Cloud Computing Point of Sales Development for Indonesia Small Medium Enterprise

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Abstract—The agile development of Internet technology and cloud computing are frequently prevailing create small and medium enterprises (SMEs) have an opportunity to be able to utilize information technology at a cost that is affordable and does not require massive investment. Based on the previous study SME's belief that Point of Sales (POS) based on cloud computing is the alternative technology to accelerate their business. Nowadays not only large-scale business uses the internet in business processes, but many micro enterprises able to use it, especially when internet users outside of their organization is also increasing. From the data gathering done by the qualitative methodology from SME's entity, there were features necessary need for Indonesian Small Medium Enterprise and the most important factor in cloud computing POS infrastructure is reliability, security, and scalability. The result of this study is Point of Sales based on cloud computing for the small-medium enterprise.

Index Terms—Development; Cloud Computing; Internet; POS; SME's.

I. INTRODUCTION

Nowadays the growth of internet technology enabled Small Medium Enterprise (SME's) to be more contentious in this era. This development made micro, small and medium enterprises improving their business processes, assets supervision, and decision-making which related to business strategy by adopting some technology. The data from http://internetlivestats.com shown that over the last five years the number of internet users in Indonesia had considerable increase. In the previous three years had a new technology called cloud computing, cloud computing technology allows SME's use information technology solutions very flexible in the needs of the operating system platform, infrastructure, and software. The flexibility of cloud computing provides a new solution for SME's who want to use the software and application without spending a huge amount and make a significant investment to buy hardware needs of information technology. This study purpose is to design and develop the Point of Sales based on cloud computing for Small Medium Enterprise. The development features based on a necessary need from Indonesian Small Medium Enterprise. The requirement gathering by using Qualitative Methodology which consists data collection, data analysis, triangulation process and conclusion finding. The data collection process done by the discussion with ten informants in Surabaya, Indonesia, the informants consists of three categories: business owners, IT specialists, IT users. Through the interview process is expected to deliver IT users need the features, then this requirement will be validated by IT experts and business owners, while business owners also provide features what the requirements of POS then verified by IT

experts. Based on interviews with IT users, business owners and IT experts found that cloud computing is the recommended solution for POS applications. Based on previous research the most important factor in Cloud computing POS infrastructure is reliability, security, and scalability. The features required and necessary for IT Users related to store operation, transaction summary and sales report. Meanwhile, the requirements for a business owner are the transaction report should send in their email every day, dashboard required for the business owner to control their business from everywhere and forecasting also needed. Furthermore, the IT specialists verify all requirements from IT users and business owner able to develop in cloud computing. The purpose of this study is to discover the information systems for SME's requirements and the exploration of cloud computing technologies. The results of this study are developing an application model that precise and appropriate for SME's needs. This paper is in the developing POS based on cloud computing using client-server programming with mobile computing programming stage; the mobile computing is evolving for IT users in store to operate the business operation, meanwhile the business owner able to supervise their business from web application or mobile application.

II. LITERATURE REVIEW

A. Cloud Computing

Cloud computing defined as a shared pool of on-demand computing resources that are accessible over the internet and dynamically configured to optimize resource. Cloud computing offers users ubiquitous and convenient access to a shared pool of computing resources consisting of networked servers, storage and software applications that are configured based on user demands, rapidly provisioned to communicate with need, and made accessible on a pay-per-use basis. Essentially, cloud computing represents the IT services which presented over the internet on a scalable, virtual infrastructure using the latest communication technologies, cloud computing services allow users access to shared resources in a customize service format to their needs without buying, install, maintain, and manage those computing resources[1]. Cloud services also have the possibility to reduce the problem of information systems which is a difficulty often faced by SMEs. These challenges include among others [1] unfurled management functions through the advantages of information systems, [2] bridging limited funds to have skilled technical employees in information systems, and [3] constraints on the investment of capital for Information and Communication Technology. Some of these challenges have led SMBs to have a slower adoption rate for IT innovation compared to

large companies [2]. Cloud services have the chance to overcome many challenges, as mentioned above, and requires little equipment investment in information and communication technology infrastructure. The cloud services can even be managed by suppliers and service providers are paid by the system of "pay as you use". Cloud services enable SMEs to receive additional benefits including increased business focus, the infrastructure is more economical, collective problem solving, experimental business models, reduce dependence on human resources and improve the experience of SMEs [3]. An important conclusion from the previous research is that the cost savings and cost reduction are not the most important factor for small businesses (SMBs or SMEs) to adopt cloud. "Ease of Use and comfort 'and' Security and Privacy 'is considered the top two priorities for them to adopt cloud, followed by cost reduction or cost savings. This shows that SMEs are happy to adopt cloud for ease of use, convenience and better security and privacy in addition to reducing their investments. factors that significantly affect the adoption of cloud computing, are shown in Figure 1 [4].
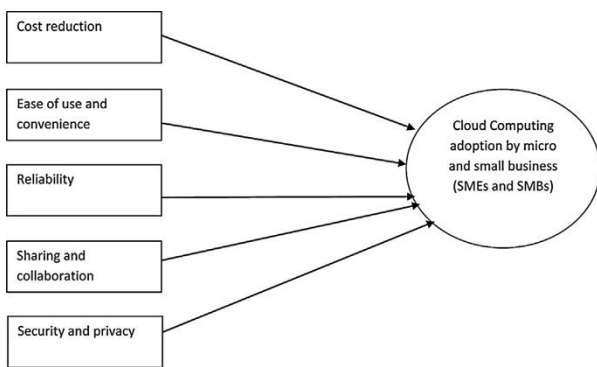

Figure 1: Factors That Significantly Affects In Cloud Computing Adoption.

B. Point of Sales

Definition of Point of Sales (POS) is a retail store, a cashier at the store, or the location where the transaction occurred. More specifically, POS refers to the hardware and software used for checkouts - the equivalent of an electronic cash register. POS used in supermarkets, restaurants, hotels, and virtually any retail business. Most retail POS systems do more than simply the task of "point of sale". Even for smaller retailers, many POS systems already include an integrated accounting, inventory management, purchasing demand forecasting, customer relationship management (CRM), service management, leasing, and payroll modules. Because of these functions, the supplier has sometimes seen a POS as retail management software or business administration software. Today, most large retailers using POS software or POS system hardware with standardized interfaces by suppliers and retailers working together to standardize development of computerized systems and simplify interconnecting POS [5].

III. SYSTEMS DESIGN

Requirement gathering for POS feature done in previous research. The previous research uses Qualitative Methodology for data compilation, data analysis, triangulation process, result in analysis and judgmental conclusion. Qualitative studies based on data that are fundamentally different from the data collected in another observational study. The standardized measures employed in quantitative studies constrict the various perspectives of study participants along predetermined to continue (e.g., categorical or continuous) so that they can statistically aggregate. The data collected in qualitative studies are typically obtained through in-depth discussions, focus groups, direct observation, document review, and audio recording review. These data, generally not aimed at establishing generalizability, lend themselves to generating new theoretical insights about particular phenomena [6]. The data compilation in previous research conducted using in-depth interviews with ten users which consist of IT User, IT Expert and Business Owner. The in-depth interview process to gather the POS features that IT user needs, then this requirement will be validated by IT specialists and business owner, while business owners can also present the feature what they require of the POS for later verified by IT experts.

Table 1
Summary of POS Features

Features	Influence Factor
• Sales • Storefront operation • Stock Transferred • Stock Audit • Transaction Summary and send it to email every day • Report Analysis • Dashboard • Forecasting • Items Information • Transaction Audit • Master Data Management	• Ease of Use (For IT Users and Business Owner) • Security • Internet Connection • Reliability

IV. INFRASTRUCTURE DESIGN

The in-depth interview results security is the essential factor for the business owner and IT experts for POS based on cloud computing, this factor related to another previous research which done in 2015 which said Security is one of the biggest obstacles that hamper the widespread adoption of cloud computing. Various business and research organization are reluctant in completely trusting the cloud computing to shift digital assets to the third-party service providers. Based on requirement gathering of IT users, business owners and IT experts initiate that cloud computing is a future solution for POS applications, although some of the features not required by IT users. This statement present that the solution offered must base on customer needs and not on advances in technology, this statement has been mentioned by the research conducted by Eleonora Pantano and Milena Viassone in 2013. The research said understanding what consumers and retailers expect acquires importance for the successful adoption and diffusion of innovations. Despite a large number of technologies for points of sale and the potential benefits emerging from the introduction of these advanced systems, still only a limited number of retailers adopted them with different strategies [7]. Latest research about cloud computing in 2016 said that data protection is important factor in architectural principles and guidelines that should be followed in order to achieve success in cloud computing [8], is matched with the business owner and IT Experts statement that said in this research, moreover this statement agree with prior studies in 2015 done by Sharma

and Al Bahdi which said service providers need to be addressed the customers to feel comfortable to hand over data to a large external cloud computing network, this is the part of trust in cloud computing services which really by customer [9]. The business owner who becomes the informant on this research already using IT for quite long time and have IT education background, that factor made this study can successfully identify the features needed for a POS-based cloud computing, which is consistent with studies that have been conducted by Rahayu and Day in 2015, in this study said that an understanding of the IT needs from business owners is a major factor in technology adoption [10]. The conventional IT infrastructure keeps the digital assets in the administrative domain of the organizations [11], another article said Security governance, as part of the company's corporate governance, is the most suitable path by which to gain control of security processes and guarantee an alignment with business strategies. Information security policy compliance requires active management enforcement with adequate controls over the organization's personnel [12]. From this evidence can be seen that safety always be significant concerns for cloud computing adoption, is important for cloud service provider to provide not only reliable cloud services but also stable and safe cloud services. Based on that requirement, this research purpose the infrastructure design for POS based on cloud computing, besides the security aspect this design also considering the reliability perspective especially when the internet connection is shut down. The infrastructure design is shown in Figure 2.
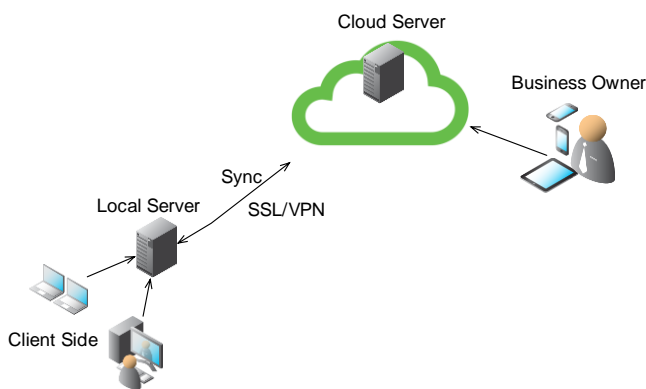

Figure 2: POS Based on Cloud Computing Infrastructure Design

The infrastructure purpose the local server with a medium specification, this server will synchronize with cloud server several times in a day, this design to provide the reliability of transaction and prevent failing data when the internet connection shut down. The communication between the cloud server and local server should implement SSL or VPN for warranty their data exchange is secure and not interrupted by another people. Meanwhile, the business owner able to supervise the business using tablet or smartphone by accessing the cloud server. The hardware and infrastructure requirement summarize in Table 2.

Table 2
Hardware and Infrastructure Requirement

Items	Location
• Tablet/computer for cashier • Bluetooth printer for receipt	• Store
• Medium specification computer for local server	• Store
• Internet connection	• Store
• 1Gb Ram, 20Gb space for Cloud server	• Cloud Server
• Trusted SSL Certificate	• Cloud Server
• Private VPN server	• Cloud Server
• Private VPN Connection	• Store

V. SYSTEMS DEVELOPMENT

The POS-based on cloud computing for this research is developed by using PHP as programming language, Apache as a web server, and MYSQL as database server. By recognizing the different requirement for the various user, this POS divide the user role for POS features. The user role is present in Table 3. Example of POS user interfaces are shown in Figure 3 to 7.

Table 3
User Role

Features	User
• Sales • Store front operation	• Cashier/Operator
• Stock Transferred • Stock Audit	• Supervisor
• Transaction Summary and send it to email every day	• Automatic by systems
• Report Analysis • Dashboard • Forecasting • Items Information • Transaction Audit	• Business Owner/Supervisor
• Master Data Management	• Business Owner/Supervisor

Table 3 shows that cashier or operator has limited access to POS, they are only able to access sales and storefront operation. The supervisor user is responsible for transferring stock between location and audit the stock items in all location. On the other side master data management activity such input new item, edit current item is the role of supervisor and business owner.
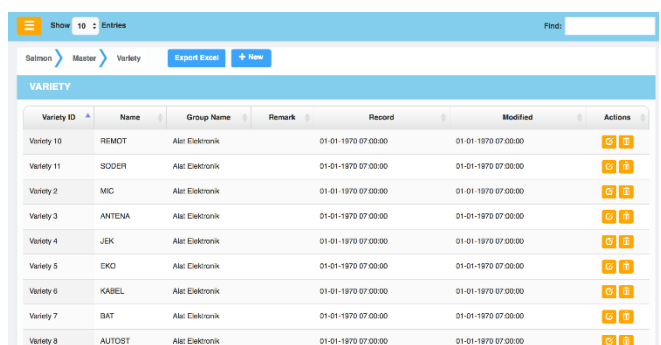

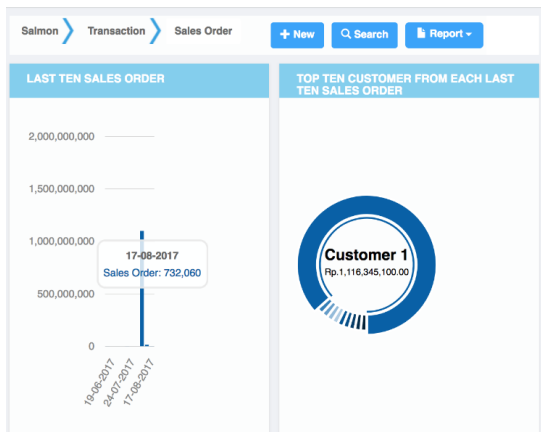Figure 3: Master Data Management

Figure 4: Sales Order

Figure 5: Top Sales Order

Figure 6: Sales Order Summary

Figure 7: Stock Transfer

The POS is developed using HTML5 and CSS3 and already responsive web design; this technology can implement in mobile programming, one of the solutions to implement this POS into mobile computing is by using Progressive Web Application. For future work, this research will deploy a native mobile application and analyze the adoption of this POS by conducting qualitative and quantitative research.

VI. CONCLUSION

In this stage POS based on cloud computing for Indonesian SME's model implemented and develop using web programming technology with responsive web design support and able to convert to mobile view, based on the finding from previous research the POS needs to implement open SSL for security reason and built the database synchronization systems for reliability and stability. The part of the discussion in this research is it necessary implement commercial SSL? is it affordable for Indonesian SME's? The question needs to investigate in the next phase. The opportunity for future works of investigates the security aspect and security threats of this POS. On the other hand, the adoption of POS based on cloud computing should further analyze for discovering the future development.

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