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# Using Information Technology to Increase Business Productivity



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ABSTRACT

The goal of this thesis was to suggest ideas for improving the information technology at Timothy and O'Connors for the purpose of increasing business productivity. The company is a small accounting and auditing firm located in Tralee, Ireland. The company mainly works with sole traders and business owners in the preparation of accounting forms to the government, managing their clients' accounts, and tax calculation.

The objective of this thesis was to research what productivity is and how the firm approaches this concept. The author used this information to discover how productivity is achieved in the firm and what qualities of it are valued above others. Secondary research was carried out on Information technology and what it meant to a firm. Research was done on how best to implement new technology and train employees on its use.

The author held interviews with the partner at the firm, Patrick O'Connor to acquire the information of upper management in regards to various subjects including how he views productivity, his attitude towards the current technology for the firm and how it was operating. The author also issued a thorough survey to all six employees, scoping the full depth of the current situation with the information technology they use on a daily basis.

During the course of the investigation the author discovered the root of a number of inefficiencies and put fourth recommendations on how best to remedy them. The author calculated just how inefficient these problems were, and ranked the most severe. The author concluded that the productivity at Timothy and O'Connor could be improved with a number of changes to their information system infrastructure.

**Keywords** Information Technology, Increasing productivity.

**Pages** 27 p. + appendices 1 p.

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Appendix 1 A Starting list of possible future company customers

## 1. INTRODUCTION

### PURPOSE OF THIS THESIS

The purpose of this thesis is to analyze the technology used at the commissioning company and to determine if there can be any improvements made to the way their technology is used in order to increase productivity.

### RESEARCH QUESTION

The research question to be investigated for this thesis is: “Using Technology, how may the overall productivity at Timothy and O’Connor be Improved?”

### RESEARCH METHODS

The author will be gathering secondary research from online and paper based, published sources. The main method of gathering my primary research will be through a survey given to all employees of Timothy and O’Connor. The author will also converse with the employees and main accounting partner to garner first hand information regarding the researched topic.

#### 1.4 LIMITATIONS OF THESIS

One of the limitations will be taking the price of purchasing new technology or the licences to acquire new software and determining the cost by the added benefit of the new technology to the company. Another limitation will be cataloguing the time required for employees to become adept in the effective usage of the new technology, including any prices that may possibly be incurred due to necessary professional training if such is required.

## 2. COMMISSIONING COMPANY

### 2.1. Introduction of the Commissioning Company

Timothy and O'Connors chartered certified accountants & registered auditors is a small accounting firm based out of Tralee Ireland. The company currently has 6 employees working in different roles at the firm. The firm works with clientele from sole traders, partnerships, to limited liability companies. The company can perform a myriad of different accounting and auditing services for their customers. The author was granted a work placement there for 3 months starting in January 2016, and was extended to a full 8 months to August 2016.

### 2.2. The Current Situation of the Information Technology at the Company

The type of output provided by Timothy and O'Connor is all information technology based. This is the reason the author believes this thesis can be important in determining if the company can benefit from any changes or observation that can be made in this thesis. The company uses basic computers to conduct all activities. The accounting software suite used by the company is called Relate.

### 3. THEORETICAL BACKGROUND

#### 3.1. Productivity

The ability to measure firm-level productivity is critical to understanding the company's level of efficiency being utilized through its business activities. At the base form, productivity is a comparison between material inputs (which could be labour, materials, or capital) and produced outputs. Productivity is paramount to a business entity' success because every business must produce a material gain from the conversion of inputs to outputs to achieve viability and overall longevity of the entity. (Anderson, Fornell & Rust 1997, 131.)

##### 3.1.1. Indicators of Performance

Key performance indicators are measurement tools used by management to help them understand how a particular organization or department within an organization is operating in terms of production. In order to establish a successful key performance indicator, the tool must assist management by indicating they are taking the correct measures in achieving the organizations strategic goals. Successful key performance indicators have a number of requirements, they:

Must be well-defined and quantifiable: The key performance indicator must have parameters which are fully understood, with very little room for interpretation. The indicator must also be easily and completely measurable at any given time.

Must be thoroughly communicated throughout your organization and department: It is important that the entire organization be aware of and understand what goals the organization are performing towards so they can work most efficiently together towards achieving those goals. Achieving these can be dealt with by incorporating KPI's into all employees' performance evaluations and through regular communication as to how the organization is trending toward the goal.

Must be crucial to achieving the goal: The key performance indicator must measure performances of critical aspects to productivity goals. (Jackson 2015)

Productivity and quality are both indicators of how effectively business inputs are being transformed into saleable outputs by the activities of a certain department within the company. Productivity is the aspect that relates the output of the transformation process to the input, and quality re-

lates to the evaluation of the processes and outcomes by internal and external customers. The overall concept of productivity or quality, as well as the emphasis placed on them, depends on how output is defined and from the source of the the definition taken into account. It can be argued that both productivity and quality can be best looked upon together. From the customer's view, output is the result of the exchange process between a service firm and the customer. (Looy, Gemmel, Desmet, Dierdonck & Serneels 1998, 360.)

Customers will evaluate quality from a service based industry by taking into account the process of the provided service, as well as the final outcome of the service and compare it to the price they have payed. Firms on the other hand will analyze the utilization of resources required in the transformation process of the final product or service provided. (Looy et al. 1998, 360-361.)

### 3.1.2. Measuring Productivity

#### Technology

A frequently used benchmark of measuring the growth in productivity is the change in technology used. Technology can be defined as the most advanced ways of converting resources used into products or outputs desired by the economy and appears as one of two types of products. The first form is called disembodied, which can be in the forms of either new organizational techniques, scientific results, or blue prints. The second form is embodied into new products such as improvements in either design and/or quality of new vintage goods and intermediate inputs. The link pointing technology as a productivity measurement is not straightforward due to the frequent explicit or implicit association of product measures from technological change. (Schreyer 2001, 11.)

#### Efficiency

The idea of finding changes in efficiency is strategically different from comparing the changes in technology. The concept of maximum efficiency in an engineering term defines a production process that has attained the maximum output that is physically achievable with the current technology with the available fixed amount of inputs. Improving upon technical efficiency within the production process will move the entity towards a state of "best practice" (when a firm is producing output with minimal or zero waste) due to the elimination or maximum decrease in technical and organizational inefficiencies. It needs to be noted that not every avenue of improving technical efficiency makes economic sense however. This occurs when the cost of upgrading some form of existing technology or the hiring of additional personnel makes the additional gains from the improved efficiency less than the additional cost of the new technology. These higher costs can either come from the increase in maintenance on the new tech-



nology or the increase in the firms salary expense from the hire of additional personnel. (Schreyer 2001, 11.)

### Real Cost Savings

Real cost savings is the most realistic method of deducing the measurement of increased productivity in an organization. Real cost savings is found by calculating the change in input and output after a technological change has been made to a current production regime. Real cost savings can stem from different types of efficiency changes made to a production system. Some of these changes can be classified as technological changes or changes in economies of scale. Changes in these two aspects can have their respective efficiency differentiations measured, however it can be extremely difficult to identify the exact source of the actual real cost savings. (Schreyer 2001, 11)

### Benchmarking Production Methods

Benchmarking production methods is the system of taking precise measurements of physical units (e.g. products manufactured per day, billable kilometres per person). The measurements are then compared to individual production measures and processed to identify inefficiencies. These methods can be used to compare employee to employee performances on different tasks, however this method has a disadvantage because the productivity measurement outcomes are difficult to combine or aggregate. (Schreyer 2001, 12.)

### 3.1.3. Types of Productivity Measures

There are many different types of productivity measures. In order for the best one to be chosen by an entity it must define the purpose of the productivity measure and consider the amount of available data to use in measuring performance. From a broad view point, there are two ways to classify different productivity measures. The first way is to classify the measure as “single factor productivity measures”. This classification is defined by measuring output to a single measure of input. The second way to classify a measure is called “multi-factor productivity measures”. This classification is defined as relating a measure of output to a group of different inputs. Another distinction relevant to industrial or firm level entities alike, is between productivity measures that compare a measure of gross outputs to one or more inputs and productivity measures that use a value-added system to capture a particular moment in time of outputs being moved. (Schreyer 2001, 12)

### 3.1.4. Selecting Processes for Innovation

Selecting processes for innovation begins with taking the full picture of the firm's key activities and selecting those that are in need of improvement, and once improved will positively impact the company's overall productivity. This selection process can help define the boundaries of the processes that will be taken into consideration for being the ones in the most dire need of improvement, so that the company can effectively focus on those specific processes in question. (Davenport 1992, 27.)

The first step is to identify the major process in the company. It is critical to know all of a company's processes to ensure an accurate, informed decision can be made. One useful tool to employ is a survey to help identify the boundary's scope of improvements for individual processes.

### 3.1.5. Assessing Strategic Relevance

After the company has determined the boundaries of its major processes, the company now selects individual process for innovation. Experience suggests the company's capabilities and resources are the limits for these innovations. A company's resources would include personnel, fiscal resources, and time, and due to resource limitations in these areas, a company would need to use great care in selecting the right processes and the scope of their improvements. It is critical that an organization understand the exact level of change (and the disruption during the changes) it can realistically take, and use that understanding to determine the number of processes it can successfully innovate at any given time.

Another issue for the company to consider is the coordination required if multiple processes are to be altered at the same time. (Davenport 1992, 27.)

## 3.2. Information Technology

Information Technology is key to any small business, and knowing about the technology and equipment the company's employees are using will go a long way in helping a company succeed. Computers and tech equipment are constantly evolving and improving. Keeping up to date with those changes can help save a company money.

Lots of tools businesses have used in the past have now been modernized with the use of new internet technologies. Simple things like data storage, email marketing, communication and more are all evolving to make it

Table 1. Overview of main productivity measures

Type of output measure	Type of input measure			
	Labour	Capital	Capital and labour	Capital, labour and intermediate inputs (energy, materials, services)
Gross output	Labour productivity (based on gross output)	Capital productivity (based on gross output)	Capital-labour MFP (based on gross output)	KLEMS multifactor productivity
Value added	Labour productivity (based on value added)	Capital productivity (based on value added)	Capital-labour MFP (based on value added)	-
	Single factor productivity measures		Multifactor productivity (MFP) measures	

easier for small businesses to access this newer information technology without spending excessive funds.

There are many options for data storage today, customer relation management products that have cloud based storage options, as well as cloud based data storage sites all make sure a company does not have to have dozens of hard drives on site risking damages or loss. Websites such as Dropbox allow for companies to back up their data to the cloud and enable a host of people within the company to have access to it.

Social media is also another way businesses have been able to maintain customer interaction and gain feedback, without having to have dedicated call centre personnel. Customers have the ability to write online reviews, as well as post comments or questions on a company’s Facebook page, where a marketing representative can then answer general questions, and then escalate anything that may need to be investigated into further. (Ramey 2012)

### 3.2.1. Impact of Outdated Technology

New technology and software can be a very large cost to small businesses, often leading to it becoming outdated because it still works adequately. The problem that comes from using outdated software and technology can be detrimental to a small business however. In many cases, using outdated technology can end up being a larger cost to a business than replacing it in the first place.

Problems that can stem from using outdated technology include:

Data Security: Technology and software is always changing. It is changing to keep up with new electronic threats and harmful computer viruses. These attacks against a company’s data can be an expensive problem should something happen to the data storage systems, and the older the

software and technology a company is using, the less likely it is to be adequately secure enough to ward off such attacks.

**Data Loss:** If there are multiple computers within a company, all running different versions of software, there is the potential that there can be data loss when data or outputs are sent between them. Older versions may not have the same options as the newer ones and this can result in changes in formatting, as well as loss of information entirely.

**Employee Productivity:** If a company's employees are using outdated technology, and are having a harder time accessing the information they need to do their job, they are becoming less productive when they have to section off time to fill in information technology requests. Waiting for programs to load properly and having to work around software that is not meant for what they are using it for. It may not be an easy cost to see, but the less time they spend doing their work, the longer projects take to complete and that means less money for the company. (Lazor 2014)

Even simple things like the internet provider the company uses, or the cellular phone plans employees are given become outdated at some point. If the company is still relying on a slower internet speed in an office, having multiple people accumulating emails, and other information will clog up the speed so much it will take far longer for things to be done. Having older phones with poor reception can make for dropped calls, or remote employees unreliable to reach in the event of an emergency.

Upgrading this technology will allow for people to be easier to contact, and tasks getting completed faster without any backlog. It also opens up the possibilities of other communication options such as video chat, which could cut down on business trip expenses or other costs. (Kooser 2010)

### 3.2.2. Objective of Information Technology

**Cost Reduction:**

The cost of producing outputs is an important factor to consider in every business; however must be considered combined with other objectives as well. If a company puts too much attention to cost reduction, other important objectives can suffer such as quality and this could actually harm profits and the business as a whole. Focusing on optimizing other objectives can positively effect the cost reduction objectives and may achieve it fully. However; optimizing on the cost reduction objective alone will most likely adversely effect the other objectives. (Davenport & Short 1990)

**Time Reduction:**

Reducing the time required to produce a company's outputs is a competitive avenue many firms are striving to achieve in order to remain competitive in their respective industries. This objective is defined by the processes involved to create the output in question and finding ways to optimize the amount of time in each process and actively finding ways to achieve faster speeds in different processes where possible. One common approach to reducing time on producing outputs is by using information technology to make several steps in the outputs creation process begin at the same time instead of completing them one at a time. This is usually done by coordinating different creation directives to various functional participants within the task scope of the process. Once again however; this must be carefully monitored so as to not impact quality of the finished output. (Davenport & Short 1990)

### Output Quality:

Processes undertaken by a firm conclude in the creation of outputs. These outputs can be in physical form such as in an industry of manufacturing, or the outputs can take the form of informational such as creating data for a customer (e.g. accounting forms, tax forms, etc.). Output quality should take the main focus of a company in terms of utilizing their information technology infrastructure in order to stay competitive because if the final product is not satisfying customers, this can damage the firms profits and reputation. There are different ways to measure output quality. One way is uniformity, and this is to ensure all outputs are identical. Another way is variability, and this ensures the output can satisfy many different demands that are placed on it. The final measure is freedom from defects and this is to ensure all outputs are created functionally and with no impurities or otherwise unintended faults. Overall, the measure of quality a firm should pursue is the one defined by the final customer of the product. (Davenport & Short 1990)

### 3.3. Implementation

#### 3.3.1. Investigating New Technologies

Before a new technology is purchased and implemented into the firm, the firm first needs to identify the problems this measure will address and try to find potential solutions. The investigations intended to find the potential problems or inefficiencies must involve the people using the existing technologies in order to get the clearest understanding of the issues that need to be addressed. The best way to approach this investigation is to either interview the employees or to allow them to submit their input on the matter. This approach not only allows a firm to more clearly identify issues, but also helps to ease the transition into the changes that will be made. After the investigation has received the required input from the affected employees. The next step is to openly publicize the given

solutions with the greatest perceived benefits and how the firm plans on incorporating them into the new technological solutions. This encourages a feeling of ownership in the employees and will positively effect the transition into the new technology. (Markgraf 2012)

### 3.3.2. Planning New Technologies

After a detailed and collaborative investigation has been undertaken to identify the greatest inefficiencies and problems with the current methods used with current technologies, the planning of implementing potential new technologies can now begin. While the Investigative stage prepares the firm for change, the planning stage will help the changes gain acceptance among employees. It is crucial to receive acceptance from the affected employees by implementing any new technologies in a way that minimizes disruption to them and modifying existing procedures and work process in any way possible. During the planning stage, it is crucial to involve the employees whom actually produce the outputs because it is their input on the matter that will yield the most useful information to make the implementation of the new technology the greatest success it can be. (Markgraf 2012)

### 3.3.3. Implementation of the New Technology

The implementation stage is when it becomes evident if the new technology is successful. The installation of new technology may require outside professionals. However; allowing the employees whom will be using the new technology to assist in the set up will induce critical understanding of its operation. If possible, incorporating training into the implementation stage will save time educating employees if they are unable to work during the initial set up. When employees are able to set up their own technologies, they are able to better maintain and operate them and overall conduct production more efficiently. Users of the new technology will also be better at identifying unexpected potential problems as well as finding solutions to these problems if allowed to be part of the implementation process. (Markgraf 2012)

### 3.3.4. Evaluation of the New Technology

The Evaluation of the new technology is the final stage to implementation where-in the organization preforms a full evaluation of the successfully installed technology. Two types of problems can emerge during the implementation process. The first problem that can emerge is with the way the technology works, the second is that there can be perceived problems

by some of the users and an evaluation will identify both types. Any problems with the actual technology can be corrected with the collaborated procedure used in the implementation process. Correcting perceived problems can be done with additional training with the new technology. It is important to solve any problems collaboratively to reduce the time and effort in fixing the same problems more than once while also having the effect of motivating employees to positively integrate with the new technology. This will effectively improve overall company performance. (Markgraf 2012)

### 3.3.5. Measuring Results

Evaluating the end result of the newly implemented technology is critical to identifying if the overall company goals are being met as well as evaluating the new technology's value to the employees using it. Before implementing a new technology, a company must first set benchmarks it wishes to achieve in terms of increased business productivity. These benchmarks will assist the company in determining the return on investment the new technology gives. Benchmarks set by the company can include a number of different parameters, these can include increased product quality, time reduction on producing outputs and cost reduction on producing outputs. If the new technology reaches company goals, this can motivate employees to become more familiar with the new technology and can lead to higher productivity. Measuring the results can also identify any features the new technology possesses that are being overlooked by employees. It can also reveal if any employees are using the new technology incorrectly and highlight any areas additional training may be required. (Beyer 2011)

### 3.3.6. Training Staff

It is critical to train employees on any new technologies the company is implementing into its business processes. When the company is in the stages of developing a training program for its employees using new technology, it is important to take the workplace culture into consideration. The company must identify the attitude of affected employees towards the adoption of new technology. Training Program being designed will be different depending on whether the employees are prone to adopting new technology and change or averse to it. One method for assisting in employee adoption of new technology is to hold training sessions with small numbers of individuals with access to the new technology. This Method will ensure an environment where employees will feel comfortable to ask any questions they may have. (Beyer 2011)

## 4. RESEARCH

The main objectives of the authors research was to investigate any possible inefficiencies or problems with the current information technology used at Timothy & O'Connor. As well as determine if it was possible to suggest any additions or upgrades to implement with the current recourses Timothy and O'Connor had available. The author gathered the research with a short survey to the staff addressing the information technology they are using. Interviews were held with the staff to get more in depth answers to questions that the survey may have been insufficient to cover. It was important to get as much feedback as possible from the employees directly using the current information technology for their input on the matter was paramount to the investigation and possible recommendations. The author asked the Partner of the firm, Patrick J O'Connor questions to determine possible recourses available to the firm and the firms overall attitude towards change. When investigating potential additional information technology to implement it was important to determine as closely as possible the return on the investment because the resources used may be more then the new technologies productivity increases.

### 4.1. Questions Asked to the Partner

In this section the author will be analyzing and discussing the answers to the questions asked of the Accounting partner of the firm Patrick O'Connor in a one on one interview. The goal of this interview was to investigate a number of topics from upper management regarding the firms information technology. The first topic was to learn how upper management measured productivity and what factors were important to the company's output. The second topic was to investigate if there were active plans in advancing the firms information technology. The third topic was to find out top managements' view on the importance of the firms information technology. Another topic to discuss was how the firm maintains their technology and how much it costs the company money to do so.

#### 4.1.1. Question One

The first question asked to Patrick was "How do you measure productivity in the firm, and what is the most important factor of the firms output?".

Patrick explained that product quality is the most important factor when it comes to the company's outputs. In the small business environment, it is



crucial to go above and beyond the clients' expectations and deliver a better product than the customer expects. Time can also be another important component to our work, especially during the November tax month. Efficiency of our technology in terms of saving time is important as well. However; it is the quality of the finished product which takes precedence.

This was a significant answer because it shows what upper management in the company comes to expect from the company's information technology. The information technology needs to be reliable in terms of the production of client work orders. However; the employees using the technology must also be knowledgeable in how to use the information technology to its fullest potential. This also indicated that the technology must be efficient in terms of speed as well, because of the small number of employees it is crucial that production must also be carried out in a time efficient manner.

### 4.1.2. Question Two

The second question asked from Patrick O'Connor was "Are there any plans to update the firm's current computer software and technology in the next years? If so, how many years?".

Patrick stated that the company is in the process of moving to a larger facility that has been purchased and is currently being renovated and being made ready for the company. The building is scheduled to be prepared for October of the year 2016. After the move, he stated that the employees will be given new computers and that there are two programs the company is currently researching to improve their human resources segment of the company. The company plans to implement the new software in early 2017 after the benefits of each program has been carefully reviewed.

This answer shows that there is an initiative from top management to keep the company's information technology current.

### 4.1.3. Question Three

The third question the author asked Patrick was "Do you have dedicated staff to troubleshoot and/or maintain current computer software and information technology?".

Patrick stated that they outsource a maintenance company that will come into the firm and troubleshoot any computers if there is an issue. He states the Necessity for this is because of the company's small size, the company cannot afford to maintain a dedicated on-site information technology professional. He states that if any employees have a question about the technology being used that they can just call the outsourced professional and they can try to guide them through the problem over the phone. In the

case of a critical malfunction to a computer and the machine must be taken off site for repairs, there is an old computer back-up that can be utilized by the employee until their machine is repaired. This can sometimes be a problem because every employee is a specialist in their own field of accounts preparation and the back-up computer cannot perform many of the tasks that the employees regularly need to perform, and usually takes a greater amount of time.

This response reveals a potential threat to the firm's productivity. If an employee's computer were to malfunction during the month of November when the firm is at its busiest state and productivity relies heavily on timely delivery, this could be a very big problem to the firm.

#### 4.1.4. Question Four

The fourth question asked of Patrick was "What is the current maintenance fee monthly for current computer software and technology?"

Patrick's response was that the cost was considerably higher than he would like them to be. He stated a large contributing factor for this was the age of the current computers his employees were using. Patrick says they break down frequently and require replacement parts that are quite expensive. He states his enthusiasm to move the company to the new building in early 2017. Patrick has decided to wait until the company moves to the new building in order to purchase and install new computers due to reasons of easy transitioning.

This was significant because the cost of using old information technology eventually reaches a point where it is inefficiently using the company's resources to maintain. Another important note to make from this answer is the time that is lost by employees when their computers malfunction and need to be sent off site for repairs. As discovered in question three, the back up computer cannot perform the employee's tasks as efficiently or if at all and this places a large burden on production.

#### 4.1.5. Analysis of Interview

The information gathered from the interview with the partner was very informative to the author's investigation into aspects of the firm's information technology from upper management. The author discovered that the most important measure of production to the company was product quality. Production speed was another important aspect to consider in the company's day to day productivity as well. The author also learned there is a high regard from top management to keep the company's information technology current. A potential threat was also discovered in the form of the old computers. Due to the firm's use of outsourced information technology professionals, repair of malfunctioning computers

requires more time because they need to be taken off-site to be repaired. It was also apparent that the firm's old computers were costing the firm money on account of them malfunctioning more often. Another way these high information technology maintenance costs are hurting the firm is the money going into fixing the computers could be used to grow the business and increase productivity in other ways. The malfunctioning computers are also costing the employees work productivity because the back up computer available to them is inefficient at performing their required tasks. There are plans to replace all the computers used by the employees when the company plans to move the site to a new building in early 2017.

### 4.2. Internal Survey Analysis

In this section the author will be analyzing and discussing the survey conducted with the staff at Timothy and O'Connor. This survey was conducted anonymously with the six staff at Timothy and O'Connor asking various questions that cover the employees situation with the current information technology and their opinions on possible production level increases from potential new technology.

#### 4.2.1. Question One

The first question on the survey asked the participants to answer yes or no to: "Do you think upgraded/additional technology and/or computer software would increase your overall productivity?" and then asked them why or why not?

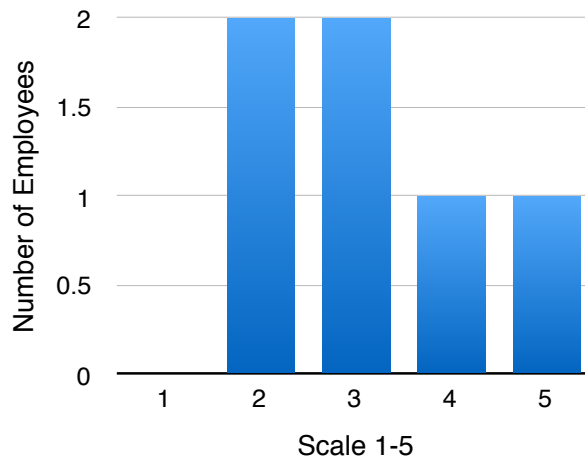
This question was important to determine how the Employees at the company viewed the amount of productivity being produced from the current Information technology available to them. All six employees answered yes to the question. As for the four employees whom filled answers into the "why or why not" section, the author received two answers whom stated new computers would be faster in terms of program start-up. One answer stated new software for their daily tasks would be more up to date in terms of financial regulations which change frequently. The last piece of feedback stated the the electronic filing system used by the firm was inefficiently organized and sometimes can take up to 10 minutes to find the correct file or letter template to send to their clients. One of the respondents who mentioned the old computers also stated that the machines freeze from time to time and require a restart of the machine to fix this problem, often causing the employee to lose unsaved work.

This feed back was significant in the research because it showed all six employees in the office believed their productivity could be improved by upgrading or purchasing new information technology for the company. The problem with the computers freezing is significant because this can

cause the employee to lose unsaved completed work, requiring the employee to lose productive time to restore it.

#### 4.2.2. Question Two

The second question the author asked the employees was “How comfortable are you learning new computer software?”. The answers to this question was a scale of one to five, one being not comfortable at all, and five being very comfortable. This question was designed to get an insight on the employee’ attitudes toward learning new methods of production. The answers to the question was as follows:

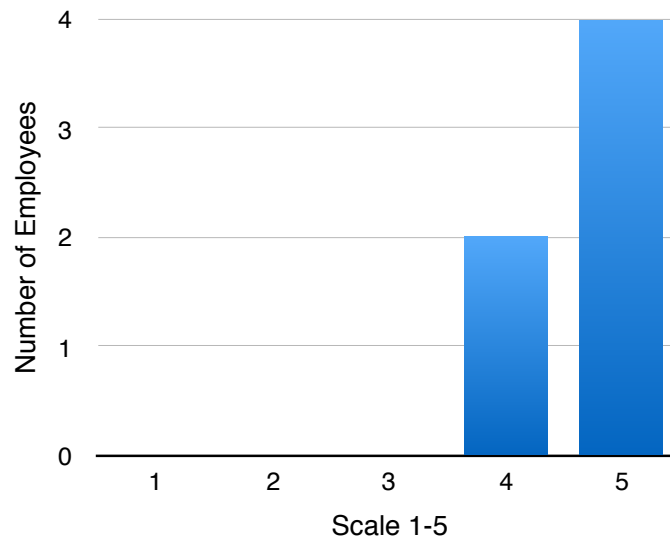


1. Selections to the question “How comfortable are you learning new computer software?”

This data shows the majority of the company is somewhat comfortable with learning new software. The data also shows that there are two employees who are not as comfortable learning new software. This could be because the employees have grown comfortable using the software that is available to them currently. It can also be an aversion to the time it takes to learn how to use new software. The strong results in the favour of the comfort of learning new software indicates that should new software be implemented, the majority of the staff will be less adverse to learning how to use it. This will also make the implementation of new software faster, but also indicates that some training methods will be required to motivate employees to accept a new change in software. These results are important when weighing the cost and benefits of implementing new software into the company. Factors must be taken into account of how much of a boost in productivity the new software will provide. This must then be weighed against how much money will the new software cost to implement and train employees, as well as the time required to train the new employees on the new software.

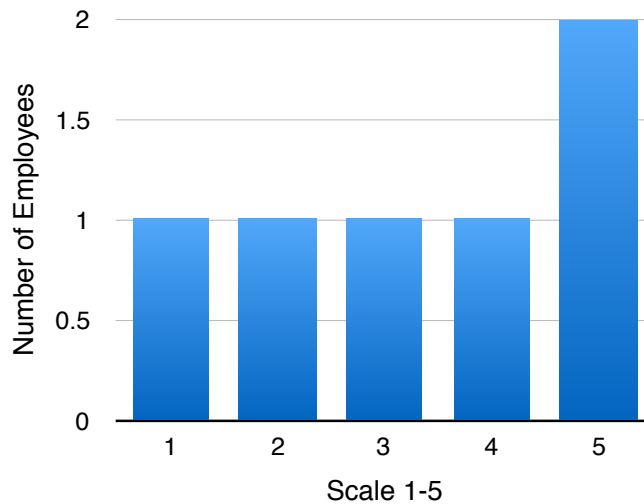
### 4.2.3. Question Three

Question Three asked the employees “How do you feel about the current computer software you use on a day to day basis in terms of efficiency?”. The question was given three different segments to compare it to on a number scale of 1-5. The three segments of the question were: speed, compatibility, and simplicity. This question was asked to get an understanding of how efficient the current software the employees were using to complete their day to day work tasks was. Speed indicates the time required to use the software to complete tasks. Compatibility indicates how well the software was designed for the employees specific tasks. Simplicity referred to the overall ease of the software to complete the employees tasks on a day to day basis. There was also a comment section at the bottom of the page where the employees were asked if they could explain why they chose the rating on each aspect of the question. This question was asked in order to gain insight on how the software at the firm was functioning overall in terms of productivity defined by the firm.



2. Selections to the speed segment of the question “Selections to the question “How comfortable are you learning new computer software?”

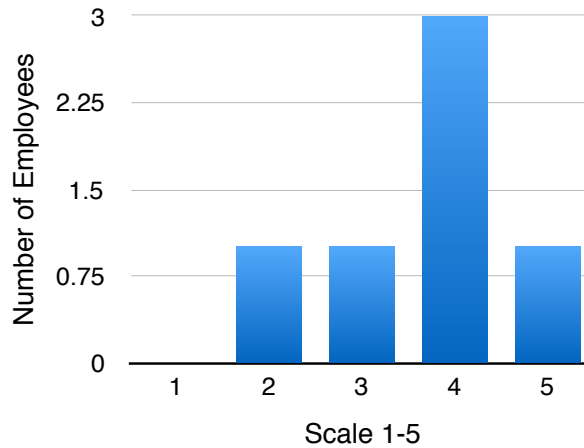
The results from the speed portion stated that none of the employees believed there was an issue with the speed at which the software preformed their day-to-day tasks.



3. Selections to the compatibility segment of the question “Selections to the question “How comfortable are you learning new computer software?”

The compatibility results were very scattered. This indicated that the majority of the company was content as to the compatibility with the software they use to complete their day to day tasks. One of the employees gave their software a score of one in terms of compatibility. The comment they gave accompanying their answer was that the software they were using was too out of date and the employee had to manually change imputed data to complete work correctly, costing the employee more time in doing so. The employee who rated a two on compatibility stated the software they are using was not optimal for their specific work and that it took anywhere from 10-30 minutes of changing data to get the completed work in the right format. This loss of productivity is quite high when taken into consideration over time.

Simplicity was a measure of how difficult software was to use by the employees and the results were as follows. The answer was on a rating of one to five, one indicating the software was very difficult to use, and five representing the software was very easy to use.



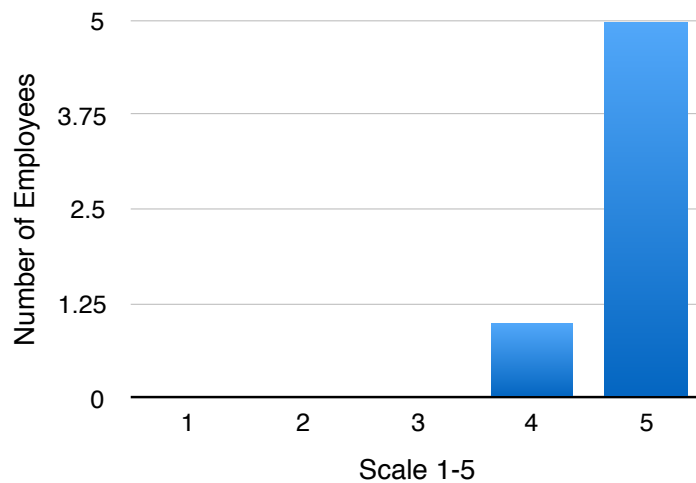
4. Selections to the simplicity segment of the question “Selections to the question “How comfortable are you learning new computer software?”

The results showed that the majority of the employees found the software they used on a day to day basis easy to use. There were two respondents that stated the software they were using was not very easy to use. The respondent that scored simplicity a two on the survey stated that the software they used was very overwhelming with a steep learning curve. The respondent that scored simplicity a three stated that the software they used was somewhat poorly designed for their work. The employee also stated there is no exact method to the software they use on a job to job basis indicating every new product created was unique and required trial and error with the software to complete. These results indicated that there was potential to possibly issue additional training to the two employees that found the software to be complicated in its use. If the two employees were to learn more about using the software, their speed should increase while not sacrificing on the quality of their work.

#### 4.2.4. Question Four

The fourth question the author asked the employees was “How willing are you to adopt and change to new Computer Software and Technology?”. This question had a rating system of one-five, one represented not willing and five represented very willing. This question was intended to gauge the company’s attitude towards adopting new technology to use in completing their day-to-day tasks.

The results were as follows:



5. Selections to the question “Selections to the question “How willing are you to adopt and change to new Computer Software and Technology?”

These results indicated the overwhelming willingness to adopt new technology into the company. The results of this question also has a positive correlation into the willingness of the employees to learn how to use the new technology. If new technology were to be introduced into the company, these results indicate that the implementation will go smoothly in terms of adoption and learning. It is also interesting to note that when these results are compared to question one, all employees believe that improved technology will increase productivity and they are willing to take the time to adopt to new technology being introduced to the company.

#### 4.2.5. Question Five

The fifth question the author asked the employees of the company was “How do you find it easier to learn new computer software and technology?”. The possible answers options chosen were: Webinars, product instruction manual, instructor/ classroom learning, self teaching, and “other” with a comment box attach to explain another method if the employees learn better by other methods. There was also the ability to choose more than one method.

All the participants selected both webinars and self teaching as a resource for learning new software and technology. This can be good in one perspective that hiring a professional to come on-site to teach can be expensive and sending employees to a classroom setting off-site is both expensive to the company and time consuming for the employee. One respondent left the comment that the webinar is a good way to become familiar with a new computer softwares functions and gives the employees



opportunities to ask questions while remaining in the comfort of the office. Another respondent stated in a comment that after they have learned the specifics and functions of a new software, the best way to get comfortable with it is to learn themselves. This is because the nature of the work the employees do means every new output prepared is unique in its properties in the same way different customers and their needs are unique.

This means that an instructor from outside the firm wouldn't know the exact needs of each employee and what they use the software for. It is also informing to note however; that when the results of this question are combined with question two of the survey investigating how comfortable the employees were when learning new software, it shows that perhaps not all the employees learn most effectively with purely webinars and self learning alone. It would be important for the company to follow up after the implementation of a new technology to get the staffs input on how effectively they are using it. This would indicate if more training is required or if different training methods are required to increase efficiency with using new technology.

### 4.2.6. Question Six

The sixth question asked of the employees was “Please list any inconveniences, annoyances, inefficiencies or issues you have experienced with the current computer software or technology you employ in your day to day activities. Eg. old or slow computers, outdated software, redundant functions, difficult to use software etc.”. This question also asked the percipients to measure each inconvenience on a number scale of 1-100 on how time consuming the inconvenience was on a monthly basis. The number scale represented two points for each minute on the scale. When analyzing this answer, the average of all numbers given were used to calculate the amount of time used dealing with these inefficiencies per employee. This question was designed to investigate any and all inefficiencies the company faced on a day to day basis that caused inefficiencies and disrupted productivity using the current information technology. The author also used this measure to forecast how much time productivity this wasted total per year. This also would rank the inefficiency in terms of severity to the company, and try to locate which problems would require the most immediate attention.

The answers received were as follows:

Slow and old computers were mentioned by all six employees. An inefficiency that stemmed from this was frequent breakdowns requiring the machines to be taken off site to undergo repairs, requiring one to two days of slowed productivity due to the necessity to work from the back-up computer not optimally set up for their tasks. Frequent freezing and slow star-up times were also mentioned problems stemming from the outdated computers. Outdated software was also reported from two respondents.

The respondents said that because their software is not up to date with the current accounting regulation pertaining to their work, they must manually adjust certain components of the work. This is an inefficiency that would require investigation if purchasing the new software would be beneficial to the company to combat the inefficiency in the time it takes to stop and manually adjust the aspects of the employees work. The rating received for this inefficiency was averaged to 83.66 which translates to an average of 41.83 minutes of productivity lost per employee per month, and 8.3 hours per year (Appendix 1). This figure is not adjusted for the amount of productivity lost due to Computers breaking down and forcing employees to move to the backup computer because this circumstance is impossible to predict and calculate.

Four respondents reported that it took time to locate important client files or work templates in the companies electronic database. It was quoted as being inefficiently organized. The rating received for this inefficiency was averaged to 31 minutes of productivity loss per employee per month, and 6.2 hours per year (Appendix 2).

Outdated software was quoted by three employees. One problem stemming from this was due to programs not being up to date with current financial regulations and required manual adjustment to the final product to make sure the information was all correct. Another problem stemming from this was that software used by an employee was not optimal for their daily tasks and required additional customization to the product in order to complete it. The rating received for this inefficiency was averaged to 48.16 minutes of production loss per employee per month, and 9.6 hours of production loss per employee per year (Appendix 3).

The next inefficiency that was given by three respondents was the difficulty in using some of the company's software. Inefficiencies stemming from this included problems that required the employee to call the software help hotlines to receive help on how to use a specific feature from the product or how to transfer customer financial information from one suite of software to another. The rating received for this inefficiency was averaged to 37.3 minutes per employee per month, and 7.46 hours per employee per year (Appendix 4).

4.2.7. Analysis of Question Six

Rank of Inefficiencies

	<b>Average Score</b>	<b>Minutes per Month</b>	<b>Hours per Year</b>	<b>Number of Employees</b>	<b>Total Productivity Lost per Year</b>
1. Old/Slow Computers	83.6/100	41.83	8.3	6	49.8 hours
2. Outdated Software	62/100	48.16	9.3	3	28.8 hours
3. Companies Electronic File Database	93.3/100	31	6.2	4	24.8 hours
4. Difficulty of Software	74.6/100	37.3	7.46	3	22.38 hours

6. Calculated rank of inefficiencies chart (Appendix 1-4)

The data received from question six shows what kind of inefficiency happens in the company on a day to day basis stemming from information technology. This chart reveals in detail what type of issues the employees are having specifically and which inefficiencies are costing the company the most in production time. The most sever issue seems to be the old computers the company is using. The reason is because this is a common issue shared by all employees and the inefficiency is harming the company as a whole. The next most inefficient issue stemming from the company’s information technology is outdated software. Although this problem only seems to affect three employees, the amount of production time it takes from the three employees is quite high and ranks number two the severity list. The third most sever inefficiency is the company’s unorganized electronic filing system. Although this problem does not cost the company much time on a weekly basis, this problem does effect four employees and the amount of time from each employee adds up over time. The inefficiency of least concern to the company is the difficulty of using the company’s software.

Each inefficiency experienced by the employees can be aided in a number of different ways to bring the overall amount of wasted production time down. These inefficiencies only affect the time component of the

company's inputs not the quality of work completed. It would also be important for the company to perform a cost analysis in order to insure the cost of dealing with the specific inefficiencies is proportionate to gains from combating the inefficiencies.

## 5. FINAL RECOMMENDATIONS

When improving information technology to increase business productivity, it is important to investigate many different aspects of information technology and the impact it has on the company.

1. The first recommendation the author would make to Timothy & O'Connor is that they update the current computers used by their employees. This issue was mentioned by all six employees throughout the investigation. The issue of old slow computers was the highest ranked inefficiency discovered by the investigation in terms of production time lost. Problems that came from this issue covered everything from slow start-up and loading times to machines "Freezing" on the employees that sometimes required a restart. Another benefit this change could bring is increase protection from digital attacks on the firm. It was not stated as a particular issue throughout the investigation; however this could be a potential threat to production if the systems were attacked at Timothy & O'Connor.
2. The second recommendation is to investigate what employees are having problems with outdated software. The outdated software is using considerable production time. The number of employees with this particular problem is small, but the problem itself takes quite a bit of the employee's time to fix the problems with their work manually. The fact that it is only three employees having this problem with their software is good in the reason that it will not cost too much money. Accounting software is expensive and the firm will need to conduct a cost/benefit analysis on each employee to see if the money is worth it to spend to fix the problem.
3. The third recommendation would be to organize the company's electronic file database. To do this, the author recommends that the staff convene and discuss how they would all agree a better method of restructuring the electronic database would be. After a new organization structure for the new layout of the database is agreed upon, one employee must invest the time to organize it in the way agreed upon by the staff. The reorganization of the database will take some time but once the task has been completed, it just needs to be communicated to staff of how to properly organize new information and the database should remain organized for a considerable amount of time. This would be a great method to

increase productivity in the firm because it is free to do. The firm needs not invest additional capital to complete this step. It is critical that all staff be apart of the planning of the new layout of the system because it is up to them to organize new entries into the correct new locations in order to keep the database organized.

4. The fourth recommendation is to investigate new software to purchase for the two employees who responded that their software is not optimally suited to the work they do on a day-to-day basis. It is critical that the company do a thorough cost/benefit study to ensure they choose the right option. One benefit the company has in this regard is that all the employees are all extremely comfortable learning new technology. This will save the company money because the willingness to learn new software is so high among employees. This should make it easier and faster to train the employees on the new software.
5. The fifth recommendation is to find out if any employees require additional training with the software they are using. The employees who find their software difficult to use may just need additional training with the software. this could be a very cheap method of decreasing the lost productivity in this method.

## 6. CONCLUSION

In Conclusion of the research completed, the author believes that it is possible for Business Productivity to be Increased by updating and improving the Information Technology used. It is clear that the Software and Technology used by employees has a direct correlation between the productivity and time spent on a project. Older technology and methods become outdated at a certain point, and it leads to malfunctions and this causes stress on employees and leads to them spending longer on a task because of the extra time spent on having to work around problems and inefficiencies.

## SOURCES

Anderson, E., Fornell, C., & Rust, R. T. 1997. Customer satisfaction, productivity, and profitability: Differences between goods and services. *Marketing Science*, 16(2), pp.129-145. Accessed 14.5.2016  
<http://bear.warrington.ufl.edu/centers/mks/articles/customersatisfaction.pdf>

Beyer, J. 2011. How to help employees embrace new technology. *Hartford Business Journal*. Published 16.5.2011. Accessed 08.12.2016. <http://www.hartfordbusiness.com/article/20110516/printedition/305169988/how-to-help-employees-embrace-new-technology>

Davenport, T. H. 1992. *Process innovation: reengineering work through information technology*. Harvard Business School Press. Published 1993. Accessed 9.4.2016.  
[https://www.researchgate.net/profile/thomas\\_davenport2/publication/216300521\\_process\\_innovation\\_reengineering\\_work\\_through\\_information\\_technology/links/53db93a20cf216e4210bf844.pdf](https://www.researchgate.net/profile/thomas_davenport2/publication/216300521_process_innovation_reengineering_work_through_information_technology/links/53db93a20cf216e4210bf844.pdf).

Davenport, T. H., & Short, J. E. 1990. The new industrial engineering: information technology and business process redesign. *MIT Sloan Management Review*. Published 15.7.1990. Accessed 4.9.2016. <http://sloanreview.mit.edu/article/the-new-industrial-engineering-information-technology-and-business-process-redesign/>

Jackson, T. 2015. 18 key performance indicator examples defined. *Clear-Point Strategy* Published 5.3.2015. Accessed 24.5.2016. <https://www.clearpointstrategy.com/18-key-performance-indicators/>

Kooser, A. C. 2010. Technology issues for business owners. *Hearst Newspapers*. Published 2010. Accessed 16.9.2016. <http://smallbusiness.chron.com/technology-issues-business-owners-2184.html>

Lazor, D. 2014. How outdated technology increases cost and decreases productivity. *Lazorpoint*. Published 17.4.2016. Accessed 21.9.2016.  
<http://www.lazorpoint.com/blog/bid/382833/how-outdated-technology-increases-cost-and-decreases-productivity>

Markgraf, B. 2012. How to introduce new technology to an organization. *Hearst Newspapers*. Published 2012. Accessed 21.9.16. <http://smallbusiness.chron.com/introduce-new-technology-organization-41307.html>

Ramey, K. 2012. The impact of information technology on small business. *useoftechnology.com*. Published 15.10.2012. Accessed 22.8.2016. <http://www.useoftechnology.com/impact-information-technology-small-business/>

Schreyer, P. 2001. Measuring productivity. Organization for economic co-operation and development. Published 2001. Accessed 5.10.2016. <http://www.oecd.org/std/productivity-stats/2352458.pdf>

Van Looy, B., Gemmel, P., Desmet, S., Van Dierdonck, R., & Serneels, S. 1998. Dealing with productivity and quality indicators in a service environment: some field experiences. *International journal of service industry management*, 9(4), pp 359-376. Published 1.10.1998. Accessed 4.6.2016. [https://www.researchgate.net/profile/P\\_Gemmel/publication/46429489\\_Dealing\\_with\\_productivity\\_and\\_quality\\_indicators\\_in\\_a\\_service\\_environment\\_some\\_field\\_experiences/links/00b495213e2ce8c38e000000.pdf](https://www.researchgate.net/profile/P_Gemmel/publication/46429489_Dealing_with_productivity_and_quality_indicators_in_a_service_environment_some_field_experiences/links/00b495213e2ce8c38e000000.pdf)

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**MATHEMATICAL CALCULATIONS FOR QUESTION SIX RANKING SYSTEM  
OF INFORMATION TECHNOLOGY INEFFICIENCIES**

## Appendix 1

Employee respondent scores: 86, 84, 80, 76, 90, 86  
Average score  $(86+84+80+76+90+86) / 6$  (the number of employees who responded) = 83.66  
Average minutes per month  $(83.66 / 2)$  (2 points counts for 1 minute) = 41.83 minutes  
Average time per year  $41.83 \times 12$  (the number of month in a year) = 501.96 minutes  
Convert into hours  $501.96 \text{ minutes} / 60$  (number of minutes in 1 hour) = 8.3 hours  
Total productivity hours lost per year  $8.3 \text{ hours} \times 6$  (number of employees responded to have the problem) = 49.8

## Appendix 2

Employee respondent scores: 70, 82, 56, 40  
Average score  $(70+82+56+40) / 4$  (the number of employees who responded) = 62.00  
Average minutes per month  $(62 / 2)$  (2 points counts for 1 minute) = 31 minutes  
Average time per year  $31 \times 12$  (the number of month in a year) = 372.00  
Convert into hours  $372 \text{ minutes} / 60$  (number of minutes in 1 hour) = 6.2 hours  
Total productivity hours lost per year  $6.2 \text{ hours} \times 4$  (number of employees responded to have the problem) = 24.8

## Appendix 3

Employee respondent scores: 100, 90, 90,  
Average score  $(100+90+99) / 3$  (the number of employees who responded) = 96.33  
Average minutes per month  $(96.33 / 2)$  (2 points counts for 1 minute) = 48.16 minutes  
Average time per year  $48.16 \times 12$  (the number of month in a year) = 578 minutes  
Convert into hours  $578 \text{ minutes} / 60$  (number of minutes in 1 hour) = 9.6 hours  
Total productivity hours lost per year  $9.6 \text{ hours} \times 3$  (number of employees responded to have the problem) = 28.8

## Appendix 4

Employee respondent scores: 80, 60, 84  
Average score  $(80+60+84) / 3$  (the number of employees who responded) = 74.66  
Average minutes per month  $(74.66 / 2)$  (2 points counts for 1 minute) = 37.33 minutes  
Average time per year  $37.33 \times 12$  (the number of month in a year) = 448 minutes  
Convert into hours  $448 \text{ minutes} / 60$  (number of minutes in 1 hour) = 7.46 hours  
Total productivity hours lost per year  $7.46 \text{ hours} \times 3$  (number of employees responded to have the problem) = 22.38