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Lean Thinking: Removing Waste and Adding Value in the Public  
Sector  
A Case Study of  
Cambridgeshire Constabulary, UK

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Lean Thinking: Removing Waste and Adding Value in the Public Sector.  
A case Study of  
Cambridgeshire Constabulary, UK

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# ABSTRACT

The idea of lean has provided enormous benefits since its emergence especially in manufacturing where it originated. Through adding value, removing waste and continuous improvement, private organisations have improved their process flow as well as quality of their services. This application has prevailed predominately in the private sector. There is a need to adopt this concept to other sectors in order to reap such benefits. In the public sector, where members of the public are demanding improved services as well as responsible government, it is highly important that processes and services are effective and efficient. Lean thinking in the public sector remains odd. However, the benefits it will bring are enormous when applied. As such, a number of questions arise; can lean really be applied to public sector? How can it be applied? What part of lean is applicable? What lessons can be benefited from others that have implemented lean? Answers to these questions require both theory and practice. Thus, this research project seeks to blend the two and use the police service as a case study of the public sector.

It is in this light that this thesis aimed to assess the applicability of lean thinking in the public sector with the view of improving customer services and to draw comments on what part of lean is useful and what not. In doing so, lean tools; Value stream mapping and Muda analysis were used. An As-Is model for the current business area under review of the case study was developed and non-value adding activities were identified and eliminated. A new improved To-Be model was designed and acceptance reviewed. Based on the review acceptance of the new improved model, comments were drawn on if lean concept is applicable in the public sector.

Keywords:

Lean Manufacturing, Public Services, Service Operations, Police.

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# 1 Introduction

Over the years, manufacturing organisations have reaped enormous benefits from the implementation of lean thinking. Through adding value, reducing waste and continuous improvement, manufacturers have improved their process flow as well as the quality of their services. However, not much of this concept has been applied to the public sector. As the public demand much improved services from the government, the need to adopt lean thinking cannot be overemphasized.

In its simplest form, *Lean* is the art of “getting the right things to the right place, at the right time, in the right quantities, while minimising waste and being flexible and open to change” (NHS, 2009). This thinking “provides a way to specify value, line up value-creating actions in the best sequence, conduct these activities without interruption whenever someone requests them, and perform them more and more effectively” (Womack and Jones, 2003).

One then wonders, can this concept be applied to other sectors apart from manufacturing? Miller (2005) asserts that it is “not just a manufacturing concept but a management strategy that is applicable to all organisations because it has to do with improving processes”. Radnor et al 2006 bring to a close that “there is little doubt of the applicability of Lean to the public sector...many of the processes and services in the public sector can gain greater efficiency by considering and implementing aspects of Lean”. If so, what parts of lean is useful in public service and what not?

It was in this light that the research project will look at the applicability of lean thinking in the police force as a case study to simplify processes and improve prompt delivery of service and increase satisfaction to its customer/public. Moreover, it will see what part of lean is useful in public service and what not.

Effective, efficient and responsive policing is the presumption of the public. The application of lean in the police service will yield (Knowledge, 2008):

- Improve citizen focus and customer outcomes
- Improve community and customer outcomes
- Improve productivity and efficiency
- Reduce unnecessary bureaucracy and costs
- Reduce delays and lead times
- Empower staff to lead innovation. Improve morale
- Improve use of resources and value for money

## **1.1 Statement of Problem**

Cambridgeshire Constabulary (the case study) has embarked on a project to modify its service delivery in its drive to delivering a citizen-focused service to meet the needs and expectations of its customers. Citizen Experience Programme (CEP) was the project established with the aim of delivering a sustainable transformation that will enable the constabulary to achieve greater level of satisfaction and confidence. To accomplish this, the constabulary identified it need to redesign its First Contact and Initial Response business area by spotting wasteful activities that does not add value and design them out.

## **1.2 Project Aim and Objectives**

The aim of the project was to assess the applicability of lean methodology in the public sector with the goal of improving customer services. And to draw comments on what part of lean is useful in public service and what not.

In order to realise this aim, the following objectives were set:

1. Point out the current process of the contact centre by mapping out the whole value stream with the vision of identifying existing core business processes requiring improvement.
2. Apply lean methodology to highlight and eliminate wastes in view of improving the existing processes.

3. Come up with a new improved model on existing process.
4. Review acceptance of the new improved model.
5. Draw comments on what part of lean is useful in public service and what not based on the acceptance review.
6. Demonstrate the applicability of adopting lean thinking in public sector.

### **1.3 Project Approach**

The research was a collaborative work between Cranfield University and Cambridgeshire Constabulary. The data gathering phase which involved workshops, observation and interviews was undertaken at Cambridgeshire Constabulary while the second phase of analysis and report writing was accomplished at Cranfield University.

The kick off point for the project was a 3 months placement at Cambridgeshire Constabulary which constitute the data gathering as well as the first part of the analysis phase. Following is an overview of how the research project was structured in line to achieve the set objectives:

#### **TASK 1 - Identify the As-Is Processes of the Contact Centre**

The first task of the research project involved the identification of the current state of the contact centre processes. A great deal of time was spent on running workshops and observations in the work streams so as to develop, observe and validate exactly how the processes work. The processes were mapped out using Value Stream Mapping (VSM) analysis.

#### **TASK 2 – Application of Lean Tools to Improve Process**

After mapping out the current state of the processes, the lean tool *muda* was used to identify Non Value Adding waste. *Muda* means “waste” in Japanese and it is any “human activity which absorbs resources but creates no *value*” (Womack and Jones, 2003).

### **TASK 3 – Process Redesign**

Having now mapped out the process As-Is and identified the value adding process as well as eliminate all the wastes, we now redesigned the process to create the ‘To-Be’ service delivery model to meet the customers’ requirements. The flow of the process was ensured to be fully optimized. New To-Be Value stream maps were created and validated through the team judgments.

### **Task 4 – Review Acceptance of To-Be Model**

This task involves the review of the new improved process model created by engaging the constabulary staff in going over the new model and thus gathering data.

### **TASK 5 – Assessing the applicability of lean thinking in the public sector.**

The adoption of lean thinking has already produce enormous benefits in the manufacturing sector. In this stage it was aimed to demonstrate if lean thinking can be applied to the public sector. The data collected during the review acceptance of the To-Be model was used to assess what part of lean is useful in public service and what not.

## **1.4 Thesis Structure**

This thesis originated from the three-month project conducted at Cambridgeshire Constabulary headquarters in Huntingdon. It was designed to address the problem acknowledged above and spread over seven chapters that link up the overall work carried out.

Chapter 1 fine point the background of the problem coupled with rationale and objectives of the project, including the research project was approached and the tasks carried out. It ends up with presentation of how the thesis was structured.

Chapter 2 was dedicated to the review of the ongoing up to date literature on public sector and lean methodology. It starts by presenting a brief introduction on the characteristics of the public sector then what lean is and a stint history of how the lean concept emerged a discussion of its success and a review of its applicability in the

public sector. It introduces the reader to the various lean tools and techniques. The chapter concludes with a summary of current stand of lean in public sector.

Chapter 3 provides thorough overview of the sponsoring organisation Cambridgeshire Constabulary coupled with the Citizen Experience Programme where this project branched out from and the First Contact and Initial response business areas which was the sole focus of this research project.

Chapter 4 presents how the research project was carried out. It starts by describing the data gathering phase conducted at Cambridgeshire Constabulary. The lean tools and techniques used for the analysis. The chapter concludes by presenting the current state (As-Is) of the process of the business area under review. This process was then been employed lean tools to remove any non adding value and the process redesigned and come up with a new improved process model which is presented at Chapter 5. Also, this chapter discusses the new improved process model designed. It gives critically looks into the model and gives the pros and cons.

Chapter 6 talks about the conclusion drawn upon from the research project along with recommendations given by the author from the process model and discussions as well as avenues for future research. A self reflection on the learning experience during the project is also carried out.

## 2 Literature Review

This section of the thesis discusses in depth literature on public sector and lean thinking. Therefore, the chapter will look into what is public sector, what lean is, how it originated and the application of lean in organisations as well as tools and techniques used in the application of lean. In addition, the author will also touch on literature available on the application of lean in the public sector which is the focal point of this research project, to gain an insight on work done by other researchers in the area.

### 2.1 Characteristics of Public Sector

In recent times the public sector has undergone or is undergoing major changes in the way it delivers its services to the members of the public. This transformation can be attributed to new government policies, demand of better quality services, political or ideological pressure for change, recurring budgetary pressures, and a cultural change from welfare to market values, coupled with increase in gaining competitive advantage (example between European economies and Asia) as well as cost and or effective models (Morley, 1995, Flynn, 1995). One of the methodologies adopted for these changes is *lean thinking*. To see how this lean thinking is been integrated into this sector (the purpose of this research project), it is ideal to start with discussing some characteristics of the public sector, and examine how it varies with organisations (like manufacturing) in the private sector for which the thinking initially developed.

The distinction between private and public sector is a bit blurred, as such it proves difficult to draw a dividing line between the two (Farnham and Horton, 1993, P. 28). This could be attributed to the large number of issues related to the public sector and its continuous evolution in recent times, example privatisation (Micheli, 2004) but the main issue that clearly differentiates public to private sector is outlined by Taylor and Popham (1989 P. 2) as *public sector depends heavily on public funds and is more constrained by fiscal policy which is part of the political sphere than private sector*. That is to say services provided by public sector are primarily financed by tax rather than direct payment by individual customers. As such public sector is accountable to

members of the public it serves (Hong, 1991). On the other hand, private sector organisations are those formed by individuals or groups for market or beneficial interests. They are controlled and accountable by the individual or group that set them up (Farhan and Horton, 1993, P. 28). Flynn (1997, P.1) concludes “that the whole purpose of public services is not to make money but to provide collectively protection, help, constraint, education and care outside market relationships”

### **2.1.1 Goals**

Just like every other organisation, public organisations set goals. These goals are been set as a guiding principle not only to aid in making decisions but also as a reference to evaluate success. Unlike the private organisations, the goals set are often very complex, unclearly defined and sometimes inconsistent. These could be attributed to the goals been set by politicians and also the “criteria of success are relative to the goals set by the politicians and cannot be reduced to a ‘bottom line’ of profit or loss (Farhan and Horton, 1993). This is due to the fact that the outcome of public organisations affects members of the public but even though private organisations affect people, the interest of its owner is of principal interest and can be reduced to bottom line of profit example share price or loss.

### **2.1.2 Management**

The management style of the public sector involves both managing and administering. But the administrative system tends to have over shadowed the managing system. Administration involves “establishing procedures which are designed to link policy with practice, to ensure consistency and to facilitate control” while managing on the other hand involves planning, controlling, organising, co-ordinating and controlling (Farnham and Horton, 2003). This administrative system is as a result of the level of accountability in the public sector. The public organisations are been allocated monies for specific purposes every year by the government and as such mandatory to account for how they spend. The result of this is “cautious attitude to the use of funds and close scrutiny over each commitment of resources” (Farnham and Horton, 2003).

Furthermore, the size of the organisations and their spreading all over with the need to ensure standard and consistent practice brings about bureaucratic administration.

### **2.1.3 Competition**

Unlike the private sector, there is no competition in the public sector. “Most public service organisations are monopolies” (Dixit, 2002). This lack of competition brings about high cost of operation, poor quality of service as well as lack of attention to customer needs.

## **2.2 What is Lean?**

Lean Thinking or Lean Production is a practice that originated from manufacturing and used as a means of improving production process, where process is “a system of activities that lead to the satisfaction of a customer by producing a particular output” (Bicheno, 2003 P. 132). The word “lean” was first coined by Womack and Jones (1990) in their book *The Machine that Changed the World* as a result of a five years benchmarking study across many automobiles organisations with the sole purpose of understanding differences in quality and productivity (Barraza et al. 2009). However, the philosophy behind lean is much older than that and better known as Just-in-Time (JIT) or Toyota Production System (Abecassis, 2006, Wu, 2003) Moreover, as early as 1920s lean tools and techniques such as single-piece flow had been used by Henry Ford (Kilpatrick, 2002). The model originated from Japanese manufacturing companies and got a worldwide attention through its success in Toyota Motor Corporation. Its application has cut across many sectors including automotive, construction, legal, health, computing, electronics, machinery, and product consumer goods among others (Abdulmalek and Rajgopal, 2006). As its popularity soars over the last several years, many researchers have dive and studied the concept of lean. As a result, numerous definitions of lean have appeared in the literature. In (2003) Womack and Jones defined Lean as a philosophy “that provides a way to specify value, line-up value creating activities in the best sequence, conduct these activities with interruption whenever someone request them and perform them more and more effectively.” While, the National Institute of Standards and Technology (NIST) Manufacturing Extension



Partnership's Lean Network (MEP Network) defines lean thinking as "...a systematic approach to identifying and eliminating waste (non-value added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection" (Buzby et al. 2002 P. 513). Similarly, Jina et al. (1995) describe lean thinking as a "means by which the overall business processes are organized so as to deliver products with greater variety and superior quality using less resource and in a shorter time than can be achieved by mass production methods." Even though different researchers have different definitions on lean, they all point out to the same concept of simply improvement of processes by the elimination of all wastes and adding value from the customer's point of view.

From the above definitions, we may assert that lean thinking is simply a management concept that involves the elimination or reduction of waste and concentrating on processes that add value to the customer in organisations operations. Waste is defined as any activity which does not add value directly or indirectly to the customer's product or service.

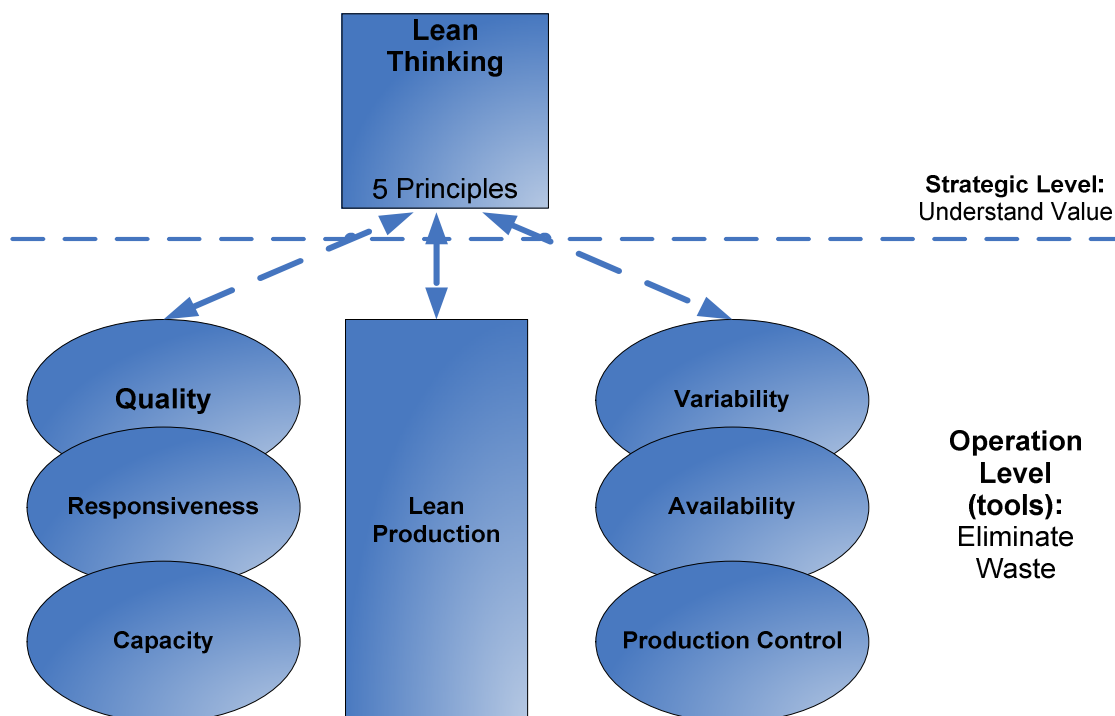


Figure 2-1 A framework for lean (Adopted: Hines et al (2004) Cited by Radnor et al (2006))

## **2.3 Lean Principles**

Womack and Jones (2003) summarised lean thinking into five principles, that are enabling “more and more with less and less - less human effort, less equipment, less time and less space - while coming closer and closer to providing customers with exactly what they want.” These principles include; identification of customer value, management of value stream, developing a flow production, using pull techniques and striving for perfection.

### ***2.3.1 Identification of Customer Value***

The essential feature of lean thinking according to Kuprenas (1998) “is the conversion of waste into customer defined value.” Therefore, the identification of value from the customer point of view is the critical starting point in lean thinking (Womack and Jones, 2003, Bicheno, 2000). This value can be expressed with a good or a service or both at once. To ascertain whether an activity adds value to the product or service, the question ‘Would the customer pay for this activity’ should be asked. Once value adding activities have been identified, every other activity is deemed as waste.

### ***2.3.2 Management of Value Stream***

Value stream is the step by step process or action required to produce a product or service. This product or service is brought about in the value stream by three critical activities in any business (ITC, 2004 P. 3); product or service definition, information management and physical management. In order to improve a product or service it is important to understand how it is either been designed and manufactured or the service rendered from start to finish. Mapping out the value stream will show the customer journey thoroughly and identification of value and non-value added wastes can readily be identified. As a result, the process can be fully understood, improved and subsequently the form for reducing variability and wastes can be achieved to customers satisfaction (Picchi and Granja, 2004).

### ***2.3.3 Developing a Flow Production***

Development of the production flow is the third step in lean thinking once the value has been identified and the value stream fully mapped out. As all the non-value adding processes have all been eliminated, the remaining value adding processes are set to flow accordingly. This ensures products or services are kept moving to the customer so that there is a continuous flow without any hindrance. As Womack and Jones (2003, p.22) explains “that tasks can almost always be accomplished much more efficiently and accurately when the product is worked on continuously from raw material to finished good. In short, things work better when you focus on the product and its needs, rather than the organisation or the equipment, so that all the activities needed to design, order, and provide a product occur in continuous flow.”

### ***2.3.4 Using Pull Techniques***

Simply put “making what the customer wants, when the customer wants it.” (Wood, 2004 P.20). This ensures that no other wastes are created, for example increase lead time, imperfect quality and stock pile inventory. When a number of issues, example high number of customers or short cycle time lead to not able to flow products or service to customers completely, ‘Pull’ techniques is use. For this reason, a buffer is intentionally planned in order to allow products or services to be carefully delivered.

### ***2.3.5 Striving for Perfection***

The last principle is striving for perfection or continuous improvement. Organisations need to always seek for perfection after identifying the value, creating the value stream, make the value processes flow accordingly and letting the customer pull value from the value stream and as so link all everything into a ‘lean enterprise.’

It is obvious from the study of these principles that they can be used in other sectors outside of manufacturing like service and public sector organisations.

## **2.4 Lean tools and Techniques**

To achieve the above principles, a variety of tools and techniques are been employed. These tools and techniques are termed ‘Lean Toolbox or Lean Building Blocks.’ The lean toolbox contains different kinds of tools and techniques that over the years have helped organisations to improve their businesses. Even though, lean thinking is not a ‘one size fits all’ panacea according to Nelder (2000) cited by Bicheno (2000), each organisation must deal with its own problems and plan its way ahead. The use of these tools over time has been proven as aid in achieving success at becoming lean. However, their wrong use can lead to a great failure (Womack and Jones, 1996). Organisations have noted that the use of two or more tools together is more effective rather than the use of a single tool. A review of some of the tools and techniques relevant to the public sector based on the book “The Lean Toolbox” by John Bicheno (2000) is discussed below:

### **2.4.1 Value Stream Mapping (VSM)**

Value stream is all the processes involved to produce a product or service to the customer. This involves design, order, produce and delivery of products. Hines and Rich (1997) cited by Radnor and Walley (2008) “suggest that value stream is identified, and the type and extent of waste in the stream mapped before new approaches and processes are implemented.” Graphical representation using shapes and icons is used to illustrate the sequence and movement of information and materials in the value stream. Therefore, VSM is a “graphical tool that helps you to see and understand the flow of the material and information as a product makes its way through the value stream” (Milutinovic, 2008 P.30)

### **2.4.2 Kaizen**

Kaizen is a Japanese word that means continuous improvement. This improvement involves everyone in the organisation from the top managers down to the workers. There are two kinds of kaizen; flow kaizen and process kaizen. Flow kaizen is about the improvement of value stream while process kaizen is about elimination of waste. We

can assert that Kaizen is the technique of not just finding and eliminating or reducing waste but continuously carrying out the habit.

In order to succeed with the application of Kaizen, this principles need to be adhered to (Kaizen Institute, 2004 cited by Milutinovic, 2008):

- “Discard conventional fixed ideas – in the organisation, one should think of ‘how to do it’ and why it cannot be done.
- Avoid excuses – start by questioning current practices – perfection is not what the organisation should strive for. The solutions for current problems should be made right away, even if it is making just 50% of the target.
- Correct right away, if mistake is made – on the first place wisdom should be used rather than spending money on Kaizen.
- ‘Wisdom is brought out when faced with hardship – ask ‘why?’ five times and seek root causes.
- Seek the wisdom of ten people rather than the knowledge of one – Kaizen ideas are infinite.”

### **2.4.3 5S**

5S is a concept which originated from 5 Japanese words that starts with ‘S’ Seiri, Seiton, Seiso, Seiketsu and Shitsuke. These words translated into English are; Sort, Set, Shine, Standardise and Sustain. It is a practise for organising, cleaning, developing and maintaining an effective work place and is the core to lean manufacturing (Milutinovic, 2008). The ultimate objective of this methodology is to improve the work environment enthusiasm, safety, quality and effectiveness, this is done by standardising the work procedures as well as organising the work environment thus simplifying the workplace, removing or reducing waste and non-value adding activity. The 5S’s are described below:

**Sorting** – This is the first step, which involves sorting out and removing what is needed at the workplace in order to carry out work Bicheno (2003) suggests removing all waste

items or items that lead to waste like accumulated dirt and grime, inventory, paper, furniture, tools, memos, manuals, rubbish, filing cabinets, etc.

**Set** – The second step is setting everything in order. “A place for everything and everything is in its place” (Chapman, 2005 P.29) The aim of this step is “to make the workplace not only good and easy to work in, but also that anyone should be able to locate the necessary equipment” (Bicheno, 2000)

**Shine** – This step focuses on neatness. All staffs are encouraged to routinely clean their work space. Bicheno (2000) reasoned that the “simple fact is that the cleaner or tidier a location is, the easier it is to see if something is out of place.”

**Standardise** – The standardise step deals with the schedule of keeping up to standard and procedures set up in the previous steps. The method of how to carry out the work, the equipment and any thing related to the organisation must be standard and made assessable and recognisable throughout the organisation.

**Sustain** – The final step is to ensure that the four earlier steps become the norm of working in the organisation.

#### **2.4.4 Muda**

*Muda* is the Japanese word for waste. Waste according to Merriam Webster dictionary (2009) is any thing that is discarded as worthless, defective or of no use. Taiicho Ohno, father of the Toyota Production System or Just-in-Time (JIT) identified seven types of wastes which are; waste of overproduction, waste of waiting, waste of transportation, waste of inappropriate processing, waste of unnecessary inventory, waste of unnecessary motions and waste of defects. The reduction or elimination of each of the wastes will improve the overall performance and/or quality of product or service to the customer.

### **2.4.5 Business process Reengineering**

In order to improve customer service, reduce costs and gain competitive advantage, organisations employ business process reengineering (BPR) technique. BPR can be defined as “the use of evolutionary tools and techniques combined with enabling technologies to provide an explosive mix to make dramatic change throughout the organisation and to deliver what the customer requires” (Jon, 1993, P.52). The focal point for these improvements is the business process, as defined earlier process is a set of activities that produces an output which leads to the customer satisfaction. Thus the technique recognises that customers want value and value is made up from quality, time, cost, and delivery, in so doing it takes on board waste reduction, simplicity, small frequent batches, and supplier partnerships. This is done recognising and simplifying the core processes in an organisation (Bichano, 2000).

### **2.4.6 Storyboarding and Brown Paper Exercise**

Storyboarding is “simply the graphic series of panels on which is displayed the history of significant changes or proposals” (Bichano, 2000, P.75). The process shows a graphical representation and planning and it permits team members to brainstorm together, make changes and/or input their own ideas.

Brown paper Chart “shows an outline process chart on which is written various information” (Bichano, 2000, P.76). The technique is used to map out business process on a large scale ‘brown paper’ hence the name. Different colours of post it notes are been used to show he different activities and the method gives priority on being ‘rough and ready’ rather than a precise, neat and tidy document.

### **2.4.7 Kaikaku**

Kaikaku is a Japanese word that stands for *instant revolution*. The technique when applied delivers results in a very short space of time. It aims at spectacular and very rapid improvement in performance in a specific area by radically eliminating wastes. The method is a condensed and intense process which when applied shows that instant change can be achieved.

### **2.4.8 Takt Time**

Takt time is derived from the German word Taktzeit which means *cycle time*. It is defined as the maximum time of a single component allowed to produce a product so as to meet customer demand. In the words of Milutoniv (2008) it is the “rate of production needed to equal the average rate of product sales to customers. This calculation is used to ensure flow processes are performing effectively or that buffers are being replenished at the desired rate.”

### **2.4.9 Pokayoke**

Pokayoke is a Japanese word that stands for *mistake proofing*. Pokayoke technique is the art of preventing defects in products by correcting or raising alarm on different human errors or machine defects as they occur. Bicheno makes a useful point that the aim of Pokayoke is to make a model of preventing mistakes - which are inevitable to become defects - which happens when a mistake reaches a customer.

### **2.4.10 Root Cause Analysis**

Root cause analysis is the technique of solving problems at the root of the matter rather than superficial level. To get to the root cause of the problem, techniques used include; 5 Whys and Barrier Analysis.

5 Whys - This is a questioning attitude where by “why?” is been asked several times. Toyota Company where this technique evolves believes that ‘why’ needs to be asked five times to ascertain the root cause.

Barrier Analysis - This technique is been used where there is problem with implementation. It involves asking some straight forward questions on the problem. These questions are:

- “What are the threats, hazards or potential problems that can influence the situation?”
- Who or what are the “Targets” for change?
- What are the barriers? These may be physical, geographic, communication, language, culture, administrative, organisational.



- What is the “Trace?” That is, what is the sequence of events or history that has lead up to this situation? Real or imaginary.”

## **2.5 Lean Application in Public Sector**

The application of lean got a worldwide attention through manufacturing, but the success achieved in this area has caused its application to other areas; public sector being one of these. Even though, the operational and strategic activities facing the public sector are different to that of manufacturing and other private sectors, the organisational goals and objectives of the public sector are similar to those of the private sector. As such, the method of achieving them should be no different (Dorsch and Yasin, 1998). The need by government to deliver more for less and the demand by members of the public for improved performance and services made necessary the adoption of industrial practices into the public sector. Savings in costs, quality improvement, improved customer satisfaction and improved responsiveness are some of the actions most notably. Lean has been identified as one way to achieve this (Radnor and Walley, 2008, O'Donnell, 2007). However, review of literature has shown that there is little proof of application of lean in the public sector with the prospect of making better public services (Barraza et al, 2009), but on the other hand, many researchers have confirmed that the public sector can gain greater efficiency in their processes and services by considering and implementing lean practices (Radnor et al, 2006, Cited by Barraza et al, 2009).

Even though there is the notion that “organisations can apply lean principles in almost any environment where a process can be defined at the working level” (Bhatia and Drew, 2007 P. 98), and recent researches have start to attest that the principles of lean used in manufacturing could be potentially applied to public sector, others (example Radnor et al, 2006) criticise the philosophy and identified some loop holes. These criticisms include: “concerns about the increased vulnerability of lean systems to errors or resource shortages; suggestions that lean systems do not cope well with demand variability; potential failure to address human dimensions of work content and work environment; and a lack of strategic perspective when implementing lean tools and techniques.” However, these criticisms does not necessarily mean that lean thinking is

not an applicable and beneficial methodology because many organisations have successfully implemented and gain extraordinary benefits from lean implementation (example, Dell Computers, Tesco, Toyota) also to dismiss the allegation one have to view the public sector for example as a compilation of operations and process that ultimately deliver value to a customer in the form of a service just like the manufacturing industry.

A review of up to date literature on the application of lean in the public sector (Radnor and Boaden, 2008) stressed “that it is important that the analysis and development of lean in the public sector continuous to be an interaction of theory and practice”, this research thus seeks to blend the two and use the police service as a case study of the public sector. Duke et al. (2009, P.298) maintain “that satisfaction with police service is shaped by citizen’s victimisation experiences, feelings of safety (especially fear of crime), estimates of the ability of police to combat crime, and response to citizen’s call for service.” Along with helping the police service to identify, categorise, minimise or remove non-adding value wastes which is one of the aim of this research project, the use of lean would enable it to “understand demand, what internal and external customers value and how service delivery processes meet that demand.” (Knowledge, 2009)

Finally, we may conclude with Radnor and Walley (2008) opinion of lean as a methodology that can be applied in any customer-focused environment to help configure resources and processes by way of engaging employees to identify what is wrong with a process and how to make improvements.

## **2.6 Summary of Chapter 2**

An extensive review of the literature on lean thinking based on previous researches has been presented within this chapter; a feasible definition of Lean has been provided, how it originated, its principles as well as the tools and techniques used in achieving lean. Moreover, a review based on previous literature on its applicability in the public sector has been looked upon.

## **3 Industrial Context**

Subsequent to this chapter the reader has been introduced to the research project and the literature on both public sector and lean thinking, here the author bring in the sponsoring organisation – Cambridgeshire Constabulary, the area it covers, the plans it set out that will shape and improve its services, the type of services it offers to the public and also the business area set out as the research area for this project. The chapter concludes by bringing to light to the need for the project.

### **3.1 Cambridgeshire Constabulary**

With its roots dated back to 1851, Cambridgeshire Constabulary is among one of the police forces in England and Wales responsible for law enforcement. It is committed in ensuring Cambridgeshire is a safer place to live in, work in or visit. The constabulary covers the county of Cambridgeshire including Peterborough Unitary Authority. It is divided into three (3) command units based on surrounding local district councils which are the Northern Basic Command Unit, Central Basic Command Unit and Southern Basic Command Unit, covering an area of over 3,500km<sup>2</sup> and a resident population of around 0.7million. These command units constitute into Peterborough City, Cambridgeshire County Council, Fenlond, Huntingdonshire, East Cambridgeshire, Cambridgeshire City and South Cambridgeshire as illustrated in Figure 1. All together the force employs 1,412 police officers, 998 police staff including detention officers, scenes of crime officers and investigators. Also 195 police community support officers and the support of around 175 special constables. The constabulary is headquartered at Hinchingsbrooke Park in the environs of Huntingdon.



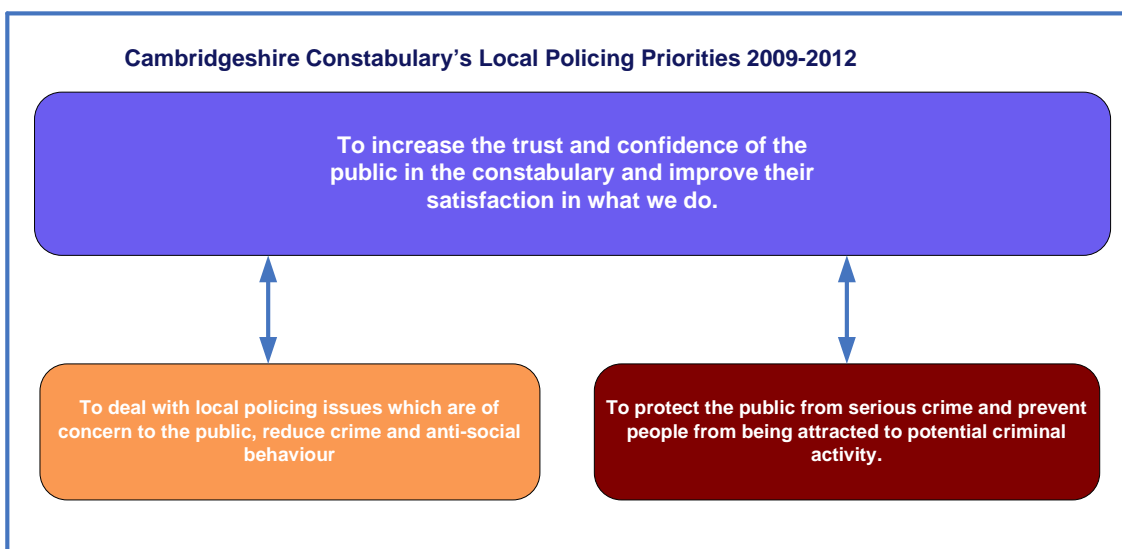
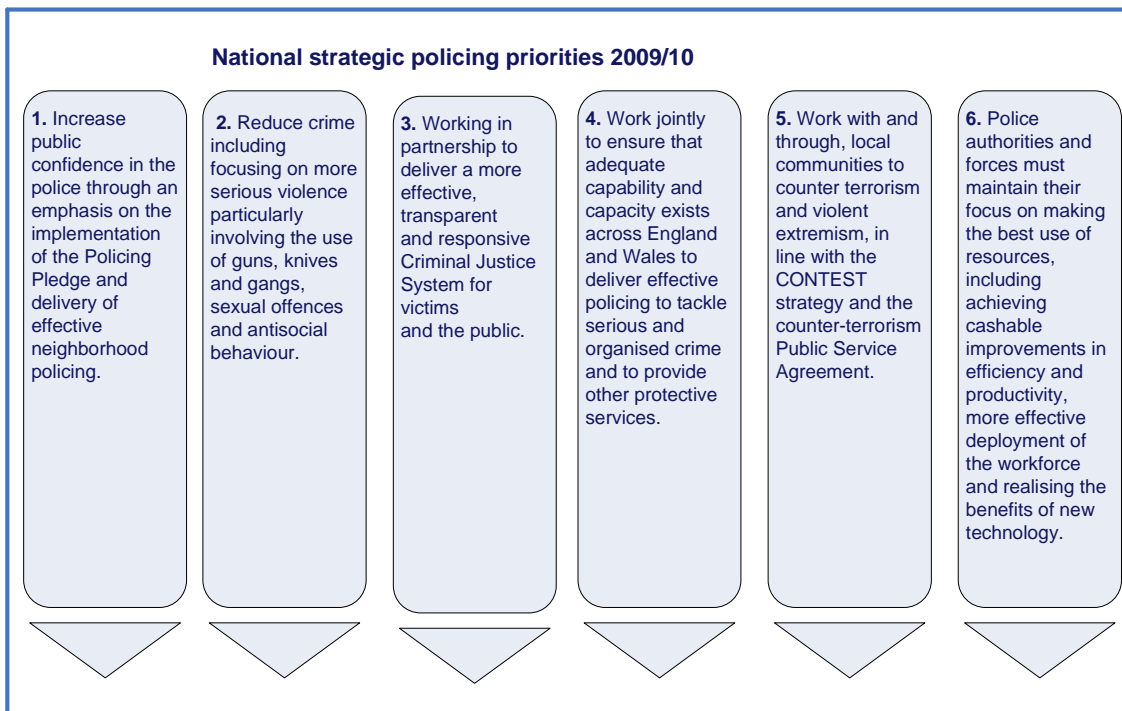
**Figure 3-1 Divisional/Directorate Map for Cambridgeshire Constabulary (Source: Cambridgeshire Constabulary, 2009)**

### **3.2 The Constabulary Plan**

In keeping to its commitment of a steadfast citizen focused policing, the constabulary implemented a set of plans that will shape and improve the services it offers to members of the public. These plans and programmes enables the constabulary to deliver a first class citizen focused policing vision for the future (Cambridgeshire Constabulary, 2009). “In order to meet the target put in place by the government and build confidence for its customers, the constabulary need to perform at an optimum level - answering calls on time, keeping victims informed of progress with their cases and tailoring policing to meet demands and expectations.” (Local Policing Plan, 2009) Some of the plans and programmes include; local policing plan and citizen experience programme.

### **3.2.1 Local Policing Plan**

The constabulary set up a local policing plan which gives a set of direction for what the force will do to deliver against its priorities. These priorities are in line to support its mission of “creating a safer Cambridgeshire - by reducing crime and disorder and winning the trust and confidence of the people it serve,” and drawn from a number of priorities including the Home Secretary’s Strategic Policing Priorities for 2009/2010, Cambridgeshire and Peterborough Local Area Agreements and Community Safety Agreement among others. As the Home Secretary (2008) acknowledged “there must be a priority on the cohesive view of all aspects of policing, through building confidence in the service, and leading to a more effective police service at all levels,” therefore, the need to plan in order to ensure optimum level and cohesive service to customers is indispensable. The diagram below shows the National Strategic Policing Priorities 2009/2010 and Cambridgeshire Constabulary Local Policing Priorities 2009-2012.



**Figure 3-2 Cambridgeshire Police Authority Local Policing Plan 2009-2012 (Adopted from: Cambridgeshire, 2009)**

### **3.2.2 Citizen Experience Programme**

In its commitment order to deliver a citizen-focused service the constabulary initiated the Citizen Experience Programme (CEP) with the task of delivering sustainable business transformation that will enable it to achieve greater levels of satisfaction and

confidence in partnership with needs and expectations of its customers. A framework developed by KPMG in affiliation with the Home Office titled QUEST Methodology compliments the delivery objectives of the CEP. Its principles are “complimentary to the delivery of the

The aim is to implement this methodology to deliver customer satisfaction performance improvements in front line policing. These performance improvements are set so as to achieve improved customer satisfaction and transformation of the police performance in the eyes of the public. QUEST Phase 1 is a newly identified project for the programme that will examine the primary contact areas of service delivery relating to First Contact and Initial Response. Its objective is to “identify, develop and implement change initiatives that will achieve measurable improvements”. It adopts the KPMG QUEST approach, which consists of three phases:

- Detailed planning phase.
- Intensive Phase to identify issues, build business cases, design and implement solution.
- Syndicate phase that delivers sustainability, embedding changes forces-wide; promoting a culture and supporting framework for continuous improvement.

For the purpose of this project, the author worked on the intensive phase.

### **3.3 First Contact and Initial Response**

Within the Cambridgeshire Constabulary there are four different business areas where it interacts with its customers. These areas are; First Contact and Initial Response, Crime Investigation and Incident Management, Criminal Justice and Proactive Operational Policing.

QUEST Phase 1 project span across the First Contact and Initial Response area and covers the primary contact areas for the public, which are:

- Contact Centres
- Enquiry Office

### **3.3.1 Contact Centres**

The contact centre is one of the first point of call for the customer. It deals with all phone calls made to the force. It comprises the Switchboard, Police Service Centre (PSC) and the Force Control Room (FCR).

#### **Switchboard**

The Switchboard handles all non-emergency calls made by customers and internal calls made to it by officers and staff within the constabulary. The dedicated number for customers to call for non-emergency is 0845 456 456 and 0345 456 456. The Switchboard filters and direct calls made on this number so as to ensure calls are sent to the right destination and aim to identify calls that are emergencies and put them through to FCR and those that are not emergencies to put them through to the PSC to be dealt with.

#### **Police Service Centre (PSC)**

All non-emergency calls made by the customer through the Switchboard are routed to the PSC. This include crime and incident related calls that are deemed not have an immediate threat to life or property. The PSC deals with 18500 calls each month on average of which 12500 calls are crime and incident (Cambridgeshire Constabulary, 2008). It aims to answer 90% of its calls within 30 seconds.

#### **Force Control Room (FCR)**

FCR is one of the force contact centers that solely handle all emergency calls made to the force on the 999 emergency numbers. Calls are routed into the FCR through the BT operator when customer dials 999 and requests the police. Also if a call meets the



emergency response criteria, the Switchboard and PSC can route the call directly to the FCR. Emergency situation results in an abrupt police response.

### **3.3.2 Enquiry Office**

The enquiry office is the walk in offices for customers. these enquiry offices are located at strategic locations within Cambridgeshire. Within Cambridgeshire there are fifteen police stations with public access through an enquiry office. At anytime, the customer can go in there to report, enquire, or seek assistance from the police. Services dealt with at the enquiry office include but not limited to meeting bail conditions, sex offenders register, reporting crime or incidents and visitations.

### **3.4 Purpose of the Project**

The purpose of this project is to apply lean thinking concepts to the public sector with aim of assessing its applicability and goal of improving customer services. This will be done by applying the lean methodology to the contact centre of the first contact and initial response business area.

### **3.5 Summary of Chapter 3**

This chapter laid a clear description of the sponsoring organisation, its commitment to the public it serves thus its motive for undertaking the project. It describes the plans in place at the constabulary for improvement in services and the business areas these improvements are set to take place.

## 4 Project Execution

This chapter presents how the research project was carried out. It starts by describing the data gathering phase conducted at Cambridgeshire Constabulary. The lean tools and techniques used for the analysis. The chapter concludes by presenting the current state (As-Is) of the process of the business area (Contact Centre) under review.

### 4.1 Research Approach

The research project was a collaborative work between Cranfield University and Cambridgeshire Constabulary. The data gathering phase which involved workshops, observation and interviews was undertaken at Cambridgeshire Constabulary while the second phase of analysis and report writing was accomplished at Cranfield University.

Thus the research project was divided into three phases. These phases were designed in line to achieve the six objectives set at the beginning of the project. The phases are discussed below and the overall research approach is presented graphically in Figure 4.

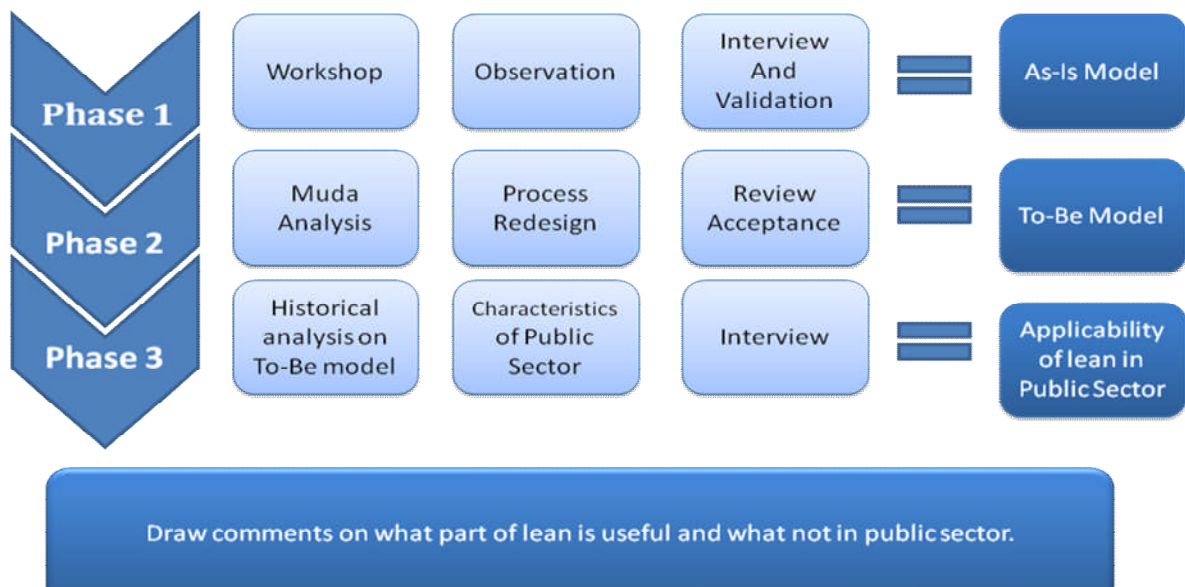


Figure 4-1 Research Approach (Source: Author)

#### ***4.1.1 Phase 1: Development of As-Is Model***

This phase dealt with the development of the As-Is state of the contact centre. It was designed so as to achieve the first objective which is the bedrock of the research project. Workshops, observations and interview and validation were the methods used in carrying out the development. The deliverable achieved from this phase is a fully value stream mapped representation of the contact centre. This phase is detailed in this chapter.

#### ***4.1.2 Phase 2: Design of To-Be Model***

Designed a new improved contact centre based on the application of lean methodology. In doing so, Muda analysis technique was used to eliminate all non-value adding activities in the form of waste then the process redesigned and acceptance by the sponsoring organisation reviewed. It was aimed at achieving the second, third and fourth objective of the research project and detailed in chapter 5.

#### ***4.1.3 Phase 3: Applicability of Lean in Public Sector***

The aim of this phase was to demonstrate the applicability of adopting lean thinking in public sector which was achieved by drawing up comments on what part of lean is useful in public service and what not based on the acceptance review in phase 2 coupled with the characteristics of public sector from the literature review and interview with the sponsoring organisation programme manager. These constitute objectives five and six of the research project and is detailed in chapter 6.




### **4.2 Review of lean Tools and Techniques Used**

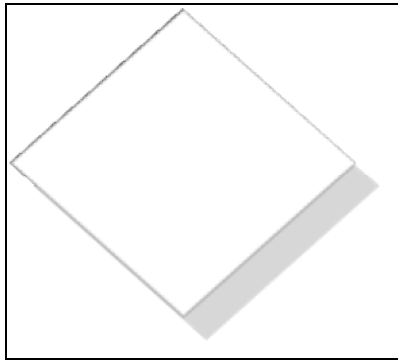
There are numerous tools and techniques used in applying lean thinking in organisations. Most of these tools and techniques have been developed over the years and new emerging ones are underway through innovation. There is in excess different

tools and techniques for different purposes and waste elimination and reduction (Green Dick 2001 cited by Pavnaskar, 2003). The tools value stream mapping (VSM) and Muda analysis were used for this research project. VSM so as to map out the process of the contact centre while Muda analysis to identify and eliminate all wasteful activities.

#### **4.2.1 Value Stream Mapping (VSM)**

Milutinovic (2008, P. 30) defined VSM as a “graphical tool that helps you to see and understand the flow of the material and information as a product makes its way through the value stream.” It also involves a step by step method to change a current state into a lean future state, which is the foundation of its success in practice (Lian and Landeghem, 2005). To map out the processes, a set of icons are used in value stream. However, in using these icons we customised them to suit our needs. The meaning of each icon and its interrelationship were clearly established. Table 4.1 below details the customised icons used.

<b>VSM Icon</b>	<b>Icon Name</b>	<b>Functional Description</b>
	Process	This icon indicates any activity or process taking place within the value stream
	Terminator	This indicates either a start or end of a value stream or referral to another department.
	Information Movement	This shows the flow of information.

	Decision Box	This indicates a process or activity that requires a decision or is having two or more likely outcomes.
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**Table 4-1 Value Stream Mapping Icons (Source: Author)**

The initial VSM was created during the workshop using brown paper exercise to document the value stream then later validated and mapped out using Microsoft Visio and then revalidated. This ensures that all information in the value stream was captured. It comprised going through the customer journey from the start of the call till the end with the project team including a contact centre staff.

**4.2.2 Muda**

Waste, Muda or non-value added activity is any process that does not add value to the process. There are seven types of wastes identified by Taiicho Ohno, father of the Toyota Production System (Bicheno, 2003). Muda technique was used to identify those activities that do not add value in the value stream and thus eliminated. These seven wastes identified by Taiicho Ohno as shown in the figure below were used.

<b>The 7 Wastes</b>	<b>Description</b>
Waiting	Staff being unable to do their work because they are waiting for people, equipment or information.
Duplication	Of activity or output.
Unnecessary movement or motion	Moving resources or people unnecessarily
Unnecessary Inventory	Too much stock of materials, work in progress, too much staff capacity.

Unnecessary Motions	Going to unnecessary meetings, generating unnecessary emails, letters. Reports etc.
Defects	Leads to failure demand and use of more resources to put things right.
Opportunity lost	If you do something incorrectly and have to do it again, you've lost the opportunity to do something right in the first place! This is why we talk about 'doing things right first time, every time'

**Table 4-2 The 7 Wastes in public service (Source: Knowledge, 2009)**

### **4.3 Data Gathering Methodology**

The data gathering stage was carried out in two phases using a qualitative research approach. These constitute workshops, observations and interviews in Phase 1 and acceptance review and validation as interview in Phase 2.

Data gathered in the first phase which adds up to the building of the As-Is model was achieved through workshops, observation and interviews. After coming up with a true representation of the contact centre and redesigning the process by applying lean methodology, an improved To-Be model was created. This To-Be model was then subjected to rigorous review and validation with the Business Process Analyst from the sponsoring organisation as interview which amount to the second phase.

### **4.4 Phase 1: Development of As-Is Model**

The nature of the research was qualitative. As Whitman and Woszczyński (2004) described qualitative research “as an interpretive approach to investigating subjects in their natural surroundings”, thus, the research was conducted as a case study in the organisation with the organisation members (staff). The following qualitative methods were applied.

#### **4.4.1 Workshop**

A one day workshop of each of the contact centres was carried out at first. This involved the project team members (Cambridgeshire Constabulary Staff) as well as the researcher and a staff of the contact centre. This allowed for the initial process map to be mapped. It began with an overview of what the contact centre do, its main functions, job roles and a scenario example of how a call comes in and is dealt with in the business area. Thereafter, current As-Is map was build involving the whole team using a paper based method with different colours of post-it notes to show different processes. The workshop was a key method used in carrying out the research because it gave an initial picture of the whole processes involved in the value stream. In total three (3) workshops (one for each contact centre) were carried out.

#### **4.4.2 Observation**

An observation on how each contact centre operates was made to capture more information and make any corrections. This method allowed the author to dip into the day-to-day activities of the processes of the contact centre that we are trying to map out and have first hand information. According to California State University Long Beach (2009) observation “is the selection and recording of behaviours of people in their environment. It is useful for generating in-depth descriptions of organizations or events, for obtaining information that is otherwise inaccessible, and for conducting research when other methods are inadequate.” Three (3) observations for the contact centre (one for each contact centre) were carried out. The researcher spends the day in the contact centre listening to incoming calls as well as how the calls are dealt with and how the contact centre operates.

#### **4.4.3 Interview**

The selection of the interview was based on the need to validate the process and also to enrich the research project by gathering data during the review acceptance, therefore the nature of the interview was semi-structured. It was conducted with the staffs of the

contact centre, the Business Analyst and the Programme Manager of the Constabulary. As the method of the interview was qualitative, it was considered as a supportive data collection method. A total of six (6) face to face interviews were carried out, four in the contact centre to validate the value stream mapped out after the workshop and observation and make necessary amendments and two with experts for the validation and review acceptance.

#### **4.4.4 As-Is Model**

All data used to map out the As-Is were collected using the methods above. Data collection started with the switchboard, then to the PSC and then to the FCR, gathering step by step activities as well as staff levels, processing times, different types of calls as well as how they were resolved. Figure 4.1 shows the As-Is map developed; the square boxes represent each process as an activity that happens, also the diamond shape box represents an activity that requires a decision. The processing time and number of incoming calls were all based on historical data obtained.

There are two telephone lines that a customer can call to get in contact with the constabulary, one for emergency which is the 999 number and the other for non-emergency matters which is the 0845 or 0345 number. Calling 999 number gets answered directly in the FCR where it handles all emergency matters while the 0845 or 0345 get answered at the switchboard and then transferred to the PSC.

After gathering all the information flows from each contact centre and mapping out the value stream, they were connected with each other by arrows in the map, representing how each contact centre receives the customer call, deals with it and or pass it to the appropriate centre and the overall customer call journey from start to finish. All calls results in either sending a dispatch car to the scene of the incident (for emergency matters mostly) or an appointment given which could be either at a police station or at the customers place or transfer to the appropriate department within the constabulary or giving advice as at when necessary.



Call Centre As-is

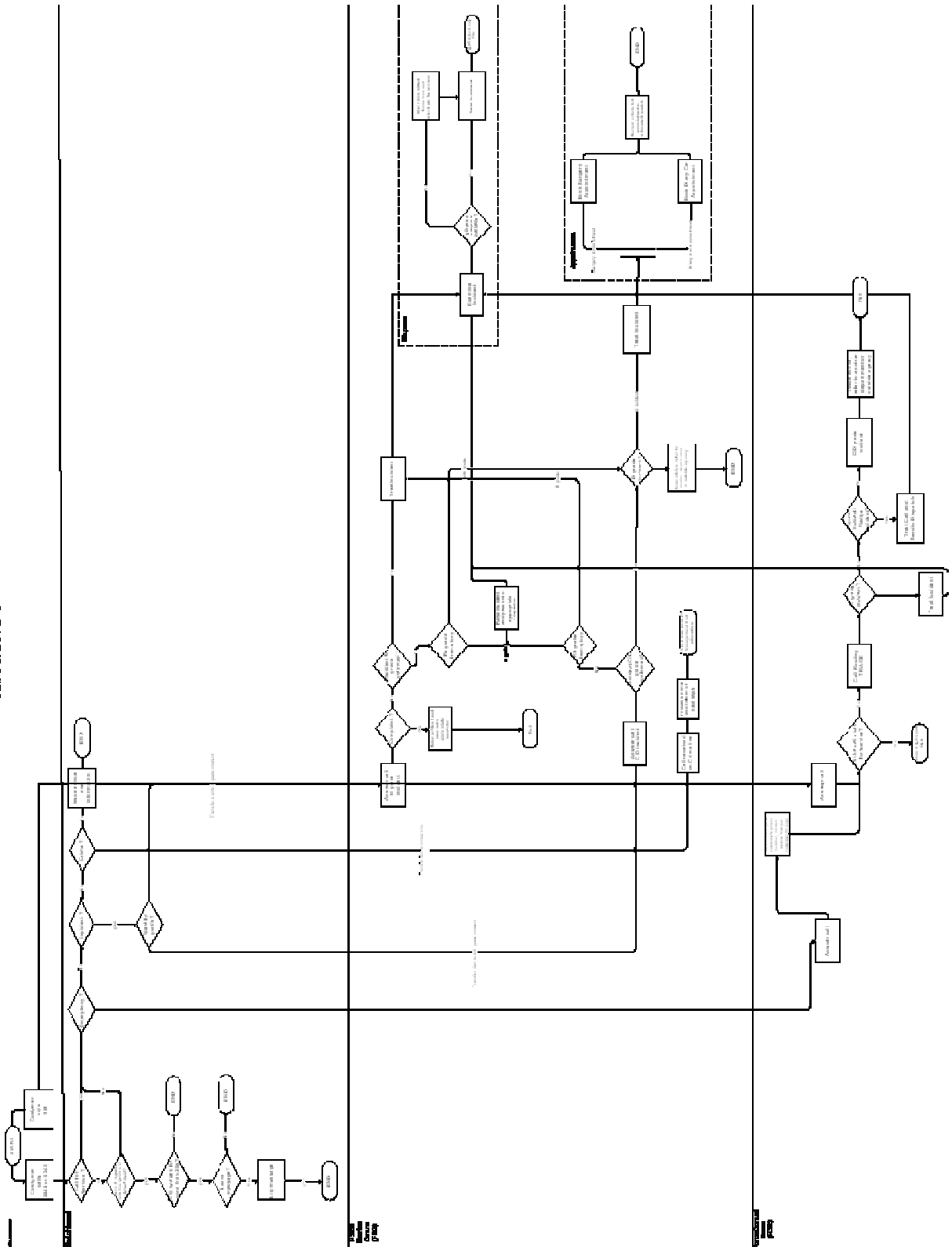


Figure 4-2 Contact Centre As-Is Model

## **4.5 Summary of chapter 4**

Based on the switchboard, PSC and FCR analysis of the As-Is, it became apparent that many improvements were possible. Numerous non-adding value activities were easily identified. Example, switchboard giving customer phone number, incident and details to FCR before putting customer through which brought about delay to the customer as well as having the customer to repeat the details to the FCR. The next chapter will describe the To-Be state designed by using the Muda analysis technique.

## **5 Process Model**

This chapter presents the new improved process model; the To-Be Model. This new model was designed by first applying Muda analysis to the As-Is model to remove any non adding value activity then the process redesigned and validated to ease the customer journey and be more effective.

### **5.1 Phase 2: Design of To-Be Model**

The process of redesigning and improving the To-Be model started while developing the As-Is model, where non-adding value activities start to be seen. Looking at the As-Is model of the contact centre several things that add no value to the customer stand out; things like delay caused by lack of resources, keeping the customer update and the customer repeating the same information many times. However, before attempting to differentiate between value adding and non-value adding activities in the process map, it was critical to define what value is and non value from the customers point of view which is the first principle of lean. Therefore the author acted as the customer because of being an outsider to the system.

#### **5.1.1 Muda Analysis**

Thus, the lean manufacturing technique - Muda analysis was used across the entire value stream to remove all non-adding value activities. We followed an organised approach where by each of the seven wastes were taking one by one and used across the entire value stream of the As-Is model; this allowed us to eliminate every waste from the customers point of view and come up with an ideal To-Be map that will help in demonstrating if lean thinking can be applied to the public sector and draw attention to what is useful and what not.

### **WASTE 1: WAITING**

Waiting refers to the amount of time the customer gets delayed before/during/after call, this occurs when ever time is not used effectively. Those identified include; 1: staying on the telephone before being answered, 2: staying on the line before customers services are finished, 3: the total amount it takes to resolve a query. Currently it takes Cambridgeshire average call duration of 327 seconds an agent stays connected to the customer. However, the agent also spends 30 seconds to wrap up activities and be available for the next call. When a customer calls requiring a person or department, the switchboard puts the customer through and the call gets queued, if for more than 30 seconds the call bounce back to the switchboard thus giving the customer the option to either leave a message and then it gets logged or he ends the call. Also the customer gets delayed when an emergency call is put to the FCR through the switchboard, the customer gets put on hold while the switchboard agents gives the FCR customers phone number, incident details and then pass on the customer.

### **WASTE 2: TRANSPORTING**

The amount of time the customer gets transported from one agent to the other or from one contact centre to the other. Furthermore the amount the customer call gets transferred to another department to be dealt with. When a customer calls the switchboard after identifying his services he gets transferred to the appropriate contact centre to be dealt with. This could be an incident send to an incident line or a crime transferred to the crime line in the switchboard or at times an emergency call thus transferred to the FCR. In addition, the customer call gets transferred to either dispatch where a resource, a police car for example or to appointment system to be dealt with.

### **WASTE 3: OVERPRODUCTION**

This type of waste is to check for duplication of activity and output in the value stream. For example in the contact centre, the call is been graded at first by the switchboard then transferred to the appropriate line in the PSC or FCR to be dealt with. It then gets re-graded to ascertain whether it was graded properly, this results in this kind of waste it should be “doing things right first time, every time.

#### **WASTE 4: INAPPROPRIATE PROCESSING**

This type of waste does not occur at the contact centre. This waste occurs by using wrong procedure or systems to process activities. But in the contact centre all procedures and systems are clearly and strictly laid down and adhered to as any error will lead to a very serious issue. Sometimes the results of this kind of waste give rise to overproduction waste.

#### **WASTE 5: UNNECESSARY INVENTORY**

The occurrence of this kind of waste tends to increase lead time, prevents rapid identification of problems and increases space thereby discouraging communication. It is caused by either too much work in progress or too much staff capacity (Bicheno, 2003). For the contact centre this does not come about due to the scheduling of staff which varies to cope with the number of calls.

#### **WASTE 6: UNNECESSARY MOTION**

Motion waste is any type of movement which does not add value to the service rendered to the customer, this could be either of people or equipment. Barcia and Boardman (...) gave the causes that brought about this waste as “poor workplace organisation, bad scheduling of work, taking many backups, improper/lack of training, non-standard work methods, redundant approval and bad hiring practices. In the contact centre, this waste was not detected.

#### **WASTE 7: WASTE OF DEFECTS**

A decrease in total number of defects occurring directly reduces the number of waste. This kind of waste usually occurs as a result of regular errors in paperwork which give rise to either scrap or doing the activity again, which cause poor delivery performance because it will entail more resources to put things right. It is caused by “improperly trained/unskilled employees, lack of communication/information, performing monotonous work, doing processes in a rush, environmental problems and confusing procedures” (Barcia et al 200?). Wastes as a result of defects does not occur in the contact centre as all staff get adequate training prior to starting work, manuals detailing

all procedures are also available as well as proper communication channels are available, also the contact centre environment are fit for purpose.

### **5.1.2 To-Be Model**

The To-Be model for the contact centre for Cambridgeshire Constabulary is shown in Figure 5.1. The results of the proceeding analysis are documented on the To-Be model, and the proposed simplified process is seen as Muda analysis was used to eliminate all the wastes. As can be seen from the new map, there are only two contact centres; one for non-emergency and the other for emergency calls. Each of the kind of waste was applied individually to the value stream in order to see if it does occur. For waste due to waiting, it was found out that at first when customer calls and request for a department or person the call is put in through and the customer gets queued which at the end after the customer waiting and no answer it bounce back and ends in the option of the customer leaving a message. Also, another waiting waste occurs when a customer calls the switchboard for an emergency. Upon identifying it as an emergency call the switchboard calls the FCR and put the customer on hold and gives the customers phone number, incident details and then put customer through, this does not add any value to the customer as the customer needs to again repeat the information to the FCR. Furthermore, when a customer books a surgery appointment, the customer needs to wait for the day and time for the appointment. All this waste was duly eliminated in the new To-Be model. Waste as a result of transportation was also present, the amount of time the customer gets transported from one contact centre to the other, and this was properly eliminated by merging the switchboard with PSC which brought about the number of contact centre from three to two. The waste of overproduction is the most predominant in the contact centre, it results during check of duplication of activity and output in the value stream. This waste results by re-grading of calls, so each process that involved the re-grading of call was eliminated. Waste of inappropriate processing, unnecessary inventory, unnecessary motion and waste of defects were not found to be present at the contact centre.

With the new improved model, the average call duration for all calls to the contact centre will be down from approximately an average of 5 minutes in the As-Is state to an

average of 3 minutes. In other words, an average of 2 minutes are spent on non-value adding activities (e.g re-grading of calls) as it is in the As-Is map, but with the To-Be model, all waste that brought about this are eliminated.





### **5.1.3 Review Acceptance**

An acceptance review of the To-Be model was carried out to validate and see if the application of the model is feasible. This allowed the new model of the contact centre to be scrutinized and serve as a mock-up for adaptability of lean in the public sector.

The reviewer was a business process analyst of the sponsoring organisation. He is a team member of the operation quest project and has practical experience on how the contact centre operates as well as knowledge of lean thinking in manufacturing.

#### **Feasibility**

Although the new improved model was made straightforward by removing all non-value adding activities, it became apparent to the author during this review that the fact that it is a police force responsible for the protection of lives and properties of its citizens certain sets of protocols and also making sure that data is been captured correctly and accurately needs to be observed. Consistency in data given by customer for example is crucial to investigation.

Also, despite the fact that this project was part of a live project for the improvement of the contact centre, it was accepted that the chances of application of the model in the constabulary was slim. The bureaucratic nature and resistance to change of public services coupled with the elimination of a contact centre and tasks specified by the model will bring about resistance to the adoption of the new model.

## **5.2 Chapter Summary**

This chapter gave an account of how the To-Be model for the contact centre was constructed. It detailed the muda analysis used in eliminating all non-value adding activities in form of wastes and also an account of the acceptance review by an expert and the probable weakness in the model.

The next chapter will conclude by demonstrating the applicability of lean in the public sector which is the essence of this research project as a whole and also states where the research fell short as well as avenues for improvement as a recommendation for future work.

## **6 Conclusion**

Over the past five chapters, the background and aim of this research project has been presented. Related work and the sponsoring organisation were reviewed. A description of how the project was executed and the outcome were also discussed. This chapter discusses the conclusion of the research project. It draws upon comments on what part of lean is applicable to public sector and sets out in summary the key findings of this research project, the limitations caused by the outcome as well as avenues to tackle these issues as future work are addressed. The chapter concludes by identifying the knowledge gained by the author during the research project.

### **6.1 Applicability of Lean in the contact centre**

The application of lean thinking is more common in the private sector especially manufacturing where it originated than in the public sector. This can be attributed to the sectors receptive to change as well as being skeptical to lean tools and techniques. It was the aim of this research project to investigate how lean can be applied to this sector by using the contact centre of the police force as a case study. Just as organisations in the private sector, public sector organisations have a set of processes and operations that together bring value as service to customers as such it is viable to sensibly adapt lean thinking. By adhering to the lean method of reducing or eliminating non-value adding activities in the form of waste - applying lean tools and techniques the author demonstrates with the contact centre of the police force as a case study how lean thinking can be applied to detect and eliminate waste in the public sector. It proves that just as wastes do occur in the private sector they are present in the public sector as well. Table 6.1 summarizes the findings. Numerous wastes were found to be present at the contact centre processes and thus eliminated. This application has shown that a gain in productivity will be achieved in the number of calls processed per day and thus bring about improvement in customer service by cutting lead time of dispatch from at least 4 days (for non emergency) to 1 day and appointment system to be able to state when and where and be there, thus eliminating any kind of backlog. The amount of calls graded correctly at first time will be up to 98% by achieving doing it “right the first time”.

<b>Lean Tool – 7 Wastes</b>	<b>Occurrence</b>
Waiting	Occur
Transporting	Occur
Overproduction	Occur
Unnecessary Inventory	Absence
Unnecessary Motion	Absence
Waste of Defects	Absence
Inappropriate Processing	Absence

**Table 6-1 Occurrence of Muda (Source: Author)**

Even though Allway and Corbett (2002) stresses that the “key to any operations improvement - service or manufacturing is not rigid, dogmatic adherence to specific tools or best practices, but the development to apply tools and techniques in a systemic process that enables the system to be sustained and improved”, public sector organisations can gain greater efficiency, effectiveness, reduction in cycle time as well as a high level of customer satisfaction.

The first principle of lean - identifying customer value was found to be useful. All activities or processes were examined to make sure they add value to the customer. Even though lack of competition in the public sector as mentioned in chapter 2 above makes it difficult to ascertain the value of the customer, in the police force for example there is no alternative for the customer, therefore identifying what is good for the customer can be elusive. Secondly, managing of the value stream is also valuable to the application of lean. Although public sector managers “lack the skills, experience and mind-set to design and manage the system to keep information and materials flowing smoothly through processes” (Bhatia and Drew 2006) but knowing end-to-end process gives a clear view and insight into the activities that occur and how they are linked and brings out any bottleneck there is. On the other hand, barriers to the adoption of lean in the public sector include top management support; having a strong leadership, commitment and preparation is a key to adopting lean. Also, the fear by employees that the adoption of lean in the organisation will result in their sack or reassignment possesses a major threat.

To bring to a close, lean thinking is applicable to any public sector organisation providing there are processes which may or may not lead to services to customers. Furthermore, there is no single one-size-fits-all model for application of lean in public sector rather every organisation will be able to adapt it to suit its needs and gain greater benefits.

## **6.2 Summary of Key findings**

The aim of this research project was to assess the applicability of lean methodology in the public sector with the goal of improving customer services. And to draw comments on what part of lean is useful in public service.

In order to achieve this aim, a number of objectives were drawn and met by constructing them into tasks;

Task 1 produced the As-Is model of the contact centre processes by mapping out the value stream thus achieving the first objective. Lean tool - Muda analysis was then applied to identify all wastes and eliminated in task 2 in view of improving the existing process to achieve the second objective. The elimination of these wastes led to the redesign of the process to optimize the flow of activities and create a To-Be service delivery model to meet objective three.

The new improved model was validated by interviewing the business process analyst and revalidated and accepted by the programme manager of the sponsoring organisation to achieve objective four. Considering the interview of the review acceptance, comments were drawn on what part of lean is useful and what not, moreover the applicability of adopting lean in the public sector were highlighted to meet objective five and six.

### **6.3 Limitations**

Apart from the time constraint on this research project, the main limitation is the lack of testing of the new improved To-Be model thus for it to be fully validated. The validation was based on the experience of two people of the sponsoring organisation. Also, having one case study prevents the generalisation of this output to the whole of the public sector hence future studies could explore this.

Another limitation of this research project is the type of people and number of interviewees. The lack of time for the project did not allow having more view on the new improved model and the opinion of the actual staff working in the contact centres. This could have given more insight on the applicability and factors affecting the To-Be model.

### **6.4 Recommended future Work**

Despite the fact that this research project has identified what part of lean is applicable to the public sector, it has some limitations which could be worked upon. It is apparent to achieve a concrete validation in the form of testing of the new improved model. Firstly, a simulation model would provide an insight and justify if the To-Be model is practical enough to be applied. Secondly, the simulation model would be a way to learn and provide an insight into the implementation.

Also, a great knowledge would be realised from broader examination with different types of organisations in the public sector.

This research project assessed the applicability of lean and drew comments on what part of lean is useful to the public sector. However, future research would benefit by presenting a model or framework on how these parts of lean should be applied. Moreover, it would be interesting in the future to examine and measure the business benefits and/or effects that the adoption of lean brings about to public organisations.

## **6.5 Learning Experience**

The main learning experience for the author was on working on an actual project with the sponsoring organisation. The author not just got to learn how public service organisations work but also how real life projects are handled. Furthermore, a great deal of understanding on lean thinking as well as tools and techniques of lean was gained.

It wasn't until now that the author came to realise how important carrying out a research and contributing your own share of investigation to the large knowledge pool is. The research project has helped in understanding how to carry out an investigation, how to manage a project and most importantly how to work in teams as well as independently.

It is envisaged that the area of this research project; lean thinking in public sector would receive greater attention from researchers as well as the government to discover and reap the benefits of lean gained by the private sector especially manufacturing.

## **6.6 Chapter Summary**

This final chapter of the thesis presented the achievements of the research project. It gave out limitations encountered during the research as well as sets out avenues for future research. The lessons learnt by the author on the course of undertaking the research project were highlighted also.

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