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Mehruz Kamal

The College at Brockport, mkamal@brockport.edu

Matthew Panebianco

State University of New York at Brockport, mpane1@u.brockport.edu

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A REPOSITORY OF CLOUD SERVICES FOR SMALL AND MICRO ENTERPRISES

Mehruz Kamal

State University of New York at Brockport
mkamal@brockport.edu

Matthew J. Panebianco

State University of New York at Brockport
mpanel@u.brockport.edu

ABSTRACT

Cloud Computing offers an opportunity to support the growth and development of small and microenterprises by enabling low cost Information Technology solutions delivered over the Internet to be made available to them so that they may adopt with little effort or skill. Since the ability of small and microenterprises to adopt technology depends upon the unique conditions in which they find themselves, we hope to facilitate this by investigating and assessing the ways in which Cloud Computing functionality and processes may support the growth of small and microenterprises. In this study, we do this through the creation of an online knowledge repository of Cloud Computing applications and services with direct correlations to addressing specific business needs of small and microenterprises. This serves as a very valuable source of information for local community small and microenterprises looking to adopt low cost Information Technology solutions to address common business needs.

Keywords

Cloud Computing, Small Business, Microenterprise, Information and Communication Technology

INTRODUCTION

The dominant form of business in both developing countries and many underserved regions of developed countries is the microenterprise. According to the Association for Enterprise Opportunity (AEO), there are over 23 million microenterprises in the U.S and that number translates to 87% of all businesses in the United States. While the majority of businesses around the world are microenterprises, they are the most vulnerable and are often run by people with limited resources, and skills to be able to avail the benefits of Information and Communication Technologies (ICTs). Microenterprises are a form of small business which employs between 1- 5 people and face challenges of limited resources, skills and ability to grow. When they do adopt Information Technology (IT) their potential to survive and grow increases as they are then able to participate in the global economy. The challenge for global development lies in enabling these microenterprises to first become aware of the available technologies and then to adopt the appropriate IT solution that fits their needs. Often the tools available to them are either too expensive or require more resources than they have available. Cloud computing offers an opportunity to support the growth and development of microenterprises by enabling low cost IT solutions delivered over the Internet to be made available to them so that they may adopt with little effort or skill. Since the ability of microenterprises to adopt technology depends upon the unique conditions in which they find themselves, we hope to facilitate this by investigating and assessing the ways in which Cloud computing functionality and processes may support the growth of microenterprises. In this study, we do this through the creation of a knowledge repository of Cloud computing applications and services with direct correlations to addressing specific business needs of microenterprises. This will serve as a very valuable source of information for local community microenterprises looking to adopt low cost IT solutions to address common business needs.

This is a very timely topic in the rapid paced discipline of Information Systems where the IT industry is experiencing an increasing focus on the innovation of Cloud computing and a shift of large organizations towards adopting such infrastructure to help reduce IT overhead costs. Cloud-based computing and services may also be an effective solution in assisting resource-constrained microenterprises in adopting and using IT. Information Systems research has focused mostly on technology use and implications within medium to large organizations and have thus resulted in very little focus on IT related issues in small and microenterprises making it an under studied topic – although it is the predominant form of business in developing countries and even in underserved regions in developed countries. This study is important as it addresses the lack of attention and research targeted to assist those microenterprises that are looking to grow and prosper, but are unable to do so because of their lack of awareness and inability to benefit from IT innovations.

BACKGROUND

Cloud Computing

Cloud Computing is one of the latest buzzwords in the computer industry. Cloud Computing can be defined as a style of computing where massively scalable IT-enabled capabilities are delivered ‘as a service’ to external customers using Internet technologies (Plummer et al., 2008). Some industry observers are seeing it as the next step in the utilization of Information Technology, with Carr (2005) comparing it to the growth of electricity in the late 1800’s and early 1900’s. Leavitt (2009) gives an explanation of the basics, with three main types of “services” being provided to cloud users: Infrastructure, Platform, and Software, all “as a service” (IaaS, PaaS, and SaaS, respectively). The services can be thought of as a “stack” of services that build on top of one another to supply a certain level of required service. Infrastructure as a Service refers to tangible physical devices in a remote location that can be accessed from a terminal location or device. Dropbox and Google Drive are prime examples of an IaaS, as their main service consists of physically holding data for a customer. Platform as a Service refers to software development kits (SDKs) and other tools that are hosted by a provider and are run from over an Internet connection, and are built on IaaS. Platform examples include services such as Codeanywhere and Cloud9; these are services that host your code on servers customized for a company’s required coding environment. Other types of platforms include services such as VMWare, which allows for users to load up a preset operating system of other software via a VLAN tunneling connection. Software as a Service consists of an application or software that is hosted by a vendor, and the use of that software is licensed to a user; this final part is built on top of IaaS and PaaS. The most popular SaaS in use today is Facebook, which stores all user information and communications on their servers along with all of the software required for its use. In the last decade there has been a large growth in the use of cloud services for businesses of all sizes, but the concerns on its use vary depending on the size of the firm. There have been “teething” problems with this new paradigm of technology; concerns and challenges have included control, lock-in, reliability, and most recently, security (Sultan, 2011). Analysis in Marston et al. (2011) shows that the best opportunities for cloud computing will be in Small and Micro Enterprises, and in developing economies that do not have legacy IT infrastructure, such as countries in Africa, Eastern Europe, and remote parts of Asia.

Small and Micro Enterprises

Small-Micro Enterprises are a large section of many economies throughout the world. Small firms are significantly different from large firms in several ways, some more important than others. Small and large firms have different operating environments; they operating more around the theory of family relations, while large firms have environments that are extremely interchangeable (Dandridge, 1979). On a global level, many small firms face financial, legal, and corruption hurdles that can adversely affect their growth, with these affects having a greater influence in less developed countries. These effects are inversely associated to firm size; hence smaller firms are more affected by these three hurdles (Beck et al., 2005). Information and Communication Technology (ICT) in general, not just cloud computing, can help firms grow and become less susceptible to failure, while the act of growing itself also heightens the need for strategic ICT use for small and microenterprises (Matthews, 2007). The main issue with technology in small and microenterprises is confidence in the technology to work, along with the possibility of growth. It is possible that some small firms may not necessarily need a large amount of ICT, if any, to operate. A study done in Flanders, Holland, showed that one-third of small firms did not have any computers (Pierson, 2003). The growing use of PDAs, tablets, and smartphones, has allowed for some small and microenterprises to bypass desktops and workstations in favor of these mobile platforms. Cloud computing has become even more prevalent thanks to the portability factor of many devices. This is especially true for small firms, who gain increased market access through their use as they are less expensive than regular systems and are generally much easier to use (Kamal and Qureshi, 2011).

Cloud Computing in Small Businesses

Carr (2005) states that Cloud computing will be the next step towards the utilization of the IT industry, where most, if not all services will be outsourced to other firms so that the focus for companies can be on their business rather than worrying about IT infrastructure. This is especially true for small and microenterprises, where a lack of employees, resources, and time can push IT integration such as Cloud Computing to the side (Cragg & King, 1993; Akbari, 2013). There has been recent research into the effects that Cloud Computing has on different business types and sizes. Small firms have been found to be some of the most impulsive businesses willing to adopt cloud computing services because they typically have less-complex IT needs; despite this, small and microenterprises are still slower than larger firms to adopt these newer technologies

(Christauskas & Musevucene 2012). Christauskas and Musevucene state that this may be a result of the lack of information about the benefits of the Cloud Computing technologies available and the security presented in the cloud for small firms, while Cragg & King state that small and micro entrepreneurs are afraid that their implemented IT would ruin their business or go under or unused. This lack of knowledge and confidence can be a big negative for small firm Cloud integration, as Kamal et al. and Cragg and King found in their research that a small business owner's enthusiasm was the main key in implementing IT and Cloud systems. This reinforces the idea that cloud computing needs to be marketed more closely to small firms so that they may know and understand the potential benefits those systems can have for their businesses. Scott (2010) found that encouraging factors for owners to implement Cloud Computing were vendor terms, no contracts, and pay-as-you-go infrastructure that is supported by cloud computing.

Cloud computing may be able to help small and microenterprises lower their financial hurdles. For small businesses, liquidity is a prime objective (Welsh & White, 1981). Small firms can survive a long time without a profit. Cash flow is more important to small and microenterprises than ROI, as well as conservative growth rates. These small growth rates allow for a solid foundation to be built so that the company does not bubble. In this sense, Cloud Computing creates a much more liquid business, in that companies do not have to invest as much money into equipment and hardware, and removes the potential risk of having low liquid items such as servers and old computers in a company's accounting, as these items depreciate quickly and are not easy to resell. Cloud computing also cuts out some of an organizations minimal preparedness for ICT and Cloud integration that is required for direct system implementation into a company (Iacovou et al., 1995). It then appears that the benefits of supporting software and technologies can have a quicker impact on the small and microenterprise business model.

What might be the largest hurdle in Cloud Computing implementation may be owner education on the use of ICT and Cloud Technologies. As discussed in Warschauer (2003) people make much better use of hardware and software technologies provided to them if some sort of purpose or instruction is also given. You cannot just give business owners the tools to use; they also need to be shown the most effective way to use those tools to help effectively run their business. Proper training and support for those tools is just as important as the tool itself. Most small businesses are influenced or pressured by trade partners to use certain technologies or software (Iacovou et al., 1995). Small and micro entrepreneurs need to have the solution explained to them in a way that helps them understand the benefits to their company, not just to another company. Kamal et al. (2008) discusses something they coined as being called "I.T. Therapy", where small business owners were paired up with Information Systems students at a local University and the students coached the owners through the use of IT to assist owners with implementing IT into their work environments to create efficiencies. Each owner eventually began to trust in their advisors and gained confidence in using whatever ICT implementation the student brought in to help the owner run their business. The researchers in that study state that "IT therapy may not directly compensate for a shortage of time, money, and information, but it may help economize each of these...IT therapy is not well suited for providing basic infrastructure, professional development services, and on-going operational support services" (Kamal et al., 2008). IT therapy could be a great introduction for small and micro entrepreneurs to begin the implementation process for Cloud Computing architecture, since they will have someone knowledgeable in their use to guide them to at least understanding the basics and give them the confidence to continue to implement and use ICT to assist their business operations.

A REPOSITORY OF CLOUD SERVICES

Based on the discussion so far, the very first step in getting small businesses to benefit from cloud computing technologies is making them aware of the various cloud-based applications that are currently available. There are numerous cloud computing software programs on the Internet, and plenty of lists provided by commercial platforms (Lynn, 2012), but unfortunately they are not conveniently available in one location. This makes it very difficult for small business owners to locate specific applications. Additionally, when they do stumble upon a program, business owners are at a loss as to what they would use the application for. Therefore, keeping in mind that the typical small to micro entrepreneur isn't very technology savvy and might become overwhelmed with the myriad of cloud computing applications on the Internet, we set out to assist them by developing a "one-stop" cloud services repository website to help small firms search for cloud computing services that would support the entrepreneurs in becoming more efficient and reach new markets.

Our goal was to create a repository to allow small business owners to visit and see what possible solutions were available in one spot, rather than having to use a search engine that might not be able to provide a user with the most useful solutions for them. The online repository would be in an ongoing continuous updating stage as we investigate more small businesses and their technology related problems that need to be solved. The online site would be used to keep track of every available cloud-based option we find and categorize them accordingly so that our users can easily find relevant options that would be helpful to their businesses.

The website has 12 pages at the publishing of this paper, minimalist in design, and is segregated by the key types of services that small businesses may look for. This was an important design choice as business owners will typically want to locate applications for a specific business need. On the website, there is a page that describes what Cloud Computing really is; our definition for Cloud Computing, the Cloud Computing Stack (SaaS, PaaS, and IaaS), and examples for those stack elements. This is shown in figure 1 below. For a lot of small businesses, they are unaware of what the new innovation of cloud computing really means and so the purpose of this page was to provide a very simplified brief description of it.

Cloud computing has become a large buzz phrase in media and tech circles as of late, and it can be hard to pin down a definition that makes sense to the consumer of a cloud service, especially for small businesses that may not be as tech savvy as their large firm counterparts. Our definition is:

Any service that is hosted on physical Information Technology infrastructure, and then accessed remotely by any user(s) through an Internet connection

Google Mail, Yahoo! Mail, Facebook, Dropbox, and even the business this website is hosted on, Weebly...these are all examples of a cloud computing service. While those are some of the bigger names in the cloud environment, there are many more, and they all have applications that can help small business owners run their businesses more efficiently. "What kind of applications?" you ask. Let's break cloud computing down to its 3 main components: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).

	IaaS	PaaS	SaaS
Interface	Interface	Interface	Interface
Application	Application	Application	Application
Solution Stack	Solution Stack	Solution Stack	Solution Stack
Operating System	Operating System	Operating System	Operating System
Hypervisor	Hypervisor	Hypervisor	Hypervisor
Compute & Storage	Compute & Storage	Compute & Storage	Compute & Storage
Network	Network	Network	Network
Facility	Facility	Facility	Facility

Infrastructure as a Service

Infrastructure as a Service

Infrastructure as a service can be defined as "Tangible physical devices in a remote location that can be accessed from a terminal location or device." These companies provide the computer hardware and networks for storage, data analysis, virtual machine emulation. Examples include Dropbox and VMWare.

Platform as a Service

Platform as a Service involves a slew of Software Development Kits (SDK) and other tools that are hosted by a company with the infrastructure and can be run over the Internet; these services built on IaaS, and generally companies that offer PaaS also offer forms of IaaS. They are generally for application development or for testing of environments and software. Examples include EngineYard, Weebly (the platform hosting this website), and Squarespace.

Software as a Service

Software as a Service is the most diverse of the 3 parts of the cloud "stack." It is when all that is offered to the client is the ability to interface and use a software application to fulfill a need. The software is generally for a specific purpose, such as accounting, human resources, keeping track of billable hours, etc... A non-business example would be Facebook, which is just an interface overlying an application. Another well-known example is any form of web-based email, such as Google Mail, Yahoo!, and Microsoft Exchange.

Figure 1. Screenshots of the webpage describing what is the Cloud.

The website then has a service directory page where the various needs that small businesses may have are discussed, along with links to our repositories for each service type and the different cloud services that we have listed within. We have identified and defined seven different types of services that small businesses would look for, depending on the particular business and their needs: Accounting and Payroll, Collaboration, Data Management, Human Resources, Storage, Marketing Your Business, and Application Development. Figure 2 below shows the Services page.

the CLOUD for small business

SERVICE BY NEED

ACCOUNTING AND PAYROLL These software services provide your firm with easy-to-use accounting and payroll software, which in some cases are all offered together through the same provider on the same platform.

COLLABORATION Need to communicate from long distances with firm members or want to be able to plan and diagram the next steps of a big project and share with the whole team? The services in the link will help you share your ideas and communicate in real time.

DATA MANAGEMENT Online databases help you keep track of important information pertaining to anything business related; things like customer mailing lists, sales data, and inventory for all of your stores. These companies all provide customers with data analysis programs to run queries and get results on their stored

HUMAN RESOURCES Executives at smaller firms may have a more difficult time keeping track of employee information without HR departments, but with these services, you can manage your employees easier and take a lot of the paperwork off of you and your firm.

STORAGE/BACKUP Storage is the hallmark of "The Cloud." These companies allow you to store your data files and access them from any device connected to the Internet, to save you some room on your own hardware, help you get rid of those pesky flash drives, or give you piece of mind that you won't lose your important data.

MARKETING YOUR BUSINESS Whether you're looking to build your own website or just looking for some tools to help you get the most out of your page, these sites can help you get started or allow you to get the most out of your pages.

APPLICATION DEVELOPMENT Development platforms help smaller firms who may not have the resources by providing them with ample space, language options, and test servers to help them develop their own software and applications.

Figure 2. Screenshots of the Services webpage

These service sections are common categories that small and micro business owners may look for when trying to optimize business operations. We wanted to shy away from using any sort of technical terms such as PaaS or IaaS so as not to intimidate or confuse any owners who were interested in potentially adopting these technology services.

Each of the business area categories outlined in the Services page is clickable. Once a category is clicked on, the user will be taken to a new page that contains cloud services of various stack levels (SaaS, PaaS, and IaaS) and prices, and intends to promote all applications equally within each page. For example, if the user were to click on the “Accounting and Payroll” category on the Services page, they would then come to the following page outlined in figure 3 below. As you will see, this new page lists all the cloud-based applications that deal with businesses being able to accomplish their accounting and payroll functions. With each of the listed cloud services, is a brief description of the application and a clickable link that will take the user directly to the application site where he/she may find out more information and may eventually decide to use the program or not. Similar setups have been developed for each of the other Service categories.

The screenshot displays a webpage titled "ACCOUNTING AND PAYROLL" with a grid of service cards. Each card includes a logo, a brief description, and a link. The services listed are:

- ABUKAI EXPENSES:** A mobile app for expense reports with a cloud service backend. Users take a photo of a receipt and receive a report.
- FRESHBOOKS:** Client and product/service records, invoice creation, and integration with other sites like Outright.
- INDINERO:** Accounting, taxes, and payroll in one solution with forecasting features.
- INTUIT ONLINE PAYROLL:** Advanced, affordable online payroll website with a comprehensive set of tools and support.
- OFFICETIME:** Time and expense tracking software for remote work, with export and invoicing capabilities.
- QUICKBOOKS ONLINE:** Excellent choice for service-based or simple product-based businesses needing mobile access.
- SAGE ONE:** Tracks projects and expenses, helps with transactions, and includes contact management and invoice reports.

Figure 3. Screenshots of the Accounting and Payroll Cloud Services page

CONCLUSION

While the majority of businesses around the world are small and microenterprises, they are the most vulnerable and are often run by people with limited resources, and skills to be able to avail the benefits of Information and Communication Technologies. When they do adopt Information Technology their potential to survive and grow increases as they are then able to participate in the global economy. The challenge for global development lies in enabling these small and microenterprises to first become aware of the available technologies and then to adopt the appropriate technology solution that fits their needs. Cloud computing offers an opportunity to support the growth and development of small and microenterprises by enabling low cost IT solutions delivered over the Internet to be made available to them so that they may adopt with little effort or skill. The contribution of this study is in facilitating the first step towards this goal by developing an online repository of cloud services that are categorized by common business needs. This online repository serves as a “one-stop” location for small and micro enterprise entrepreneurs looking for cost-effective options to meet their business goals and bring about improved administrative efficiencies. Future research will focus on analyzing the actual benefits of cloud computing application adoption among small and microenterprises.

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