Improving Sales Calls and generating a parts matrix at Evans and Reid

Major Project

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1. Declaration of Authenticity

I confirm this Thesis is a result of the Authors original work and research. It has been composed by the Author and has not been previously submitted for examination and marking which has led the award of a BEng Hons Manufacturing Systems Engineering Degree.

2. Acknowledgements

I would like to thank Mr. Kelvin Lake for his support as project supervisor for helping me through this Dissertation, advising and guiding me through challenging tasks. It has been an incredible learning experience and I would like to wish him every success in the completion of his PHD.

I also extend my thanks to the directors, managers and work colleagues at Evans and Reid, for providing me with the information needed for this paper and sharing their knowledge with me.

I would like to thank my piers for making my experience at UWTSD Swansea very enjoyable and I am sure I will miss them in the future. Knowledge of their work experiences in their different companies has opened my view on Mechanical Engineering in general.

I would also like to thank my lecturers at Swansea for making the learning experience although challenging also enjoyable and interesting.

Finally, I would like to thank my Grandparents for helping me through the tough times and heavy workloads with continuous support, my Father for always believing in me and my Uncle for help and guidance on assignment work, they have made the experience worthwhile.

3. Abstract

This report is proposing a new Parts Matrix at the Evans and Reid Company for selling parts and attachments for the mini excavator's trade. The current process in place involves taking calls from end users and trade customers and searching through spreadsheets in order to find parts and generate a sales order.

The new proposed process will be to outsource a new parts matrix to be generated within the company, it will reduce missed calls and help generate more sales quicker bringing in a higher profit margin.

The define stage concluded that the need for a parts matrix in desperate as the calls missed are costing money and losing current customers. Evans and Reid were not meeting customers' requirements and need and constantly searching through spreadsheets was not helping.

The measure stage consist of current sales orders produces for customers at random and quantifying the size of the problem which is making the information relevant and proving that all information presented is relevant and true.

The Analyze phase shows how the current process works and shows that it proves to be time consuming therefore the money lost has been calculated and shown. The figures mount up and prove to be a loss of £692,174.51 a year in missed calls, these missed calls can be sales orders at an average cost calculated.

The Improve phase shows how the process would be improved and implemented. Figures show the cost it would be to implement. The parts matrix will be outsourced and it would take 6 months to implement then all Evans and Reid employees would need to be trained accordingly.

Control is how the parts matrix will be continuously implemented and updated due to machinery changing and models changing parts. An employee would have to be in charge of implementing these changes.

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6. Aims and Objectives

The Purpose of this Project is to justify the need for a new parts matrix at Evans and Reid, the current sales team are taking too long on certain calls and spending too much time searching through current parts lists and matching parts to serial numbers of machines with there being so many models. There is a lack of understanding between Evans and Reid employees and customers and therefor there is a delay in productivity, the production and manufacturing department carry out duties after the sales department have taken orders and then they begin to design and manufacture requested parts.

With there being such a lack of understanding with the customers and in particular foreign customers as there is a language barrier which will normally be easier to email which again is time consuming, the justification must be made for the change. To understand what exactly the problem is and define it and then work to resolve. It has to be with maximum productivity in mind as the calls are taking too long and not enough sales are being made in the process with most of the calls being queries or quotes or even customers phoning in to ask for advice on certain pieces of equipment.

7. Project Timing Plan

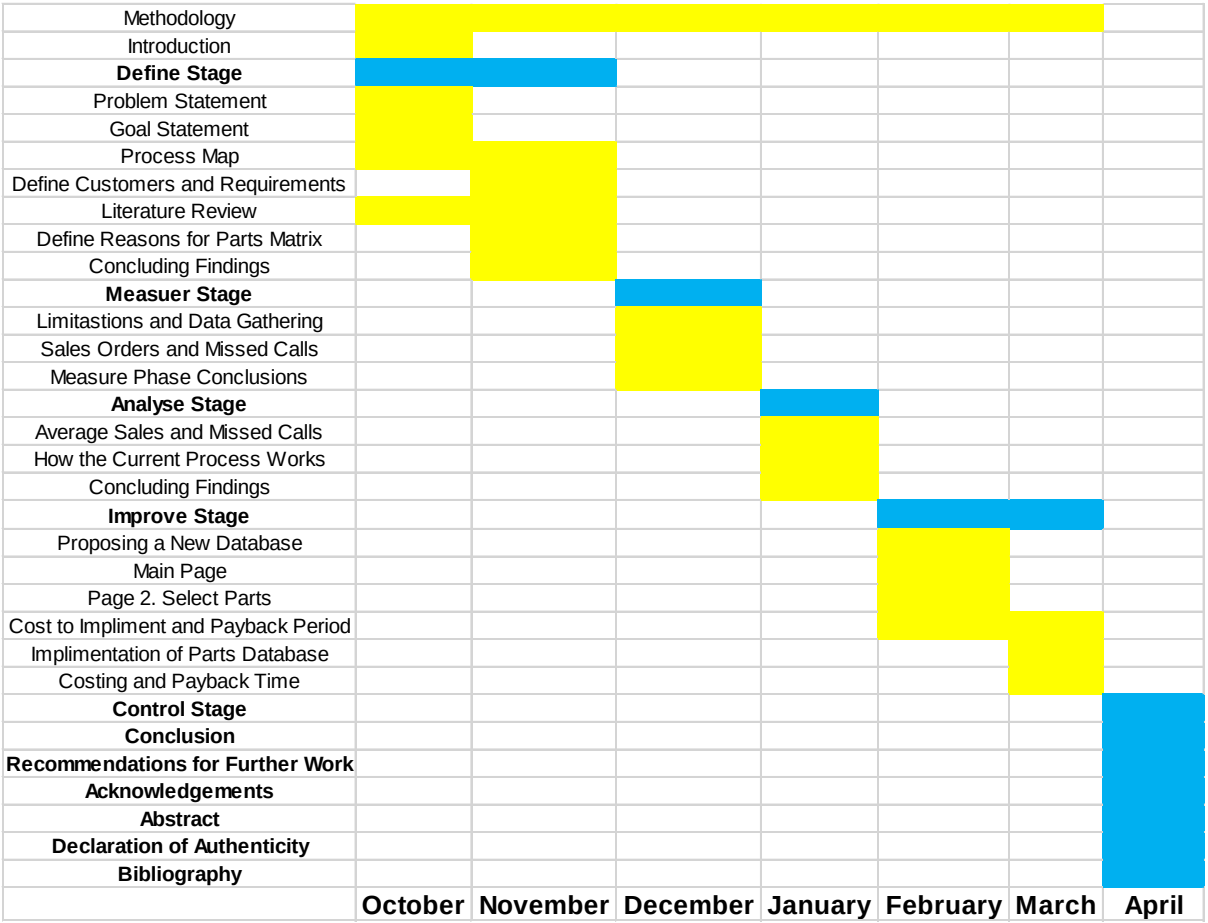


Figure 1 Patrick O'Brien Proposed Project Chart

As can be seen in figure 1, a rough guide to the project timeframe was drawn made to make assumptions on how long each section should take up until the final date. However this rough draft was not taking constraints and delays into account.

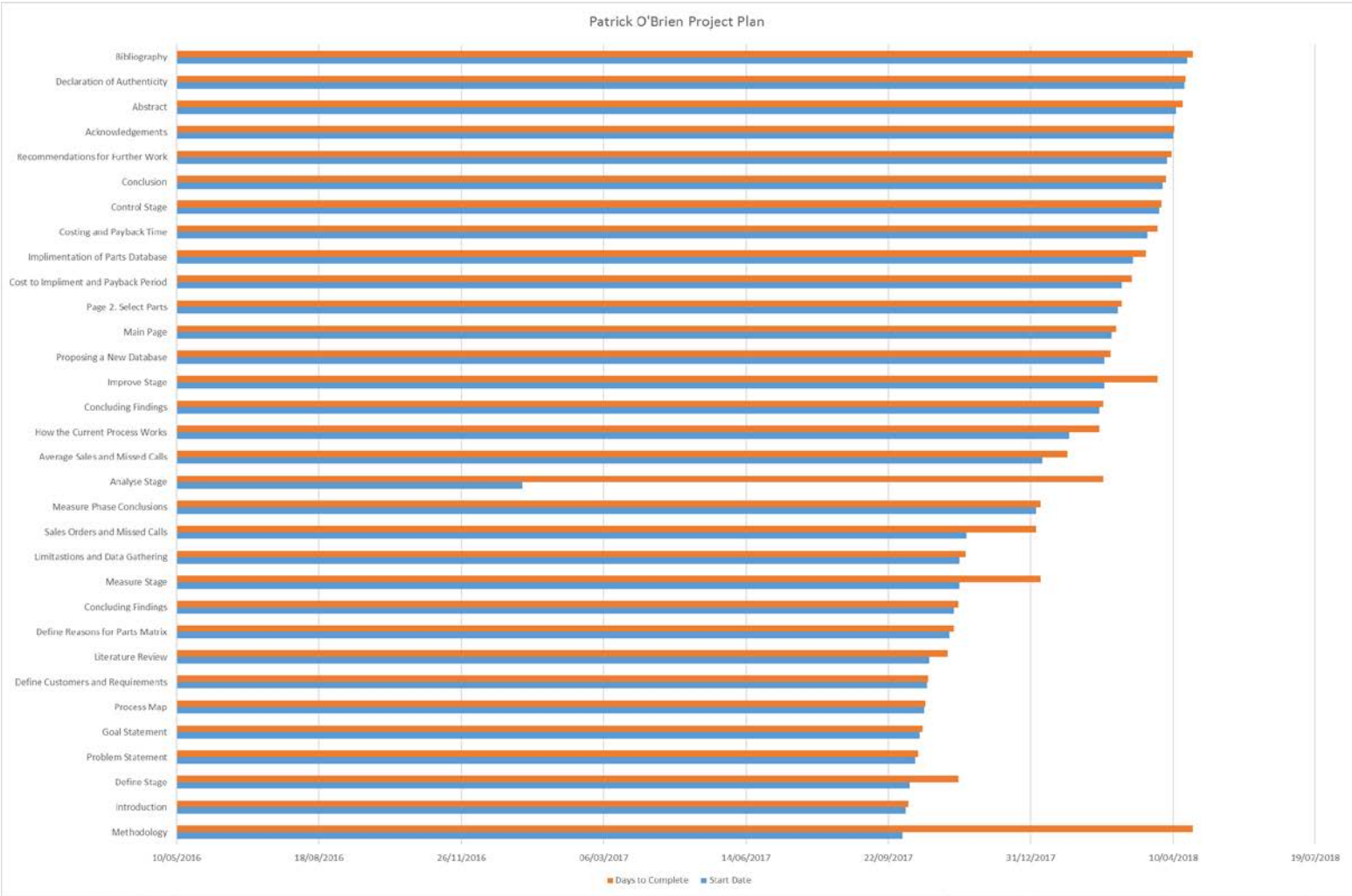


Figure 2 Patrick O'Brien Project Progress Chart

As can be seen in Figure 2, the Project ran to schedule and there were not a lot of Delays and Constraints. Although the main constraints came in the gathering of date from the measure stage to use in the analyze section and then to work towards a main solution.

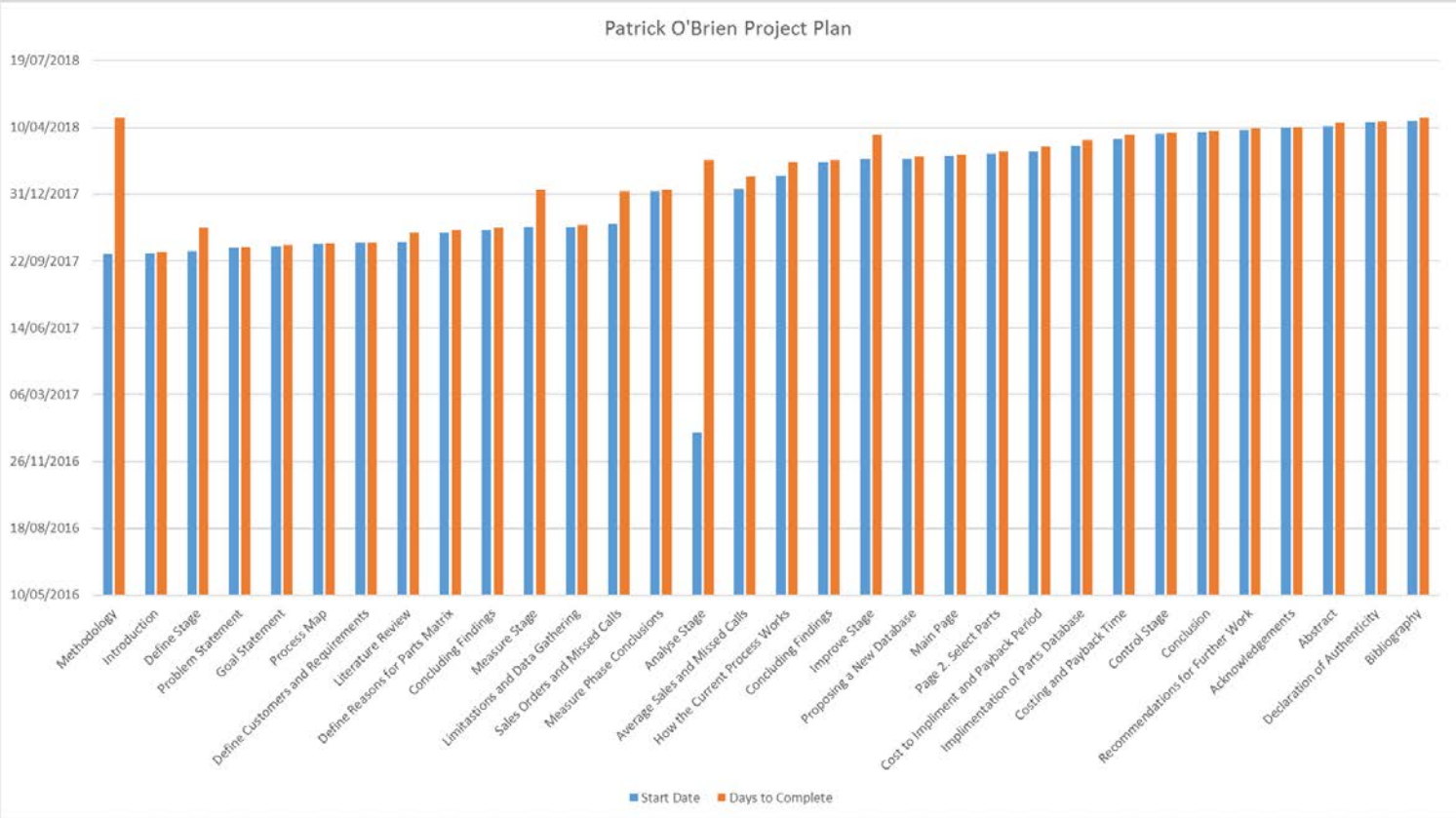


Figure 3 Patrick O'Brien Final Project timing Plan

As can be seen in Figure 3, the project has been completed with minimum distractions or setbacks. The project is clearly laid out with timeframes in which each section was completed within. The order of each section and the biggest timeframes clearly show the priorities taken and precautions to gather data.

8. Methodology

The Lean Six Sigma DMAIC methodology will be utilized and adhered to with this assignment and help to improve the process and to quantify the need to produce a parts matrix at Evans and Reid due to current calls being un-answered and therefore losing sales.

Lean Six Sigma is widely used across the globe throughout all industries and professions, it helps rectify productivity, quality and improves processes. It is a study which helps extend processes and shows the full capability, it also helps companies focus upon the customer and the requirements and needs they have and expect from the business. (Joseph Martle, 2014) States that “The application of Lean Six Sigma allows quality and efficiency improvements to be effectively realized. The focus of Lean is about speed, efficiency and taking waste out of a process. Six Sigma focuses on effectiveness and removal of errors”.

As (Goldratt, 2004) says “So this is the goal, to make money by increasing net profit, while simultaneously increasing return on investment and simultaneously increasing cash flow”. It’s about improving processes and overcoming obstacles such as bottlenecks and setbacks, Lean Six Sigma is the prefect tool to abide by to help solve problems and justify changes. If good changes are made and the customers are satisfied they will remain loyal. (Harris, 2013) States that “Any business wants to retain its customers. Indeed, this is a significant factor in determining the success of a firm. But, of course, customer loyalty and retention only ever come as a result of high levels of customer satisfaction”.

The DMAIC methodology approach is often applied to a process that is already existing but it needs to be improved, it can range from anything in a business if there are improvements to be made.

The DMAIC Methodology is:

- **DEFINE**
- **MEASURE**
- **ANALYZE**
- **IMPROVE**
- **CONTROL`**

This selected method will be suffice to tackle the problem at Evans and Reid and will provide logical and critical analysis for decision making and outlining bottlenecks and problems. It will

also prove a useful tool to display the current process to see what can be done in between to improve productivity.

9. Introduction

Evans and Reis was formed as a business in 1992 after they had successful careers in mining, civil and mechanical engineering. The first of the products that were created were buckets for the agricultural profession and not long after excavators and parts and attachments. Mr. John Evans then proceeded to produce aftermarket undercarriage parts, tracks, booms tracks and pins and bushes for mini excavators, this process has now developed which now means that Evans and Reid have the largest stock in take in Europe.

Mr. Simon Reid continued in going forward and implementing parts for the agricultural side and has also built a range of components and equipment for the agricultural machine handling businesses which is recognized nationally for the durability, quality and good service.

(Evans, 2017) States that “Evans and Reid develop and update parts and products continuously and additions to the product range are being announced regularly on newsletters and internet website by the marketing team always keeping the customers in mind. The workforce at Evans and Reid have been built and trained so that the customers can expect and receive professional and informed advice from engineers and technical sales to ensure the best solution to any situation. In twenty years the company has built and continued to provide quality products and expert advice with rapid customer service”.

The Production and engineering staff design and manufacture a full range of buckets along with other bespoke attachments for excavators or tele handlers as well as skid steer loaders, and tractor loaders and the business currently produces over 4000 units per annum.

The Design department even take orders from customers who phone or visit and turn the ideas into a reality with a good quality service and have a MTO scheme (Made To Order) the idea is that the team will meet all requirements from the customer and satisfy any need or want required. The designs are drawn up and then sent to the customer for approval before continuing on the manufacture.

To become Europe’s largest stock list of aftermarket parts of mini excavators, and an allied construction machinery to serve a worldwide customer base from a facility in Neath the stock list is;

> The products are forever expanding and includes Steel & Rubber Tracks, Undercarriage parts (Such as Front Idlers, Bottom + Top Rollers and Sprockets), Pins and Bushes for the Arms of Excavators, Tipping Links, Seal Kits for the hydraulic cylinders, engine parts which

for these small machines include starter motors, alternators, fuel stop solenoids, fuel pumps, filter kits and water pumps. (Evans, 2017)

10. Define

The Define Stage will be split into sections as Follows:

- Introduction to the Define Stage
- Problem Statement (5W's)
- Goal Statement (SMART)
- Process Map (SIPOC)
- Define the Customer and Their Requirements
- Literature Review
- Define the Reason for a Parts Matrix
- Concluding Figures

10.1 Introduction to the Define Stage

The Define phase is the first of the five stages and it is the introduction into the DMAIC Six Sigma methodology. The Define Stage purpose is to precisely articulate the problem occurring in the business, to clearly see the goal that has to be reached and then look at potential help or recourses. (Jasmine James, 2012) States that “At this stage of the process, the project members must look at existing data that is available which shows the ongoing problem. The information available should refine and confirm that there are indications of an issue”.

Evans and Reid have a problem in the sales department where missed calls are constantly occurring, with missed calls constantly happening in the sales department that means there are missed opportunities for sales and profit. (Dr Tarik Taikgia, 2018) Explains that “if your business is frequently operating but losing profit because of slow sales, you’ll need to make some changes to how your business is running, then once this is established there can be changes made and protocols put in place”.

Customer demands must be met within the business so design goals must be made to suit, the customers are the number one priority. (Ross Beard, 2013) States that “Excellent customer service and high customer satisfaction must start with understanding customer expectations. You need to know who your customers are and what they want”. With the customers’ demands and needs are established then defining the problem can begin.

With there being so many missed calls at Evans and Reid the customers wants and needs are not being met, therefor customers or potential customers can go and purchase from other suppliers rather than try and try again to get through to the sales team. (Ivor Jones, 2016) Explains that “A lost customer means lost feedback and no opportunity to improve. Many companies use their existing customer base to research product improvement and development. When you lose customers, you lose their opinions, advice and criticism”. The problem must be defined in detail to prevent the loss of the company’s current customers and future ones.

10.2 Problem Statement (5 w's)

WHO - The problem is that phone calls at Evans and Reid are time consuming with customers that have a limited knowledge of components and parts required, these calls along with being time consuming, can on occasion be of very little sales value to the business.

WHAT – The boundaries of the problem are the customers understanding and communication skills and the loss of sales not being made due to missing calls while prolonging non-productive ones. The issue identified is during protracted calls taking place, trying to establish what part of the machine, what type of machine and what serial number they need to use for the make and model. Evans and Reid generate an average of £10,000 a day in sales, with orders ranging from £10 - £20,000, during a protracted call that may only generate a sale of £10, a call may be missed from a potential customer prepared to make a £20,000 order.

WHEN – This issue occurs every day, but the call times vary, during some calls a solution may be found in 10 minutes, but other calls can take up 30 minutes. A proportion of the calls are time consuming calls may only be enquiries, during this time a sale may be lost to a competitor. This is an issue that requires addressing and appropriate action needs to be taken**.**

WHERE – This issue is only occurring in the sales department and does not affect other departments directly, however it does have an effect indirectly, if instructions to production and dispatch are delayed, orders on occasion have failed to make the delivery times on time in full to the customers.

WHY – It is important to fix the problem identified due to potential loss of sales, turn over, net profit due to missed customer calls and time misused translating information. The business is on average making £10,000 a day, and due to customer relations and wanting to maintain sound relationships and must help the ones struggling to understand the machines. With an average sale of £350 per sale, the company are missing on average 11 calls a day which is potentially £3850 in sales if not more. This would take the average daily revenue to £13850 and therefore the problem will need to be addressed.

10.3 Goal Statement (SMART)

When setting targets or objectives to achieve in a company or business, it is important that they are clear and understandable and well written. Managers, business owners and employees will know exactly what needs to be done and achieved. (Dr. Mikel Harry, 2017) States that '**S** – Simple, specific with a stretch, sensible, significant. **M** – Meaningful, motivating. **A** – Acceptable, achievable, action-oriented, accountable, as-if-now, agreed, agreed-upon, actionable, assignable. **R** – Realistic, reviewable, relative, rewarding, reasonable, results-oriented, relevant to a mission. **T** – Timelines, time-frame, time-stamped, tangible, timely, time-based, time-specific, time-sensitive, timed, time-scaled, time-constrained, time-phased, time-limited, time-driven, time-related, time-line, timed and toward what you want, truthful."

The goal of this is to achieve as much revenue as possible for the business, in doing so there needs to be a solution which can cut the unnecessary call times and the missed calls. There must be significant change to the process of operations within the sales department to achieve this. The meaning of this will be to have a solution which makes queries and quotes more simple and effective to the huge customer base worldwide. To make it achievable it must be proven that it can work, there are a vast amount of parts and components that are sold at Evans and Reid which range in the thousands so there will have to be a system in place that will accommodate all of this. With the plant producing so many aftermarket parts there will be a bigger profit margin and a spike in sales if the company can reduce these calls to suit the business, which in turn will be very rewarding. Within this project there must be a realistic timeframe for it to be completed by, when there is a solution it must be given relevant time and consideration to perform the changes as everything from the under carriage to the arms and Kingpost to buckets will have to be coincided with. The goal is also to keep all managers, employees and customers content, due to this being a change they require training in the change, understand why there is change and then how to improve the change moving forward.

10.4 Process Map (SIPOC)

A SIPOC is a good and high-level view of a process. It stands for Suppliers, Inputs, Process, Outputs and Customers. Every process starts with suppliers. Who then provide the inputs to the process which then results in an output that is produced for the customers.

(Simon, 2017) States that"A SIPOC diagram is a tool used by a team to identify all relevant elements of a process improvement project before work begins. It helps define a complex project that may not be well scoped, and is typically employed at the Measure phase of the Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) methodology. It is similar and related to process mapping and 'in/out of scope' tools, but provides additional detail."

SUPPLIERS	INPUTS	PROCESS	OUTPUTS	CUSTOMERS
Parts Supplier	Database	Sales Team	Aftermarket Parts	End User
Other Companies Selling Unlisted Parts	Spreadsheets	Production Department	Manufactured Parts	Main Dealer
Main Dealers	Parts List	Engineering Department	Copied Parts	Foreign Dealer
Manufacturers of Aftermarket Copy Parts	Hand Book	Manufacturing Department	Genuine Parts	Rival Companies
	Production Training	Stores Department	New Components	
	Skill Set Training		Manufactured Buckets	
	Knowledge and Understanding			

After Clearly being able to see the process in the company from suppliers to customer the problem is within the process in the sales team area which more and more calls get missed everyday which then delays outputs and then delays the product to the customer.

10.5 Define the Customers and Their Requirements

The focus of every project is on the customers of the process or business. The customer is defined as the individuals or the groups who receive the goods of the process. Customers can be external to the organization or an internal component to the organization. For any business, customers are the final authority that determine the final value of any product or services with their decisions to buy or not to buy. This decision is based on complex system of critical customer requirements. (Stuart James, 2017) States that "A customer expectation regarding an aspect of a product or service (e.g. quality, speed, etc.). Such an expectation is a CCR when the customer may be expected to refuse to purchase, or to purchase from a competitor, if the expectation is not met."

At the sales department at Evans and Reid they have many customers both internal and external. Internal customers are the production team, if a customer or dealer phones, emails or even physically enters the building, then the company must manufacture the component required, we then must send a set of detailed production instructions to the planning engineers, who in turn will then prioritize the job and plan accordingly.

If a customer requires a part that is in stock, a dispatch note is sent through the stores, detailed is the part number and location, the operative will then package it and either send through a courier, or the in-house delivery team.

The external customers may be in any country across the globe, it is ensured that a 5-star service is provided. With such a demand from customers it is critical to examine the problems generated due to phone calls. Calls come in constantly from customers who have machinery out of service, they require the services of Evans and Reid to get them back into business, some may be smaller companies who rely on the machine to make and earn money, whereas other customers are large companies that can afford to take the machines out of use for an extended period. With the call lengths at Evans and Reid some customers can phone up and tell you exactly what it is they require and even sizes, other customers will need to be sent engineering drawings or pictures for them to confirm sizes. Once this is done it is established the amount and material they require for parts, if it is heavy duty machinery or not, along with the type of conditions the machines are in, this can be a significant issue which requires priorities highlighted and investigated into.

10.6 Literature Review

As a current Member of the Sales Department at Evans and Reid and dealing with calls from customers and dealers all over the globe it has been found that dealing with foreign dealers can prove to be quite challenging. The company has a vast parts programme and system using Microsoft Excel, where a customer will phone or email with a Machine make, model and serial number and request a part or advice. Using this system can be difficult due to language barriers or knowledge and understanding of machine parts and materials.

When searching through the system there are over 30 spreadsheets for all parts and compliances through the company, there can be up to ten different types of the same model and the serial number information is critical. After obtaining serial numbers there is then another software to use which is Sage 50 Accounts Professional, where the customer name or postcode is entered to find correct prices and availability also to keep a record of anything purchased or quoted for further reference.

Due to these processes taking so long there are phone calls from abroad lasting up to half an hour or even longer where the time could be utilised somewhere else increasing sales and productivity. At Evans and Reid, they use a system called Unify on My Portal to log all calls and it will keep every call on the system, it logs calls answered, call lengths, calls missed. This system helps me see the problems that exist in the sales department.

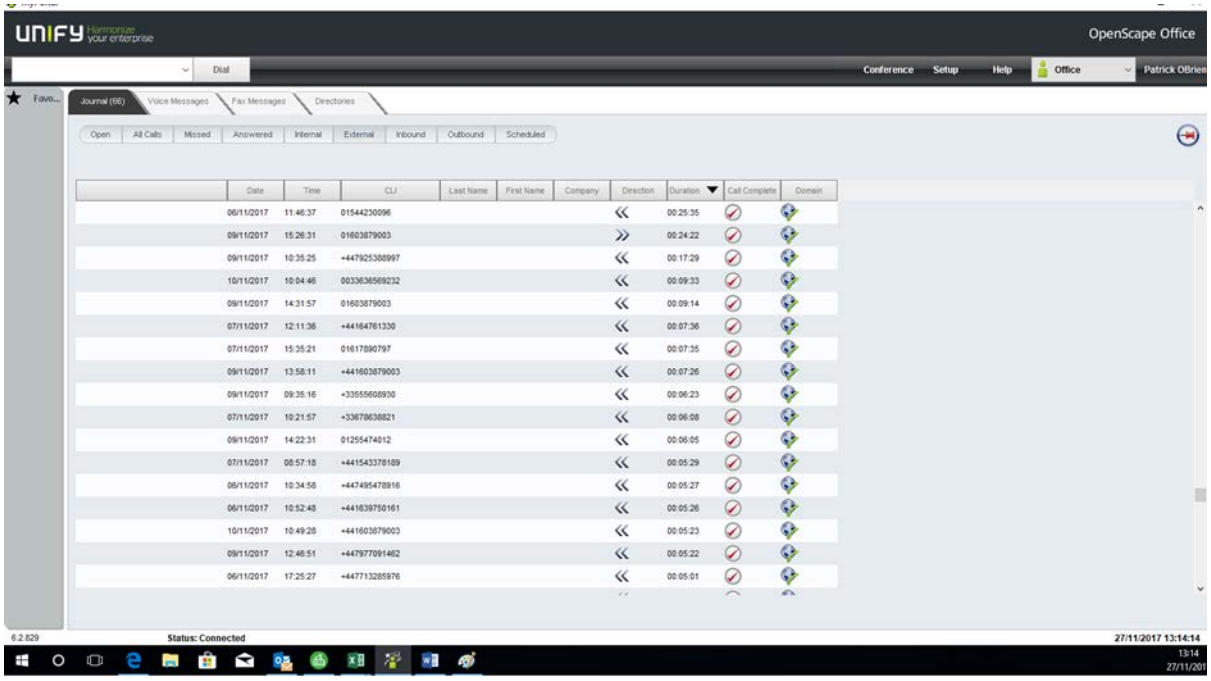


Figure 4 Patrick O'Brien Call Times

As you can see in figure 1, there are three calls that are over 15 minutes, that is over 45 minutes one the phone to three people were as you can also see at the bottom of the list that in the time I have spoken to three people I can speak to eight. Even though these numbers are not foreign there is clearly a problem where the customer is unsure of what they require.

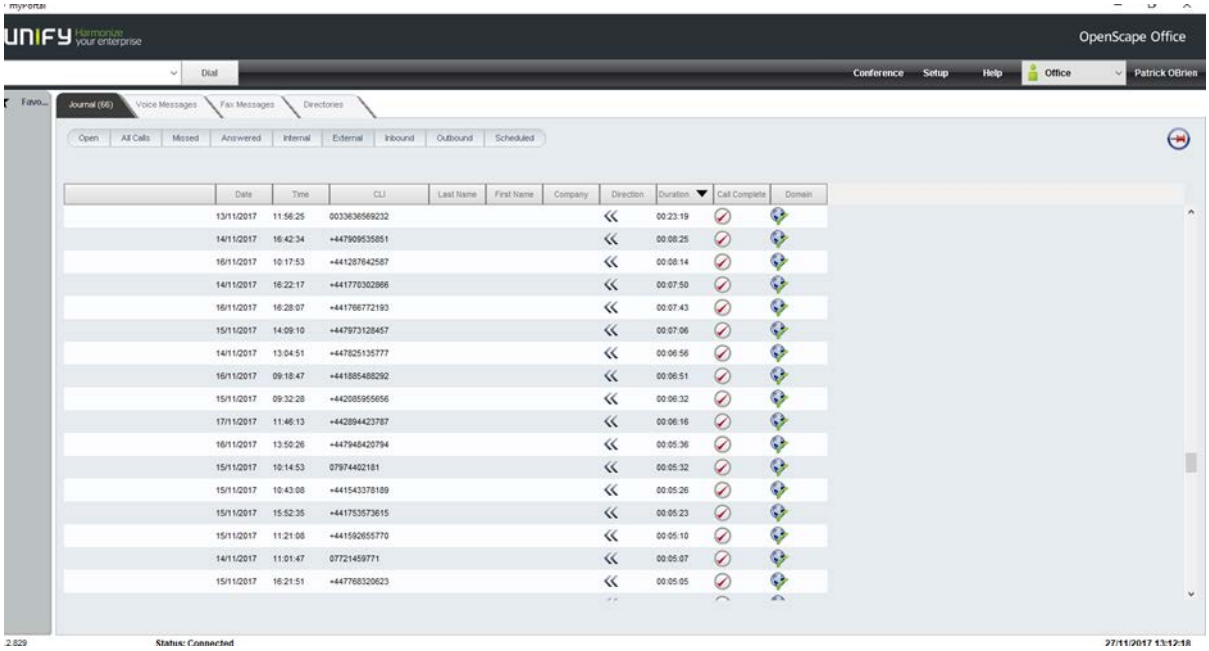


Figure 5 Patrick O'Brien Call Times

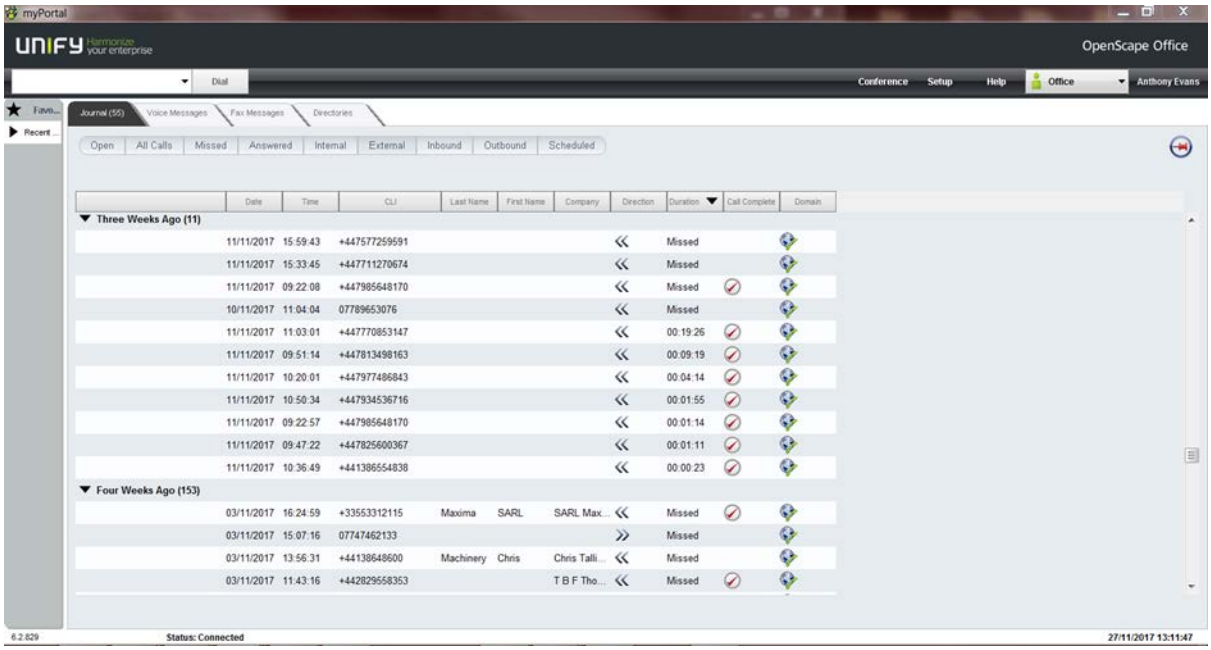


Figure 6 Anthony Evans Call Times

In Both Figure 2 and Figure 3 you can now see a lot of missed calls and a number of calls that have taken in excess of ten minutes, due to the amount of time on one call there are other customers having to wait or moving business to competitors, there is clearly a bottleneck at this part of the system (Zenjiro Imaoka, 2008) states that " A bottleneck (or constraint) in a supply chain means the resource that requires the longest time in operations of the supply chain for certain demand. Usually, phenomena such as increase of inventory before a bottleneck and insufficiency of parts after a bottleneck are often seen. Statistically, since fluctuations are inconsistent, the phenomena (excess inventory and insufficient materials) do not always occur.

The average call length at Evans and Reid is between 5 and 6 minutes, there are some customers who take less than a minute to call and place an order, these customers have been trading and dealing with the business for many years and have developed a relationship with Evans and Reid. Other customers are unsure what type of machine they have or that the third party customers have, so technical sales members have a harder task of asking dimensions, sending dimensions, drawings or having to communicate and talk them through measuring processes in determining what type or kind of part they require. On occasion the personnel communicating with the sales team aren't near the machine but know a serial number so then it is easier to interpret. Other reasons that affect call lengths are that the customer needs to check if information referred to is correct, to contact their customers to check if that is the correct information, and then it involves re-contacting again. Due to these setbacks and miss information it was having a knock-on effect with sales team directly affecting business revenue. This in turn would affect the production department, as production orders are processed through the sales team. Due to delays and call inefficiency the orders were being delayed and not being processed in time for the working production schedule for the day which will then delay part manufacture completion time.

With an average of £10,000 generated a day, an average of 200 incoming calls a day there is a significant profit being completed. The sales team also receive orders through emails via outlook 2018. Most emails are from customers such as L & S Engineers in Walsall and Sarl Maxima in France, the orders vary but are mainly stock buckets and dipper end kits.

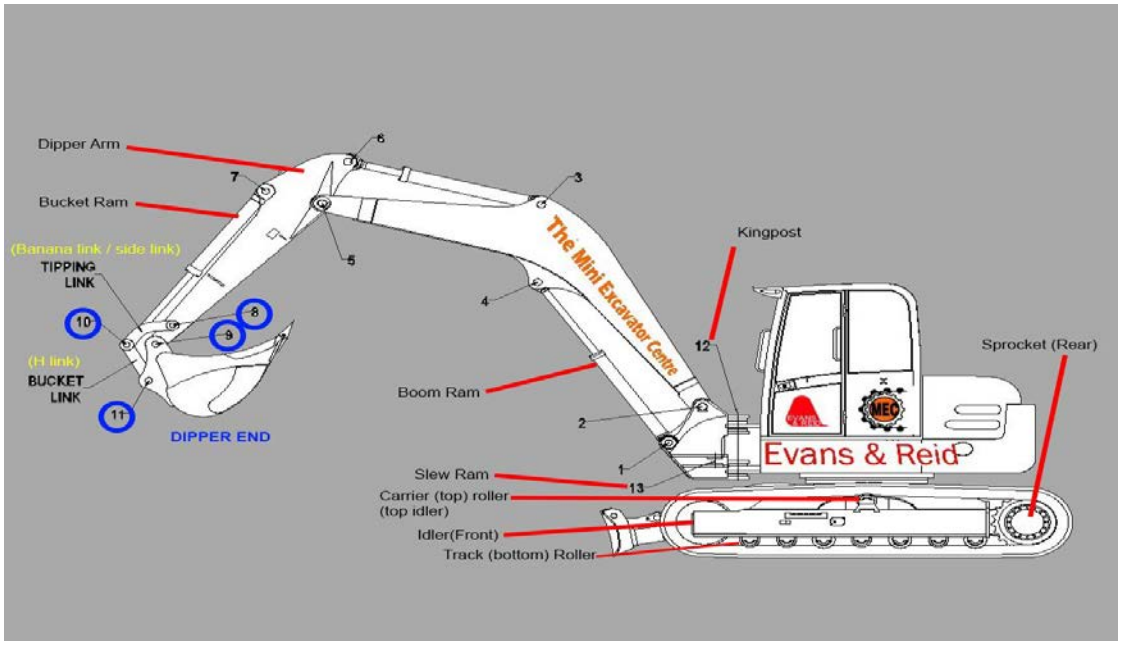


Figure 7 Evans and Reid Generic Position Diagram

With regards to figure 4, the dipper end kit is all the pins and bushes in positions 8, 9, 10, & 11 which are labelled and circled in blue they are the at the very end of the arm on excavators and mini diggers, they hold on the tipping links, bucket links and the bucket or attachment. The dipper end kits are generally in stock and or made up to suit but the information is on Sage to inform what pins and bushes are involved. The regular customers usually spend £1500 a day that leaves £8500 to revenue over the calls. Most calls received in a working day are just queries or customers asking for advice or prices, out of the 200 calls only roughly 30 come to orders so 30 into 8500 is £283.33 that is the average sale per sales call in a day at Evans and Reid.

Sales team members are constantly answering customer calls or replying to emails every day in the company but to find out the average calls taken per team member there are a lot of things to take into consideration, the team are seconded, some concentrate more on the emails and more on the technical information for the phone calls, there are two members who concentrate more on the emailing system and the other two who concentrate on the phones to deliver complex information and experience gained in the plant industry. The other is the manager who answers phones when it gets busy but orders and takes care of the stock levels. So given a weighting of 2 at 30% one at 20% and the other two at 10% each the calls vary and two sales members answer 120 calls between them, the manager at 40 and then the two members help with sharing the remaining between them to help the department not miss calls.

There was inefficiency in results and sales were dropping from an average of £10,000 a day down to £8,000 but there was an increase in foreign sales which clearly meant were are losing order and sales time and decreasing in productivity. The number of calls Evans and Reid have a day can vary from 150 to 300, that is incoming and outgoing together, the calls incoming tend to vary from 150 to 250 on busy days. It is busier in the spring and summer seasons than the winter as the beginning and middle of the year tend to be the better plant machinery months and the winter tends to be mostly agriculture, although some days there will be requirements and needs for spare parts for plant parts on building sites or refurbishment companies.

A parts matrix was suggested to company Directors Mr John Evans and Mr Simon Reid by using Microsoft Access, Mr Evans and Mr Reid had only ever used the Excel spreadsheets to work out and find parts. If a customer needs a part or component, they will need to explain to the working bodies at Evans and Reid to ensure that serial numbers and machine models will then match to the customer's current excavator. (DENT, 2016) States that "When an engineer is taking a look at the basic concepts applicable and to achieve correct Error Detection and diagnosis, in order to put into perspective the value of the correct techniques for satisfying future customer requirements and needs". As a sales member there are many techniques and knowledge requirements needed to help us identify what is required. The matrix is proposed to help identify (either us or the trade persons or end users) what is required and what modifications, if any are required.

Using Kurt Lewin's three step theory to change:

1. Unfreeze
2. Implementation (Change)
3. Refreeze

I had to explain how and why it was relevant and needs to be addressed in a correct manner to keep sales up and to keep competing with rivalry companies.

UNFREEZE

(James Manktelow, 2016) States "This first stage of change involves preparing the organization to accept that change is necessary, which involves break down the existing status quo before you can build up a new way of operating.

Key to this is developing a compelling message showing why the existing way of doing things cannot continue. This is easiest to frame when you can point to declining sales figures, poor

financial results, worrying customer satisfaction surveys, or suchlike. These show that things must change in a way that everyone can understand.

CHANGE

After the uncertainty created in the unfreeze stage, the change stage is where people begin to resolve their uncertainty and look for new ways to do things. People start to believe and act in ways that support the new direction.

The transition from unfreeze to change does not happen overnight: People take time to embrace the new direction and participate proactively in the change. A related change model, the Change Curve , focuses on the specific issue of personal transitions in a changing environment and is useful for understanding this aspect in more detail.

REFREEZE

When the changes are taking shape and people have embraced the new ways of working, the organization is ready to refreeze. The outward signs of the refreeze are a stable organization chart, consistent job descriptions, and so on."

After the call sheets (Figure1-3) were presented and explained, the reason for the parts matrix on Microsoft Access were described and all figures from recent sales were presented and proven. The issue was addressed as a minor concern now but the probability to become a major problem in the future. With the customer base continuously growing at Evans and Reid, if we could minimize or remove the bottleneck now it would make life better for the sales team. (Hayes, 2010) States that "Organizations may fail to recognize the need for change because members pay insufficient attention to what is happening in the wider environment. Even where organizational members are aware of what is going on outside, they may fail to recognize its implications for the organization".

Mr. John Evans and Mr. Simon Reid both looked at my proposal for change at the Evans and Reid Sales Office parts Database and entrusted this project to myself, where I would be looking at parts and re- sale components. The Six Sigma Methodology of DMAIC will be used to help guide the project of Converting from Microsoft Excel To Microsoft Access. The Six Sigma DMAIC methodology (Define, Measure, Analyze, Improve and Control) can be thought of as a guide to problem solving and product/ process improvement.

10.7 Define the reason for the Parts Matrix

For the parts matrix to work it has to be better than the original system which will mean increasing productivity and sales revenue in the sales department, with sales personnel constantly searching through the computer system and spreadsheets while having customers waiting for the information on the phone can prove to be difficult occasionally and especially if wrong information has been passed on.

Unless the machine is a brand new model there are many models that have been produced over the space of 20 years and serial numbers are required to identify what parts are for certain machines, this is then requiring time and delaying the sales coming into the business. With customers being unsure about parts and products with the machines they possess or a customer of theirs possesses, if there was such a parts matrix that has been generated there could be a make and model inserted and then serial number and all different years of the models could be accessed and then parts selected to speed up the process and make a 10 minute phone call into a 2 minute one.

With the result of that there would be less customers waiting on the line to be helped and therefore less calls missed per day and improving productivity. (James Mallinson, 2017) Describes that “When it comes to maximizing how productive you can be there are many factors you can consider, for example; cutting down your projects list to the essentials, finding the right tools, avoiding procrastination etc. Another point that can be made while increasing your productivity that tends to get overlooked – speeding up your work so that you will be getting things done faster”. As James Mallinson describes speed up your work to be getting things done faster, that is exactly what this matrix will do if it is managed correctly, to do so it will have to be monitored daily. Spreadsheets at Evans and Read are updated once a month and the sales team have to then copy the master copies to ensure they are up to date with new information and there are comments that you can see if you hover over boxes on Excel.

The parts matrix will need to be a live document and updated and continuously monitored, it will be able to be accessed by customers on the company website also so the unsure customers can talk to us while there and they can be taught how to use it. It will defeat all delay problems that the spreadsheets cause and then that will lead to more phone calls being answered which will then also lead to satisfied and happy customers and no complaints due to the old and slow system which is currently being used at the company. With this parts matrix it would certainly improve the call system and cure the current problems that exist and set the sales team and production then has a snowball effect which will also be improved.

10.8 Concluding Figures

With an average of £10,000 a day of income revenue and with that the regular customers that purchase every day spend £1500 which leaves the remaining £8500 to calls and emails. With most calls that are received and taken in a working day are just queries and people asking for advice or costings of parts, out of the 200 calls received a day by the sales team only 30 to 35 are actually purchase order calls. So 30 into 8500 is £283.33 that is the average sale per sales call in a day at Evans and Reid. There was inefficiency in results and sales were dropping from an average of £10,000 a day down to £8,000 with delays in phone calls because tam members are searching through the system for parts or drawings and dimensions to relate the correct parts to the correct machine and serial number.

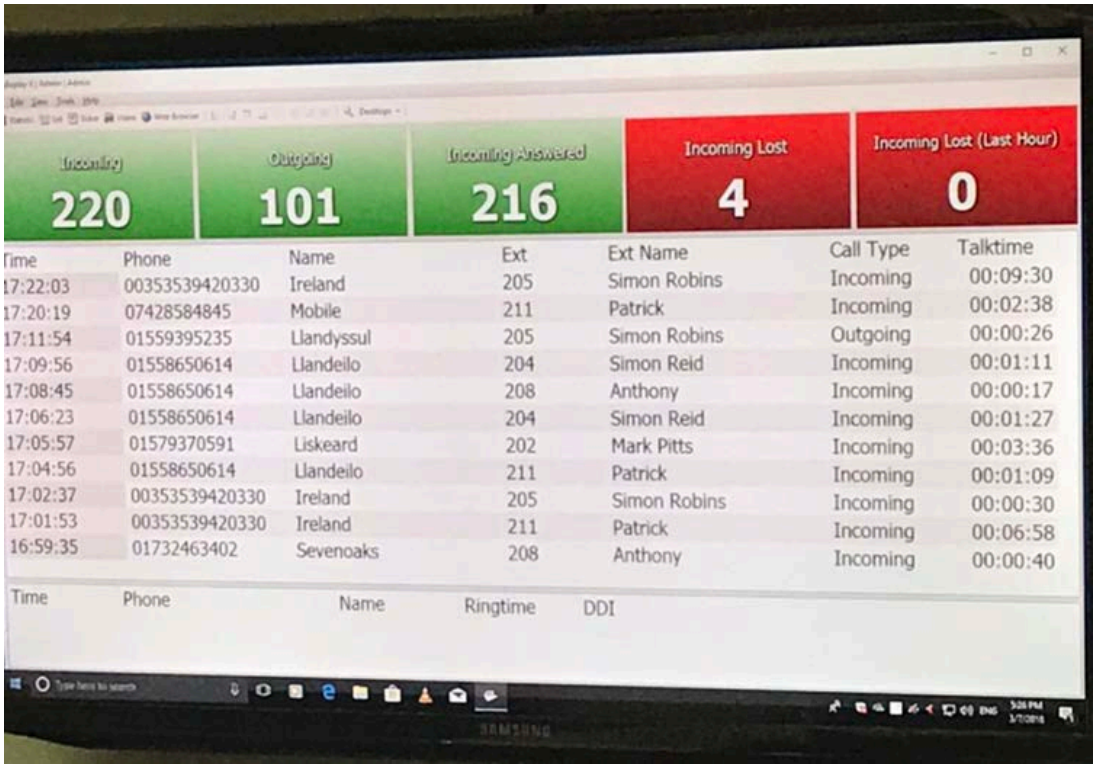


Figure 8 Live Call Register

As it can be seen in figure 5, there are a range of calls and times but if the attention is turned to the same number which is from Ireland (at the bottom of the screen) you can see that this customer has phoned twice speaking to two different members of the sales team and the first call is nearly seven minutes long. This is clearly a lack of understanding and a lot of time discussing parts and machine models and then also looking for parts which match serial numbers. The same customer then phones back to speak to the same team member they

spoke to secondly and the call is nine and a half minutes long which shows a clear discrepancy in the configuring of information. There is too much time being spent searching through the current part sheets and trying to match serial numbers and also sales team members relying on good information from customers in able to help them further.

11. Measure

The Measure phase will be split into sections as follows:

- Introduction to measure Phase
- Limitations and data gathering
- Call Profit and Missed call costing
- Measure Phase Conclusions

11.1 Introduction to Measure Phase

The aim and objective are that using the measure phase for this project and this stage of the DMAIC process will be to gather as much information as possible of how the process in hand is working and its discrepancies. The measure phase concentrates more on collecting the data and analyzing what it is that is causing the biggest effect to the problem at Evans and Reid, all aspects must be considered of the daily problems to overcome that sales members are required to do. The problems that cause the biggest impact to daily schedules and customer order delay will have to be found and prioritized and then processed in detail. (Dr Mark Willis, 2014) Backs up my statements by referring that "The focal point of this phase is to identify which metric gives the highest effect on the problem. Those who give greatest impact are prioritized to create a list that will be studied in detail. With a prioritized list of data in hand, the project owner will then determine the probable ways the procedure could go wrong or how the data may perhaps go wrong".

While gathering data and studying the outcomes there must be failures and delays in order for this procedure to deem successful. In the sales department there are numerous missed calls daily and customers can get fed up of waiting on hold for to be dealt with. This will lead to a loss of revenue and products being dispatched which in turn and notably will lose the company money. Another objective of the measure phase is to analyze the substantial measures that are high priority and to revise the successes the company has, also to assess the customer requirements that are being met as well as not. (Dr Mark Willis, 2014) Also states that "The objective of this phase is to determine the significant measures that are essential to assess the success, meeting significant buyer requirements and start developing a procedure to effectively gather data to quantify course performance".

The measure phase will also be used to define the quality aspect of the current situation, the customer requirements have to be met at any business but to assure future business from them is essential, the customers have to be dealt with professionally and to the best of a person's ability. Keeping customers waiting on hold as other team members are also dealing with a call is not professional and can cause frustration then in turn loses potential business and revenue. (Dr Dracov Gulec, 2015) States that "There are a few acronyms that you need to know to understand the Measure phase of the DMAIC process. The factors are the internal quality parameters that relate to the wants and needs of the customer. There are two categories of CTQs. The first category is KPIV and the second category is KPOV. KPIV is an acronym that stands for Key Process Input Variable and KPOV is an acronym that stands for Key Process Output Variable". The Key process output variable is a part of the process that

will show a result as output, some of the parts or components that are sold at the company can show certain impacts to the performance and sales. Logging of the stocked items and made to order items is key. With logging items in and out employees can see the main items being sold and prioritize certain items. The more complicated items can then be analyzed and check how why they aren't so frequent are and see how long phone calls are taking to discuss which can then lead to a no sale due to customer information being incorrect on not precise.

11.2 Limitations and Data Gathering

The data that has been gathered in this study of the measuring phase of DMAIC Six Sigma are screenshots of the process in which the sales are produced and carried out, which is used on a Sage 50 Accounts software. The other data samples are pictures of the Live Call Register (LCR) in which Evans and Reid has in the sales office and it updates every 11 calls, depending on the length of each call is depending on how often it refreshes, as seen in figure 5 the calls can vary from up to 10 minutes and 30 seconds, it depends if the customer has a big enquiry of if it is a quick phone call to pass on a message or an order number.

In an ideal world the calls and sales represented on Sage would have been logged and recorded over the period of six months and then calculations in order would be carried out and with missed calls taken into account an average cost to the company for every missed call could be established. However this procedure has not been possible due to the work load currently being over powering and therefor being unable to monitor frequently or constantly to discuss and analyze the problem. (Heidi Wiesenfelder, 2005) Describes that “The focus of data collection should be in gathering data that helps to describe the problem, as well as uncovering any factors that provide clues about how, when, where, or in what circumstances the problem occurs or worsened, in some cases this can be accomplish by establishing clear operational definitions for the measures being tracked”. The data gathered for the measure phase in this project were at random on three separate dates to try and be cross referenced with sage and therefore be counted as ‘average’ as there will be sales orders produced to back up the calls and it can then be seen what and how much the calls made the company through sales and therefore the missed calls will cost the business money as appose to, if the calls were answered then sales can be generated.

Other limitations of the data gathering and measuring process is that the calls logged on the Live Call register are not documented or stored anywhere, once the calls have refreshed there is no more access to the information except the unify call log which is not a correct or accurate software. (Jean Scheid, 2011) States that “The goal of the Measure phase of a Six Sigma DMAIC project is to get as much information as possible on the current process so as to fully understand both how it works and how well it works. For many processes, tracking cycle time provides valuable information, especially when the problem being addressed is related to delays and process duration”.

To make the random snapshots in time relevant, in the next stage there will be data collected and sales generated cross referenced through sage and costings that average calls are generating and profit being made, therefore the problem of the missed calls can be evaluated

with figures and average costings potentially can be lost due to miss opportunity to the calls being answered.

11.3 Sales Orders and Missed Calls

On the 7th of March, screen shots were taken of the Live Call Register to display how many calls were taken in the space of 20 minutes and missed.

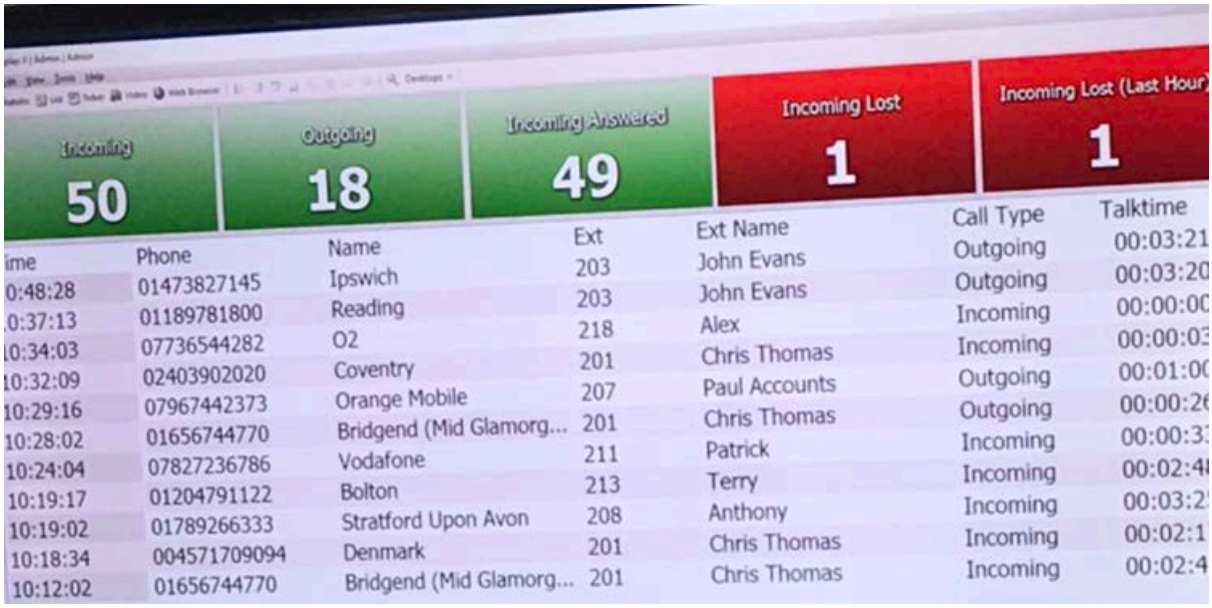
Figure 9 Picture of the Live Call Register 07/03/2018

Due to cross-referencing phone numbers with dates on Sage the top number which is from an Irish company called Finne Machinetech and they placed an order for parts which came to £1898.76 and therefor making a profit, however in the space of 20 minutes

Steve White Plant Hire - 40166 Back Order	234.00	W00062
Finne Machinetech, 20059 off container	1898.76	F00324
Sarl Maxima, Yan Bo8-3, P&B	457.48	M00419

Figure 10 Finne Machinetech Sales order 07/03/2018

Due to an order of that size and price the 9 minutes 30 seconds is justified, in order to guarantee customer requirements and satisfaction there is great detail required to recover in order of selecting correct required parts and matching them to the correct serial number and model of the machine.



Incoming	Outgoing	Incoming Answered	Incoming Lost	Incoming Lost (Last Hour)
50	18	49	1	1

ime	Phone	Name	Ext	Ext Name	Call Type	Talktime
0:48:28	01473827145	Ipswich	203	John Evans	Outgoing	00:03:21
0:37:13	01189781800	Reading	203	John Evans	Outgoing	00:03:20
10:34:03	07736544282	O2	218	Alex	Incoming	00:00:00
10:32:09	02403902020	Coventry	201	Chris Thomas	Incoming	00:00:03
10:29:16	07967442373	Orange Mobile	207	Paul Accounts	Outgoing	00:01:00
10:28:02	01656744770	Bridgend (Mid Glamorg...	201	Chris Thomas	Outgoing	00:00:26
10:24:04	07827236786	Vodafone	211	Patrick	Incoming	00:00:33
10:19:17	01204791122	Bolton	213	Terry	Incoming	00:02:48
10:19:02	01789266333	Stratford Upon Avon	208	Anthony	Incoming	00:03:2
10:18:34	004571709094	Denmark	201	Chris Thomas	Incoming	00:02:1
10:12:02	01656744770	Bridgend (Mid Glamorg...	201	Chris Thomas	Incoming	00:02:4

Figure 11 Live Call Register 20/02/2018

As seen in figure 8, the snapshot reveals a numerous amount of calls from a wide range of places but if the attention is turned to the 01204791122 in Bolton, it is from a company called Astrak UK which is a large customer of us and they have many depots but in this instance there was an order placed at this time due to cross referencing through Sage archived sales orders the information is available.

Gormley Equipment Sterling A/C	65.45	65.45 GBP	COMPLETE
Astrak UK	358.81	358.81 GBP	COMPLETE
Milling International Marketing	2043.91	2043.91 GBP	COMPLETE

Figure 12 Astrak Sales Order 20/02/2018

An order of this size will only contain a maximum of 3 components, whether it be three bottom rollers, one front idler or a small rubber track. As Astrak have been a dealer selling mini excavator parts for years the company is well established and knowledgeable in this field therefor they will know exact parts and requirements and they will be set up as account payable so it is a quick call with a part and an order number to speed up the process.

Sarl Maxima Volvo EC35 P & B	604.32	M00419
Scanbolt Aps TB035 pins & bushes	202.48	A00319
Hydraulic Plant Services Ltd EB12.4 P&B	579.36	H00023

Figure 13 Scanbolt Sales Order 20/02/2018

As seen in Figure 8, there is a call From Denmark which is Scanbolt, a foreign dealer that uses is Evans and Reid to purchase from daily and as this is a small order for Pins and Bushes. Scanbolt employees know what they want to purchase as they only deal with certain machines so the job is easier for us as the models start to get repetitive, as you can see in figure 10, the order is £202.48 which is an average size order for replacing pins and bushes for excavators.

Sarl Maxima	B37-2A	212.50	
Digger Parts Direct		431.48	COMPLETE
Janssen Leon & Co BVBA		79.25	COMPLETE

Figure 14 Digger Parts Direct Sales Order 20/02/2018

In figure 8, the phone contact number 02403902020 is a company which deals in mini excavator parts and is a regular customer called Digger Parts Direct. The company purchases from Evans and Reid Daily, as this call was only three seconds long they must have asked for somebody specifically and were asked to call again later or the relevant person would contact them when they become free, as a result of the call back an order was placed but in the timeframe of 11 minutes there are still two missed calls.

Incoming	Outgoing	Incoming Answered	Incoming Lost	Incoming Lost (Last Hour)
225	101	220	5	1

Time	Phone	Name	Ext	Ext Name	Call Type	Talktime
17:57:52	07714266866	O2	205	Simon Robins	Incoming	00:05:05
17:57:51	07932425882	T-Mobile	216	Marketing Suite	Incoming	00:00:00
17:47:57	01544388277	Kington	204	Simon Reid	Incoming	00:21:47
17:31:36	07774878530	Vodafone	211	Patrick	Incoming	00:01:57
17:29:15	07774878530	Vodafone	211	Patrick	Incoming	00:00:20
17:22:03	00353539420330	Ireland	205	Simon Robins	Incoming	00:09:30
17:20:19	07428584845	Mobile	211	Patrick	Incoming	00:02:38
17:11:54	01559395235	Llandyssul	205	Simon Robins	Outgoing	00:00:26
17:09:56	01558650614	Llandeilo	204	Simon Reid	Incoming	00:01:11
17:06:23	01558650614	Llandeilo	204	Simon Reid	Incoming	00:01:27
17:02:37	00353539420330	Ireland	205	Simon Robins	Incoming	00:00:30

Figure 15 Live Call Register 07/11/2017

In Figure 12 it can be seen there are a wide range of calls and some repetitive numbers occurring as in other figures also, Evans and Reid have very regular customers such as Finne Machinetech but the number that stands out is 01544 388277 which is a regular dealer called Southern Plant Spares (SPS) in which the conversation took over 21 minutes to establish needs and parts on the system and spreadsheets from their customer and requirements.

Southern Plant Spares, TB125 P&B	631.17	S00003
Southern Plant Spares - U10-3	1896.42	S00003
H T S Spares Ltd CAT 301.8C pins & bushes	368.92	H00178

Figure 16 SPS Sales Order 07/11/2017

As shown in figure 13. The SPS order is quite expensive and possible having required special buckets to be made or a grab but the level of precision is misunderstood and therefor the concentration level on meeting this customer's requirement is a priority so one of the sales team members is unavailable for the next 21.5 minutes.

Name	Amount £	Allocated	Despatched	A/C
Llynfi Groundworks & Landscaping	101.58		COMPLETE	L00830
L & S Engineers Limited	77.76	FULL		L00163

Figure 17 Llynfi Groundworks & Landscaping Sales Order 07/11/2017

The company Purchasing in figure 14 is the contact number 01559 395235 from Llandyssul and is an end user customer who only purchases from Evans and Reid when they need a part or an attachment made, this customer is very efficient as they placed a £101.58 order in under 30 seconds and clearly they knew what they required which must have been a single bottom roller etc.

Darlow LLoyd & Sons Ltd	360.00	COMPLETE
Malcolm Herbert Plant Hire Ltd	691.20	COMPLETE
L & S Engineers Limited	205.62	COMPLETE

Figure 18 Malcolm Herbert Plant Hire LTD Sales Order 07/11/2017

AS can be seen in Figure 12, there is a customer from Llandeilo that regularly deals with Evans and Reid called Malcolm Herbert Plant Hire LTD, in this instance the customer was clearly unsure as to what they needed and required as the live call register clearly shows two calls one after another to the same gentleman which shows a lack of communication or understanding or spread sheet errors before placing the order or an order amendment.

Incoming	Outgoing	Incoming Answered	Incoming Lost	Incoming Lost (Last Hour)
193	52	186	7	0

Time	Phone	Name	Ext	Ext Name	Call Type	Talktime
17:03:53	01543378189	Cannock	205	Simon Robins	Incoming	00:05:05
17:01:39	01639643761	Neath	202	Mark Pitts	Incoming	00:01:12
17:00:27	01639643761	Neath	213	Terry	Incoming	00:00:16
17:00:14	07539910383	Mobile	204	Simon Reid	Incoming	00:00:13
17:00:01	07539910383	Mobile	213	Terry	Incoming	00:00:29
16:59:02	07539910383	Mobile	204	Simon Reid	Incoming	00:02:00
16:57:02	07539910383	Mobile	205	Simon Robins	Incoming	00:00:55
16:55:19	02830821230	Newry	211	Patrick	Incoming	00:06:28
16:51:32	07585438438	Mobile	213	Terry	Incoming	00:04:21
16:51:23	07540450811	Mobile	205	Simon Robins	Incoming	00:01:45
16:42:35	01592655770	Kirkcaldy	205	Simon Robins	Incoming	00:03:16

Figure 19 Live Call Register 04/12/2017

Shown in Figure 16 there are various calls from customers and dealers and most of the calls are quick and precise but there is one call in particular which took over six minutes to resolve which was from a company called L & S Engineers in Newry who are regular customers to Evans and Reid and have a big customer range of End users but Evans and Reid supply them.

Malcolm Herbert Plant Hire Ltd	691.20	COMPLETE
L & S Engineers Limited	205.62	COMPLETE
SARL GILLETT Euro	170.76	COMPLETE

Figure 20 L & S Engineers Sales Order 04/12/2017

As shown in figure 17 the L & S Engineers order was £205.62 which is normally only a few undercarriage parts as they are on 15% discount or pins and bushing replacements but as the call time took over 6 minutes for such a small order it clearly shows a discrepancy with information or time taken to look through relevant spreadsheets to match up parts and machine models and serial numbers.

Rhinox-Group Ltd	355.20	COMPLETE
Dunrave Plant Services	157.20 FULL	
Hamilton Contracting Services	232.80 FULL	

Figure 21 Rhinox-Group LTD Sales Order 04/12/2017

Rhinox are also a well-established parts dealer based in Kircaldy for all types of excavator being mini or large and they are well educated in the parts system. With an order of this size and a call time of over three minutes there is most definitely a delay in part searching through the excel spreadsheets to find what is needed for what machine and which component is required.

Incoming	Outgoing	Incoming Answered	Incoming Lost	Incoming Lost (Last Hour)
201	53	195	6	1

Time	Phone	Name	Ext	Ext Name	Call Type	Talktime
16:42:45	07549629682	Mobile	213	Terry	Outgoing	00:05:46
16:41:15	01685722256	Merthyr Tydfil	205	Simon Robins	Incoming	00:01:50
16:39:25	01685722256	Merthyr Tydfil	211	Patrick	Incoming	00:00:22
16:36:57	07831339280	Vodafone	205	Simon Robins	Incoming	00:06:10
16:36:03	01200415300	Clitheroe	201	Chris Thomas	Outgoing	00:01:13
16:34:43	01763242660	Royston	201	Chris Thomas	Outgoing	00:00:34
16:33:39	00353539420330	Ireland	211	Patrick	Incoming	00:01:11
16:33:02	01543378189	Cannock	208	Anthony	Incoming	00:03:59
16:24:44	01782305414	Stoke On Trent	211	Patrick	Incoming	00:06:13
16:23:45	01543378189	Cannock	208	Anthony	Incoming	00:05:56
16:23:31	07977468660	Orange Mobile	213	Terry	Incoming	00:03:55

Figure 22 Live Call Register 01/11/2017

This figure (19) shows that there are various calls from national customers and international dealers but as you can see the call time varies, from calls that are 30 seconds or less to calls over six minutes. The call times vary so much as to searching for parts or customers unsure of what the parts are and need professional help from the sales team at Evans and Reid but the attention in this snapshot is the two calls one after another from a company in Merthyr Tydfil.

Hamilton Contracting Services	232.80 FULL		H00765
Cautrac	105.00	COMPLETE	C00081
Peter Harries Bobcat Hire	378.00 FULL		H0009

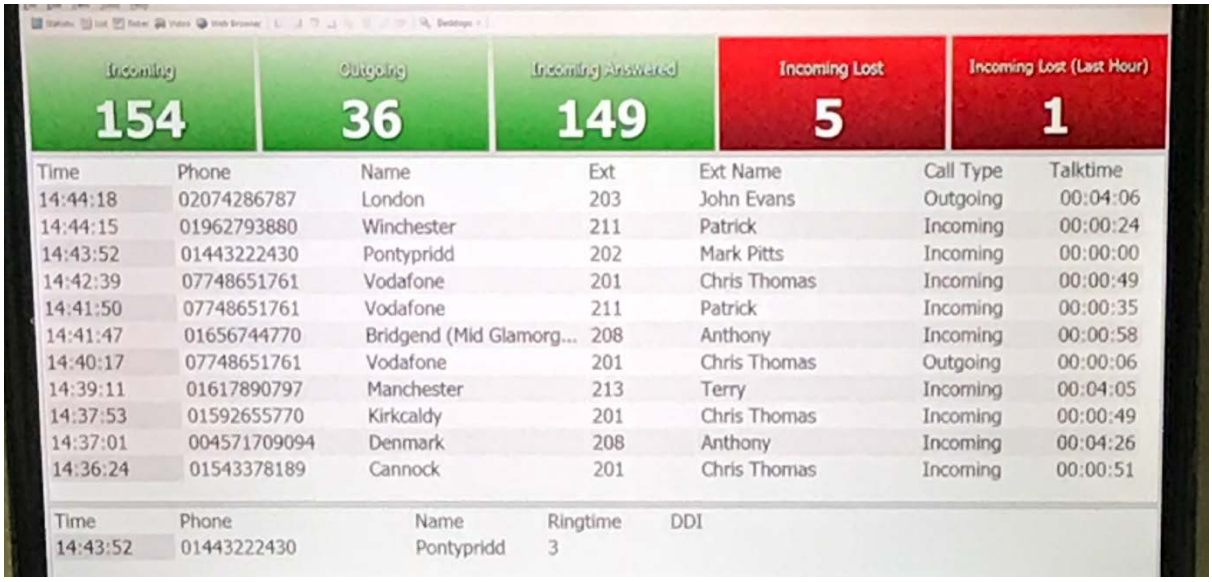
Figure 23 Cautrac Sales Order 01/11/2017

Cautrac are a main dealer who specialize in undercarriage parts and if they run on low stock that is when they make enquiries and order with Evans and Reid. This is however a small order for them to place so it must be one front idler or one bottom roller to make up the complete undercarriage for a customer they have. An employee of Cautrac made a call to one of the sales team members and spoke for 30 seconds then straight after called back and spoke to another, there must have been a mix up in the spread sheets matching up parts to the machine make and model and serial number or the Cautrac staff were unsure as to what they needed, whatever the reason it is still taking up time and causing the sales team to miss calls.

Mick Russell	3667.20	
K D Plant & Machinery Sales	187.03	COMPLETE
M Moseley	40.00	COMPLETE

Figure 24 K D Plant & Machinery Sales, Sales Order 01/11/2017

K D Plant 7 Machinery sales are a customer based in Stoke on Trent, they sell main parts for agricultural Loaders and also deal in excavator parts and machines, however Evans and Reid supply them, with most parts they need including rubber tracks and windows from an external supplier. This company is very experienced in the plant and agricultural trade which means that for a 6.5 minute call and the outcome is only £187.03 makes you realize that there is a delay in this process of generating the sale which also meant that taking time to search through the excel spreadsheets matching parts to required components and correct models, this delay cannot be afforded as in the space of 25 minutes there are seven missed calls which is not acceptable for the business even if customers are not sure what they want and are delaying sales generated but mainly Evans and Reid employees searching through spreadsheets to find required attachments.



Incoming	Outgoing	Incoming Answered	Incoming Lost	Incoming Lost (Last Hour)
154	36	149	5	1

Time	Phone	Name	Ext	Ext Name	Call Type	Talktime
14:44:18	02074286787	London	203	John Evans	Outgoing	00:04:06
14:44:15	01962793880	Winchester	211	Patrick	Incoming	00:00:24
14:43:52	01443222430	Pontypridd	202	Mark Pitts	Incoming	00:00:00
14:42:39	07748651761	Vodafone	201	Chris Thomas	Incoming	00:00:49
14:41:50	07748651761	Vodafone	211	Patrick	Incoming	00:00:35
14:41:47	01656744770	Bridgend (Mid Glamorg...	208	Anthony	Incoming	00:00:58
14:40:17	07748651761	Vodafone	201	Chris Thomas	Outgoing	00:00:06
14:39:11	01617890797	Manchester	213	Terry	Incoming	00:04:05
14:37:53	01592655770	Kirkcaldy	201	Chris Thomas	Incoming	00:00:49
14:37:01	004571709094	Denmark	208	Anthony	Incoming	00:04:26
14:36:24	01543378189	Cannock	201	Chris Thomas	Incoming	00:00:51

Time	Phone	Name	Ringtime	DDI
14:43:52	01443222430	Pontypridd	3	

Figure 25 Live Call Register 12/01/2018

This day was again a mix of calls from all over Britain and other countries in Europe and once again there are some repetitive numbers as other figures because companies are so busy with customers and then constantly calling upon Evans and Reid to supply parts that they aren't able to do. But as Evans and Reid are in such a high demand, delays and missed calls cannot be acceptable to meet these customers' requirements and needs.

U K Construction Parts Ltd	245.40	COMPLETE	B00830
Ian Huxham Services	1569.60	COMPLETE	H01252
Dunrave Plant Services	765.12	COMPLETE	D00512

Figure 26 Ian Huxham Services Sales Order 12/01/2018

Ian Huxham is a sole trader and who services machines based in Winchester and is a very frequent customer of Evans and Reid, when he orders they are big orders but as it can be seen in figure 22 he called a member of the sales team and knew everything he wanted and even had an order number to place the entire order after only 24 seconds on the phone. In an ideal world this is the aim to get the information sheets and customer friendly manuals to bring everything up to speed.

C P Hire (GB) Ltd ** reserved for Dafydd **	632.66 CANCEL	
Martin Pears Engineering Ltd	857.59	COMPLETE
John Francis	87.60	COMPLETE

Figure 27 Martin Pears Engineering LTD Sales Order 12/01/2018

Martin Pears is a plant engineer based in Manchester who started up his own company servicing asnd repairing machines who works out of a workshop and mobile, he gets called out to farms and big companied to fix excavators. He goes to the machine or it is brought to his workshop he diagnoses and then places the order for spare parts from Evans and Reid in order to carry out the repairs and services so the orders tend to vary but in this instance in figure 24 you can see it is £857.59 which could be a full undercarriage replacement. This call is over four minutes long which is not expected for an order of this size there is a delay in finding parts and serial numbers which is delaying time for the next sale.

In the space of 18 minutes at the sales team there are six missed calls and that is very poor as there are reliable customers trying to contact the team for help and support and with delays they are having to wait and call back or leave an answer phone message for the sales team to contact them when free which in not satisfying them or meeting the needs and is unacceptable.

Incoming	Outgoing	Incoming Answered	Incoming Lost	Incoming Lost (Last Hour)
11	5	9	2	0

Time	Phone	Name	Ext	Ext Name	Call Type	Talktime
09:01:12	01792341777	Swansea	215	Andrew	Outgoing	00:09:42
08:52:54	07971960540	Orange Mobile	213	Terry	Incoming	00:01:12
08:47:40	01962793880	Winchester	201	Chris Thomas	Outgoing	00:01:02
08:47:19	07876232541	Vodafone	208	Anthony	Incoming	00:07:24
08:45:26	0800100600	Freephone	215	Andrew	Outgoing	00:05:37
08:44:42	01592655770	Kirkcaldy	213	Terry	Incoming	00:02:46
08:41:31	07768664565	Vodafone	205	Simon Robins	Incoming	00:02:58
08:41:28	07932425882	T-Mobile	207	Paul Accounts	Incoming	00:00:46
08:37:44	03308380420	National	215	Andrew	Outgoing	00:00:50
08:33:01	07971960540	Orange Mobile	213	Terry	Incoming	00:05:36
08:28:31	01554772431	Llanelli	211	Patrick	Incoming	00:00:00

Time	Phone	Name	Ringtime	DDI

Figure 28 Live Call Register 08/12/2017

As shown in figure 25, there are various calls and call lengths from customers requiring assistance or parts from Evans and Reid and yet there are still delays being shown on the live call Register in the sales office with the reasons being highlighted more and more as the measure phase continues.

Wayne Moore	106.40	COMPLETE
Partexs Direct Ltd	249.86	COMPLETE
A J M Plant Maintenance	140.52	

Figure 29 Partexs Direct LTD Sales Order 08/12/2017

Partexs Direct Limited are dealers of scrap machine parts and also new parts plus sell agricultural attachment parts for tractors, they are regular customers and loyal to Evans and Reid purchasing almost every day based in Bridgend and the number for them on the live call register is 07971 960540. The call took over five minutes to place a £249.86 order as the outcome which shows delays as this is only small and will consist of pins and bushes, one small rubber track or a few undercarriage parts.

Cautrac	105.00	COMPLETE
Peter Harries Bobcat Hire	378.00 FULL	
A J M Plant Maintenance	181.56	COMPLETE

Figure 30 Peter Harries Bobcat Hire Sales Order 08/12/2017

Peter Harries Bobcat Hire is a company based in reading who rent out bobcat machines ranging from track dumpers to tele handlers and shovel loaders. The company contact is Peter and his number is 07876 232541 on the Live Call Register, the phone call takes over seven minutes and only generates a sale of £378, with a company that specifies in only certain machines there is a delay in searching for parts requested by Peter Harries and it is slowing down the sales process and fuels the two missed calls in the space of 30 minutes.

Incoming	Outgoing	Incoming Answered	Incoming Lost	Incoming Lost (Last Hour)
150	38	146	4	0

Time	Phone	Name	Ext	Ext Name	Call Type	Talktime
15:08:55	004526295609	Denmark Mobile	211	Patrick	Incoming	00:00:55
15:07:54	01288341326	Bude	211	Patrick	Incoming	00:00:21
15:07:00	01792391007	Swansea	204	Simon Reid	Outgoing	00:02:29
15:04:17	01592655770	Kirkcaldy	215	Andrew	Incoming	00:01:07
15:03:10	01592655770	Kirkcaldy	213	Terry	Incoming	00:00:20
14:58:42	01543378189	Cannock	211	Patrick	Incoming	00:08:08
14:51:16	01646682809	Milford Haven	206	Rosey	Incoming	00:00:30
14:51:15	01592655770	Kirkcaldy	201	Chris Thomas	Incoming	00:02:17
14:50:30	01646682809	Milford Haven	213	Terry	Incoming	00:00:00
14:47:25	01613328501	Manchester	203	John Evans	Incoming	00:00:54
14:44:18	01592655770	Kirkcaldy	208	Anthony	Incoming	00:05:29

Time	Phone	Name	Ringtime	DDI

Figure 31 Live Call Register 02/03/2018

As can be seen in figure 28 there are again numbers that may be recognised from other figures and various new ones as there are constantly customers requesting assistance and service and help but even as it is a repetitive number Rhinox from Kircaldy, there is definitely a problem in communicating parts and machine requirements back and forth with the Evans and Reid sales team and to have 3 call incoming to the company in the space of 20 minutes.

Lee Gregory	885.60	COMPLETE
Arta Sliddele APS	218.40	COMPLETE
Milling International Marketing	168.26	COMPLETE

Figure 32 Arta Sliddele APS Sales Order 02/03/2018

Arta Sliddele APS also known as Arta Wear Parts are a company based in Copenhagen Denmark and they deal in second hand and worn machines so they are constantly ordering parts for excavators and dumpers to refurbish and sell on to make business and a small sale at £218.40 is expected to take a minute or less which again shows the ideal sales time and order completed.

Paul Thomas	127.20	COMPLETE
Interserve Construction Ltd	7.70	COMPLETE
D J Bartlett	1237.10	COMPLETE

Figure 33 Interserve Construction LTD Sales Order 02/03/2018

Interserve Construction LTD are a company based in Milford Haven who are well defined in the construction profession and have been a part of major projects all over the UK the contact number is 01646 682809, they actually phone twice but get disconnected or loss of connection but in the second call, it is 30 seconds to place an order of £7.70 which is a washer set and the part number is available in the Evans and Reid catalogue, knowing this company they will know this part number and there is a delay processing with the spreadsheets and accessing relevant data. While delays and confusions are happening in the space of this 15 minute Live call register there are 4 missed calls, if the delays can be cut down or stopped there will be no or a minimum of missed calls delaying time and costing Evans and Reid money due to loss of orders and not meeting certain customers satisfaction and requirements. It is a major problem currently at Evans and Reid and must be resolved.

11.4 Measure Phase Conclusions

This measure phase is to prove that the calls incoming are directly linked to sage sales turnover, however the sales team are accessible via email and sales can be generated through email conversations. Calls can then be taken from customers to discuss carriage or postage costs and estimated time of arrival. If this is correct then the sale would have been made via email and an attached order number and even the customer's delivery not attached for it to be sent directly to an end user, but the sales team are still required to talk to the customer or dealer via phone call to finalize and confirm the purchase. A sales team member is still required to talk to that customer about that certain sale so it can be traced using the live call register and the date sales order search vis Sage and therefore it becomes a relevant source to back up opinions of there being a delay in this department and also missed calls are the defect due to it.

In the figures above which show the live call registers at certain points in time it is noted that there have been repeat calls from customers, some seconds and others minutes after the first call was finished. This problem is that there is a lack of communication or new information has arisen to discuss and help with finding required parts to proceed to a sale. Other reasons could be that questions are not answered or additional questions were asked and therefor new information was required. Another delay and limitation of repeat calls is as seen in the live call register pictures some customers who make a repeat call don't talk to the same sales team member so the conversation will not flow. The process must start again by the second sales team member finding the required machine and serial number and then once up to speed use the new information to generate a sale.

12. Analyze

The Analyze phase will be split into the following sections:

- Introduction to the Analyze Phase
- Average Sale and missed Call Costing
- How the Current Process works
- Concluding findings

12.1 Introduction to the Analyze Phase

The third section of the DMAIC process is the Analyze Phase, it helps project members identify the problems occurring and the defects in the company process. The statistical analysis of the problem can now begin. (Allison Catherine, 2017) Explains that “The ANALYZE phase is the beginning of the statistical analysis of the problem. The practical problem was created earlier. This phase statistically reviews the families of variation to determine which are significant contributors to the output”.

In this phase the information from the Measure Phase will be revised and the gap noticed that is delaying the goal. (Ruth Davies, 2017) Explains that “In this phase, you will do a data and process analysis and measure the gap that is preventing you from your goal performance. This will automatically lead you to doing a root cause analysis”.

One the measure phase has been completed the Analyze phase can gather all the measured material such as graphs and charts to see where the costing is and the major problems. (James Madden, 2014) States that “after collecting process performance data, the participant is able to analyze the process and list their concerns or pain points. These activities allow the participant or team to take advantage of the collective wisdom of the process team. The participant can proceed with further process analysis by conducting detailed analysis.

The measure phase shows the different types of customers and the missed calls and costings of sales orders, this phase will be concentrating on the current process in hand, (Dr Benjamin Parsons, 2016) explains that “Six Sigma aims to define the causes of defects, measure those defects, and analyze them so that they can be reduced. Process analysis includes creating a more detailed process map, and analysing the more detailed map, where the greatest inefficiencies exist”. Costs of the problem will also be calculated and established to see the size of it and the losses currently existing.

12.2 Average Sale and missed Call Costing

The Sales turnover from calls that are average are shown in the measure stage, now to analyze the results and see the sheer size and cost of the problem there has to be a mean (average) sale calculation. It will consist of all the calls and sales in the measure phase to work out a true average sales order.

Company	Date	Sale (£)
Finne Machinetech	07/03/2018	£1,898.76
Astrak UK	20/02/2018	£358.81
Scanbolt	20/02/2018	£202.48
Digger Parts Direct	20/02/2018	£431.48
Southern Plant Spares	07/11/2017	£1,896.42
Llynfi Groundworks & Landscaping	07/11/2017	£101.58
Malcolm Herbert Plant Hire LTD	07/11/2017	£691.20
L & S Engineers	04/12/2017	£205.62
Rhinox Group LTD	04/12/2017	£355.20
Cautrac	01/11/2017	£105
K D Plant & Machinery Sales	01/11/2017	£187.03
Ian Huxham Services	12/01/2018	£1,569.60
Martin Pears Engineering LTD	12/01/2018	£857.59
Partexs Direct LTD	08/12/2017	£249.86
Peter Harris Bobcat Hire	08/12/2017	£378
Arta Sliddele APS	02/03/2018	£218.40
Interserve Construction LTD	02/03/2018	£7.70

Total
£9,714.73
Mean
£571.45

As it is shown in the above graphs, you can see the variety of companies and dates, also what those companies spent on those dates. To work out the total the sum of all these costings have been calculated. One that was completed the sum of the sales were then divided by the amount of sales (17) then the mean value was calculated.

When Missed Calls are taken into perspective, one must assume boundary conditions and that every call is a potential sale, therefore every call missed is losing the company Profit and

revenue. Know knowing the cost of an average sale, the missed calls can be calculated so a mean value of money that is lost every working day can be calculated.

Date	Missed Calls
07/03/2018	4
20/02/2018	2
07/11/2017	6
04/12/2017	7
01/11/2017	7
12/01/2018	6
08/12/2017	2
02/03/2018	4
	Total
	38
	Mean
	4.75

The Current missed calls have been noted from each day then an average daily amount has been calculated. Now with the boundary condition further calculations can be made for the expense of this problem that is currently at Evans and Reid. The daily missed call costing is the mean missed calls multiplied by the mean sale costing.

Daily Cost
£2,714.41

Now that the daily missed call costing is calculated and established it can then be worked out to a much larger scale to see how much it will cost over time.

With there being a five day working week at Evans and Reid the weekly cost can then be worked out by multiplying the daily cost by five.

Weekly Cost
£13,572.05

Considering this value is only for a week's work, there is a considerable amount of profit in sales not being taken due to missed calls. With working out the monthly cost, you simply take the weekly cost value then multiply it by 52 and then divide the value by 12 to get a true figure.

Monthly Cost
£58,812.21

These figures are justifying the need for change and why, this analysis is showing the problem is greater than originally first thought of. To see how much this value would be for over a year simply take the weekly figure and multiply it by 52 but taking bank holidays into account it is only 51 weeks to give a true represented figure of the working year.

Yearly Cost
£692,174.51

The amount of potential money lost over a calendar working year is a significant amount and could bring in a higher profit margin and revenue to the company. This much could go towards upkeep of the building or investment into new product and appliances. Even new machinery or more machinery enabling the company to expand. This is the loss that Evans and Reid are having to deal with and it quantifies the size of the current problem at hand.

12.3 How the Current Process Works

The current process is currently taking too long for Evans and Reid Employees to generate a sales order and gain profit, a dealer or end user will be phoning or emailing to enquire of a new part or a manufactured product to suit the machine they have. The four main spreadsheets which are in use are:

- Pins and Bushes
- Master Undercarriage list
- Bucket prices
- Current Carriage Cost Calculator

The first on the list are the pins and bushes Spreadsheet.

	A	B	C	D	P	Q
1	Machine Make	Machine Model	Serial Number	Info	Bush 10	Seal 10
1850	Komatsu	PC15R-8 from Ser No	F21803 up, Italian	Italian	80012	81002
1851	Komatsu	PC15R-8	10001 up	Japanese	80012	81002
1852	Komatsu	PC16R-2	F00003 up	European	80098	81002
1853	Komatsu	PC16R-3	F60003up and F70003 up	Italian	80098	81002
1854	Komatsu	PC18MR				
1855	Komatsu	PC18MR-2	15001 up	European	80098	81002
1856	Komatsu	PC18MR-3	20001 up		80098	81002
1857	Komatsu	PC18MR-3	F30001 up	European		
1858	Komatsu	PC20-3	14001 up		80056	81003
1859	Komatsu	PC20-5	18001 up	320*100*45	80056	81003
1860	Komatsu	PC20-6 Japanese	24001 up	Japanese	80056	81003
1861	Komatsu	PC20-6F Italian	F10001 up		80056	81003
1862	Komatsu	PC20-7	before F20419		80097	
1863	Komatsu	PC20-7	from F20419		80097	
1864	Komatsu	PC20-7	35001 to 42354	Japanese	80098/97	
1865	Komatsu	PC20-7	from 42355 on	Japanese		
1866	Komatsu	PC20MR-1	10001 up		80098	81002
1867	Komatsu	PC20 MRX-1	Italian	Italian	80098	81002
1868	Komatsu	PC20MR-2	F00003 up	Italian	80581	81002
1869	Komatsu	PC20MR-2	15001 up	Japanese	80581	81002
1870	Komatsu	PC20R-8	Italian F30001 up	Italian	80098	81002
1871	Komatsu	PC20R-8	10001 up	Japanese	80098	81002
1872	Komatsu	PC22MR-3	F30001 up		80581	81002
1873	Komatsu	PC25-1	1001 up	Japanese	80056	81003
1874	Komatsu	PC25R-8	10001 up	Japanese	80098	81002
1875	Komatsu	PC26MR-3	F30003 up	Italian	80354	81003
1876	Komatsu	PC27R-8	F30001 up	Italian	80097	81003
1877	Komatsu	PC27R-8	10001 up	Japanese	80097	81003
1878	Komatsu	PC27MR-2	15001 up		80354	81003
1879	Komatsu	PC27MR-2	F00103 up	Italian	80354	81003

Figure 34 Pins and Bushes Spreadsheet

As it can be seen in the above screen shot that there are so many models for one make of machine and then so many parts available to select from, it is crucial that the correct serial number matches up with the correct machine to gain correct parts. If correct parts are not selected and the customer receives them, they will have wrong diameter pins and bushes to fit to their machine and then there will be a cost that Evans and Reid will have to pay to get the parts returned and to send the correct items to the customer so it takes time to locate and

then discuss with the customer to check sizes, the small red sections in the top right hand corner are the comments which will tell the sales team member the dimensions of the pin or the bush in question then once again this takes time to establish. Very rarely the customer only wants one pin or one bush so this has to be done for every item requested and if the customer is requesting parts for more than one machine then it is even more time consuming.

1	Machine Make	Machine Model	Serial Number
1373	JCB	801	645001 to 645999
1374	JCB	801	648000 to 649729
1375	JCB	801	649730 to 649999
1376	JCB	801.4	720001 to 722368
1377	JCB	801.4	722369 to722424
1378	JCB	801.4	722425 to 723984
1379	JCB	801.4	<723985
1380	JCB	8014	791000 to 795999
1381	JCB	8014	01282000 to 01283999
1382	JCB	8014	01156000 to 01156999
1383	JCB	8014	01319000 to 01324999
1384	JCB	8014	01392500 to 01392999
1385	JCB	8014	01626000 to 01627499
1386	JCB	8014	01792933 to 01794933
1387	JCB	8014 CTS	02069289 to 02071289
1388	JCB	8014 CTS	2475101 to 2475500
1389	JCB	8014 CTS	2475101 to 2475500
1390	JCB	8014 CTS	2541501 t0 2541670
1391	JCB	8014 CTS	2558251 to 2558760
1392	JCB	801.5	730001 to 730048
1393	JCB	801.5>	730049 to 730614
1394	JCB	801.5 Pro Dig	730320 to 730370
1395	JCB	8015	730800 to 731999
1396	JCB	8015	820000 to 821999
1397	JCB	8015	894200 to 894877
1398	JCB	8015	894878 to 895999
1399	JCB	8015	1020000 to 1023999
1400	JCB	15C	2700721 to 2710460
1401	JCB	16C-1	
1402	JCB	801.6	728001 to 728336

Figure 35 Pins and Bushes Spreadsheet Makes and Models

It is Crucial to always be 100% sure that the correct machine is in question because as it can be seen there are so many machine make and models which are similar and then with the parts, some are the same and then some are different in later models as the boom has changed or the cylinder arm has been modified or even a new Kingpost has been fitted.

The Second spreadsheet listed was the Master Undercarriage Parts.

E1603 | 20015(39)

	A	B	C	D	E	F	G	H
1	Machine Make	Machine Model	Serial Number	Rubber Track	Steel Track (links)	Track Chain (links)	Clip on rubber pad	bolt on rubber pad
1597	JCB	8050 ZTS	1741500 to 1742999	10139	20070(39)		21003	21013
1598	JCB	8050 RTS	1741500 to 1742999	10139	20070(39)		21003	21013
1599	JCB	8050 ZTS	1928460 to 1928479	10139	20070(39)		21003	21013
1600	JCB	8050 ZTS	2379083 to 2384083	10139	20070(39)		21003	21013
1601	JCB	51R-1 T3	1922451 to 1924450	10147 CHECK				
1602	JCB	51R-1 T4	1922451 to 1924450	10147 CHECK				
1603	JCB	8052	802000 to 803370	10147	20015(39)	20010	21003	21013
1604	JCB	8052	803371 to 803999	10147	20015(39)	20010	21003	21013
1605	JCB	8052	1178000 to 1178999	10147	20015(39)	20010	21003	21013
1606	JCB	8052	01614000 to 01615999	10147	20015 (39)		21003	21013
1607	JCB	8055RTS	01536000 to 01537499	10147	20015(39)		21003	21013
1608	JCB	8055ZTS	01536000 to 01537499	10147	20015(39)		21003	21013
1609	JCB	8055ZTS	01614000 to 01615999	10147	20015(39)		21003	21013
1610	JCB	8055RTS	01614000 to 01615999	10147	20015(39)		21003	21013
1611	JCB	8055RTS	02060250 to 02060749	10147	20015(39)		21003	21013
1612	JCB	8055ZTS	02060250 to 02060749	10147	20015(39)		21003	21013
1613	JCB	8055RTS	2426001 to 2426500	10147	20015(39)		21003	21013
1614	JCB	8055ZTS	2426001 to 2426500	10147	20015(39)		21003	21013
1615	JCB	55Z-1 T3	1924451 to 1926450	10147 CHECK	20015(39)		21003	21013
1616	JCB	55Z-1 T4	1924451 to 1926450	10147 CHECK	20015(39)		21003	21013
1617	JCB	8056	1296000 to 1296999	10147	20015(39)		21003	21013
1618	JCB	57C-1 T3	1926451 to 1928450	10147 CHECK				
1619	JCB	57C-1 T4	1926451 to 1928450	10147 CHECK				
1620	JCB	8060	883000 to 883829	10147	20015(39)	20010	21003	21013
1621	JCB	8060	883830 to 884999	10147	20015 (39)	20010	21003	21013
1622	JCB	8060	1236000 to 1237999	10147	20015 (39)	20010	21003	21013
1623	JCB	8065 RTS	01536000 to 01537499	10147	20015 (39)	20010	21003	21013
1624	JCB	8065 RTS	1537500 to 1538309	10147	20015 (39)	20010	21003	21013
1625	JCB	8065 RTS	1538310 to 1538999	10147	20015 (39)		21003	21013
1626	JCB	65R-1	01913904 to 01914904	10147	20015 (39)	20010	21003	21013
1627	JCB	67C-1		10147	20015 (39)	20010	21003	21013
1628	JCB	JS70	695001 to 695500	10152	20031(42)	20029(42)	21004	

Figure 36 Master undercarriage Spreadsheet Tracks

When a customer has an enquiry for undercarriage parts and then asks about tracks for the machine, it is then important to establish if the customer requires steel or rubber tracks. The model and serial number is needed to establish what track is needed then the measurements of the old tracks. The measurement will be the width, the pitch and how many links, once all of that information has been passed on the type of track can be found or searched for.

	A	B	C	J	K	L	M
1	Machine Make	Machine Model	Serial Number	Top Roller	Bottom Roller	Front Idler	Sprocket
1551	JCB	8027ZTS	01226000 to 01226499	30010A	40028	50133	60033
1552	JCB	8029 CTS	2314949 to 2315949				
1553	JCB	803	665001 to 665736	30010A	40028	50020	60033
1554	JCB	803	666001 to 667435	30010	40028	50020	60033
1555	JCB	803	666678 to 666780, 666816 to 821,765139 to 765178		40028		
1556	JCB	803	765001 to 767004	30010	40028	50020	60033
1557	JCB	803 E	765001 to 767004	30010	40028	50020	60033
1558	JCB	803 PLUS	765607 to 827239	30010	40028	50020	60033/035
1559	JCB	803 Super	827240 to 829317	30010	40028	50020	60035
1560	JCB	803 Super	765607 to767004	30010	40028	50020	60033
1561	JCB	803 Super	820000 to 827239	30010A	40028	50020	60033
1562	JCB	803 Super	829327 to 829999	30010	40028	50020	60035
1563	JCB	803 Plus	829327 to 829999	30010	40028	50020	60035
1564	JCB	803 Plus	827240 to 829317	30010	40028	50020	60035
1565	JCB	803 Plus	1159001 to 1159999	30010A	40028	50020	60033
1566	JCB	803 Super	1159001 to 1159999	30010A	40028	50020	60033
1567	JCB	8030 ZTS	01228500 to 01230499	30010	40028	50133	60033
1568	JCB	8030 ZTS	01908500 to 01908999	30010	40028	50133	60033
1569	JCB	8030 ZTS	02021000 to 02021999	30010A	40028	50133	60069
1570	JCB	8030 ZTS	2116878 to 2117878	30010A	40028	50133	60069
1571	JCB	8030 ZTS	2432101 to 2433100	30010A	40028	50133	60069
1572	JCB	8032 Z	1177000 to 1177999	30010	40028	50133	60033
1573	JCB	8032 Z	899000 to 899999	30010	40028	50133	60033/60035
1574	JCB	8037Super		30010	40028	50020	60033
1575	JCB	8035 ZTS	01230500 to 01231499	30010A	40028	50133	60069
1576	JCB	8035 ZTS	02022000-02022999	30010A	40028	50133	60069
1577	JCB	8035 ZTS	02439811 to 02440500	30010A	40028	50133	60069
1578	JCB	8037 ZTS		30010	40028	50020/133	60033
1579	JCB	804	734001 to 734401	30010	40028	50020	60033
1580	JCB	804 Plus	734402 to 734629	30010	40028	50020	60033
1581	JCB	804 Super	734630 to 734833	30010	40028	50020	60033
1582	JCB	804 Super	734834 to 735865	30010	40028	50020	60033/035

Figure 37 Undercarriage Parts Spreadsheet.

If the customer needs a spare part to go on their machines undercarriage then the machine make model and serial number is required. After that has been established then the customer will need to inform the sales team personnel if the machine is currently on steel or rubber tracks, due to the fact that not all of the parts are compatible for steel and rubber. Some machines have bigger and stronger rollers and sprockets for the steel tracks than rubber. The front idlers rarely change on machines due to the tracks but when you see options it is normally an alternative in case one part is out of stock.

One it has been established that the machine is either on steel or rubber tracks then the discussion can continue as to what parts are required. Once it is established what is needed a price can be generated.

The Third Spreadsheet on the list is the Bucket Price List

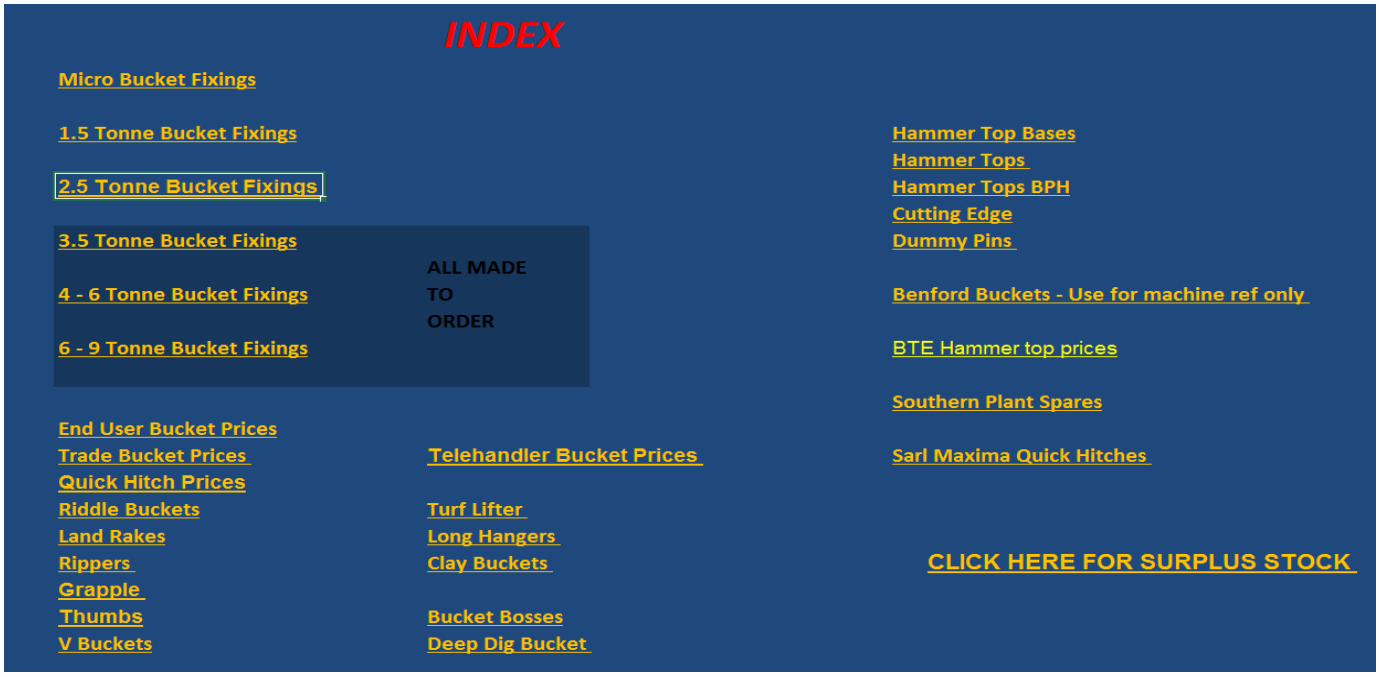


Figure 38 Bucket Pricelist Spreadsheet Index

As can be seen above in figure 35, the bucket spreadsheet has a lot of information in it and is clearly the most complex one of them all, there are so many attachments and different style of buckets that can go on excavators. When a customer requires a bucket or attachment the sales team member will first as the make and model and then size of the machine they can begin their search.

155	Kubota KX61	30	111	132	Lug	BK001-BK005
156	Kubota KX61-2	30	111	132	Lug	BK001-BK005
157	Kubota KX61-3	30	111	140	Lug	KX61-3
158	Kubota KH60	35	134	132	Lug	KX71
159	Kubota KH66	35	134	132	Lug	KX71
160	Kubota KX71	35	134	132	Lug	KX71
161	Kubota KX71-2	35	134	132	Lug	KX71
162	Kubota KX71-3	35	134	136	Lug	KX71-3
163	Kubota U20	30	111	132	Lug	BK001-BK005
164	Kubota U20-3	30	111	140	Lug	KX61-3
165	Kubota U25-3	30	111	140	Lug	KX61-3
166	Kubota U30					NOT STOCKED - MADE TO ORDER
167	Kubota R410 tractor backhoe	35	134	132	Lug	KX71
168						
169	Libra 125S, 130S,225S	35	135	165	L/C	CAT302.5
170						
171	Massey Fergusson MF128	35	124	180	L/C	C28
172	Massey Fergusson MF130	35	124	180	L/C	C28
173						
174	Messersi M-22V	30	105	123	L/C	NOT STOCKED - MADE TO ORDER

... | 1_5T Bucket Fittings | 2_5T Bucket fittings | 3_5T Bucket fittings | 4_0T to 6T Bucket fittings | 6T to 9T Bucket fittings | Benford Dealers June 2008 | Benford_ lenhoff Ju

Figure 39 2.5 Tonne Bucket List

In figure 36 it shows a range of Kubota 2.5 tonne machines, the 2.5 tonne is the maximum lifting weight of the machine. On the right it says KX71 or KX61-3 that is the code to type into sage to find sizes and price but for different customers the price will vary and some machines take the same buckets as others but that is down to knowledge and experience.

2	Make/Model	Pin Ø	Gap	Pin C/C	Pin Retained By.
155	Kubota KX61	30	111	132	Lug
156	Kubota KX61-2	30	111	132	Lug
157	Kubota KX61-3	30	111	140	Lug
158	Kubota KH60	35	134	132	Lug
159	Kubota KH66	35	134	132	Lug
160	Kubota KX71	35	134	132	Lug
161	Kubota KX71-2	35	134	132	Lug
162	Kubota KX71-3	35	134	136	Lug

Figure 40 Hanger Dimensions

Once the make and model is established it is then important to agree on hanger dimensions. The three main measurements is the pin diameter, the gap between the dipper arm where the dipper end of the bucket (See Figure 4) fits onto the hangers and is then bolted on in two positions. Then the final measurement to establish is the distance between the two pin or bolt centres.

3	TRADE PRICES JUNE 2013											
5	PROFILE	6"	9"	12"	18"	24"	30"	36"	42"	48"	54"	60"
6	Micro	£129	£129	£140	£160	£178						
7	"A" Up to 1.8 tonne	£141	£141	£155	£176	£196						
8	"B" 1.9 to 2.8 tonne		£183	£192	£208	£224	£241	£270				
9	"C" 2.9 to 3.8 tonne		£203	£217	£237	£251	£271	£300				
10	"D" 3.9 to 5.5 tonne		£252	£265	£279	£309	£333	£360				
11	"E" 5.6 to 8 tonne		£293	£313	£347	£387	£403	£467	£527	£587		
12	JCB3CX		£277	£299	£327	£352	£386	£413	£458			
13	M/F 50B/50XS/50HXS		£325	£351	£380	£406	£441	£471	£519			
14	CAT 428		£443	£351	£380	£406	£441	£471	£519			
15	FORD 550/555/655		£325	£351	£380	£406	£441	£471	£519			
16	N/H 85/95/LB110		£443	£351	£380	£406	£441	£471	£519			
17	CASE 580		£465	£390	£422	£449	£486	£517	£568			
18	10-14 TONNE				£857	£924	£962	£999	£1,048	£1,085		
19	14-18 TONNE				£1,007	£1,059	£1,111	£1,178	£1,242	£1,305	£1,402	
20	18-22 TONNE				£1,151	£1,192	£1,248	£1,303	£1,337	£1,372	£1,455	£1,524

Figure 41 Trade Bucket Price List

2	END USER PRICES JUNE 2013											
4	PROFILE	6"	9"	12"	18"	24"	30"	36"	42"	48"	54"	60"
5	Micro	£142	£142	£158	£178	£198						
6	"A" Up to 1.8 tonne	£157	£157	£174	£196	£218						
7	"B" 1.9 to 2.8 tonne		£205	£215	£232	£250	£269	£302				
8	"C" 2.9 to 3.8 tonne		£217	£231	£252	£266	£279	£302				
9	"D" 3.9 to 5.5 tonne		£268	£283	£297	£325	£354	£382				
10	"E" 5.6 to 8 tonne		£312	£334	£369	£413	£441	£498	£562	£625		
11	JCB3CX		£294	£318	£348	£374	£411	£439	£488			
12	M/F 50B/50XS/50HXS/850/860		£346	£373	£404	£431	£470	£501	£553			
13	CAT 428		£471	£373	£404	£431	£470	£501	£553			
14	FORD 550/555/655		£346	£373	£404	£431	£470	£501	£553			
15	N/H 85/95/LB110		£471	£373	£404	£431	£470	£501	£553			
16	CASE 580		£496	£416	£449	£466	£470	£539	£593			
17	10-14 TONNE				£944	£984	£1,025	£1,030	£1,116	£1,167		
18	14-18 TONNE				£1,072	£1,128	£1,184	£1,257	£1,323	£1,390	£1,494	
19	18-22 TONNE				£1,225	£1,271	£1,328	£1,387	£1,426	£1,461	£1,548	£1,613

Figure 42 End User Bucket Price List

Once measurements are identified and agreed for the machine in request, the sales team then identifies what size bucket the customer is in need of and if the customer is a trade company or an end user. They then proceed to check the end user or trade prices, (figures 38, 39) and before generating sales they will then pass on price information to make sure the customer is fully aware.

If customers have special requirements such as:

- Quick Hitch
- Riddle Bucket
- Ripper Tooth
- V Bucket
- Land Rake
- Grapple
- Hydraulic or Mechanical Thumbs
- Cutting Edge

All if the above attachments are made to order, the same process is required before having parts manufactured, the make model and sometimes serial number and then the hanger details and dimensions before proceeding with production.

The Final Stage and Spreadsheet is the Current Carriage cost Calculator.

	CARRIER PRICES FOR SALES		Min Price	Min Weight. kgs	Add per Kilo	Surch	New Carriage Cost	Carriage Cost with Surcharge	Con Weight Kgs.	Carriage Price	Minimum Price	AM Delivery	N/D Pre 9.00 AM	N/D Pre 10.30	SAT AM	Carriage Forward
4	Next Day		Devon & Cornwall Add £2.40 per consignment													
5	England & Wales		£10.04	30	£0.23	1.13	£10.04	£11.35	30	£14.50	£14.50	£10.50	£42.00	£40.00	£38.00	£10 (UK)
7	Mainland Scotland		£13.96	30	£0.23	1.13	£13.96	£15.77	30	£16.00	£16.00	£10.50	£42.00	£40.00	£38.00	£18 (Eire)
9	Isle Of Wight		£22.47	30	£0.23	1.13	£22.47	£25.39	30	£29.00	£29.00					
10	Express (1-2) Days	TNT														
11	Grampian & Highlands		£32.00	20	£0.98	1.13	£32.00	£36.16	20	£40.00	£40.00					
12	Northern Ireland		£32.00	20	£0.98	1.13	£32.00	£36.16	20	£40.00	£40.00					
13	Offshore Islands (Inc Scottish)		£42.00	20	£0.98	1.13	£42.00	£47.46	20	£52.00	£52.00					
14	Channel Islands		£50.00	20	£0.98	1.13	£50.00	£56.50	20	£60.00	£60.00					
15	Economy Non Guarenteed (2-5) Days	TUFFNELL														
18	Grampian & Highlands*		£32.00	20	£0.35	1.13	£32.00	£36.16	20	£40.00	£40.00					
19	Scottish Offshore/Scilley Isles/ Isle of Man		£40.00	20	£0.62	1.13	£40.00	£45.20	20	£47.00	£47.00					
20	Channel Isles*		£47.50	20	£0.75	1.13	£49.00	£55.37	22	£59.37	£57.00					

Figure 43 UK Current Cost Calculator

As shown in figure 40 the UK carriage costs are based on weights and it is set to standard so before generating a sales order the weight is to be discussed and price with customers. For England and Wales the general under 30 kg is £14.50. Weights over that will be calculated according to prices that currently exist with the couriers, and will then be accounted for. If a customer is purchasing a bucket or a steel track for example, these items normally exceed 200kg and will be too expensive to ship with this sheet.

	FRENNI.CO.UK - NEW FEB 2017									
2	AM DELIVERY -£12.00	CARRIAGE FWD TO SA POST CODE - £10								
3	TIMED DELIVERY (10AM -1PM) -£20	CARRIAGE FWD - REQUEST QUOTE							NEXT DAY	
4	SAT DELIVERY - £38.00	PREMIUM SERVICE - HIGHLANDS/ OFFSHORE / N IRE / EIRI ADD £10							Quarter	Half	Full Pallet	2 Pallets	3 Pallets	4 Pallets	5 Pallets	6 Pallets
6	Local	SA - LOCAL							£42.50	£42.50	£42.50	£83.00	£121.50	£158.00	£192.50	£225.00
8	UK CORE	AL, B, BB, BD1-22, BD97-99, BL, CH, CV, CW, DE, DN1-12, DN16-17, DN21-22, DN31-35, DN40-55, DY, EN6-8, GL1-4, GL7, GL14, GL16-20, GL50-56, HD, HP, HR1, HR4, HR6-9, HX, L, LE, LN1, LN5-6, LS, LU, M, MK, NG, NN, OL, OX, PE1-11, PE13-16, PE19, PE26-30, PE38, PE99, PR, S, SG1, SG3-6, SG13-19, SK, SN1-7, SN25-26, ST, SY1-4, SY99, TF, WA, WF, WN, WR, WS, WV							£42.00	£49.00	£57.00	£112.00	£165.00	£216.00	£265.00	£312.00
10	UK Inner	BD23-24, BH1-5, BH11-15, BH17, BS, CB 4-7, CB 24-25, CF,DH, DN14-15, DN18-20, DN37-39,EN9-11, FY, GL5-6, GL8-13, GL15, HG, HR2-3, HR5, HU, IP22, IP24-33, IP98, LA1-10, LL11-14, LN2-4, LN7-10, NE1-13, NE15-18, NE20-45, NE62-64, NE82-83, NE85, NE88, NE92, NE98-99, NP, NR1-9, NR13-22, NR32-35, NR99, PE12, PE20-21,PE31-37, PO1-6, PO11-14, PO16, RM4, RM50, SN8-16, SN38, SN99, SP10-11, SR, SY5-9, SY12-15, TS, TW15-20, WD3-5, WD17-18, WD24, WD99, YO							£42.00	£53.00	£60.00	£118.00	£174.00	£228.00	£280.00	£330.00
12	UK Outer (South/East Fringe)	BA3-16, BA20-22, BH6-10, BH18, BH21-25, BH31, BN1-3, BN5-18, BN41-45, BN50, BN52, BN88, BN99, CB1-3,CB21-23,CB8-11, CM1-6, CM11-24, CM92, CM98-99,DN36, E4, E7, E11-12, E17-18, EN1-5, HA, HP,IG, IP1-21, IP23, LA11-23, LN11-13, N2-3, N9-14, N17-18, N20-22, NR10-12, NR23-31, NW2, NW4, NW7, NW9-11, OX,PE22-25, PO7-10, PO15, PO17-22, RM1-3, RM5-20, SG, SL, SO18-19, SO30-32, SO50,53,97, SP1-9, SW14, UB, W3-5, W7, W13, WD6-7, WD19, WD23, WD25							£44.00	£53.00	£62.00	£122.00	£180.00	£236.00	£290.00	£342.00
14	Northern belt / South East	BN20-27, CM0, CM7-9, CM77, CO1-16, CR3, CR5-6, DL, ME1-10, ME14-20, ME99, NE19, NE46-49, NE61, NE65-71, RH1-6, RH8-12,RH20, SM7, SO14-17, SO20-24, SO40-45, SO51-52,SS5-17, SS22, SS99, TW1-14							£45.00	£57.00	£67.00	£132.00	£195.00	£256.00	£315.00	£372.00
16	South West Core	BA1-2,BH16, BH19-20, BR, CA, CT, GU1-20, GU26-35, GU46-47, GU51-52, GU95, ME11-13, RG, RH7-9,RH13-19, SS0-4,TA,TN,							£53.00	£57.00	£67.00	£132.00	£195.00	£256.00	£315.00	£372.00
18	Central Wales/Central Scotland	DT, EH1-14, EH27-30, EH47-49, EH51-55, EH91, EH95, EH99, EX1-18, EX24, EX31-37, FK1-7, G1-5, G9, G11-12, G20-23, G31-34, G40-46, G51-53, G58, G65-80, G90, LL15-36, LL40-41, LL57, ML1-9, SA1-20, SA31-48, SA80, SA99, TQ1-3, TQ11-14							£50.00	£59.00	£74.00	£146.00	£216.00	£284.00	£350.00	£414.00

Figure 44 Frenni Pallet Weight Costs

With the sae of a heavy item the sales member will have to search for a postcode of the customers delivery address in the left hand column and then work out the size of the items before the sale is completed. The customer will have to be satisfied with the price and the next day delivery.

Zone	ECONOMY 2 - 3 DAYS							
	Quarter	Half	Full Pallet	2 Pallets	3 Pallets	4 Pallets	5 Pallets	6 Pallets
	£37.50	£37.50	£37.50	£73.00	£106.50	£138.00	£167.50	£195.00
1	£40.00	£42.00	£49.00	£96.00	£141.00	£184.00	£225.00	£264.00
2	£40.00	£42.00	£49.00	£96.00	£141.00	£184.00	£225.00	£264.00
3	£43.00	£45.00	£52.00	£102.00	£150.00	£196.00	£240.00	£282.00
4	£43.00	£45.00	£54.00	£106.00	£156.00	£204.00	£250.00	£294.00
5	£48.00	£49.00	£61.00	£120.00	£177.00	£232.00	£285.00	£336.00
6	£48.00	£50.00	£61.00	£120.00	£177.00	£232.00	£285.00	£336.00

Figure 45 Economy Pallet Carriage cost

If the customer find the next day delivery service too expensive and find themselves in a position to wait an extra day for the required parts then the economy Frenni service is offered see figure 41.

12.4 Concluding findings

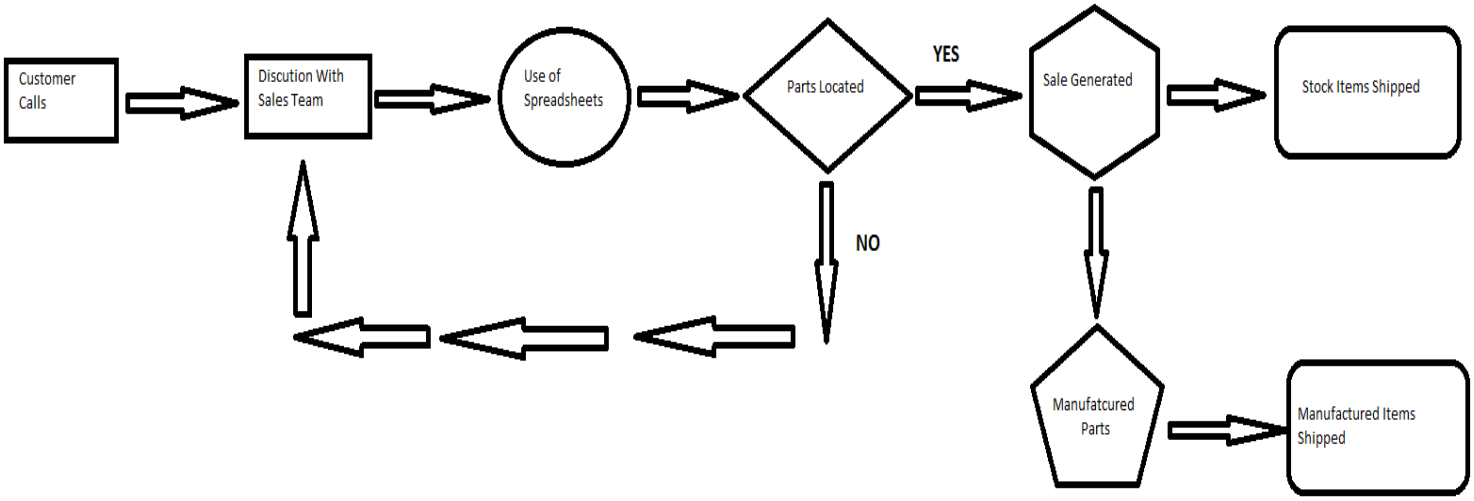


Figure 46 Current SIPOC Process Chart

The current process of searching through spreadsheets and then confirming correct parts is the reason for such delays within the sales department. There are so many variables in the different types of models of excavators, the current process is stuck between the discussions with the sales team, the use of spreadsheets and locating the parts because when the correct parts can't be located the sales team member is required to have a further discussion about the machine and type.

Instead of the process going straight to the sale and going past yes, the customer and sales team member are having to pass no and go back to the conversation stage. With this current Process it is causing the department to miss calls and therefore miss sales because of this discrepancy, it is currently costing the company £2714.41 in missed sales orders which is unacceptable and needs to be improved.

13. Improve

The Improve phase will be split into sections as follows:

- Introduction to the Improve Phase
- Proposing a new Database
- Main Page
- Page 2. Select Parts
- Cost to Implement and Payback Period
- Implementation of Parts Matrix
- Costing and Payback Time

13.1 Introduction to the Improve Phase

Improve is the fourth part to the SIX SIGMA DMAIC process, it is to focus on improving a process or to determine a solution based on the first three stages (DMA). Once the problem has been correctly examined it can therefore be changed for a better outcome. (Dr Wayne Jeffries, 2017) states " The phase of the Design, Measure, Analyze, Improve, and Control approach in which process improvement solutions determined during the first three phases are put into action. The improve phase consists of implementation of specific process improvements and measurement of any resulting changes in output."

For this improvement phase it will be based on generating the Parts Matrix in order to make sales easier, quicker and more efficient within the sales department at Evans and Reid. This Parts Matrix will be quick and easy to use and improve quality for the customer and company. (Lucy Cole, 2016) States "Act of enhancing or making better in terms of quality, value or usefulness. This can be by making ideas, objects or processes more desirable by adding or removing components".

For the improvement to be made, a cost and time scale must be found in order to progress further. It also has to be established how the parts matrix will operate and how it will be accessed in the company and it has to be proposed how it will actually function.

13.2 Proposing a new Database

The current process has been analyzed and shown, it is clearly time consuming and very confusing for customers and sales team employees with a big loop continuing of required further information which delays the sale process. Gathering new information or requiring dimensions from customers to check which type of part need to be located has proved to be challenging.

The parts matrix or database proposed will work as followed:

13.2.1 Main Page

The front or main page of the new database will ask for the user to type in a machine make, then the model and finally the serial number. As the serial number is unique to each machine, the same as a license plate to an automobile. The user can then check with the customer that the year of manufacture is correct to the machine they have. This will be displayed on the screen after the serial number is entered.

As the user types in the machine, the models will show and then it can be selected and if the model that the customer is requiring does not appear on the data base it saves a lot of time searching through spreadsheets where sales team members can then ask dimensions and what they require and get the parts manufactured. Again this will save a lot of time and help prevent missed calls.

Once the machine has been selected and the year has been agreed on the model or model range then the Evans and Reid employee can continue on to the next stage of the Matrix.

13.2.2 Page 2. Select Parts

Once the correct model of machine has been established and located the next stage will be to select from the following list:

1. Pins, Bushes and Seals
2. Undercarriage Parts and Motors
3. Buckets and Attachments
4. Rubber and Steel Tracks and Track Attachments

The customer will then explain what they require for their excavator, the sales team personnel will then need to select what the product ranges under.

If the customer asks for a Dipper End Kit for a JCB 8014 Serial Number Range 01156000 to 01156999 then the Parts Matrix will produce the information

JCB	8014	01156000 to 01156999		88041

Figure 47 JCB 8014 Dipper End Kit

The sales employee can then click on the part link which will show all parts that are listed in the Dipper End kit and check if full kits are in stock. If not the details will enable users to check if there is the quantity to make a kit and also all engineering drawing of the parts in case of customer enquiries to check bucket pin diameters and lengths for example.

A list of prices will also be on display next to the parts such as

- 15% Dealer Price
- 10% Dealer Price
- 5% Trade Price
- End User Price

It will Speed up the sales Process with Dipper end kits as there will be no searching for drawings or stock as it will already be there.

If the Customer asks for a Top Roller, Bottom Roller, Front Idler and a Sprocket for a Hitachi EX80-5 Serial Number 50001 onwards

Hitachi	EX80-5	50001 up		30006	40111	50058	60082

Figure 48 Hitachi EX80-5 Undercarriage Parts

Once the machine and serial number has been entered these parts will show up and the user can select one or all of them to tally up a cost and the dimensions to confirm, the customer can then discuss what they require and how many of each component. Again the dimensions and drawings and price list will be shown next to all the parts and then will enable the sage sale to run smoothly as all the Evans and Reid Sales Team would need to do is to type in the part number into the customer account and process the sale. This will also speed up time on the undercarriage sales in the company.

If a Customer was to request a Rubber, Steel track or a track chain or a track pad for a JCB 8080ZTS (Zero Tail Swing) Serial Number 01442000-01443999

JCB	8080ZTS	01442000-01443999	10194	20036(39)	20047(39)	21005	21011	21023

Figure 49 JCB 8080ZTS Tracks and Track Attachments

Once machine make model and serial number entered and the customer requests a track or track adjustment the parts will show on screen such as Figure 45. The measurements and pricelist will also appear then the customer can confirm the links pitch and width of tracks. The sales personnel can then confirm prices and attachment prices if needed. This will speed up searching for certain machine attachments and requirements through drawings as they will all be available on the same page.

When a bucket or an attachment is requested to be made for an excavator such as a Volvo EC25 Excavator, all of the same models will take the same buckets and attachment so a serial number in not required for this selection available on the database. Once the machine is entered there will be various pieces of information.

Volvo EC25	35	125	170	SQ	EC25

Figure 50 Volvo EC25 Part number and hanger Dimensions

After the machine has been confirmed the results on the next page will show hanger dimensions to confirm and part number to process in Sage. Once the customer is satisfied there will then be a selection of bucket sizes.

B Profile	6"	9"	12"	18"	24"	30"	36"

Figure 51 B Profile Bucket Sizes

The next option would be for the customer to confirm the size or sizes they require and then also state the quantity of the sizes needed.

"B" 1.9 to 2.8 tonne		£183	£192	£208	£224	£241	£270

Figure 52 B Profile Bucket Trade Prices

"B" 1.9 to 2.8 tonne		£205	£215	£232	£250	£269	£302

Figure 53 B Profile End User Bucket Prices

The Prices will be then displayed and confirmed ready to process the sales order, this will however speed up the sales process as the information that is required is all available from the same Matrix and there is no searching required. There will also be engineering drawing available to talk customers through or send via email.

There will be an Option on each machine in the matrix Buckets section for attachments. This will then enable you to select from the following:

- Cutting Edges
- Grapple
- Land Rakes
- Quick Hitches
- Riddle Buckets
- Thumbs
- V Buckets

If a Customer requests a Cutting Edge for the B Profile Excavator the following list and Price will appear.

SIZE	SELLING PRICE PER METRE
200mm x 20mm	£87.73
250mm x 25mm	£140.27
250mm x 30mm	£158.63
150mm x 20mm	£67.60
STANDARD CUTTING EDGE	
100x12	£20.00
150x16	£40.40
150x20	£45.34
200x20	£51.61
200x25	£62.61
250x25	£76.39
300x30	£99.00

Figure 54 Cutting Edge Prices and Size

The customer can then decide what size thickness and length for the bucket they have and also the top four are heat treated, that is important to specify to make sure the customer is fully aware and may need if for more intricate work.+

When a customer request a grapple for the same machine being a B profile, the user will click on the link and this price list will appear.

GRAPPLE PRICES, August 2011	End User				Trade Price			
PROFILE	**3+2 Grapple**		**4+3 Grapple**		**3+2 Grapple**		**4+3 Grapple**	
"A" Up to 1.8 tonne	£841	Drw	£881		£789	Drw	£832	
"B" 1.9 to 2.8 tonne	£908		£961		£848		£901	

Figure 55 Grapple List and Prices

Once it has been established if a 3 + 2 grapple is required or a 4 + 3 grapple the prices and drawings are available to discuss dimensions and what the use is for. The difference between the two are just the size, the bigger one is for more heavy duty whilst the smaller is for pulling weeds and general clearance.

With any questions that the customer will have or queries they will be answered without searching through other software to retrieve what they seek therefore saving more time and increasing productivity for the sales process.

If a Customer requested a Land rake for a B profile machine, the user would have to click on the link and the following list would appear.

END USER PRICE		
PROFILE	**5T**	**Add per tine**
"A" Up to 1.8 tonne 15mm tines	£301.12	£38.57
"B" 1.9 to 2.8 tonne 20mm tines	£331.45	£46.75
"C" 2.9 to 3.8 tonne 20mm tines	£359.50	£54.53
"D" 3.9 to 5.5 tonne 25mm tines	£481.60	£54.93
"E" 5.6 to 8 tonne 25mm tines	£486.77	£54.53
JCB3CX 25mm tines	£486.77	£54.53
M/F 50B/50XS/50HXS/850/860	£486.77	£54.53
CAT 428 25mm tines	£514.82	£54.53
FORD 550/555/655 25mm tines	£514.82	£54.53
N/H 85/95/LB110 25mm tines	£514.82	£54.53
CASE 580 25mm tines	£625.84	£54.53
10-14 TONNE 30mm tines	£1,070.21	£116.87
14-18 TONNE 40mm tines	£1,279.39	£140.24
18-22 TONNE 40mm tines	£1,363.93	£155.43

RAKE CALCULATOR

ALL MEASUREMENTS NEED TO BE IN MM!!

Width of Rake = 600

Width of Tines = 25

Gap Between Tine = 100

Number of Tines = 6

Figure 56 End User Grapple Price List

TRADE PRICES		
PROFILE	**5T**	**Add per Tine**
"A" Up to 1.8 tonne 15mm tines	£274.24	£29.22
"B" 1.9 to 2.8 tonne 20mm tines	£302.24	£35.06
"C" 2.9 to 3.8 tonne 25mm tines	£327.95	£40.90
"D" 3.9 to 5.5 tonne 25mm tines	£428.39	£46.75
"E" 5.6 to 8 tonne 25mm tines	£443.53	£46.75
JCB3CX 25mm tines	£443.53	£46.75
M/F 50B/50XS/50HXS/850/860	£443.53	£46.75
CAT 428 25mm tines	£468.07	£46.75
FORD 550/555/655 25mm tines	£468.07	£46.75
N/H 85/95/LB110 25mm tines	£468.07	£46.75
CASE 580 25mm tines	£569.74	£46.75
10-14 TONNE 30mm tines	£975.54	£87.65
14-18 TONNE 40mm tines	£1,164.87	£105.18
18-22 TONNE 40mm tines	£1,243.55	£116.87

RAKE CALCULATOR

ALL MEASUREMENTS NEED TO BE IN MM!!

Width of Rake = 1000

Width of Tines = 20

Gap Between Tine = 100

Number of Tines =

Figure 57 Trade Users Price List

The customer can tell you how many tines and the tine diameter they require than the price can be calculated accordingly. They decide the full width of the rake, then the diameter and the calculator tells you how many tines are required so the calculation can be made after 5 tines and a price can be discussed. This process will also save time in the process due to the fact all the information needed will be in one place.

A customer that requires a quick hitch for a B Profile machine will need to be advised on the type.

PRICE INCLUDES TEST				
PROFILE	QUICK HITCH		SEMI QUICK HITCH	
	Trade	END USER	Trade	END USER
"A" Up to 1.8 tonne	£396	£435.00	£347	£410
"B" 1.9 to 2.8 tonne	£452	£520.00	£375	£440
"C" 2.9 to 3.8 tonne	£537	£600.00	£456	£520
"D" 3.9 to 5.5 tonne	£638	£700.00	£541	£610

Figure 58 Quick Hitch Types and Prices

When a customer requires a quick hitch for their machine. The sales employee must ask if they require a Semi Quick hitch (Which is a spring lock quick hitch and is a quick release) or a normal mechanical quick hitch. A Quick hitch is used to attach buckets the end of the dipper arm on excavators. Once this is established the prices can be confirmed and passed across. The prices once again vary for trade customers and end users. This process will speed up in order of information passing back and forth.

When a customer request a riddle bucket, the sales member will click on the link for it and the following sizes and prices will appear.

	Riddle Buckets			End User					Riddle Buckets			Trade Price			
	Width at the top bars across at 3" gaps								Width at the top bars across at 3" gaps						
PROFILE	18"	24"	30"	36"	42"	48"	54"	Bar Dia.	18"	24"	30"	36"	42"	48"	54"
"A" Up to 1.8 tonne	£304	£325	£363					20mm	£260	£277	£309				
"B" 1.9 to 2.8 tonne	£337	£352	£370	£401				25mm	£288	£301	£316	£341			
"C" 2.9 to 3.8 tonne		£380	£402	£431				25mm		£325	£342	£367			
"D" 3.9 to 5.5 tonne		£435	£463	£491				25mm		£371	£395	£418			
"E" 5.6 to 8 tonne			£546	£601	£661			30mm			£465	£512	£564		

Figure 59 Riddle Bucket Sizes and Prices

Riddle buckets are used for dredging and clearing planta and stones from earth, they are mainly used for sorting. Once the size of the machine is established the sales team can proceed to inform the customer of the sizes available for the riddle buckets and prices for each. The customer can then decide which on is best for the purpose and use, all manufacturing prices will be available and dimensions for each size so there will be time saved in this process due to all information available that's is needed to discuss with the buyer.

If a customer requests a thumb for their excavator then the sales team select Thumbs and the following information will appear.

MECHANICAL THUMB PRICES November 2014			Typical Width	Typical Length
PROFILE	**End User**	**Trade Price**		
"Micro" 0.8 tonne	£350.00	£312.70	180mm	354mm
"A" Up to 1.8 tonne	£494.00	£413.00	250mm	537mm
"B" 1.9 to 2.8 tonne	£562.00	£445.00	290mm	625mm
"C" 2.9 to 3.8 tonne	£615.00	£472.00	230mm	664mm
"D" 3.9 to 5.5 tonne	£684.00	£541.00	304mm	735mm
"E" 5.6 to 8 tonne	£779.00	£625.00	350mm	1100mm
JCB3CX	£779.00	£625.00	350mm	1100mm
M/F 50B/50XS/50HXS/850/860	£794.00	£640.00	350mm	1100mm
CAT 428	£794.00	£640.00	350mm	1100mm
FORD 550/555/655	£794.00	£640.00	350mm	1100mm
N/H 85/95/LB110	£806.00	£652.00	350mm	1100mm

Figure 60 Mechanical Thumb sizes and Prices

HYDRAULIC THUMB PRICES November 2014			Curved		Straight	
PROFILE	**End User**	**Trade Price**	Typical Width	TypicalLength	Typical Wi	Typical Length
"Micro" 0.8 tonne Not practical to manufacture						
"A" Up to 1.8 tonne	£526.82	£437.25	250mm	670mm	250mm	518mm
"B" 1.9 to 2.8 tonne	£630.70	£481.24	290mm	777mm	230mm	643mm
"C" 2.9 to 3.8 tonne	£698.54	£539.54	230mm	863mm	230mm	748mm
"D" 3.9 to 5.5 tonne	£842.70	£632.82	304mm	1025mm	304mm	853mm
"E" 5.6 to 8 tonne	£938.10	£735.64	350mm	1100mm	350mm	981mm
JCB3CX	£938.10	£735.64	350mm	1100mm	350mm	981mm
M/F 50B/50XS/50HXS/850/860	£951.88	£751.54	350mm	1100mm	350mm	981mm
CAT 428	£951.88	£751.54	350mm	1100mm	350mm	981mm
FORD 550/555/655	£951.88	£751.54	350mm	1100mm	350mm	981mm
N/H 85/95/LB110	£964.60	£763.20	350mm	1100mm	350mm	981mm

Figure 61 Hydraulic Thumb sizes and Prices

Once it has been established out of the two types, mechanical thumb or hydraulic then the sizes and the price can be configured. The dimensions are available on request and the price list for each profile. The hydraulic thumb is more expensive and used for mainly construction and breaking walls but they are still popular even though most customers choose mechanical thumbs. This saves time because sales team members are not searching through lists to answer questions and requests.

When a customer requests a V bucket the following sizes and prices will appear.

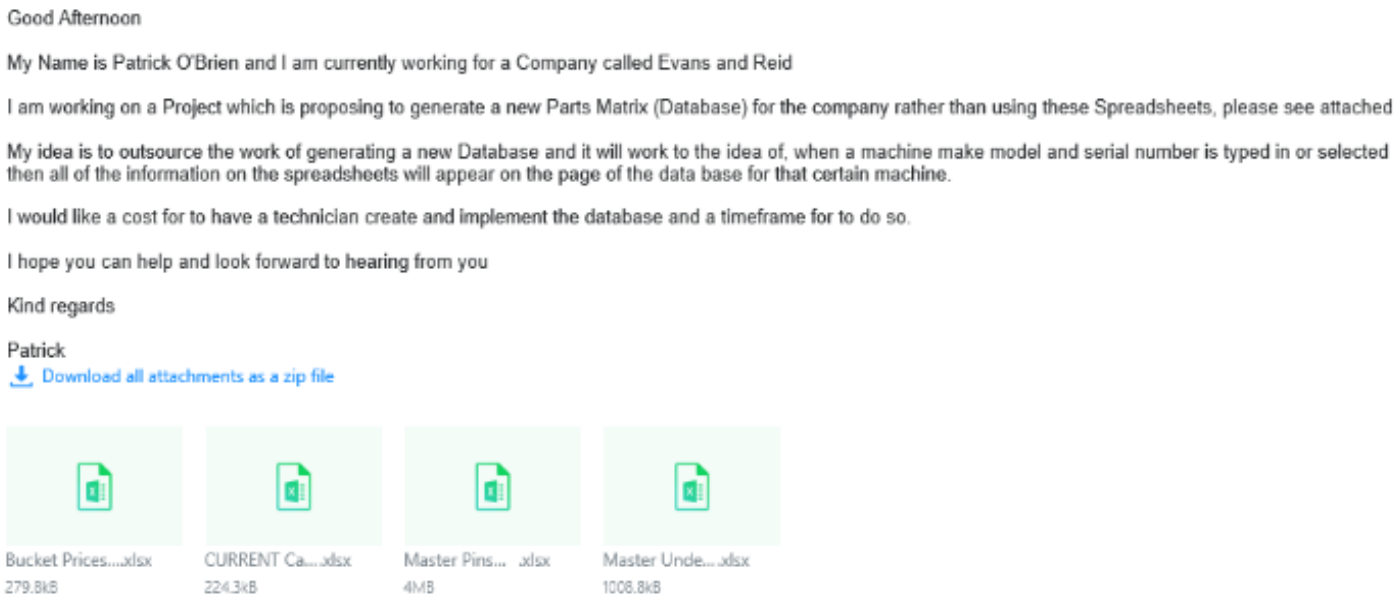
		V Buckets		End User							V Buckets		Trade Price				
PROFILE	9"	12"	18"	24"	30"	36"	42"	48"		9"	12"	18"	24"	30"	36"	42"	48"
"A" Up to 1.8 tonne	£282	£298	£319	£341	£381					£240	£255	£273	£291	£325			
"B" 1.9 to 2.8 tonne	£327	£337	£354	£369	£388	£421				£285	£287	£303	£316	£332	£363		
"C" 2.9 to 3.8 tonne	£348	£366	£384	£399	£421	£452				£297	£310	£327	£341	£363	£386		
"D" 3.9 to 5.5 tonne		£400	£429	£457	£486	£514					£342	£367	£389	£415	£438		
"E" 5.6 to 8 tonne		£466	£503	£545	£574	£631	£694	£754			£399	£429	£465	£488	£538	£593	
JCB3CX		£466	£503	£545	£574	£631	£694	£754			£399	£429	£465	£488	£538	£593	
M/F 50B/50XS/50HXS/850/860		£466	£503	£545	£574	£631	£694	£754			£399	£429	£465	£488	£538	£593	
CAT 428		£493	£528	£571	£600	£657	£721	£781			£425	£456	£492	£515	£564	£618	
FORD 550/555/655		£493	£528	£571	£600	£657	£721	£781			£425	£456	£492	£515	£564	£618	
N/H 85/95/LB110		£493	£528	£571	£600	£657	£721	£781			£425	£456	£492	£515	£564	£618	
CASE 580		£598	£635	£677	£706	£763	£826	£886			£532	£562	£597	£622	£671	£725	
10-14 TONNE			£1,145	£1,184	£1,224	£1,263	£1,315	£1,366				£1,032	£1,068	£1,104	£1,139	£1,186	£1,233
14-18 TONNE			£1,270	£1,326	£1,383	£1,454	£1,522	£1,692				£1,146	£1,197	£1,247	£1,312	£1,373	£1,526
18-22 TONNE			£1,518	£1,566	£1,629	£1,692	£1,732	£1,772				£1,371	£1,413	£1,471	£1,529	£1,564	£1,600

Figure 62 V Bucket Sizes and Prices

V Buckets are used for digging small trenches for pipes and land lines and mainly used by power companies and welsh water. Other customers use them for to dig around farms and to create a base for building walls. The customer will have the option of sizes for each profile and then the prices for trade and end user customers will also be available in one place which again will also speed up the sales process and increase productivity.

13.3 Cost to Implement and Payback Period

For this Database to be Implemented the work would have to be outsourced. It would have to be done by a company who specialise in software developments and therefore it would not interrupt current workloads as Evans and Reid would still have full staff capacity and not be a man down. A local software consultant was contacted to see if this service is something that they can provide.


Good Afternoon

My Name is Patrick O'Brien and I am currently working for a Company called Evans and Reid

I am working on a Project which is proposing to generate a new Parts Matrix (Database) for the company rather than using these Spreadsheets, please see attached

My idea is to outsource the work of generating a new Database and it will work to the idea of, when a machine make model and serial number is typed in or selected then all of the information on the spreadsheets will appear on the page of the data base for that certain machine.

I would like a cost for to have a technician create and implement the database and a timeframe for to do so.

I hope you can help and look forward to hearing from you

Kind regards

Patrick

Download all attachments as a zip file

Bucket Prices....xlsx 279.8kB

CURRENT Ca....xlsx 224.3kB

Master Pins... .xlsx 4MB

Master Unde....xlsx 1008.8kB

Figure 63 Patrick O'Brien Email Sent for Parts Matrix implementation

All information was sent across to the consultant including the spreadsheets, see figure 59. The current carriage cost calculator will not be in the new database as the couriers send us these in an excel version each and then the sales members just copy them across to update the current version on the main server.

13.3.1 Implementation of Parts Matrix

Hi Patrick,
Thank you for your enquiry, I have taken a look at the attached spreadsheets and this is something we can help with.

Our hourly rate is £30, and I estimate that this project will take up to 600 hours over 6 months to complete.

This will include an analysis of the business processes, development and implementation of the software and also multiple training sessions and a user guide for reference.

This would bring the total cost to £18,000. If the software would then need to be updated after implementation there would be a one-off cost of £1000.

If this is a suitable solution for your company then please let me know and we can arrange a formal consultation.

Many Thanks
Kyle Harris

Harris Software Solutions.

Figure 64 Kyle Harris Email Reply Parts Matrix Implementation

The consultants reply with timeframe was more than was expected although the information and the instrument is a delicate piece of software. Luckily a local company are able to carry out the implementation and are available to as soon as required. As seen in Figure 61, the training and implementation is all in the fixed price. Now the costing and payback time will have to be calculated to see the figures and money saving calculations.

13.3.2 Costing and Payback Time

The cost to implement the Parts Matrix is £18000 plus an initial £1000 to produce the software and to update it which will then be a self-sufficient programme to run with no further updates.

With a Monthly cost of:

Monthly Cost
£58,812.21

While the Parts Matrix is being produced the company will be losing the potential in sales revenue:

6 Months Cost
£352,873.26

While the Parts Matrix is being produced the £19,000 must be added to this figure:

Total Cost
£371,873.26

With a yearly cost of losing sales due to potential missed calls;

Yearly Cost
£692,174.51

The Payback period in months after the parts matrix being implemented will be:

Pay Back Time
6.44704342

14. Control

As this is a project proposing a new Parts Matrix and not actually physically implementing the database, there are certain control measures that can be put in perspective for to do so. (Michael, 2016) States that “The last phase of Six Sigma’s DMAIC model is the Control phase. The focus of this stage is to make sure that the action item created in the Improve phase is well-implemented and maintained”

The data base will need to be regularly updated, such as the spreadsheets are updated daily and saved as a master copy to the main server at Evans and Reid. A similar procedure will need to be carried out on the Parts Matrix. The Director John Evans is the person who is in charge of gathering new information on all aspects of excavators so the likely duty will be undertaken by him.

Figure 60 states that all employees will undertake training and help to secure knowledge of the software. (Michael, 2016) Also states that “It is Essential that all Personnel who are directly affected by the project shall be trained and monitored as well”.

Another control feature could be to announce the changes on the company website and newsletters and leaflets could be sent to the main dealers and main trade customers so they are aware of changes and can use the full capacity of their time when getting information off end user customers to get the correct and appropriate information. The Production and manufacturing department can also be met with to take any suggestions for controlling time wasted in this stage of the sales process.

15. Conclusion

With the Problem that was defined and estimated to be £283.33 a sales order and every missed call meant missing out on that amount of money generated. Which when multiplied by the mean 4.75 missed calls a day is £1,345.81 a day as the phones were not answered. The real sales call was found in the measure phase to be £2,714.41 which is more than originally thought and until it was analyzed in detail the actual size of the problem was not common knowledge.

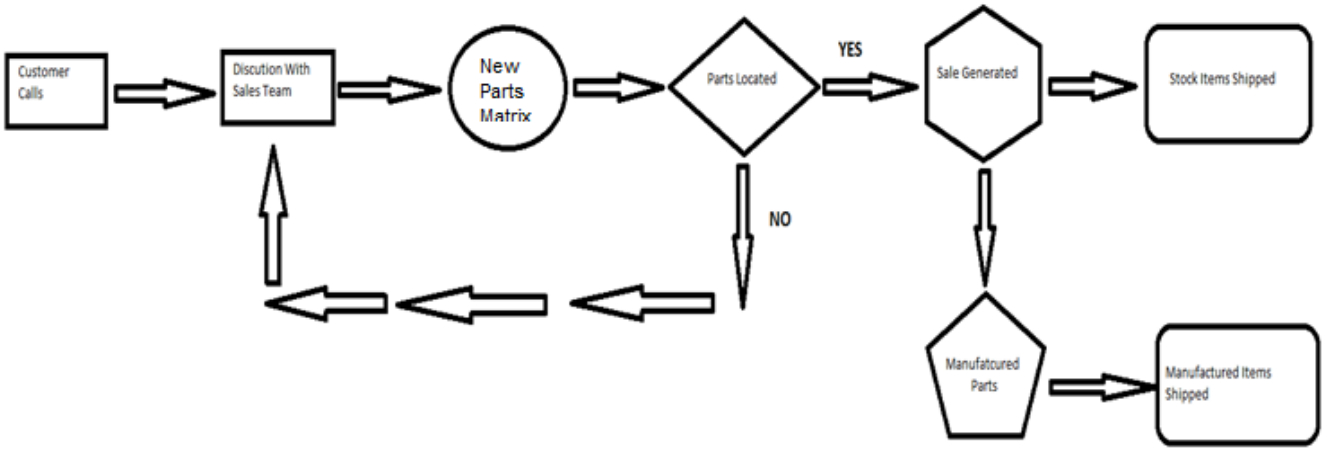


Figure 65 New Process Chart

With outsourcing the Parts Matrix to be implemented the time and money that will be saved in the final outcome will benefit Evans and Reid significantly, in Figure 61 it shows the new process map. This process will be improved and mainly the parts will be located without any issues, this will save more time and make phone calls shorter therefor missing less. This will reduce the loop significantly of not locating parts and having to keep the discussion of the machines and parts ongoing.

16. Recommendations for further work

If this work was continued, recommendations would be:

- Carry out and Implement the Parts Matrix
- Compare costings of outsourcing and buying a Package to carry out in house
- Learn more about various software's to use
- Look into different types of processes
- Consult business advisers and consultants for project advice

All of the above work can be carried out if this project is accepted by the owners and managers at Evans and Reid. This new process is clearly going to save a lot of money and generate more revenue through sales making more profit for the business.

17. Bibliography

Allison Catherine. (2017, 03 20). *ANALYZE*. Retrieved from Six Sigma Material: http://www.six-sigma-material.com/Analyze.html

DENT, J. J. (2016, 05 14). *Diagnostic engineering requirements*. Retrieved from www.computerhistory.org: https://www.computer.org/csdl/proceedings/afips/1968/5071/00/50710503.pdf

Dr Benjamin Parsons. (2016, 01 12). *Six Sigma - Analyze Phase*. Retrieved from Tutorials Point: https://www.tutorialspoint.com/six_sigma/six_sigma_analyze_phase.htm

Dr Dracov Gulec. (2015, 07 11). *5 Key Deliverables of the DMAIC Process Measure Phase*. Retrieved from Master of Project Academy: https://blog.masterofproject.com/dmaic-process-measure-phase/

Dr Mark Willis. (2014, 06 19). *Six Sigma DMAIC – Measure Phase*. Retrieved from What is SixSigma . Net: http://www.whatissixsigma.net/six-sigma-dmaic-measure-phase/

Dr Tarik Taikgia. (2018, 02 08). *What operating at a loss means*. Retrieved from Business.Govt.NZ: https://www.business.govt.nz/tax-and-accounting/business-finance-basics/what-to-do-if-your-business-is-operating-at-a-loss/

Dr Wayne Jeffries. (2017, 03 01). *DMAIC Improve Phase*. Retrieved from Business Dictionary.com: http://www.businessdictionary.com/definition/DMAIC-improve-phase.html

Dr. Mikel Harry. (2017, 12 12). *S.M.A.R.T.* Retrieved from iSixSigma: https://www.isixsigma.com/dictionary/s-m-a-r-t/

Evans, J. (2017). EMployee Handbook Evans and Reid. *About the Business*, 2.

Goldratt, E. M. (2004). *The Goal : a Process of Ongoing Improvement.* Great Barrington: North River Press.

Harris, A. (2013, 10 16). *6 unexpected ways Six Sigma can benefit your company*. Retrieved from PEX Process Excellence Network: https://www.processexcellencenetwork.com/lean-six-sigma-business-transformation/articles/6-ways-six-sigma-can-benefit-your-company

Hayes, J. (2010). *The Theory and Practice of change Management.* Hampshire: Macmillan Publishers Limited.

Heidi Wiesenfelder. (2005, 08 20). *The Six Sigma DMAIC Process*. Retrieved from Bright Hub Project Management : https://www.brighthubpm.com/six-sigma/25326-dmaic-phase-two-measuring/

Ivor Jones. (2016, 02 15). *The Real Cost of Losing Customers*. Retrieved from Think Sales: https://www.thinksales.co.za/the-real-cost-of-losing-customers

James Madden. (2014, 04 18). *Analyze – Phase 3 (of 5) of Lean Six Sigma*. Retrieved from Go Lean Six Sigma: https://goleansixsigma.com/analyze-phase-3-of-5-of-lean-six-sigma/

James Mallinson. (2017, 08 03). *Getting Things Done... faster* . Retrieved from productivemag.com: http://productivemag.com/5/getting-things-done-faster

James Manktelow. (2016, June 15th). *Lewin's Change Management Model*. Retrieved from Mind Tools Essential Skills for an Excellent Career : https://www.mindtools.com/pages/article/newPPM_94.htm

Jasmine James. (2012). Define the Problem. *DMAIC: The 5 Phases of Lean Six Sigma*, 3.

Jean Scheid. (2011, 06 29). *DMAIC Phase 2: Measure*. Retrieved from Bright Hub Project Management: https://www.brighthubpm.com/six-sigma/25326-dmaic-phase-two-measuring/

Joseph Martle. (2014, 12 05). *Lean Six Sigma*. Retrieved from APMG International: https://apmg-international.com/product/lean-six-sigma

Lucy Cole. (2016, 06 18). *Business Dictionary*. Retrieved from Quality Improvement: http://www.businessdictionary.com/definition/improve.html

Michael, D. L. (2016, 05 10). *Six Sigma DMAIC – Control Phase*. Retrieved from What Is Six Sigma: http://www.whatissixsigma.net/six-sigma-dmaic-control-phase/

Ross Beard. (2013, 10 15). *The Complete Guide to Customer Expectations.* Retrieved from Client Heartbeat: http://blog.clientheartbeat.com/customer-expectations/

Ruth Davies. (2017, 09 8). *The Analyze Phase of DMAIC*. Retrieved from 6Sigma.us: https://www.6sigma.us/rca/analyze-phase-dmaic/

Simon, K. (2017, 12 13). *SIPOC Diagram*. Retrieved from ISixSigma: https://www.isixsigma.com/tools-templates/sipoc-copis/sipoc-diagram/

Stuart James. (2017, Decemcber 14). *Critical Customer Requirement (CCR)*. Retrieved from Survey Methods: https://surveymethods.com/glossary/critical-customer-requirement/

Zenjiro Imaoka. (2008, September 02). *Bottleneck (Constaint)*. Retrieved from Lean - Manufacturing - Japan: http://www.lean-manufacturing-japan.com/scm-terminology/bottleneck-constraint.html