# A STUDY ON CLOUD COMPUTING ADOPTION WITHIN SMALL AND MID-SIZE BUSINESSES (SMBS)

Anthony S. Richardson, Southern Connecticut State University
richardsona4@southernct.edu

Geoffrey A. Mate, Southern Connecticut State University
mateg2@southernct.edu

## ABSTRACT

A growing number of organizations have difficulty scaling-up their IT infrastructure to handle their growing needs and increased resource demands. Digital Technology Platforms (DTPs) have been identified by Gartner, Inc. as one of the top 10 strategic technology trends of 2017. While DTPs may be mainstream and easily adopted by large enterprise-sized organizations, there is an opportunity for such platforms within Small and Mid-Size Businesses (SMBs). The bottom line is that computing and server hardware is expensive for SMBs. Furthermore, it may be difficult for SMBs to assess and price the labor and resources needed for a company to have acceptable performance while controlling costs. The purpose of this paper is to examine how cloud computing technologies are adopted by SMBs and the respective drivers associated with costs and capability that may reduce costs for an organization. This paper explores how four variables – Robust Capability, Limited Capability, Cost Constraint, and Resource Abundance interact to impact the adoption of DTPs within SMBs. Adopters of DTPs are classified as Efficient, Proactive, Resistive, and Reactive. With respect to adoption efficacy, a model is proposed for assessing the capability and resource readiness as correlated to SMB adoption of DTPs. A study of 12 SMBs and the implementations of DTPs is presented and posited with the proposed adoption model. Due to the extensive investments required in procuring infrastructure services –adoption enablement is imperative for SMB-sized organizations to realize a return on investment. Implications are discussed.

## INTRODUCTION

This research is relevant because companies must plan for the future and establish their technology base to handle any flux in business activity. If a business does not scale their IT infrastructure appropriately, it could cause the business to lose revenue later on or even come to a grinding halt. Many IT staff and engineers within SMBs are not completely aware of the options available or costs involved because technology is constantly evolving.

Managers must understand the technical needs of the company and the available solutions to make the most efficient and cost-effective decisions regarding what resources (if any) should be placed in the cloud. There is so much talk today about this subject that it is assumed by many that cloud computing is necessary to grow. Many enterprises feel that cloud services are superior to in-house data centers or storage (Khajeh-Hosseini & Sommerville, 2010). This idea is further cemented in people's minds by powerful businesses trying to push other organizations to get into the cloud. These powerful businesses include Microsoft and Amazon. It has been predicted that by 2018, 30% of Microsoft's revenue will be cloud-based (Columbus, 2016). While making some businesses run faster and more efficiently, the main selling point for cloud services seems to be cost savings. Cloud computing is supposedly cheaper than buying physical computers. It is generally observed that Cloud computing makes eminent sense for SMEs; however, there are significant technical, organizational and environmental issues which need to be tackled before cloud computing services are effectively used by organizations (Al-Hujran et Al., 2018). SMEs are of interest in this paper because present research shows that cloud computing adoption does provide financial benefits to the adopting firms (Nicholas-Donald et Al., 2018).

There are many services that cloud providers offer, however, the most common services are Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS) (Furht & Escalante, 2010). The act of providing storage for a company's data is infrastructure as a service, or IaaS, and is what most people are thinking about and referring to when they say a company is "moving to the cloud." However, most companies use a combination of SaaS, IaaS, and PaaS, and many other DTP services fall under one of these broader categories. These services will be further defined in this paper.

The companies used as examples in this paper are indeed actual real-life businesses. Their names and any other identifying information will be removed due to privacy and compliance concerns. For example, the first company discussed will be referred to as "Company A." DTP solutions analyzed will specifically be cloud services. We will assess the companies' IT department budgets and their capability of moving into the cloud. A discussion will follow on how this resource availability affects a company's ability to move into the cloud. Finally, we will conclude as to whether or not it was cost effective for each company to use a cloud solution, or if it would have been cheaper to not use a cloud service. We will wrap up our discussion with future considerations and any potential threats to the research, including anything which we did not have direct control over and may have hindered the results.

## What Is "the Cloud"?

Most organizations that offer cloud computing provide business applications online, which clients can access online from a web browser or web service. All of this software and data are stored on servers (Bhardwaj et. Al., 2010).

But more simply, cloud computing can be defined as one of three overarching services: SaaS, IaaS, and PaaS. Software as a Service, or SaaS, is when an organization offers you some set of software or applications which they manage, but you pay for what you use. For instance, a business user may use an application licensed by an organization, such as Salesforce, but the application is configured and managed by another service provider organization who charges the user for the amount they use it or the amount of storage that is used by the application. There are different ways to charge for this service, but SaaS, like most other cloud offerings, use a pay-as-you-go kind of charge scheme.

IaaS, or Infrastructure as a Service, refers to computing machines and resources being utilized as a service. This includes cloud providers offering storage of software and data on their servers while offering a pay-as-you-use cycle. However, what many people do not understand is that IaaS does not just refer to storage of data, but also to having the computing resources you need at all times, on demand. This demonstrates one of the major selling points of cloud computing besides cost savings: speed and performance optimization. Administrators in organizations paying for IaaS can create a virtual machine and have it running in production within seconds. It will run just like a physical computer on site. This incredibly efficient benefit to every day IT work cannot be overstated and is one of the main reasons companies move to the cloud. Cloud providers say that no end-user should have to suffer a slow computer or lag in production time because their organization cannot provide adequate resources to perform their jobs. They claim to offer affordable solutions to this common problem in the form of IaaS (Armbrust et al., 2010).

PaaS, or Platform as a Service, is similar to IaaS, but also includes services that are required for a specific application, as opposed to just general storage and computing resources. This paper will mostly be examining companies that utilize IaaS and mainly use the cloud for storage and availability of resources.

## Adoption Model Defined

A business is considered Under-Adopted in the cloud if they have migrated under 25% of their servers into the cloud. They are considered Moderately-Adopted if they have migrated 25% to 94.99% of their servers to the cloud. Businesses are considered Fully-Adopted if they have migrated 95% or more of their servers to the cloud. It may sound strange to say that a business has fully adopted IaaS when only 95% of their servers are housed and managed on the cloud, since "fully" would seem to imply 100%. But what must be understood is that it is difficult to have every server a company needs in the cloud. There are almost definitely a few or more servers housed on site for businesses to support the core requirements of businesses. There are not many companies generating the levels of revenue we are going to be looking at which do not have at least one or more servers on site being managed solely by the company and not a cloud provider. So, a third range is needed to qualify what it means to be fully adopted as opposed to assuming 100% transfer of server management; that is not realistic.

A business is small if their annual revenue is in the range of $0 to $499,999,999 (Between $0 and just under one million). A business is mid-size if annual revenue is within the range of $500,000,000 to $999,999,999 (between $500 Million and just under one billion dollars).

A company is considered Cost Constrained if their annual IT budget is less than 1.5 million dollars. A company is Resource Abundant if their IT budget is 1.5 million dollars or more. A company is an Efficient Adopter if they are both Cost Constrained and have Robust Capability. They are identified as a Proactive Adopter if they have Robust Capability and Resource Abundance. They are a Resistive Adopter if they are Cost Constrained and have Limited Capability. And finally, they are considered Reactive Adopters if they have Limited Capability but are Resource Abundant.

Regarding employee resource depth and a company's capability to move into the cloud, a business is considered to have Robust Capability if there is a minimum of 5 years of total experience amongst their IT employees working with any cloud services. A business is considered to have Limited Capability if this overall IT departmental experience is less than five years. With these definitions set forth, we were able to examine and evaluate how different size businesses migrate and manage their storage with DTPs. By examining their costs and also their internal IT capabilities, we were able to examine further the cost and other possible circumstances surrounding why they moved to the cloud. This circumstance may shed some light on why and how these companies moved to DTPs. Figure 1 depicts the proposed segmented pyramid Adoption Model of Business, concerning Digital Technology Platforms.

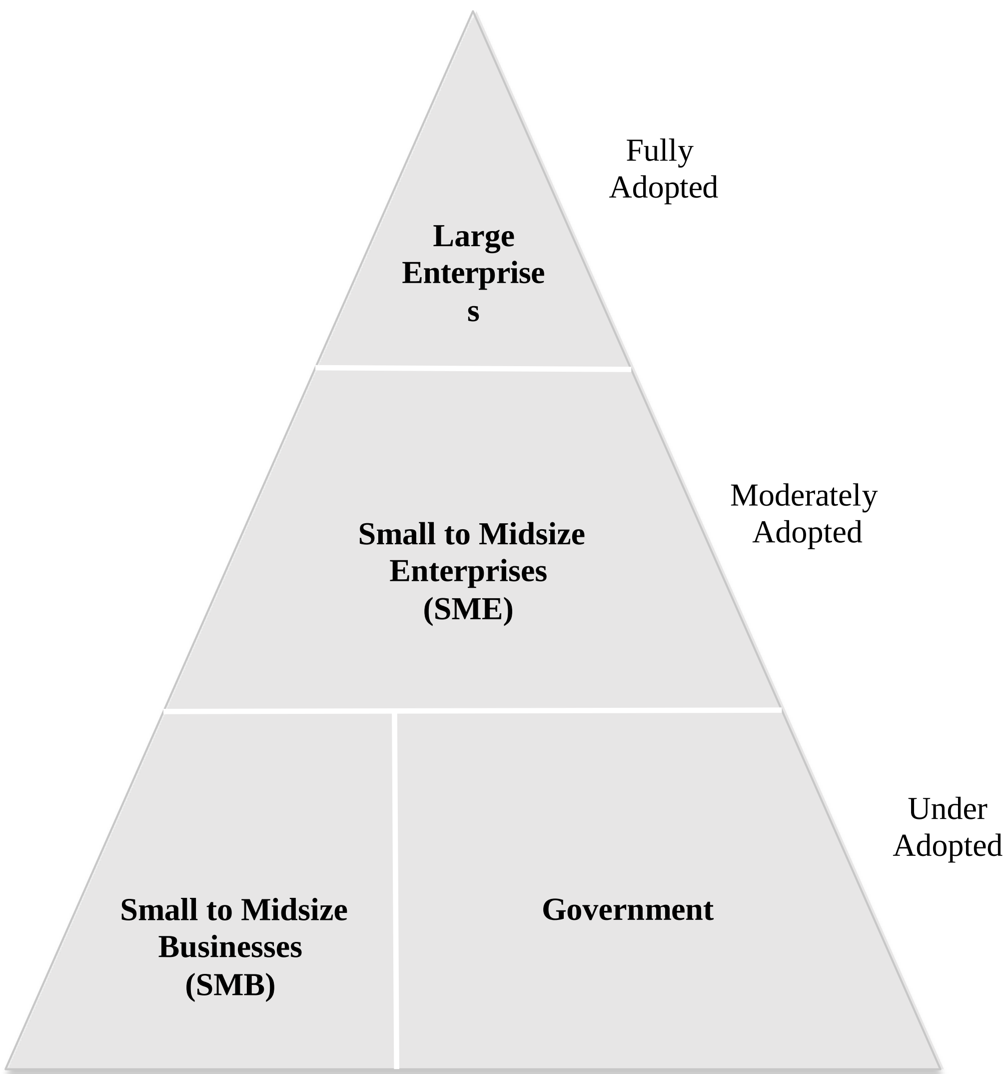


**FIGURE 1. ADOPTION MODEL OF BUSINESSES**

Figure 2 depicts the proposed quadrant model and classification of adopter types concerning digital technology platforms.

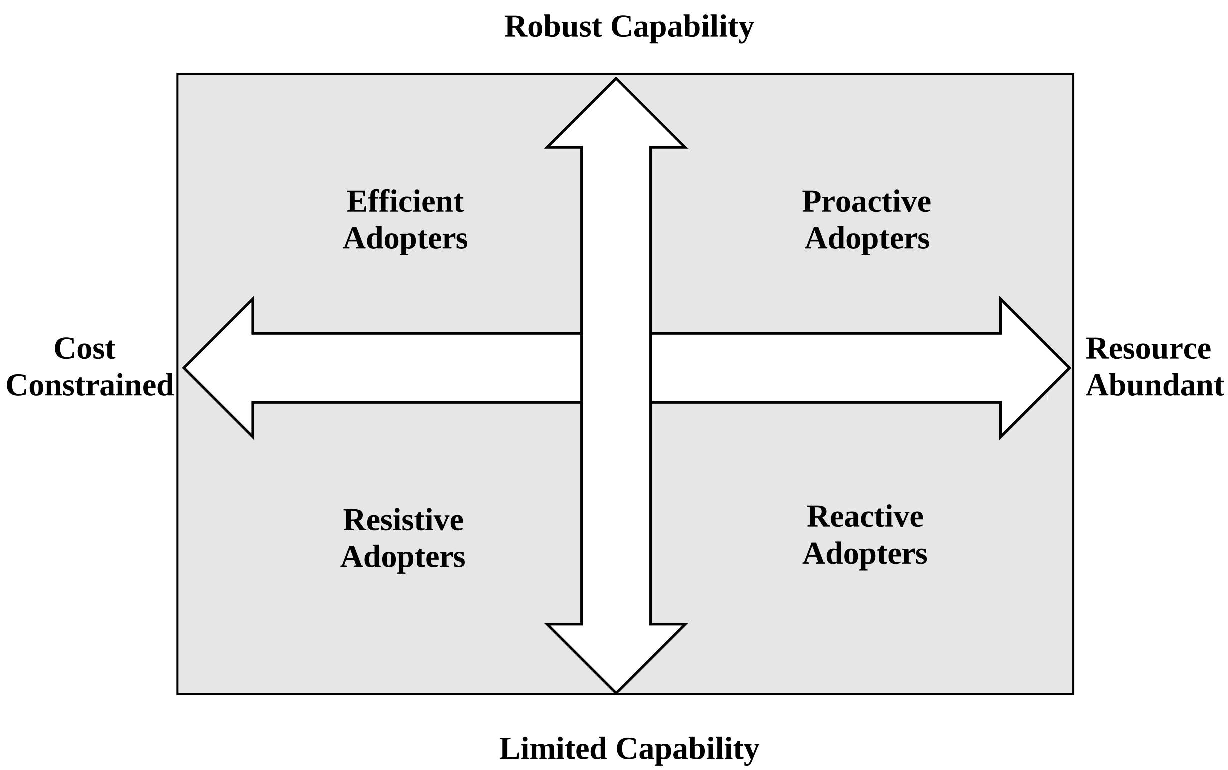


**FIGURE 2. CLASSIFICATION OF ADOPTER TYPES**

### Revenue, IT Budget, and Cost Constraint

Of the twelve organizations studies, six of them (Companies A-F) are considered small businesses and the other six are medium-sized businesses (companies G-L), based on the most recent annual revenue from 2016. In reviewing the adoption model of businesses, it is important to note that no large businesses are discussed in this paper as only small and mid-sized businesses are studied. Table 1 on the following page details the types of organizations and annual revenues that were sampled for this study.

**TABLE 1. ORGANIZATIONS SAMPLED FOR THE STUDY**

| Organization | Industry | Annual Revenue 2016 |
|---|---|---|
| Company A – Small Business | Passenger Transportation | $ 4,700,000 |
| Company B – Small Business | Marketing & Advertising | $ 10,100,000 |
| Company C – Small Business | E-Commerce/Automotive Dealer | $ 10,500,000 |
| Company D – Small Business | Software | $ 45,917,000 |
| Company E – Small Business | E-Commerce/ Automotive Dealer | $ 365,107,000 |
| Company F – Small Business | Energy (Utility) | $ 370,120,000 |
| Company G – Medium-Sized Business | Retail | $ 639,100,000 |
| Company H – Medium-Sized Business | Real Estate | $ 683,800,000 |
| Company I – Medium-Sized Business | Construction | $ 782,800,000 |
| Company J – Medium-Sized Business | Food Service | $ 800,000,000 |
| Company K – Medium-Sized Business | Legal | $ 846,500,000 |
| Company L – Medium-Sized Business | Financial Services | $ 864,400,000 |

It is sometimes assumed that the more revenue a company has, the higher their budgets are. Logically, one would think that out of two companies, the one with a higher revenue would have a higher budget for IT and would be willing to pay more for IT needs and changes. While sometimes true, a higher source of revenue does not necessarily mean that a company will be willing just to throw more money into their IT systems. This is observed within our data below which shows how company G, a mid-size business with revenue of over 600 million dollars, has less of an IT budget than some of the small businesses. The 2016 IT budget for company G was $800,000 per year, while the 2016 budget for Companies D, E, and F were all over $1,000,000. We believe the IT department budget can be affected by factors other than revenue. One factor may be talent or expertise of IT employees. If the IT department is very knowledgeable and has proven to be a major asset to the company, then management may be willing to allocate more resources to IT. All too often, businesses provide enough funding for IT to keep the company running, but not enough to expand or improve performance. It may take a very experienced and successful team to encourage management to allocate the appropriate funds. Table 2 details the annual IT budgets of the organizations that participated in the study.

**TABLE 2. ANNUAL IT BUDGETS OF ORGANIZATIONS WITHIN STUDY**

| Organization | Annual IT Budget 2017 | Monthly Budget |
|---|---|---|
| Company A | $ 400,000 | $ 33,333 |
| Company B | $ 500,000 | $ 41,667 |
| Company C | $ 500,000 | $ 41,667 |
| Company D | $ 1,000,000 | $ 83,333 |
| Company E | $ 1,250,000 | $ 104,167 |
| Company F | $ 1,175,000 | $ 97,917 |
| Company G | $ 800,000 | $ 66,667 |
| Company H | $ 3,000,000 | $ 250,000 |
| Company I | $ 3,000,000 | $ 250,000 |
| Company J | $ 1,500,000 | $ 125,000 |
| Company K | $ 1,200,000 | $ 100,000 |
| Company L | $ 3,000,000 | $ 250,000 |

Each small business we investigated was rated Cost Constrained. Some of these organizations were severely cost constrained. It may be expected since small businesses should try to save money at every opportunity. The smaller the company, the more money you need to save. It is not about staying within budget when you are a small enterprise, but about being as far under budget as possible. But every mid-size business was resource abundant except two: company G and company K. These are both high revenue companies which have migrated the majority of IT storage and infrastructure to the cloud. They both have a high stake in their cloud structure since they are almost entirely managed in the cloud, yet only one company has an IT staff of significantly higher DTP experience. Company G has 12 years of experience while Company K has 19 years. Company K has a higher percentage of their infrastructure hosted in the cloud, so it makes sense that they would want to ensure that their staff can handle any issues when they occur.

Another factor may be the industry the business is operating within. It is possible that certain types of businesses may not need as much IT support as others, no matter how large or revenue generating they become. Company G is a retail entity, Company D produces a specialty product (alarms), Company E works in the automotive industry, and company F is an energy (utility) provider. These are all very different industries, and therefore all may have different IT needs, but all still have a significant difference in budget size. It is possible that retail does not use as many computing resources or need as much IT maintenance, which would allow them to have a lower IT budget and still operate at a capacity to generate large revenue. A closer look at all of these businesses operations would be needed to break down why a mid-size business would have such a lower IT budget than several of our small businesses.

The IT budget is, of course, a critical aspect of deciding whether to migrate an organization's resources to a DTP such as the cloud. We would be willing to wager that there are many managers or even leaders in organizations who would say this is the most important measure of whether a company could or should move to the cloud. However, one other factor to consider when making this decision is the company’s Resource Capability. Resource Capability defines how competent, and able an organization is (or would be) at shifting IT services to the cloud if it decided to do so.

Infrastructure is included as well as supporting cloud services and maintenance. It can be a blessing to unload certain IT services to another organization because some IT functions can be a real headache to have to manage (Akkad, 2010). However, a business considering this transition must ask itself, how does it know that it is ready to move to the cloud and how can the business-be sure this will be a success without any major delays in business-as-usual? One way would be to take stock of current IT resources and staff and see if they are knowledgeable enough and experienced enough to handle this transition. If management were to decide to move IT operations to the cloud because they thought it would save the business money in the long run, but nobody on the IT staff has any working knowledge of cloud technology, this could be a disaster. It does not matter how much money one invests into a project; a company must have the right staff to execute any project, let alone a project that could disrupt the entire operation. To evaluate how prepared an organization is to make the jump into DTPs, we have developed a model as defined earlier.

## Digital Technology Platform (DTP) Expertise

Table 3 details the experience and depth each small business entity has with the respected cloud models, IaaS, PaaS, and SaaS.

**TABLE 3. SMALL BUSINESS DTP EXPERTISE (BY LETTER)**

| Type of Cloud Experience | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Total Years' Experience IaaS | 10 | 8 | 7 | 4 | 4 | 7 |
| Total Years' Experience PaaS | 3 | 4 | 7 | 3 | 3 | 2 |
| Total Years' Experience SaaS | 3 | 5 | 5 | 7 | 6 | 4 |
| Total Years Cloud Experience | 16 | 17 | 19 | 14 | 13 | 13 |

Table 4 details the experience and depth each mid-size business entity has with the respected cloud models, IaaS, PaaS, and SaaS.

**TABLE 4. MID-SIZED BUSINESS DTP EXPERTISE (BY LETTER)**

| Type of Cloud Experience | G | H | I | J | K | L | Average for all companies |
|---|---|---|---|---|---|---|---|
| Total Years' Experience IaaS | 3 | 5 | 5 | 7 | 6 | 4 | **5** |
| Total Years' Experience PaaS | 4 | 5 | 7 | 7 | 4 | 5 | **4.5** |
| Total Years' Experience SaaS | 5 | 3 | 4 | 8 | 9 | 7 | **5.5** |
| **Total Years Cloud Experience** | **12** | **13** | **16** | **22** | **19** | **16** | **15** |

As observed in the above table, each business has its cloud experience rated by the number of years of experience in each service, then by a total number of years in all three cloud-related services. This experience is defined by the number years working for a company that utilizes cloud technology and the number of years working with that particular service. Hands-on employee experience is the criterion that counted toward cloud experience. The same hands-on experience applied to an IT employee who worked for a business using the cloud. Moving into the cloud is a major trend which many enterprises are following (Christauskas & Miseviciene, 2012) and it is important that these businesses have the talent to support such a migration.

There are a couple of key observations to be made based off this table alone. One thing to notice is that businesses with higher revenue do not necessarily have the most experienced IT staff for cloud computing. In a generation where cloud computing is becoming critical for businesses to compete with other large businesses consistently, one might jump to the conclusion that a company with significantly higher revenue would higher the most experienced staff it could. Strikingly, this table shows that is not always true. Company H has 13 years of cloud experience, which seems like a lot, but is not as much as others within the table; less than almost all of the mid-size companies we examined had comparable years of experience. Companies E through F equal company H with 13 years of experience, but all other small businesses here have more years of experience. So once again, larger organizations with higher revenue do not necessarily hire or hold staff with more cloud experience, even though this could be considered a necessary technology for most of them; these decisions could also be influenced by industry.

Another important observation is that the median experience is higher for IaaS. On average, most of these companies have IT staff more experienced in IaaS than either of the other major cloud services, suggesting that this service is more important to an organization. Because IaaS by definition is a service for the IT foundation of a business, it could be more critical for a business to have than other services (Giordano, 2017). It would depend on the type and size of the business, but based on this table, IaaS is a more important and critical service than either of the other two overarching cloud solutions (PaaS and SaaS). If the data in this table correlates with the number of servers each business has migrated into the cloud, then this hypothesis may be supported. In the next section, this paper will examine the metrics of computing resources each company has moved into the cloud.

### The Adoption Model of Businesses

Using the server data presented below, we can see which companies are moderately adopted and which ones are under adopted. We can then compare these findings with the proposed adoption model of businesses previously shown.

**TABLE 5. THE CONTRAST OF ON-SITE VS. CLOUD SERVER ADOPTION**

| Organization | Number of servers on-site | Number of servers in the cloud | Percentage of servers in the cloud |
|---|---|---|---|
| Company A | 90 | 12 | 0.13 |
| Company B | 138 | 43 | 0.31 |
| Company C | 114 | 24 | 0.21 |
| Company D | 70 | 11 | 0.16 |
| Company E | 153 | 115 | 0.75 |
| Company F | 204 | 199 | 0.98 |
| Company G | 121 | 79 | 0.65 |
| Company H | 90 | 86 | 0.96 |
| Company I | 220 | 157 | 0.71 |
| Company J | 253 | 205 | 0.81 |
| Company K | 238 | 217 | 0.91 |
| Company L | 201 | 190 | 0.95 |

**TABLE 6. CLASSIFICATION OF ORGANIZATIONS BASED ON SERVER PLACEMENT (ON-SITE VS. CLOUD)**

| Organization | Under Adopted | Moderately Adopted | Fully Adopted |
|---|---|---|---|
| Company A | Yes | | |
| Company B | | Yes | |
| Company C | Yes | | |
| Company D | Yes | | |
| Company E | | Yes | |
| Company F | | | Yes |
| Company G | | Yes | |
| Company H | | | Yes |
| Company I | | Yes | |
| Company J | | Yes | |
| Company K | | Yes | |
| Company L | | | Yes |

The model hypothesized that small businesses would be under adopted (under implications from their supposedly smaller IT budgets), while mid-sized businesses would be at least moderately adopted. As expected, mid-size companies who had not migrated to the cloud at a moderate capacity, migrated fully to the cloud. The small companies were a bit more surprising. The data shows that smaller businesses are only 50% under-adopted cloud technology and services, while the other half are moderately- or even fully-migrated.

It is surprising that a small business would be fully migrated because a business that is smaller but still has a large revenue may want more control over their resources, as opposed to giving responsibility to a cloud provider to manage infrastructure and data. The only business that is small but fully adopted is company F. This energy company has revenue of over 370 million dollars, but still has a cost-constrained IT budget. The budget is well under 1.5 million dollars. It is possible that this business is growing rapidly and management feels that although it is small now, pretty soon it could grow too quickly, even quicker than they are ready to handle.~~,~~ I~~n~~ that case, perhaps the IT team needs the assistance of cloud technology and needs a cloud provider to make sure the business scales accordingly and has the infrastructure to handle the growing needs of an up and coming energy-company. Next, we will look at cost savings, which has been a major selling point of cloud services and long-held benefit (Mell & Grance, 2009).

**Resource Costs**

The following figures (3 & 4) detail the resource (dollars) spent both before and after DTP implementation between the second half of the 2016 calendar year and the first half of the 2017 calendar year.

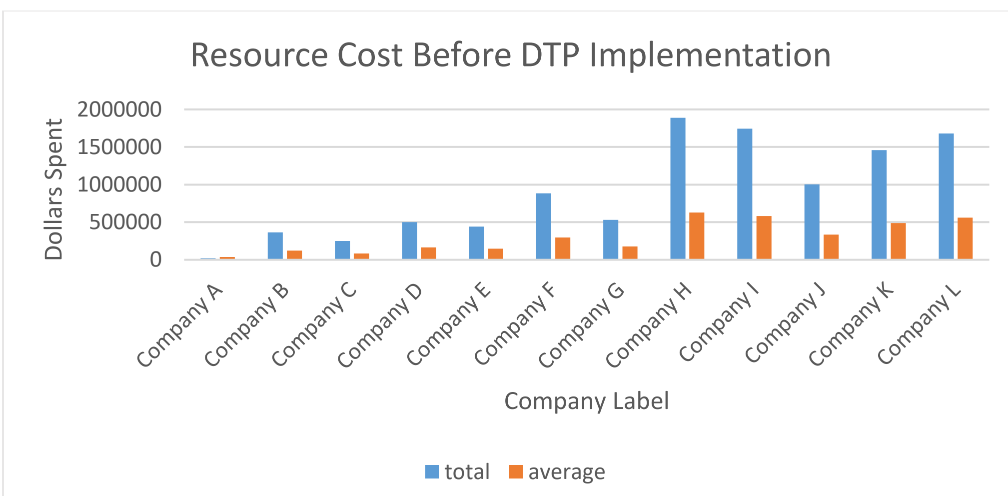


**FIGURE 3. RESOURCE COST IN 2016 BEFORE IMPLEMENTATION OF DTPS**

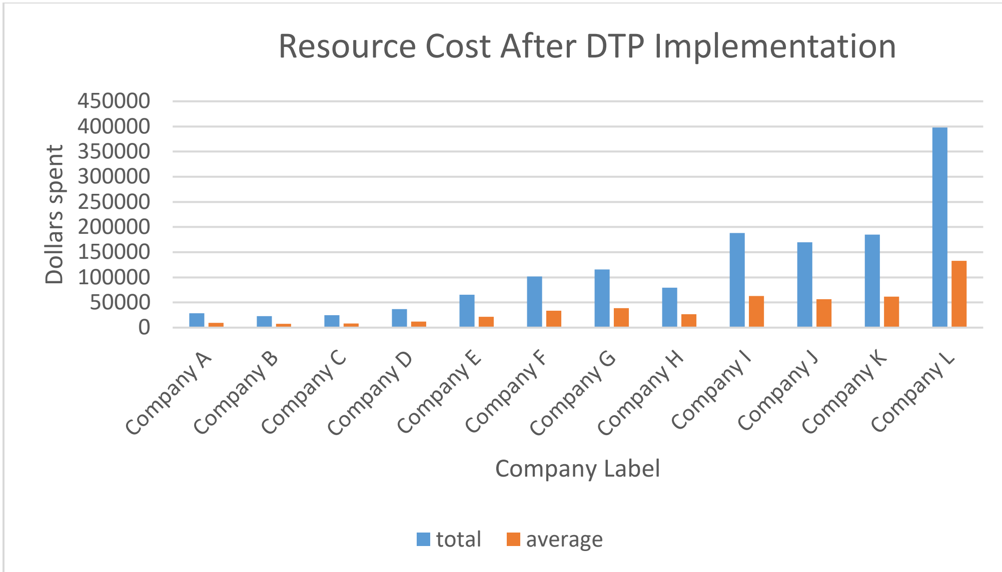


**FIGURE 4. RESOURCE COST IN 2017 AFTER IMPLEMENTATION OF DTPS**

In viewing the total IT computing resource cost for each company, we compared what they were for the last six months before the cloud migration and the first six months after the cloud migration. This method allowed for observation of the immediate cost-saving results of cloud technology. It showed that every company realizes cost savings from using the cloud. These savings are not minimal, but dramatic. Some companies save hundreds of thousands of dollars as was the case with Company L. The total cost of resources was $1,243,398 and after DTP implementation it was $301,000. Also keep in mind that cost savings can vary as time goes on because resource needs change and the price Microsoft charges for their cloud services may change, but for now it seems to be a large cost savings strategy to move into the cloud. This simple comparison is an enticing motivator for businesses to assess their needs and make a decision as to whether they need to move to save money. Along with saving money, moving into the cloud could help long-run productivity and other factors of business operation, but that is beyond the scope of this paper.

**Classification of Adopter Types**

After analyzing and reviewing all of the information and data gathered from these 12 organizations, it is clear that there are patterns emerging related to the type of companies that will tend to migrate to the cloud and at what capacity. But as with most models and rules, there seem to be some exceptions. Companies with more revenue do tend to migrate more of their IT infrastructure to the cloud and utilize more cloud services than those with less revenue. This is observed in the number of servers that each company has moved into Azure. However, the type of industry may affect the decision to migrate. For instance, Company A's business is training pilots to fly airplanes which requires a lot of simulation technology and computing resources to track flight information and data which can be sensitive data that needs to be accessed immediately for several reasons, with safety being number one. For these reasons, Company A may want or need, to be completely responsible for their servers and data and not give access to anyone else, including Microsoft, which could explain why they have migrated only 13 percent of their servers into the cloud despite having millions in revenue. It could also be suggested that Company A might not migrate much more computing resources into the cloud even if they had 100 million dollars in revenue simply based on their industry and current migration percentage. Company A is cost constrained because its IT budget for 2016 was only $400,000, but high capability because its IT staff had more than five years of experience working in the cloud. Therefore, based on the definitions set forth at the beginning of this paper, this business would be classified as an Efficient Adopter. The term efficient seems appropriate for Company A because they appear to want to keep most of their data private and readily available to them without any interference or need to go to anyone else, yet they still utilize Azure cloud services when necessary as their budget allows. They use cloud services when it suits them as opposed to just jumping on board to use the cloud as many companies seem to be doing (Columbus, 2017).

We can see what type of Adopter each organization is by looking at the data collected regarding company budgets and cloud technology. Companies A, B, C, D, E, F, G, and K are Efficient Adopters, while Companies H, I, J, and L are Proactive Adopters. There are no Resistive or Reactive Adopters because none of these organizations are low capability. That is, they all have an IT staff which has a minimum of 5 years' experience working with cloud technologies. They all have double that amount of experience; this experience measure may suggest that companies migrating their IT resources to the cloud know they need people working for them who already know how to deal with this kind of tech, or it could be possible that these companies hired more staff or consultants who are trained in cloud technology to help with the migration. It would be interesting to see what these businesses' IT staff experience was one or even two years before their migrations.

Of the four Proactive Adopters (Companies H, I, J, and L), two of them have fully migrated to Microsoft Azure. These companies trust Microsoft to hold their data securely and provide access when needed. The future of these companies or at least the continued smooth operation of these companies over the next few years depends on their ability to leverage their cloud services and relationship with Microsoft successfully. These companies are large enough and have enough revenue to justify their need for using cloud services, but there are other reasons to migrate. Again, it could be said that the industry each business operates within their need to migrate and to what extent. There have been studies performed to see if certain types of organizations are moving into the cloud at a faster pace (Kerrest, 2016). It is also possible that some organizations have more proprietary or legally restricted information that is not allowed to be stored in the cloud, which would cause certain types of business to migrate less, even if they wanted to so (Badola, 2015). However, we cannot make that conclusion based on the results of this paper alone. Also, not every large business is a Proactive Adopter as we hypothesized they might be. Despite having large revenue and large IT budgets which would allow for full migration, not every large company did fully migrate, particularly Company G. This company only moved 65 percent of its resources to Azure even though it could have moved everything.

## CONCLUSIONS

There is a pattern to which companies migrate to the cloud and to what extent, but not every company follows this pattern. The pattern appears to be that businesses with more experience and higher revenue migrate more computing resources to the cloud. Exceptions include Companies E, F, G, and I. Company E is an Efficient Adopter, but has moved significantly more resources to the cloud than Companies A, B, C, or D. Although Company E has not fully migrated, 75% is a large majority of resources and puts a lot of responsibility in the hands of Microsoft to handle their business needs. Company F has fully migrated and is more migrated at 98% than any other business studied in this paper, including all the large enterprises. Company G is a large business, but has only migrated just over half of its resources to the cloud, despite its massive revenue. Perhaps the company maintains that it does not need the cloud as much as other companies do and hasn't been swayed by popular opinion regarding how great the cloud is, and therefore, simply has not chosen to move everything over to Microsoft. Alternatively, perhaps their decision to not migrate as much is more strategic. This would make sense because most companies only migrate to the cloud if they can see some relative advantage in doing so (Alshamaila & Papagiannidis, 2012). Company I is an exception because although 71% is a large number of IT resources to move to the cloud, this is not nearly as much as most of the other large companies.

Most of the companies studied fit our models. The models suggest that companies with more revenue, larger IT budgets, and more trained staff will migrate more of their IT infrastructure and resources to DTPs, particularly cloud technologies. These technologies include IaaS, PaaS, and SaaS. The notable exceptions to this hypothesis are Companies E, F, G, and I. They appear to break from this line of thinking and logic; thereby breaking the pattern the models and other companies set forward. However, regardless of how much of their infrastructure they migrated, it is important to note that all of these companies did migrate to some degree. Cloud computing has already been shown to have major benefits; these benefits include a substantial increase in communication, collaboration, and real-time analysis (Bassett et al., 2015). Cloud computing is critical to staying competitive. This paper does not cover all of the benefits of cloud computing and only discusses a few. Others benefits include loss prevention, sustainability, and automatic updates, to name a few (Salesforce, 2017).

### Limitations

The computing- resource costs compared for when these businesses utilized DTPs (and did not) were measured at different times of the year. Cost information analysis for DTP usage was from January through December. The months July through December were utilized to review the non-use DTP cost information. It is unknown if the different seasons or times of year would make a difference in computing resource costs. It may play a factor in how much cooling to apply to a server room because the temperature varies with the seasons. The temperature plays a huge part in determining how a pc or server run (Smathers, 2017). It can also destroy a computer if it gets too hot. It is well known, and those who have been in server rooms will attest, that servers very easily can overheat. There may be other factors influencing data with the seasonal change other than temperature, but they are unknown at this time; this can be considered a limitation of the study.

The IT budget information is from 2017, while the revenue information and part of the cost information were from 2016. It is unlikely that the IT budget changed dramatically in one year, but it is possible it could have been significantly more or less in 2016. The IT budget determines what resources (PCs, servers, virtual machines, hardware parts, peripherals such as monitors and wires, etc.) will be available for a company's fiscal year. This number also determines what kind of equipment to order and what actions to take when making infrastructure change decisions. The decision to use DTPs and the extent to which a company wants to use DTPs depends on this budget. Differences in this amount can make a huge difference in an organization's ability and willingness to migrate to the cloud. This is especially true with IaaS since moving resources to DTPs in this fashion is very costly and time consuming for a company.

Also, once the migration to a cloud service is achieved, especially IaaS, moving back to self-managed resources is just as costly. It is also costly to change one's mind and switch DTP providers because everything that was moved will have to be moved again. An example of this would be a company migrating all their servers to AWS, then a year later deciding they can get a better monthly rate with Azure and then move all of those same servers to Azure. This can slow production down in business for months. This technical disruption in business can cause users to be unable to perform certain job duties at certain times since the resources housing their data are being put offline and moved briefly. In this scenario, not only would it be costly to move to IaaS with a DTP; it would also impact performance costs. Given that some of the data is being reviewed during times when there would have been a change in the IT budget, this may affect the results.

The mid-size businesses we analyzed had a higher IT budget than is typical for businesses of that size. This is according to a study done by Gartner. Companies that are mid-sized typically spend 6.7% of overall revenue on IT (Guevara, 2017). Some of the mid-size companies we looked at had almost double that percentage, and that may be because they simply can afford it and wish to make sure the money is budgeted accordingly and available in case of need. For instance, it would make sense to budget for those rare instances when the unexpected happens like an office burning down and new construction is needed.

A company that can afford it, generally will ensure that they have budget allocations to address any possible issues that may arise regarding their IT and infrastructure. The businesses we looked at are just a few of the thousands of companies with revenue in the range of $500 million to just under $1 billion, and the average IT budget may not be so high, as Gartner claims to be the case. However, because the companies we chose do not reflect what is believed to be the average cost of an IT budget, this could affect the results regarding what cost savings a typical mid-size company can expect to see with DTP implementation.

Today, there are cloud-based solutions for storing and managing data. The cloud is something relatively new and not every SMB has training or knowledge in this scope of practice. So, while it may be beneficial for a business to move their storage to the cloud, they might not have the talent or expertise to accomplish this move. Although saving money is always a top concern for businesses; some companies may not move into the cloud for reasons other than cost. Because it is difficult to understand with complete certainty the reasons a company is or is not moving to the cloud, making determinations based on the data can be deemed speculative. Although we considered the experience of the IT employees as a variable in the determination of whether a business moves to the cloud, we must still remember that the assumptions made by this paper are not necessarily completely accurate.

We did not have any companies in this study which were Low Capability. All of these companies had IT staff well versed and experienced in DTP technologies with at least 5 or more years of IT experience.

Also, the companies studied in this paper have all just recently migrated to the cloud as of January 2017. It is common for cloud service costs to be higher during the initial transition from self-managed storage than they are once a company has adjusted to doing business in a DTP environment. In the beginning, the IT team for the client business is usually learning how to utilize the services offered by Microsoft Azure and utilize them effectively. Thereafter, the costs usually level off with time. The IT team understands the associated services and costs, and plan activities accordingly. For example, the system administrators and engineers for a company will learn how many virtual servers or PCs are required to test something as time goes on. Therefore, they become well-versed in the technology. This decision all depends on the IT team and their knowledge and level of experience in the cloud. So, these companies may see an even further cost reduction past the initial six-month period of operating in the cloud.

## Future Considerations

While the core focus of this study was to examine how cloud computing technologies are adopted by SMBs and the respective drivers associated *costs* and *capability,* there exists an opportunity to extend this work further while uncovering other significant factors that are attributed to the spread and adoption of cloud computing technology across different organizations. The most appropriate lens for extending this work would be Diffusion of Innovation Theory, which is posited on seeking to explain how, why, and at what rate new ideas and technology spread (Rodgers, 2003). Rogers argues that diffusion is the process by which an innovation is communicated over time among the participants in a social system. The categories of adopters are innovators, early adopters, early majority, late majority, and laggards. Diffusion manifests itself in different ways and is highly subject to the type of adopters and innovation-decision process. The criterion for the adopter categorization is innovativeness, defined as the degree to which an individual adopts a new idea (Rodgers, 1962). At present, the authors of this paper were unable to identify any literature which covers Cloud Computing adoption juxtaposed to Diffusion of Innovation Theory. We believe extending this work will be a valid contribution to enhance the given literature on this broad topic.

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