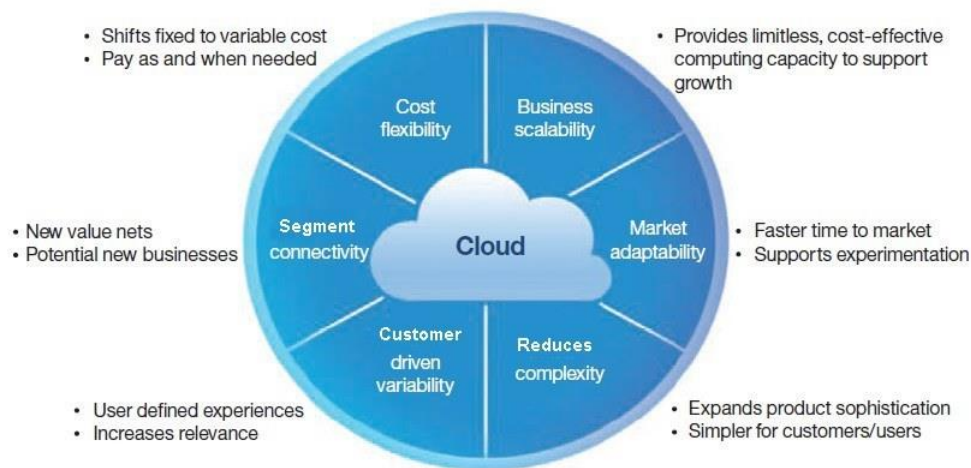

Figure 1: Cloud Computing Business Models in Banking (source: IBM, 2013)

The range of applications includes:
1) Customer analytics and customer relationship management
2) Browser-based technologies such as enterprise content management
3) IT development and application infrastructure by outsourcing (Capgemini, 2012).

The most active cloud applications in banks are CRM (46%), Application Development (46%) and Collaboration Platforms (41%). Banks consider a range of features. The most important features relate to security control and operational risks. These include transparency, auditing controls, encryption, greater responsiveness and the resolution of problems. The other features relate to governance issues.

Six major benefits of the cloud for banking have been highlighted
1) Cutting costs
2) Improving and flexibility and scalability
3) Increasing efficiency
4) Serving clients faster
5) Forging stronger client relationships
6) Bringing clients (buyer-sellers) together (Brown, 2014)

The range of benefits for banks using cloud applications are extensive as shown in Table 1. Frontline services are enhanced by analytics, business services, collaboration, connectivity, and product development. Back office operations can take advantage of new applications, faster upgrading and more effective storage. Risk management and security are better managed.

Table 1: Benefits of Cloud Computing for Banks (Source: IBM, 2013)

Area	Sample benefit
1.Analytics	Integrating customer data across banking platforms to enable near real-time insights.
2.Business Services	Extending and incorporating third-party services to extend the banking ecosystem to support customer's everyday requirements.
3.Collaboration	Enabling employees across distributed branches to access trading and banking systems through a secure cloud infrastructure.
4.Connectivity	Deploying a private cloud to centralize management of desktops allows for greater remote flexibility control, enabling banking employees to access the applications and data they need.
5.Development and Testing	Enabling a bank's development teams to quickly and easily create virtual environments thus increasing the agility of development and testing.
6.Industry Applications	Enabling payment providers to standardize and modernize transaction processing.
7.Upgrading	Allowing capacity to be allocated, expanded and reallocated efficiently for flexibility and agility reducing complexity and cost increases related to scaling up application for future growth.
8.Storage	Providing scalable storage solutions to ensure that the real-time demands of new trading and analytics processes are maintained.
9.Manage Backup	Backing up a bank's critical business data to ensure that in the event of a disaster a bank can recover rapidly and easily.
10.Security	Enforcing active security and endpoint management to ensure corporate governance and banking IT policies are maintained.

However, there are still major challenges in deploying cloud applications in banking:
1) Security and compliance
2) Reliability
3) Cloud management
4) Interoperability
5) Regulations (Brown, 2014)

Table 2 shows how banking services have changed by greater implementation of the Cloud. The responsiveness of banks to the market is reduced to weeks and actual service delivery to seconds. The products and services are simpler to use and available anytime and anywhere. Risk is lower and customers can choose the service delivery they prefer. Through the cloud more transactions can be managed much quicker at lower costs. The technology is also more flexible and adaptable to the user. The customer becomes actively involved in the process as a partner in product and service delivery to take advantage of the cloud technology requirements. IT service support is required to maintain operations on 24x7 basis.

Table 2: Impacts of the Cloud on Banks (Source: Tata Consultancy Services, 2010)

Time to Market	Years →Months→ Weeks
Response Time	Days →Minutes
Complexity	Highly Complex →Federated & Simple
Availability	24x7 (selected channels)→ Ubiquitous
Risk Tolerance	High →Low
Delivery Method	Automatic, Pull →Ubiquitous, Push
Transactions	Millions →More Millions
Cost / Transaction	High→ Low
New Product Launch	3-5/Year →30-50/year→ User Compatible
Technology	http/ftp/online/batch →Instant – any device/any time/anywhere
Customer	Consumer →Prosumer
Partnerships	Service Provider →Co Creator

In the actual practice of cloud application, 71 % of international bank executives would invest more in cloud based technologies (Groenfeldt, 2014). Many banks worldwide are using cloud applications already and realizing significant benefits. Robeco Direct (Netherlands) has moved its retail banking to the cloud. BankInter (Spain) uses the cloud to run credit risk simulations in 20 minutes compared to 23 hours in the past. Suncorp Bank (Australia) launched a virtual private cloud and data center. This cut costs by 50%. Before this application it would take 8 weeks and thousands of dollars using dedicated a server. This process now takes eight minutes and costs less than $ 1.00 (Groenfeldt, 2014). A large international bank implemented a cloud marketing campaign to deliver personalized product offers to customers across multiple channels in real-time. The bank realized improved processes, a thirty-five percent reduction in marketing costs and shorter cycle times (Groenfeldt, 2014). Additionally, the personalized customer experiences enabled through the cloud delivered a $20 million increase in corporate earnings while enhancing customer connectivity and improving response rates. In Thai banking there are a few banks using cloud applications. The limitations are a lack of awareness and misunderstanding of cloud applications. The main concerns are security low bandwidth, Internet access and service continuity. Data protection is also major concern (Numnonda, 2013). Another barrier is there are few IT technology providers in Thailand available to provide the cloud applications and support.

2. Review of Literature

Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that support those services (Armbrust et al., 2009). For the hardware maintenance a bank expects the same service quality regardless of whether a given application runs on cloud infrastructure or a traditional hardware configuration (Bauer and Adams, 2014).

A key factor related to decisions to select the cloud application provider are references based on word-of-mouth from to peers who have already invested in the service. These reviews about the service or product are from bank IT professionals who are independent of the IT technology provider and are respected by the bank (Park et al., 2012). The cloud is still a relatively new concept to many banks (Gebreel, 2014). As more banks adopt it, the trust will grow and examples of success will be shared (Barley, 2008). There is strong emphasis on the benefits of implementing

private cloud computing initiatives (Milbrink, 2016). Proven expertise and specific experience in cloud applications are key criteria for the selection of potential cloud application providers (Stratecast, 2012).

In the cloud computing selection and implementation, customer considerations focus on application support, availability, disaster recovery capabilities, and service level agreements (SLAs). Banks also require security policies and capabilities, costs, scalability, and the specific technology that will be used. The level of experience implementing cloud solutions is also specified (OSF, 2016).

The in-depth experience of the service provider is essential when a bank selects a cloud service provider (Setuix, 2016). The customer prefers a cloud provider with a track record and the capability to be responsive. The service provider needs to consistently demonstrate evidence of managing enterprise data centers, secure hosting and mission critical applications. The explicit service promise of the cloud computing applications is that the bank will gain the expected benefits of the applications (Bouchenak et al., 2013). The contract between the cloud provider and bank has specific service requirements to detect failures and resolve problems quickly and cost effectively.

When deciding between competitive IT service providers, banks evaluate each competitor's value proposition and chooses the best option (Powers, 2014). If promises don't materialize, customer dissatisfaction increases. Delivering on the service promise builds trust and demonstrates the dependability of the cloud provider to the bank. This requires a significant emphasis on the IT provider's commitment to service quality.

The success factors which cloud providers can convince the bank's decision maker include reliability, ownership of issues, trouble-shooting, keeping customers informed, an efficient team, and providing customer support. (Tan et al., 2007). For banks high service quality is considered as critical for enhancing long-term relationships with the cloud provider in a competitive business environment (Camarero, 2007; Hawke and Heffernan, 2006). The long-term relationships with customers will establish the reference for the cloud application provider to use in future contracts with other banks (Bairi and Manohar, 2011).

3. Qualitative Analysis

The cloud computing literature focuses on cloud computing hardware, software and required service features. There are few studies on cloud computing service quality or the bank's selection of IT service provider related to the service quality, service and technical capability.

In the current business scenario of banking, the industry is moving to implement cloud computing technology for cost effectiveness, competitiveness and greater revenue generation. It is important to identify what criteria increasing service quality bank exectutives use to select the IT service provider for the bank.

Description of the Interview Respondents
Interviews were conducted with respondents who are the directly involved in and the cloud project implementation in banks. The emphasis was to identify the characteristics of the decision involved in cloud computing initiatives, the banks potential to implement cloud applications and the important criteria they use to decide the technology provider. Face-to-face interviews were conducted with 21 the executives, such as, senior vice president, vice president, assistant vice president, senior managers and the team leaders of the bank's IT department. The average interview time was half an hour per person or one hour for a group. Example questions in the interview included:

1) What is the benefit or advantage of cloud computing technology to your bank?
2) What are the decision criteria to choose a cloud application provider?
3) Among public cloud, private cloud, and hybrid cloud which will be most suitable for your bank and why?
4) What do you require in the Service Level Agreement (SLA) of a cloud application project for your bank?
5) Is there any difference in the SLA for the legacy IT systems and the cloud?

Table 3 describes the illustrative quotes from bank executives interview related to the decision criteria for selection of an IT provider.

Table 3: Bank Executive's Criteria to Select the IT Cloud Provider

Area	Sample benefit
1.Technical Capability	"The technical capability of the service provider is important. If you read the Service Level Agreement (SLA) in our IT hardware and OS maintenance service contract. It is clear that a common requirement of service features we have in the RFP for cloud systems are the same service requirement providing for the legacy systems. The standard requirement for technical capability that we describe in the RFP are 24x7 hardware and OS support, access to get support from a skilled engineer or senior personal, provide account service manager to take ownership and accountability to fix hardware and OS issues, providing proactive planning, advise and guidance for operational best practices, firmware, security patch and microcode support making the system up to date."
2.Service Quality	"When we look at a tangible and reliability measurement dimension to estimate performance of the service provider to our bank, we expect that the service provider has to provide a high availability uptime guarantee at 99.9% of the work for twenty-four hours per day, seven day per week without system interruption. This is to ensure that the cloud system is always ready to serve the bank's customer at all times."
3.Decision Criteria	"Bank requires a faster service response from the service provider to immediately fix any hardware and OS problem. The reason is that bank has invested millions of US dollars in our cloud system with the real-time visibility and reporting capabilities within the cloud environment to maximize the utilization our investment. Therefore, we have to be notified by the system if there is any failure. When there is a system error or hardware replacement is needed, the IT provider has respond and fix it within 4 hours to prevent the system downtime from a hardware failure and provide required OS support."

Figure 2 presents the qualitative analysis showing the important considerations of banks as they decide to invest in cloud computing applications. The first aspect is strategy. Will the bank emphasize front line or back office operations? Will a private cloud approach be priority? The next issue will be the comparison of costs and benefits of cloud applications compared to the legacy IT operations. This will depend on which operations the bank will apply the cloud applications, for example in product or service offerings or in database management. After strategy the most important consideration is the cloud provider. The provider must have past experience and the capability to offer a range of cloud computing applications. The emphasis will be on the relationship between the bank and service provider specifically related to the service promise including service quality and performance expectations. The appropriate match between the customer and provider will influence the decision of the bank IT executives to select the best service provider.

The service requirements for a cloud project are the same for a legacy system. Technical support is required 24x7 for maintenance and OS issues. The service level agreement for cloud projects is also the same as a general service contract. The SLA specifies requirements to achieve specific KPIs – repair in 4 hours or helpdesk in 15 minutes. Because of the high investment in the cloud system any delay is very costly. The SLA is the most important factor in the IT executive's decision to choose an IT service provider for the cloud project. The IT cloud provider is responsible for the design; development and technology transfer for the cloud project. It is also expected that maintenance will also be provided. The IT provider is expected to maintain the continuity of the bank through preventive maintenance and problem solving a service interruption. It is important that the IT service provider can integrate the existing IT infrastructure with the cloud system. Service quality for the IT executive includes tangibility, reliability, timeliness, and assurance. The decision criteria are based more on comprehensive performance rather than only cost criteria. The cloud provider who can provide the integration of the legacy and cloud computing systems will have advantage. This includes proactive planning, guidance for operational practices and security. The cloud provider needs experience in banking. They should be responsive, flexible and adaptive. Collaboration is a major influence on the IT executive decision to choose a cloud provider.
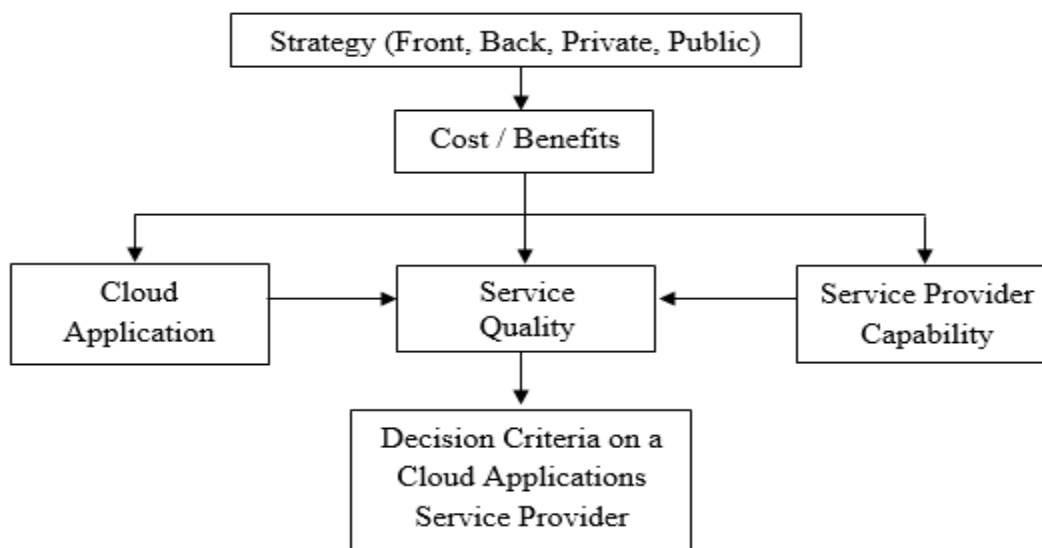

Figure 2: Qualitative Analysis of Cloud Applications in Banks

4. Quantitative Analysis

4.1. Data Collection

From the review of literature and interviews a survey was designed. The data was collected by a self-administered survey sent by personal visit directly to the IT executives, or given to them to respond to at their convenience. A questionnaire with 68 items was distributed to qualified executives and professionals working in banks. The service quality measurement was developed by modifications on the original SERVQUAL scale. All the items are measured by asking the respondents to rate each item applying a six-point scale ranging from "no expectation" = 0 to "very high expectation" = 5. The higher scores reflect a higher perceived expectation of the IT executive. The survey included items related to the cloud computing technology provider, the technical support they could deliver, the cloud service features which they offer and the service quality dimensions.

4.2. Sample Description

This study focused on the Banking industry which is a major consumer of IT services in Thailand in term of IT spending and nationwide 24x7 operations to support millions of end-customers. Banking-specific directories and the distribution list of customer from the marketing department of the leading IT services companies were used to select banks and identify prospective respondents for this survey. The size of the IT departments in banking is large enough for the purpose of this study. The sample size was 367. The response rate is 83.22%. Table 4 shows respondents classified by position.

Table 4: Respondents Classified by Position

Position	Number of people	Percentage
Executive members	23	6.27%
IT director level	26	7.08%
IT manager / supervisor level	143	38.97%
IT professionals	134	36.51%
Related outsource professionals	41	11.17%

These respondents are best qualified to express their expectations of service quality and the decisions related to IT infrastructure, cloud computing requirement, and related maintenance services. Table 5 indicates the respondents are from banks classified as a Thai private (i.e., ownership with Thai national shareholders having fifty percent or more of the company's common stock), joint venture (i.e., ownership shared between a Thai and foreign company), international (i.e., owned and operated by foreign shareholders), or state enterprise (i.e., a bank more than fifty percent owned by Thai government).

Table 5: Respondents Classified by Type of Company

Type of company	Number of company	Percentage
Thai company	10	33.3%
Joint venture company	7	23.3%
State enterprise company	5	16.7%
International company	8	26.7%

4.3. Measurement

The reliability test (Cronbach's α) for each measure was satisfactory for each dimension service quality (.973), IT service provider capability related to cloud computing (.971), technical capability of the IT service provider (.971), and cloud application features (.971). A confirmatory factor analysis (CFA) identified the variables that were most related (Anderson and Gerbing, 1988; Byrne, 2013; Hair et al., 2010). The standardized factor loadings were used to determine the validity of the constructs (Anderson and Gerbing, 1988; Hair et al., 2010).

In Table 6, the findings indicate that each factor loading ranged from .530 to .897. This provided evidence of construct validity for all the constructs in this study (Anderson and Gerbing, 1988; Bagozzi and Yi, 1988, 1991; Fornell and Larcker, 1981; Hair et al., 2010)**.** The data were tested for discriminant validity. The results indicate that Average Variance Extraction (AVE) values are greater than .500 and all Construct Reliability (CR) score greater than .700. The discriminant validity was confirmed (Hair et al., 2006).

Table 6: Factor Analysis of Variables

1 Service Provider IT Capability Related to Cloud Computing		AVE	CR
1.1 Factor 1: Responsiveness		.539	.921
Helpful	.814		
Prompt	.813		
Responsive	.793		
Single Contact	.778		
Senior Support	.738		
Service Promise	.702		
Easy to Work	.673		
With Timely	.669		
Competitive	.669		
Dependable	.666		
1.2 Factor 2: Benefits from Service Provider		.569	.798
User Community	.832		
Paperless	.713		
Fast Reporting	.712		
1.3 Factor 3: Proven Service Process		.565	.776
Local Language	.740		
Clear SLA	.679		
References	.679		
Onsite Available Experts	.624		
1.4 Factor 4: Origin of Service Provider		.627	.828
American Service Provider	.897		
European Service Provider	.884		
Thai Service Provider	.542		
1.5 Factor 5: Service Support		.527	.768
Helpdesk	.782		
Prompt Service	.764		

Timely Response	.622		
2. Technical Capability of the IT Service Provider			
2.1 Factor 1: Level of Technical Support		.532	.871
Availability	.803		
Quality	.757		
Proactive	.755		
Spare Parts	.741		
Virus Protection	.698		
Network Connectivity	.607		
2.2 Factor 2: Security and Data Privacy		.607	.820
Security	.855		
Safety	.838		
Privacy	.622		
2.3 Factor 3: Integrated Support		.520	.759
O/S and Software	.821		
Monitoring	.777		
Service Updates	.530		
3. Cloud Applications			
3.1 Factor 1: Cloud Application Features		.582	.893
Help Function	.761		
Ease of Navigating	.738		
Understandable	.737		
Information Risk	.735		
Link to Business Process	.675		
Professional Appearance	.668		
Flexibility	.656		
Problem Solving	.637		
Quality of System	.625		
3.2 Factor 2: Speed		.615	.827
High Speed	.836		
Connectivity	.820		
Fast Download	.689		
3.3 Factor 3: Accessibility		.702	.825
Access	.838		
Updated	.838		

5. Factor Analysis

5.1. Service Provider Capability Related to Cloud Computing

In Table 6, factor 1.1 relates to the responsiveness of the service provider. This includes the help desk staff, prompt service, personal attention and single point of contact. Additional criteria are access to senior expertise, fast service reports, and adjustment of pricing and competitive pricing. It is important also to have a positive work relationship and confidence in the service provider. Benefits from the service provider relates to factor 1.2. This includes access to other users, less

paper work and faster reporting. All of this depends on peer experience and less costs. Factor 1.3 relates to the proven service process including a specific service promise and onsite service in the local language. Word of mouth references from other users support the expected service performance. The origin of the service provider is the fourth factor. This indicates the preference for international service providers (European or American) compared to a Thai provider. Factor 1.5 covers service support which meet time and quality requirements related to a cloud computing application.

5.2. Technical Capability of the IT Service Provider

Factor 2.1 emphasizes the level of technical support available. This includes a service window, remote diagnostics, system monitoring, available spare parts, on-line safe access and network connectivity. Factor 2.2 emphasizes security and data privacy. Integrated support is the focus of factor 2.3 including proactive monitoring and updated service solution to support the cloud computing.

5.3. Cloud Applications

Factor 3.1 considers all the important characteristics of the cloud application including features including help function, navigation, ease of use, accessible information, good design with technical problem solving and quality. It also includes features to facilitate payments. Speed is the focus of factor 3.2 including connectivity, fast downloads and transactions. The last factor includes access using any device and updating on cloud computing applications.

5.4. Service Quality

This set of variables is unidimensional. It includes all the conventional SERVQUAL dimensions; tangible, reliable, responsive, assurance and empathy.

5.5. Decision Criteria on IT Service Provider for Cloud Computing Application

This factor is also unidimensional based on the features of cloud computing including ease of use, the hardware availability and the fast response of the service provider. Related to these indicaters is the experience of the service provider in cloud computing applications and the reference from other bank users of that service provider's cloud computing service performance.

6. Results – Structural Equation Modeling (SEM)

The Structural Equation Modeling (SEM) using Analysis of Moment Structures (AMOS) program was used for analyzing the data and identifying the strongest and significant relationships (Hair et al., 1998).

Results in Table 7 are based on standard estimates which indicate that Service Quality is strongly related to the decision to select IT provider for the cloud computing project with a coefficient of .712. The factors that most influence service quality are the service provider capability related to the cloud (.953) and cloud application (.922). Technical capability of the IT service provider is

correlated .678 with service quality but not with the decision to select. The importance of the IT cloud provider capability strongly relates to service quality. This in turn strongly relates to the decision to select the cloud provider.

Based on the correlations as shown in Table 7, for the technical capability of the IT service provider, the strongest relationships are integrated support (.667) and level of technical support (.652). For the service provider's capability related to cloud computing, the most important factors are origin of service provider (.733), responsiveness (.727) and service support (.721). In cloud application, the key factors are the characteristics of cloud application features (.656), accessibility (.518) and speed (.449). For service quality, the correlations are very strong: assurance (.974), empathy (.948), reliability (.945), tangible (.920) and responsiveness (.871). For the decision on the IT service provider, the most important factors are reputation (.765), problem solving (.675), collaboration (.500), experience (.456) and service promise / value for money (.359).

Table 7: Standardized Estimates for the Decision Criteria on Cloud Applications

Independent Variables	
1. IT Service Provider Capability Related to Cloud Computing	**.953**
1.1 Responsiveness	.727
1.2 Benefits	.682
1.3 Proven Service Process	.705
1.4 Origin of Service Provider	.733
1.5 Service Support	.721
2. Technical Capability of the IT Service Provider	**.678**
2.1 Level of Technical Support	.652
2.2 Security and Data Privacy	.592
2.3 Integrated Support	.667
3. Cloud Applications	**.922**
3.1 Cloud Application Features	.656
3.2 Speed	.449
3.3 Accessibility	.518
4. Service Quality	
4.1 Tangible	.920
4.2 Reliability	.945
4.3 Responsiveness	.871
4.4 Assurance	.974
4.5 Empathy	.948
Dependent Variable	
5. Decision on IT Service Provider	**.712**
5.1 Collaboration	.500
5.2 Problem Solving	.675
5.3 Service Promise / Value for Money	.359
5.4 Reputation	.765
5.5 Experience	.456

7. Empirical Model

From Figure 3, the analysis indicates that the key relationship to the selection of the IT service provider depends on service quality (0.712). The greater the service quality, the more likely that cloud provider will be selected. Three key factors relate strongly to service quality. These are IT service provider capability (0.953), the cloud application (0.922) and the technical capability of the IT provider (.678). These results demonstrate that the bank's decision will depend on and important combination of the service and technical capability of the IT cloud provider, the characteristics, design of the cloud applications and implementation with high service quality.
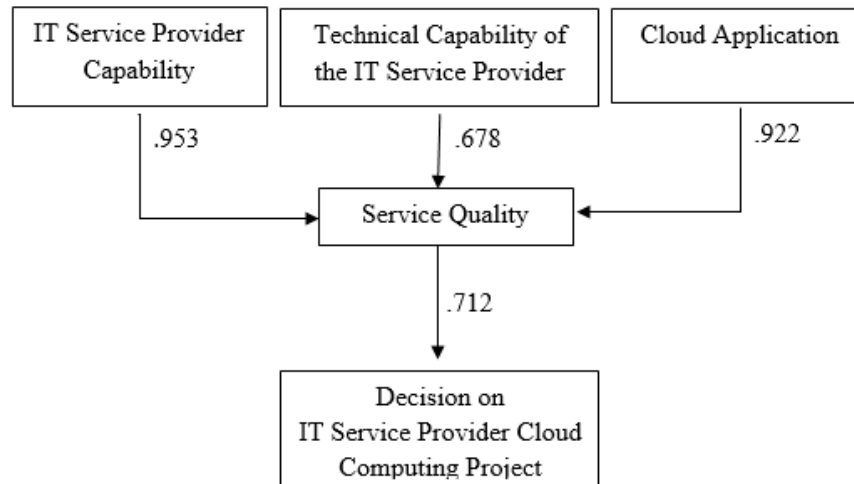

Figure 3: Empirical Model

The Structural Equation Model (SEM) was tested Goodness-of-Fit using all possible paths among the constructs. The goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the Tucker-Lewis coefficient (TLI), the comparative fit index (CFI) and Root Mean Square Error of Approximation (RMSEA) were used to evaluate each dimension of the model. Resutls indicate X^2 = 103.960, Df = 102, CMIN/DF = 1.019. The fit indicators GFI = .956, AGFI = .901, TLI = .999, CFI = .999 were greater than .900. This confirms the suitable fit of the model (Hu and Bentler, 1999). RMSEA was .010. It is less than .060 which also indicates a reasonable fit (Bollen, 1989; Arbuckle and Wothke, 1999; Diamantopoulos and Siguaw, 2000).

8. Conclusions

The interviews with IT executives stressed the service promise to the bank of the cloud applications. These included eliminating the duplication of applications. Service benefits were identified such as: access by the customer devices, increased customer convenience for a variety of services that are non-stop and global. The legacy of existing hardware and software was a major limitation because of additional investment in these obsolete technology hardware and equipment and a high operational costs. The choice of public or private cloud application was related to strategic and security concerns. Security is a significant problem because of the nature of financial data and the threat of hacking private cloud is preferable.

In Asian countries such as Thailand there is weak policy, regulation and legal support for cloud computing. This limits the effective implementation of this technology. Other issues are the lack of experience in applying in cloud technologies and technical limitations. From the service provider's perspective there are more demands from the customer to maintain business continuity, and enhance preventive a approaches, quicker problem solving and higher service quality. They must focus on total system protection. The cloud provider is expected to work closely with the bank's IT team with a very proactive and fast responsiveness.

Bank IT executives require that the cloud provider implements automated operations with an understanding of the integration of the existing hardware and software with the cloud technology and applications. Their decision to purchase cloud services require the same service level agreement as legacy IT operations. In most cases they have very specific service requirements such as call back in 15 minutes, spare parts for cloud physical infrastructure hardware maintenance available in 2 hours and complete repair in 4 hours. Cloud computing will put more pressure the IT cloud providers to increase the speed of execution and minimize down time.

Banks in Thailand are implementing cloud computing but relatively slower than their global peers. Service quality is a major factor in the decision to implement cloud applications and to choose a technology service provider. The analysis demonstrates the key factors to measure service quality and selection criteria of the bank executive's decision on IT service provider to implement and maintain the cloud computing applications for the bank. Results of the quantitative analysis of this study indicate:

- The service provider's capability is related to the cloud computing applications including responsiveness, benefits, proven service process, origin of service provider, and service support.
- The technical capability of the IT service provider relates to the level of technical support, security and data privacy, and integrated support.
- The cloud applications include specific features, speed, and accessibility.
- The critical factor is service quality strongly related to the IT executive's decision to choose the IT cloud provider.

For theoretical implications, this research confirms the importance of the conventional SERVQUAL criteria as a key factor in the decision to select an IT provider for cloud application. Even though cloud computing is a new generation of technology and service applications in banking, service quality is a continuing requirement for the effective performance of cloud applications and the decision to choose a specific provider.

9. Recommendations

For the cloud computing infrastructure which consists of computer hardware, O/S, and cloud applications, a bank expects a similar service level agreement (SLA) similar to the bank's legacy IT systems. The cloud provider should realize the important role of service quality in the bank's decision process. The provider has to maintain and improve their service quality for a sustainable long term relationship with the bank customer. The technology capability alone is insufficient to provide good service quality for cloud computing.

For banks considering cloud applications, this study demonstrates the key indicators IT executives use to evaluate the provider. The key factors are the service capability related to the cloud application features, technical capability of the IT cloud provider and service quality. These are interrelated. Banks emphasize the service promise rather than only costs. The cloud providers will also benefit by understanding the importance of these indicators and the expectations of the bank's decision makers.

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