An analysis of the effectiveness of a behavioural based safety intervention in a UK paper mill.

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Doctor of Philosophy

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THE UNIVERSITY OF ASTON IN BIRMINGHAM

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Summary

This research examines a behavioural based safety (BBS) intervention within a paper mill in the South East of England. Further to this intervention two other mills are examined for the purposes of comparison – one an established BBS programme and the other an improving safety management system through management ownership. BBS programmes have become popular within the UK, but most of the research about their efficacy is carried out by the BBS providers themselves. This thesis aims to evaluate a BBS intervention from a standpoint which is not commercially biased in favour of BBS schemes. The aim of a BBS scheme is to either change personnel behaviours or attitudes, which in turn will positively affect the organisation's safety culture.

The research framework involved a qualitative methodology in order to examine the effects of the intervention on the paper mill's safety culture. The techniques used were questionnaires and semi structured interviews, in addition to observation and discussions which were possible because of the author's position as participant observer. The results demonstrated a failure to improve any aspect of the mill's safety culture, which worsened following the BBS intervention. Issues such as trust, morale, communication and support of management showed significant signs of negative workforce response.

The paper mill where the safety management system approach was utilised demonstrated a significantly improved safety culture and achieved site ownership from middle managers and supervisors.

Research has demonstrated that a solid foundation is required prior to successfully implementing a BBS programme. For a programme to work there must be middle management support in addition to senior management commitment. If a trade union actively distances itself from BBS, it is also unlikely to be effective. This thesis proposes that BBS observation programmes are not suitable for the papermaking industry, particularly when staffing levels are low due to challenging economic conditions. Observers are not available when there are high hazard situations and this suggests that BBS implementation is not the correct intervention for the paper industry.

Key Words: SAFETY CULTURE; BEHAVIOURAL BASED SAFETY;

SAFETY MANAGEMENT SYSTEMS; PAPER INDUSTRY.

Acknowledgements

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Abbreviations and Acronyms

ABC (model)	Antecedents Behaviour Consequences
ACSNI	Advisory Committee on Safety of Nuclear Installations
BBS	Behavioural Based Safety
BP	British Petroleum
BST	Behavioral Safety Technology
CASE	Creating A Safer Environment
CBI	Confederation of British Industry
CCM	Corrugated Case Material
CEO	Chief Executive Officer
COSHH	Control Of Substances Hazardous to Health (Regulations 2002)
CPI	Confederation of Paper Industries
FOC	Father Of the Chapel
FOD	Field Operations Directorate, (HSE)
FTSE	Financial Times Stock Exchange
GP	Georgia Pacific
GPMU	Graphical Paper and Media Union
HASAWA	Health And Safety At Work Act
HMI	Her Majesty's Inspectorate
HSE	Health and Safety Executive
HSC	Health and Safety Commission (until 2008, thereafter merged with HSE)
HSL	Health and Safety Laboratory
HSG (65)	Successful Health and Safety Management (Health and Safety Guidance 65)
IAEA	International Atomic Energy Agency
INSAG	International Nuclear Safety Advisory Group
IT	Information Technology
JSC	Joint Standing Committee
KPI	Key Performance Indicator

MD	Managing Director
MOC	Mother Of the Chapel
MPS	Making Paper Safely
MSc	Master of Science
NASA	National Aeronautics and Space Administration
NGA	National Graphical Association
OHSAS	Occupational Health and Safety Management System
PABIAC	Paper And Board Industry Advisory Committee
PBL	Plaster Board Liner
PCM	Paper Company Manager
PDCA	Plan Do Check Act
PLC	(The Plc) – name of the paper company's parent organisation
PM	Paper Machine
PPE	Personal Protective Equipment
PUWER	Provision and Use of Work Equipment Regulations
RIDDOR	Reporting of Injuries Diseases and Dangerous Occurrences Regulations
SIM	Sector Information Minute
SIP	Safe Interventions Project
SMS	Safety Management System
SOGAT	Society of Graphical and Allied Trades
SUSA	Safe and UnSafe Acts
SWOT	Strengths Weaknesses Opportunities Threats
TU	Trade Union
TUC	Trade Union Congress
UK	United Kingdom
UKAEA	United Kingdom Atomic Energy Authority
US	United States
UTM	Under The Machine (pulper)

CHAPTER 1 – INTRODUCTION

This chapter forms an overview of this thesis. It details the reasons and justifications for carrying out the research; it defines the research question and the aims and objectives. The structure and objectives of the research are defined, as are the results. The work was conducted in a paper and board manufacturing company referred to as The Paper Company, whose company history and profile are detailed within Chapter 2. The company has had serious concerns about their health and safety performance since 1995/6 following a double fatality within a matter of months at their Mill One[1] facility in Kent. Since 1996 health and safety accident statistics steadily improved, but plateaued in the financial year 2002/3. A number of initiatives have been adopted to improve safety performance and these have proved effective, but despite the substantial efforts during the plateau there was a paucity of tangible evidence to demonstrate further sustained improvement.

There was a genuine desire from the senior management team to improve health and safety performance since the low point of 1995/6 and the plateau indicated that something was required to drive the accident trends further downward. This thesis critically evaluates the implementation of a behavioural based safety (BBS) programme at Mill One (the largest of The Paper Company's six mills). The BBS programme is implemented in the mill when the safety management system (SMS) is in a period of growth. In addition to the Mill One programme, other parts of the business where BBS are running are critically examined and compared with Mill One. In furtherance of the BBS interventions and the readiness of those mills to initiate the interventions, a mill which works on its SMS is also examined and the results displayed and discussed.

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[1] Table 1.1 demonstrates the company structure and geographical locations of The Paper Company, its parent company and The Paper Company's constituent parts.

The author was both participant and observer when conducting this research, being employed as the group health and safety manager. The merits and demerits of this are further discussed within Chapter 5 (Methodology).

Significant use of consultants were used for the research, the major consultant interventions being the BBS provider for Mill One, and the auditors of the SMS in Mill One and the other paper company mills. The consultant interventions were initiated by the author. The interface between the use of consultants and the role of participant observer are further discussed within Chapter 5.

1.1 KEY DEFINITIONS

This thesis discusses several key concepts, many of which are often misunderstood, have multiple meanings, and several different titles for largely the same concepts. The key definitions are outlined to ensure clear and common understanding.

1.1.1 Safety culture

The Health and Safety Executive's (HSE's) *Successful health and safety management* hereafter referred to as HSG (65) (HSE, 2000a) suggests that there are four characters which best define an organisation's safety culture. These are:

- "methods of **control** within the organisation;
- methods of securing **co-operation** between individuals, safety representatives and groups;
- methods of **communication** throughout the organisation;
- **competence** of individuals".

The safety culture of an organisation is defined as:

> "the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organisation's health and safety management".

(HSE, 2000a ibid)

1.1.2 Safety climate

The safety climate can be described as a snapshot of an organisation's safety culture taken at a specific time. This can give an indication of the safety culture at the point of climate analysis only. Techniques exist to measure safety climate which generally take the form of questionnaires and semi structured interviews, in addition to such techniques as observation. Safety climate can be regarded as, "the surface features of the safety culture discerned from the workforce's attitudes and perceptions at a given point in time" (Flin et al., 2000).

1.1.3 Behavioural Based Safety

BBS can take several forms and is known by several titles. Some titles of BBS in common usage are: safety behaviour modification; behavioural SMSs; safety observation systems and behavioural safety. What BBS systems have in common is that they all seek to modify the workforce's behaviours, which it is argued in time will effect an attitudinal change, thus modifying safety culture.

BBS programmes are generally defined by having observation and feedback programmes to view, monitor and record workplace behaviour and any subsequent changes. Krause (1997) explains that BBS are much imitated and thus suggests that a BBS programme:

> "...refers strictly to use of applied behaviour analysis methods to achieve continuous improvement in safety performance. These methods

[19]

include identifying and operationally defining critical safety related behaviours; observing to gather data on the frequency of those behaviours; providing feedback; and using data for continuous improvement.

In order to achieve long-term continuous improvement, these critical elements must be implemented and maintained via significant employee involvement."

1.2 RESEARCH QUESTIONS

The research aims to study the implementation and subsequent effectiveness of behavioural safety at The Paper Company. Success is measured by using several key performance indicators (KPIs) such as accident data, near miss statistics and observations. The key research questions are: can BBS be implemented when the SMS is experiencing change, and is the level of organisational cultural maturity suitable. The impact of BBS on the SMS and vice versa, offer a unique research opportunity.

1.3 RESEARCH AIM AND OBJECTIVES

The aim of this thesis is to evaluate the implementation of BBS at Mill One. The objectives of the research are as follows:

- Analyse the current and historical safety position of the paper industry within the UK and compare and contrast with The Paper Company data from similar periods
- Ascertain safety culture within Mill One by studying previous climate surveys. These have been by both The Paper Company and a BBS consultancy
- Carry out a thorough literature review to build up a rich picture of safety culture research and BBS research
- Evaluate the efficacy of the BBS implemented at Mill One
- Evaluate the efficacy of Mill One's SMS – measurements taken are 2004 (pre behavioural intervention) and 2007 (post behavioural intervention)

- Establish whether the SMS can sustain and aid the implementation of a behavioural intervention

- Determine whether attempting to change worker behaviours can have an effect on the organisation's safety culture. The paradigm is that safety culture improvement changes worker attitudes, whilst behavioural safety changes worker behaviours (BSI, 2008).

- Evaluate the efficacy of the BBS scheme at Mill Two (this was an established intervention which commenced prior to the author's employment with The Paper Company

- Examine whether improving the SMS can lead to a better safety culture (based on an intervention at Mill Three).

1.4 JUSTIFICATIONS FOR THE RESEARCH

The justifications for the research stem from three main sources. The first of these was the desire from within The Paper Company to improve health and safety in line with their continuous business improvement theme. There was also a great reluctance for them to slip back to the mid 1990s position where they were heavily criticized by the Graphical and Paper and Media Union (GPMU) for what the union perceived as an appalling accident record. Within the paper industry The Paper Company was seen as something of a health and safety exemplar, after safety improvements (Larkin, 1999). The second reason for carrying out this research is to continue to work within the spirit of the Paper and Board Industry Advisory Committee (PABIAC) initiative[2] and to reduce accidents to 50% of the 1998 figures[3]. The final justification for the research is to continue research carried out by the author as a contribution to a Masters degree (MSc) in Safety Health and

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[2] The PABIAC initiative was initially driven by demands from the Graphical Paper and Media Union (GPMU) for a safer workplace. The initiative is a tripartite body, comprising the HSE, GPMU and the UK Paper Companies.

[3] The 50% target was initially aimed at the period between 1998 and 2001 inclusive. Only 30% was achieved and the time period was extended from 2001 to 2004 – the target was the same 50%.

Environmental Management at the University of Glamorgan (Brown, 2001). This compared the safety approach at the Bridgend Mill prior to a fatality that occurred in July 2001 and the approach post fatality. The accident is described below:

"On 6th July a fatality occurred on Jupiter machine at Bridgend during a short procedure whilst the machine was in operation. The crew had taken the sheet off the reel and were changing doctor blades and cleaning the area between the yankee cylinder and the reel. The intervention was almost complete and the machine was being made ready for threading the sheet back to the reel via an air tube blower. During this operation a large pneumatically driven sheet driven stabilising foil was switched manually to the lower position. In doing so the machine man was trapped between the foil and a cross machine walkway handrail, which bridged the UTM[4] on which he was working. The machine man was positioned towards the back of the machine and out of sight of the operator lowering the foil."

(HSE, 2001a [Paper Federation Sector Information Minute 4/2001/11])

1.5 RESEARCH PROBLEMS ENCOUNTERED

1.5.1 Enforced change of research topic

This thesis was begun in October 2002 and the research was based in Georgia Pacific (GP) Paper Mill in Bridgend, South Wales. In January 2004 the author moved to a group health and safety role with The Paper Company, covering six paper mills (this at the time of submission has reduced to four mills), a recycling operation operating from nineteen depots and the company's logistics arm (the logistics company), which operates from twelve depots. From January 2004 to April 2004 it was necessary to affect a research suspension to allow for the new role. The focus of the research was changed, and this essentially led to a new intervention being studied. The work carried out at GP has been used in the literature review and also the research studying the history of paper making and papermaking safety is included.

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[4] Under machine pulper. Tissue making is a continuous process and the sheet is sometimes diverted to the UTM while operators are carrying out tasks such as cleaning. The UTM is a tub shaped chest with means of mechanical agitation to break down the sheet for recycling purposes.

1.6 THE THESIS HOST COMPANY AND ITS CONSTITUENT UNITS

The following is a brief breakdown of the company and its constituent sections. An indication of particular managers important to the work has also been included and these have been made anonymous. Chapter 2 presents a more detailed breakdown of the business.

Thesis reference	Description
The PLC	FTSE 250 packaging company with headquarters in London
The Paper Company	A paper company which is one of five divisions of the PLC, based in Berkshire
Mill One	Paper mill based in Kent
Mill Two	Paper mill based in the North West
Mill Three	Paper mill based in Devon
Mill Four	Paper mill based in Somerset
Mill Five	Paper mill based in Berkshire
Mill Six	Paper mill based in South Wales
Logistics company	The logistics arm of The Paper Company
Recovered paper company	The recycling arm of The Paper Company
PLC Manager One	Senior board level director of the PLC
PLC Manager Two	Senior Director with board level responsibility for health and safety within the PLC
PCM One	Senior operational manager for The Paper Company (control of Mills Two – Six)
PCM Two	Senior operational manager for The

	Paper Company (control of Mill One)
PCM Three	Mill manager of Mill Two
PCM Four	Senior manager for The Paper Company (human resources)

Table 1.1: The business units and key individuals referenced within this thesis

1.7 CHAPTER HEADINGS

The chapter headings with a brief description have been included in this section to give an overview of the thesis.

Chapter	Title	Summary
1	Introduction	An introductory chapter that sets out the aims and objectives of the research.
2	Background	Details the history of papermaking within the UK. This includes the process, the economic situation and the health and safety performance of the industry. Paper company specific information is presented in addition to the more general industry information. An overview of safety culture and behavioural safety within the industry is also provided.
3	Guarding methodology	Examines the historical papermaking approach to guarding. The legal framework and history is detailed.
4	Literature review	Introduces organisational culture, safety culture and the behavioural safety approach. A selection of the main behavioural safety providers are detailed and critiqued.

		Traditional SMSs are also included within the review.
5	Methodology	This chapter details the use of the climate surveys, why certain KPIs were chosen as measurement criteria, the methods for implementing the behavioural programmes and the interview techniques used.
6	Narrative	Written in the first person, this chapter details a description of events within the research period.
7	Results	The results against the KPIs identified are presented.
8	Review of BBS initiative: factors that determined its effectiveness	This discussion chapter explains how the data from the semi structured interviews, questionnaires and consultant data are interpreted.
9	Conclusions	Written in four parts: conclusions; recommendations to the employer; recommendations to consultants and further research.

Table 1.2: Chapter headings

CHAPTER 2 – BACKGROUND

"...when someone arrives at work in the morning they have a right to expect to return home in one piece. Unfortunately, for workers in paper making, this is not a right that can be taken for granted." (Larkin, 1999)

This chapter sets out a background to the paper industry. The earliest handmade papers to the modern high speed machines are detailed by way of an introduction to papermaking. The broad introduction to the industry is then supplemented by company information on the following:

- The PLC - the parent company of The Paper Company
- The Paper Company – a division of the PLC
- The Paper Company – Mill One where the safety intervention has been implemented
- The Paper Company – Mill Two where a previous safety intervention impact is analysed
- The Paper Company – Mill Three where a systems based intervention is analysed and compared to Mills One and Two.

A detailed overview of the PLC and its constituent divisions is provided to fully explain where Mill One and The Paper Company sit within the company framework.

2.1 THE PAPER INDUSTRY – A HISTORY

Paper making is an ancient skill traditionally thought to have been introduced by Ts'ai Lun in AD 105 in China (Paperonline, 2004a). It is thought that he made the paper from textile waste, using rags. The word paper is derived from the word *papyrus*, which was a plant found along the lower Nile in Egypt. Circa 3000 BC, Egyptians created sheets of papyrus by harvesting, peeling and slicing the plant into strips. The strips were then layered, pressed together and smoothed to make a flat, uniform mat, the quality of which was high (HQ Papermaker, 2004).

2.1.1 Hand-made paper

Papyrus is only one of the predecessors to paper. The name given to the sheeted product from various plants is generically entitled *tapa* which was derived from the bark of paper mulberry, fig and daphne.

In AD 610 handmade paper skills had reached beyond China to other parts of Asia, including Korea, Central Asia, Japan, Tibet and India. Arabian merchants when expanding eastward discovered the art of papermaking and the skills spread over time in to Europe – the earliest countries to be introduced to the skills being Spain and Italy. By the mid fifteenth century, paper was made in all of western Europe – this was opportune, in that it adequately served the needs of the newly developed printing press which Johannes Guttenburg had invented in 1440 (Inventions, 2004).

The methods used to make handmade paper changed very little from the earliest making of tapa. The basic steps up until automation were as follows: mixing the source of fibres with water and dissolving them to make a pulp; using a screen containing a porous material with an outer frame (known as a deckle[5]) to spread the mixture evenly and lifting the screen carefully out of the water and allowing it to drain off. Once the water has dripped away the sheet of paper remained and after drying could be peeled away.

Handmade paper had obvious drawbacks – the main ones being its lack of speed during manufacture and the length of time taken to dry the paper. Fibres were traditionally made from rag pulp, normally derived from linen or cotton. These are still used today to make products such as bank notes which require quality and durability. During the seventeenth century, rags became a much needed commodity due to the increased use of the printing press and the huge upsurge for papermaking during the Reformation (Paperonline, 2004b). Searches for other materials to use in place of the

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[5] Deckle refers to the wooden removable frame that holds in the water and fibre mixture when making paper. Once removed the edges were quite rough from the removed frame – the rough edges were known as the papers deckle. The paper edge in today's papermaking industry is still referred to as the deckle.

now heavily regulated rags proved largely fruitless – the use of straw was common place, but its quality was inferior.

2.1.2 Early automation

The lack of suitable materials and the slow pace of papermaking proved to be problematic to the countries that had a need for the use of writing materials. The Italian papermakers had developed the following: the use of water power; the stamping mill (used to press the water out from the porous frame instead of by hand; the mould made of wire mesh which led to an important aspect of the first machine; the paper press with slides for feeding in the material; drying the sheets on ropes and dip sizing (dipping the frame in to the fibre and water mixture).

The Italian process still had drawbacks, in that it was held back by a limited number of frames to form the sheet and also the limit of and regulatory control on rags.

2.1.2.1 First stage mechanisation

Only the invention of groundwood pulp by Saxon Keller in 1843 and of chemical pulp, first patented in 1854 by Mellier Watt (Paperonline, 2004c) solved the problem of the fibre shortage for papermaking. So from the mid 1500s to the mid 1800s there were raw material shortages with commodities that were necessary to make suitable quality paper.

The raw materials problems did not succeed in holding back the inevitable early automation of the industry. The initial Paper Machine (PM) model was patented in 1799 by the Frenchman J.N.L. Robert, but it was not a success. The potential in the design was noted however, and the drawings were brought back to England by the Englishman John Gamble in 1801 (Today in science, 2004). The Fourdrinier brothers, Henry and Sealy, who managed a leading London wholesale stationers, saw the machine's potential and

lacking the technical knowledge to realise it, they enlisted the services of the engineer Bryan Donkin (Dartford archive, 2004a).

By 1806 Donkin had a continuous PM running with commercial success – this effectively made the previously used forming frames redundant and hand made paper quickly became used for only limited purposes.

2.1.2.2 Second stage mechanisation

"Between about 1840 and 1880, efforts were made to obtain rag substitutes on an industrial scale and appropriate industrial plants were developed." (Paperonline, 2004d). The advent of groundwood pulp and chemical pulp was necessary to realise the potential of the expanding automation of the industry.

The name *Fourdrinier* is synonymous with papermaking today – the design is still a common one for machines. The Fourdrinier machine (Figure 2.1) is a slightly modified version of the original Donkin machine of 1806 (Dartford archive, 2004b)
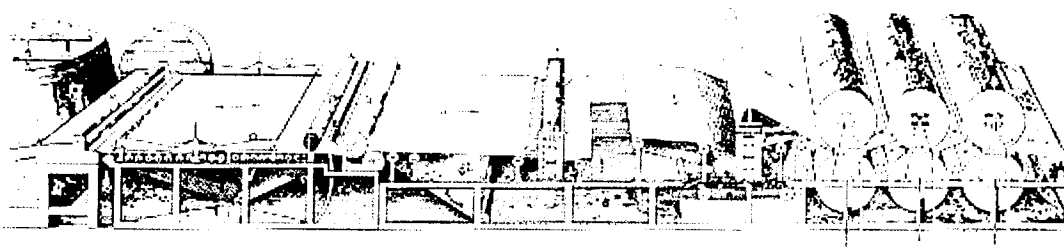
Figure 2.1: Fourdrinier machine circa 1850

2.1.2.3 Third stage mechanisation

The third stage occurred between 1860 and 1950. "This era was marked by the enlargement of the web[6] width, an increase in working speeds, the introduction of electric drive and further improvements to various machine parts. Machines designed specifically for the production of particular paper and board grades (for example the Yankee cylinder[7] and multi-cylinder machines[8]) were also developed. The web width grew from 85cm (1830) to 770cm (1930), while production speeds rose from 5 metres/minute (1820) to over 500 metres/minute (1930)." (Paperline, 2004e).

2.1.2.4 Fourth stage mechanisation

This stage covers the period 1950 to 1980. The primary changes during this period were the advent of deinking[9], increased automation and further speed increases. The industry between these dates began to close the mills whose profitability were unacceptable and mergers were commonplace.

2.1.2.5 Fifth stage mechanisation

1980 onwards could be referred to as the fifth stage of papermaking history, which has seen drastic changes from circa 2000 onwards. The demands of the emerging economies, particularly China and India are having enormous impacts on prices, on energy demand and pricing and are indeed changing the world map of papermaking. China during 2006 was averaging two new coal fired power stations per week to satisfy its demand for energy (Timesonline, 2007), to fuel its growth. Machines, particularly from 2000 onwards in Europe and the emerging economies, are being constantly

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[6] The web refers to the finished paper size.
[7] Yankee cylinder refers to the sole drying cylinder normally found on a tissue machine. These can be in excess of one hundred tonnes and are steam filled revolving pressure vessels to quickly dry the paper sheet.
[8] Used on paper and board machines these are a series of drying cylinders, steam filled that dry the paper in a similar fashion to that of a yankee cylinder, but because of the typically heavier grammage paper this is done more slowly for sheet quality.
[9] Deinking is the process used to remove the inks and ash from used paper fibres from sources such as pamphlets, newsprint and magazines.

increased in size and speed, and tonnage records, speed records and greater web widths are always being sought.

Stora Enso, one of the world's largest paper making companies started their PM 4 (Paper Machine 4) up in 2003 at a cost of $500 million (US). The machine now runs at 2,000 metres per minute and produces 400,000 tonnes of recycled newsprint per year.

The 10 metre wide plus machines and their impressive speeds and tonnages, in conjunction with escalating energy costs, have spelt the end for the small paper mills within Europe. Paper mills have traditionally worked to very small financial margins. The swift increase in energy costs meant that their costs rose sharply, with little hope of improvement in the short to middle term and limited opportunities to raise prices, small mills futures were limited.

Figure 2.2: Analysis of gas and electricity prices (pence/KWH) Oct 2001 – Apr 2007

The machine in Figure 2.3 is typical of the new types of PMs now increasingly common in the European and particularly Chinese markets in this post 2000 era. The average speed of over 1,500 metres/minute and daily tonnes over 2,000 are impacting greatly on UK paper making companies.
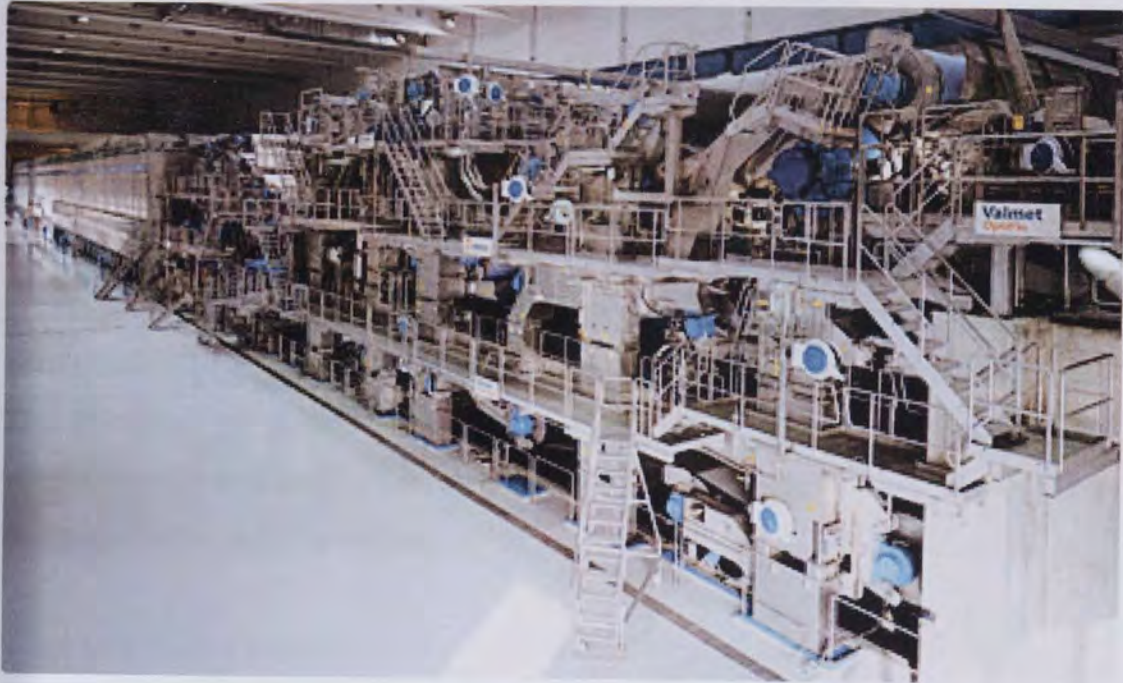
Figure 2.3: Machine manufactured by Metso for the Palm Mill (Germany)

2.1.3 Modern papermaking

The paper and forestry sector of industry within Europe has an annual turnover of in excess of €400 billion, directly employing around 279,000 employees and indirectly a further 3.3 million, creating jobs for 4 million people in total (Paperonline, 2006).

The modern paper making machine is now significantly larger and faster than its predecessors of the fourth stage of paper making. The fifth stage of papermaking (post 1980, and more specifically post 2000), whilst experiencing huge technological leaps still resembles the basics of early automation. The Fourdrinier machine is still recognisable in the machines that one sees today. Its importance has proven critical within papermaking.

The key achievement that Donkin's Fourdrinier machine achieved was that it was a continuous process – the sheet was formed on a continuous wire, which transferred to a felt that was then pressed prior to passing on to driers. This largely led to the end of the hand-made paper making process

with the exception of some fine writing papers, which are still made by hand today.

2.2 THE PLC

The PLC is a company that has grown from humble roots from one factory in Neath, South Wales to a £1.6 billion packaging giant through a combination of organic growth and acquisitions during the 1980s onwards. This is typical of the fifth stage of the papermaking and packaging industry where merger and acquisition to consolidate one's position and to grow the business were commonplace.

2.2.1 The PLC – present

The PLC is a top 250 FTSE listed company whose primary business interests lie in two fields – namely, packaging and office products. It is an international group with revenue in 2005/6 of £1,653 million and it employs 11,400 people in 16 countries. The company is split in to four segments which can be best demonstrated by Figure 4 (annual turnover in £s and percentage of PLC turnover are demonstrated):

The PLC

UK paper and corrugated packaging	Continental European corrugated	Plastic packaging	Office products wholesale
£649.6m	£276.6m	£202.4m	£518.7m
39%	17%	12%	32%
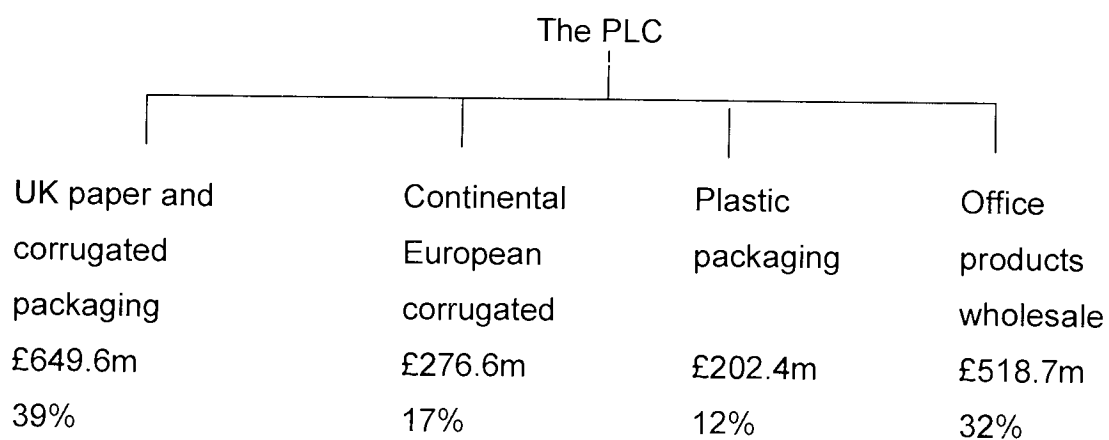
Figure 2.4: The PLC company structure

2.2.2 The PLC – a short history

The company began in 1940, manufacturing folding cartons at Neath in South Wales. The business was incorporated in 1960 and was listed on the London Stock exchange on the 3rd March 1986.

The 1980s saw the group grow rapidly with the acquisitions of The Paper Company in 1986 and Mill One in 1988. The initial diversification into plastic packaging occurred with the purchase of a liquid packaging operation as part of a larger £12 million investment. This was followed by the acquisition of the plastic tap business, Waddington and Duval.

The PLC experienced continued growth in the 1990s, through a combination of organic growth and acquisitions. During this period, the group's largest paper mill, Mill One was upgraded between 1993 and 1996 at a cost of £110 million. The continental Europe division was purchased in 1991 for a cost of £170 million – this provided the group with a strong and pivotal presence within continental Europe. The group gained a position within the office products wholesale market in 1993 with the purchase of a renowned office products wholesale company. The leading UK manufacturer of envelopes, books and pads was purchased in 1996 (and later sold in 2005).

More recently there has been significant investment within the paper mills and corrugated factories within the UK and continental Europe. In March 2004 a corrugated containers company was acquired for £167 million.

The PLC's various plastic operations were consolidated in to one separate division which focuses on two markets: liquid packaging and dispensing; and industrial returnable transit packaging. Two major acquisitions were made in 2000 and 2002 to establish a leading global position in liquid packaging and dispensing.

2.3 THE PAPER COMPANY

The Paper Company is the paper making arm of the PLC. It is one of two parts of the PLC's UK Paper and Corrugated Packaging segment. The Paper Company can be best identified by the use of an organisational chart which is demonstrated in Figure 2.5:

The PLC

UK Paper and
Corrugated Packaging
Segment

The Paper Company   Packaging

Paper   Recovered Paper   Logistics
Mills   Depots   Depots
(6)   (19)   (13)
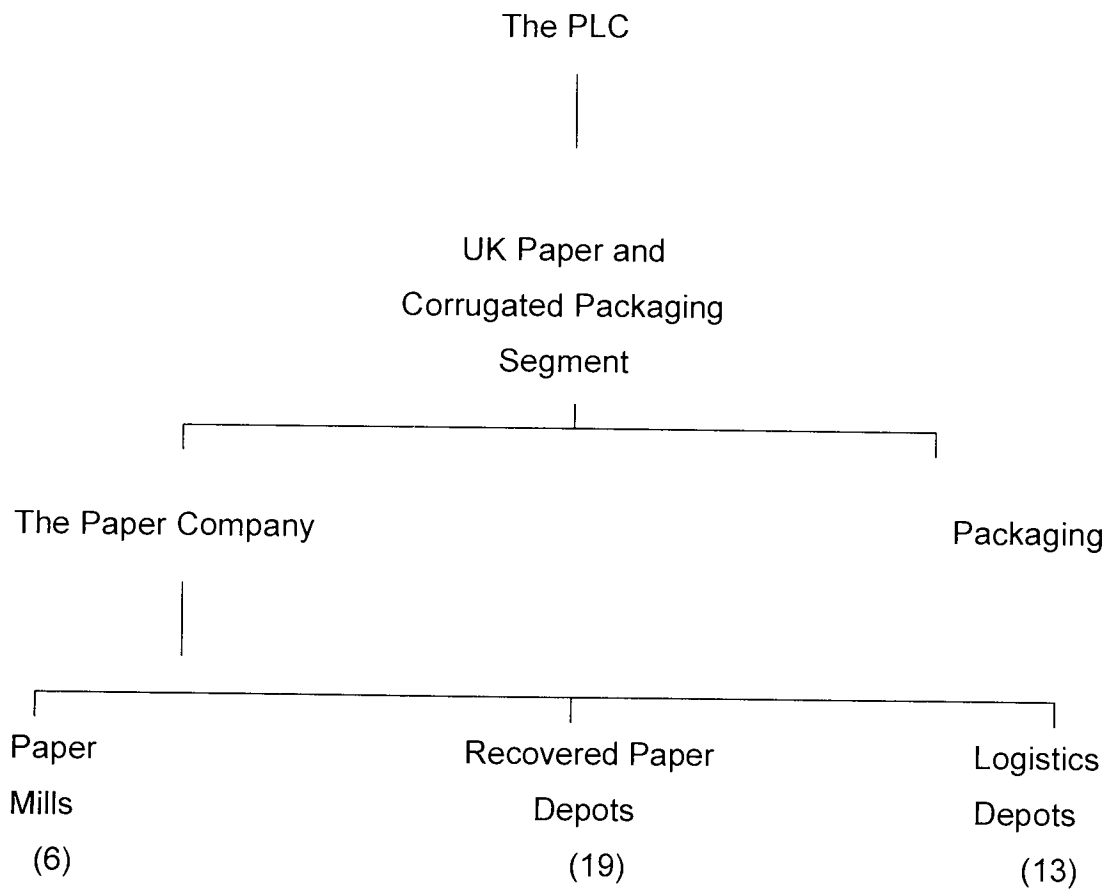
Figure 2.5: An overview of The Paper Company structure within UK Packaging

2.3.1 The Paper Company – present

The Paper Company is the largest UK manufacturer of corrugated case material (CCM). The three elements of the business are interlinked, as demonstrated in Figure 2.6:
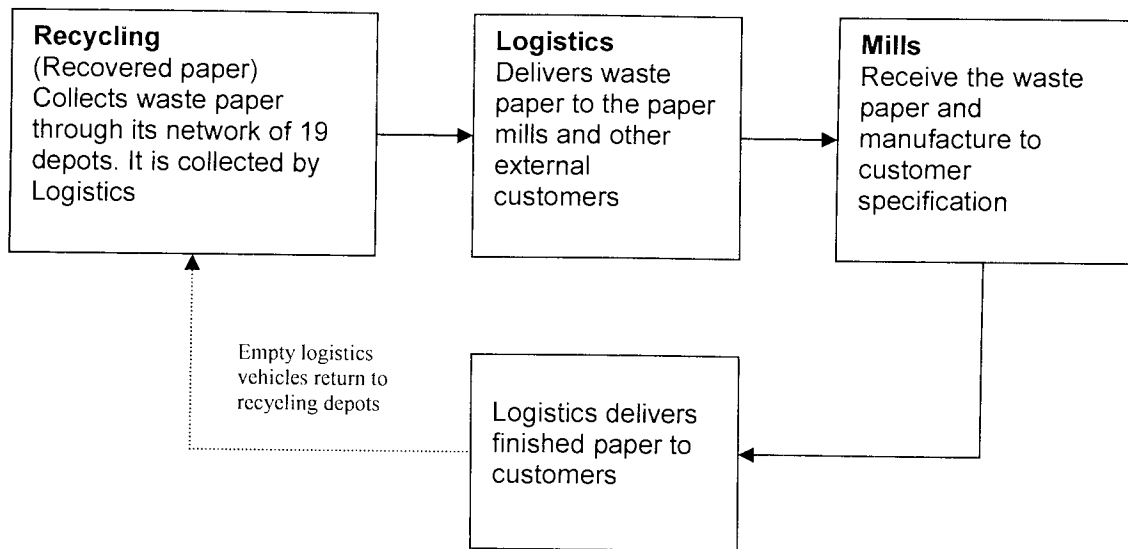
Figure 2.6: A demonstration of the relationships between the three sections of The Paper Company.

2.3.2 The Paper Company history

The Paper Company was originally incorporated on 20th August 1898, as Tillotson & Sons Ltd. It assumed its current name on the 10th August 1988.

2.3.3 The recovered paper business

The recovered paper company[10] was acquired by The Paper Company in 1987. It began its business as a paper merchant in 1975. The following years saw growth into a substantial provider of waste paper to UK mills, acquiring new businesses to increase its geographical coverage. In 1987 The Paper Company purchased the recovered paper company, thus

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[10] The Paper Company uses 100% recovered (recycled) paper in all its products.

ensuring its own paper mills were guaranteed the supply of waste paper harvested.

The recovered paper company growth continued, most recently through the purchase of the former BPB Recycling business, providing five more recycling facilities to the existing network. There are currently nineteen recycling depots stretching from Cornwall to Scotland, but of equal importance, the recovered paper company has expanded its services to the broader arena of facilities management. The recovered paper company network of recycling facilities combines with a nationwide network of recycling and waste partners. This means that customers can contact them to wholly manage their entire waste collection.

The recovered paper company is now the largest recycler in Europe. Its own facilities, combined with that of its partners, recycle approximately 1.8 million tonnes of material annually.

2.3.4 The Logistics business

The logistics company can trace its origins back to the mid 1930s when it was started by Mr Griggs with two vehicles. The company was based in Soham, Cambridgeshire and provided a service to local farmers, transporting sugar beet to the processing factories, and cut flowers to the markets in London. During the war years the vehicles were commandeered, but the company re-started soon after 1945.

In the 1960s Mr Griggs' son Tony joined the Company, which then became involved in the packaging industry, providing transport for Tillotsons Corrugated Cases. In 1958 Tillotsons started the Burwell packaging operation, followed by Monmouth in 1963, Launceston in 1969 and Ely in 1970, now all part of the PLC today.

Tillotsons then acquired a 40% stake in the logistics company, which provided the opportunity to expand the fleet.

Today the logistics company supplies time-sensitive primary haulage, secondary distribution and warehousing across the UK via a network of 11 sites. It operates 194 vehicles and has 640 trailers on the road, as well as managing 20,000 square metres of ambient warehousing. The logistics company provides haulage services not only for The Paper Company, but also the wider business of the PLC.

2.3.5 The paper mill business

The Paper Company now has six paper mills producing a total of 1 million tonnes of paper, 70% of which is CCM, the remainder being plasterboard liner (PBL) and speciality papers.

The six mills[11], annual tonnage (000's) and number of PMs are represented in Table 2.1:

Mill name	Mill One	Mill Two	Mill Three	Mill Four	Mill Five	Mill Six
Tonnes ('000)	600	100	35	200	100	150
PMs – no.	3	2	1	2	1	1

Table 2.1: The Paper Company mill information, demonstrating annual tonnages and number of PMs (2004/5)

2.3.6 Mill One

Mill One is today the flagship of The Paper Company – producing slightly in excess of 70% of the total production tonnage.

2.3.6.1 Mill One - A Brief History

The mill was built between 1923 and 1925 by Edward Lloyd[12], to produce newsprint for the newspaper that he owned. The four PMs installed were, at the time, the world's largest. A power station and pulp mill were built to power and service the mill. The mill's production was soon 5,000 tonnes per week.

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[11] Both Mills Five and Six closed in 2005/6.
[12] Edward Lloyd was a newspaper printer of that era.

Along with the manufacturing site, Lloyds also built a village to house its employees. The village still remains today, under the control of the local council and private residents. Many of the current employees reside there today.

In 1936, Bowater acquired Lloyds and the site and expanded the mill with increased output on all the machines. The 1960s and 1970s saw newsprint go into rapid decline and Bowater diversified part of the mill operation into CCM[13] and part into fine papers. A semi-chemical[14] pulp mill was built to produce semi-chemical fluting[15] and in the late 1970s PM 3 was given a new wet end configuration to allow the manufacture of corrugated case liner.

By the late 1980s, Bowaters decided to retire from primary paper making and the mill, along with several other paper mills in the area, was sold to the then management who set up a company named UK Paper. Shortly after the management buyout the mill was split into two separate mills – the CCM operation was sold to the present owners and the fine paper operation remained with UK Paper, which is now owned by M-Real, Finland's third largest paper making company.

2.3.6.2 Mill One today

Mill One is today the largest CCM mill in the UK by a factor of two. There are only seven machines in Europe with a capacity greater than that of its individual machines. The product range includes CCMs, PBL and specialist grades of paper products such as industrial towelling.

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[13] CCM is brown paper grades that are used for packaging boxes.
[14] Semi chemical pulp is produced by 'cooking' wood chips to gain their fibres.
[15] Fluting is the name given to the undulating filler in packaging boxes that is between the two sheets of board either side.

The mill is housed on a shared site with a company named M Real of Finland[16]. The mills have an abundance of water, in their position on the Swale estuary. Their power is provided by a company named Grovehurst, both companies have board members who sit on the Grovehurst board of directors.

2.4 SUMMARY

This chapter has illustrated the history of papermaking from its handmade origins in China in 105 AD to the modern machines making up to 600,000 tonnes per annum. Whilst the machinery from Donkin's Fourdrinier is still identifiable in modern machines, the functionality, speed and complexity of modern machines makes them a very different machine to the original Fourdrinier of the 1800s.

Similar to the history of machinery, The Paper Company and its parent company the PLC have been described and their pattern of growth to modern times outlined. This chapter leads in to Chapter Three which concentrates on automated paper making machinery and its guarding and applicable legislation.

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[16] The Paper Company bought the M Real mill adjacent to its site in late 2007. This was to provide the capacity to make lightweight papers (under 100 grams). This was the last mill owned in the UK by M Real and was part of a consolidation exercise throughout Europe.

CHAPTER 3
PAPERMAKING - GUARDING PHILOSOPHY

Chapter 2 demonstrated the various stages of papermaking from early handmade papers to 10 metre wide 2,000 metres/minute machines. The major hazards within papermaking have historically been related to the heavy machinery and its interface with the operators. This chapter concentrates on machinery and machinery guarding because of the HSE priority given to the topic and the disproportionately high instances of machinery related major RIDDOR and fatalities within the industry and The Paper Company. This will be highlighted within this chapter by the various examples given through publications such as HSE SIM (Sector Information Minutes) documents.

This chapter demonstrates the various regulations, and other pieces of law, that have applied to papermaking historically. It charts the progression of applicable law, of standards specific to papermaking, in addition to any industry body activity and guidance.

3.1 APPLICABLE LEGISLATION AND GUIDANCE

Two key pieces of legislation are discussed within this section. What is obvious within the industry is that their interpretation of the Health and Safety at Work etc. Act 1974 (HASAWA) and the subsequent Management of Health and Safety at Work Regulations 1992 was either not understood, poorly interpreted or simply not followed. The 1974 Act was an enabling Act that provided general duties for employers. The following (HSE, 1974) suggests that although not specifically mentioned, risk assessment was the tool that business would need to use to assess which of its activities caused unacceptable levels of risk:

"Crucially the new Act imposes new comprehensive statutory obligations on employers. It is no longer enough for the employer simply to consider how well he complies with a number of fairly specific requirements. He now has to re-assess every aspect of his activities...in particular, the Act requires

employers to apply to matters of health and safety the same managerial techniques that an efficient company applies to its commercial activities."

3.1.1 The Factories Act 1961

The Factories Act 1961 was the primary piece of legislation for the paper industry from its inception in 1961 (Ford & Clarke, 2007). The 1961 Act was taken verbatim from its predecessor the Factories Act 1937 and large chunks of previous Acts (the 1937 Act was preceded by the Factory and Workshops Acts 1878 and 1891). Key sections of the Factories Act 1961 for the industry were: Section 12; Section 13; Section 14 and Section 15. Descriptions of the aforementioned sections are listed and briefly described within Table 3.1:

Section no.	Section name	Description of key points
12	Prime movers[17]	•Every flywheel directly connected to a prime mover shall be securely fenced •Every part of electric generators, motors and rotary converters, and the flywheels connected to them shall be securely fenced
13	Transmission machinery	•Every part of transmission machinery shall be securely fenced
14	Other machinery	•Every dangerous part of any machinery apart from those within Sections 12 and 13 shall be securely fenced •For operational reasons, if a dangerous part of machinery cannot be secured by a fixed guard, a device may be used to which automatically prevents the operator coming in to contact with the dangerous part
15	Provisions as to unfenced machinery	•Applied to parts of machinery that were safe by position – but may have to be reached for maintenance purposes, e.g. lubrication •Any part of transmission machinery used in processes named in the Factories Act 1961 schedule (paper and board was included within this) because of the continuous nature of the process be worked on with the machinery in motion (Ford & Clarke, 2007 ibid)

Table 3.1: Breakdown of sections of the Factories Act 1961

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[17] Prime movers are defined within the Factories Act 1961 as, "every engine, motor or other appliance which provides mechanical energy derived from steam, water, wind, electricity, the combustion of fuel or other source" (Ford & Clarke, 2007 ibid)

Table 3.1 clearly demonstrates that from 1937 there was a legislative requirement for much of the industry's machinery to be guarded to prevent injury to persons who may come in contact with that machinery.

3.1.2 The Fourth Report

Safety in Paper Mills (HSE, 1979), or the *Fourth Report* as the guidance is generally referred to, was the fourth report of the Joint Standing Committee (JSC) for Paper Mills. The report built on previous reports from JSCs, most notably the report dated 18th July 1952 (HMSO, 1952). The JSC was a tripartite body, enlisting members from the relevant unions, the HSE and the British Paper and Board Federation. The introduction states that, "The document should be read in conjunction with the HASAWA 1974 and the Factories Act 1961.". The guidance is referred to within its text as, "authoritative guidance to paper and board mills on means of improving and maintaining standards of health and safety...the committee recognises the need for a flexible approach when it is not practicable to provide full physical protection" (HSE, 1979 ibid).

The guidance document takes in to account the changes within the industry as far as the process and technological changes are concerned, and sets out its information in logical generic headings such as: general principles; machinery in preparation areas; paper and board-making machines and finishing machines.

The use of textual information and many photographs and diagrams makes the guidance document an easy to reference booklet giving good examples of possible compliance routes to relevant safety personnel within the industry and the HSE.

Much of the information regarding PM guarding is still applicable on today's papermaking machines.

3.1.3 Guarding in the papermaking industry

> "The papermaking industry in the UK has an appalling record. The major and fatal accident incident rate - calculated per hundred thousand employees – in each of the three years 1994/5, 1995/6 and 1996/7 was at or above the equivalent rate for the construction industry – long recognised as an industry with an unacceptably high rate of accidents."

> Wilcock, 2001

The following SIM document further demonstrates the point made by Wilcock:

> "It is widely accepted that machinery safety standards in the industry need to be improved. This is confirmed by inspectors' experience and the current accident record. Results from the audits...revealed a constant over-reliance on measures at the lower end of the Provision and Use of Work Equipment Regulations 1998 (PUWER 1998) control hierarchy, such as safe systems of work and training, rather than the provision of adequate safeguards."

> HSE, 2000b [SIM 4/2000/11]

Much of the paper industry's problems as far as accidents were concerned were focused around the areas where machine operators had to have an interface with a moving PM. Tail feeding[18] is one of those high pressure moments in papermaking where operators are working in conjunction with moving parts. Because the industry's guarding philosophy was relatively laissez faire, this meant that guarding standards as prescribed were not followed. This rendered any interface with moving machinery as life threatening whenever it occurred – the industry was still largely unguarded.

A SIM document from HSE in 2001 indicated that the industry was still struggling to come to terms with protecting its operators when tail feeding, but also acknowledged progress:

> "Tail feeding is one of the times when operators are at the highest risk. These include entanglement arising from whole or part body access, falls from height, manual handling, stress, heat and noise. Making Paper Safely effectively prohibits hand feeding of paper tails directly

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[18] The tail is a narrow part of the paper reel that is torn by a papermaker when initially feeding a new reel into a PM, or following a paper break (when the sheet breaks during production). Once the tail has fed through the machine on a reduced speed, then the speed is increased and the tail widens until it fast becomes a full width reel of paper.

into nip rolls and sets out a hierarchy of preferred options. Mills have realised that effective guarding make manual intervention during tail feeding increasingly difficult. Most mills have made considerable efforts to improve performance in this important area."

HSE, 2001b [SIM 4/2001/10]

Through the Confederation of Paper Industries (CPI), formerly known as the Paper Federation of Great Britain, there is a communicative briefing format when serious accidents and incidents occur. The *safety alert* forms contain basic information of incidents that other mills can learn from. The following is an example of cross European sharing of an incident within a Dutch paper mill:

"There has been a fatal accident at DeEendracht. Number 10 papermaker was cleaning out the press pulper[19]. The deceased didn't lock off but asked two guys, one of whom was the supervisor to oversee the panel. Both were distracted and an assistant started up the system.

The deceased was trapped by his legs and they had to amputate them to release him but he died two hours later."

The Paper Federation of Great Britain (2003)

3.2 PAPERMAKING HEALTH AND SAFETY PERFORMANCE

Papermaking prior to the mid 1990s had been free of specific HSE *targeting*. The paper industry figures were hidden in amongst the larger group of printing within the HSC annual statistics. The printing industry is much larger than the paper industry with a far lower accident rate. HSE's accident reporting databases improved during the 1980s and 1990s, and during the 1990s, it became apparent to HSE and PABIAC that the paper industries accident record was far worse than had previously been considered.

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[19] Pulpers are large vessels that mix the paper fibres with water and or chemicals or bleaches. They are powered by large electrically driven rotors and the industry has some experience of fatalities within them. The incidents are usually related to not locking off the rotor.

3.2.1 The Killer Mill Campaign

The *Killer Mill Campaign* was a significant catalyst for change and was focused on the poorly performing paper mills following two fatalities within the industry – both were at Mill One. They were eight months apart and occurred in the latter part of 1995 and the early part of 1996. It was the double fatality that forced action upon the industry.

The GPMU wrote an article that effectively vilified the paper industry and pointed to the aforementioned incidents in particular, singling Mill One and The Paper Company as particularly poorly performing. Coupled with the 1994/1995 Health and Safety Commission (HSC) major incident rate[20] figures for paper at 308, compared with 216 in construction and 126 in manufacturing, (Horbury & Bottomley, 1998) the impetus for change was born:

> "The GPMU sought a meeting with the Council of the Paper Federation and demanded action from the industry to address this appalling accident record. The meeting took place on the 20th June 1996.
>
> Subsequently employers were called on to ensure that:
>
> - Health and safety was dealt with at board level and projected to all levels of the company
> - Risk assessments were completed in line with Regulation 3 of the Management of Health and safety at Work Regulations
> - Systems of work were reviewed and shown to be safe and operating effectively
> - All staff were trained in the safe systems
> - All managers were trained in health and safety
> - All managers were appraised on their health and safety performance
> - Safety was on the top of the agenda for every mill meeting at all levels
> - There was active involvement of FOC/MOCs[21], Safety Reps [representatives] and Chapel members
> - Safety Reps were permitted the necessary time off to perform their legal functions within mills, and to be trained in those functions, and
> - There was full disclosure of all health and safety information to safety Reps and Chapels".
>
> (HSC, 2001a)

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[20] Major injury incidence rate is calculated on the basis of major injuries under RIDDOR to the HSE, and is calculated per hundred thousand employees.

[21] FOC/MOC's refers to 'Father of the Chapel and Mother of the Chapel'. The ancient print unions were organised in to Chapels many years ago when trade unionism was illegal. The father/mother of the Chapel is the most senior trade union representative on site, voted in to position democratically by their members.

3.2.2 The HSE and the paper industry

It was only in 1996 that attention was really turned upon the paper industry by the inspectorate, on the GPMU's urging:

> "The initiative to reduce accidents in the paper making industry in the UK arose from concerns expressed by the main trade unions represented on the Paper and Board Industry Advisory Committee (PABIAC)."
>
> (HSC, 2001a ibid)

Several anonymous Field Operations Directive (FOD) HSE inspectors with paper mill inspection experience have held discussions with the author and have expressed the view that when paper mills were inspected, it was the accepted norm that unguarded machinery would be witnessed and not necessarily challenged. The discussions took place between 1999 and 2002, some ten years post publication of the Provision and Use of Work Equipment Regulations (PUWER), 1992, whose Regulation 11 (Dangerous parts of machinery) states:

> "Every employer shall ensure that measures are taken...which are effective –
> a) To prevent access to any dangerous part of machinery or to any rotating stock-bar; or
> b) To stop the movement of any dangerous part of machinery or rotating stock-bar before any part of a person enters a danger zone
> 2) The measures... shall consist of-
> a) the provision of fixed guards enclosing every dangerous part or rotating stock-bar where and to the extent that it is practicable to do so, but where or to the extent that it is not, then
> b) the provision of other guards or protection devices where and to the extent that it is practicable to do so, but where or to the extent that it is not, then
> c) the provision of jigs, holders, push-sticks or similar protection appliances used in conjunction with the machinery where and to the extent that it is not, then
> d) the provision of information, instruction, training and supervision."
>
> (the HSE, 1992)

The reasons for the relaxed enforcement approach against the law within the industry by the HSE have been discussed with the aforementioned anonymous inspectors and the author. Reasons put forward were many, but the themes were a constant: it's impossible to guard paper because of the human intervention required with the machinery; one simply can't guard a PM; that's just the way the paper industry is; the costs for guarding solutions would be excessive when compared against the possible gains.

3.3 HEALTH AND SAFETY IN THE PAPER COMPANY

Accurate accident figures for The Paper Company began in 1995, so it is only from that point that indications of safety performance can be gauged. There were no other KPIs that would enable one to measure performance within the company, aside from the accident figures.

Paper industry health and safety performance can be categorised in to two distinct ages – pre 1998 and 1998 onwards. The former had legislative guidance, both in the form of the Factories Act 1961 and the industry specific Fourth Report, both largely not adhered to. The latter, which is discussed in detail within Chapter 4, followed an intervention in the form of a three year plan and included scrutiny from the trade body, the trade unions, the industry itself and the inspectorate. It also had a revised industry specific guidance document, entitled *Guide to Managing Health and Safety in Paper Mills* (HSC, 2001b), which has become commonly referred to as *Making Paper Safely* (MPS).

The Paper Company, in addition to all the UK's paper mills, worked towards the new guidance, which had been published in draft format in 1999.

3.3.1 The Killer Mill Campaign – the Mill One trigger

The Mill One double fatalities of 1995 and 1996 kick-started change within the industry, and also significant change within The Paper Company. The accident rates since accurate figures became available were poor for The

Paper Company and the double fatality was the trigger for a new approach to health and safety management within the company.

There were fears in 1996 that the rates of accident were rising and would continue to do so, unless a drastic rethink on health and safety management was undertaken. Paper company manager four was granted carte blanche control to change matters. The rising trend on a linear basis[22], showed a predicted accident rate per 100,000 hours[23] worked at 2.8 in 1997, from the figure of 1.95 in 1995.
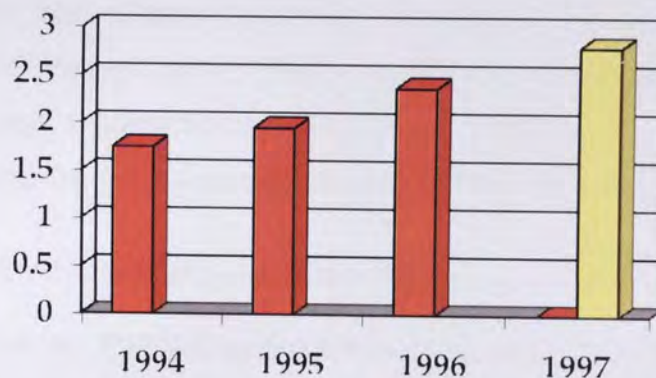
Figure 3.1: Paper company accident rates (extrapolated and predicted)

3.3.2 Implications for the industry

The implications for the UK paper industry were enormous. PABIAC established a framework to work within – PABIAC's strength was that it was a tripartite body formed by the unions, the HSE and the paper industry. The main pillars of change proposed by PABIAC were: to reduce the accident reportable rate by 50% from 1998 to 2001; to implement MPS as a guide to meeting legislative standards within the industry. The period of time that the mills accident rates were scrutinised was known as the PABIAC initiative which began in March 1998 and was completed in March 2001.

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[22] Internal graph used by The Paper Company to express how things might turn out without any changes in the safety management of the company.
[23] Accident rate per 100,000 hours worked is calculated as follows – (number of hours worked x reportable accidents)/100,000. This enables comparisons of accidents where the numbers of staff differ between sites being compared.

The common feeling within the papermaking industry was that it was simply un-guardable. The author's role as both participant and observer within the industry since the year 2000 enabled this view to be witnessed in person. The feeling at the time is perhaps best summed up by the following quote from a papermaker who shall remain anonymous:

"If you guard that machine in that way and make paper, then I don't have a hole in my ar**.".

Anon, 2001

The view expressed above was not purely the feeling from the papermaking workforce, but was shared by senior management, engineering staff, PM designers and indeed some HSE inspectors. The industry, since being mechanised and automated in the early 18th century, had remained largely unguarded until the proposed document MPS was first becoming discussed.

3.3.3 The PABIAC approach – a chronology

To best explain the PABIAC approach from its step change triggered by the GPMU in 1996 to late in 2000, a chronology of the key elements of the approach is demonstrated within Table 4. Post year 2000 PABIAC information is discussed later within the thesis, particularly within the literature review.

Event/Activity	Date	Content
Meeting between the GPMU and Council of Paper Federation	June 1996	Meeting to discuss accident record and express concern regarding growing number of fatal accidents.
PABIAC special meeting	July 1996	Extraordinary meeting of PABIAC to discuss concerns about high accident rates, to evaluate activities in other industries, to tackle this sort of issue and to agree proposals for research. Targeting of 'top ten' worst performing mills. Identified Health and Safety Laboratories to carry out research work.
Publication of interim report by HSL	Feb 1997	The report detailed initial findings on accident rates in six paper mills and outlined proposals for completion of the work. Six more mills were added to the sample to validate the emerging findings.
Working group	Dec 1997	PABIAC working group meet to discuss and outline proposals for PABIAC initiative – proposals circulated to PABIAC members for agreement. Following this was a presentation to the Paper Federation Council by the PABIAC chair and secretary
HSL report published	Feb 1998	Copies of the report copied to all participating mills – and made available to others.
CEO event	Mar 1998	Industry Chief Executive Officers (CEOs) invited to seminar in London to hear results of the research.
Submission of mill health and safety action plans	Aug 1998	Mills prepare and submit their health and safety action plans to their local HSE inspectors – copies of which were forwarded to the paper sector within HSE for assessment.
PABIAC	Feb 1999	Routine PABIAC meeting identifies that risk assessment is an area of difficulty for most mills.
Fatal accident	Oct 1999	Fatal accident occurs at Donside Mill, Scotland. First fatality for 16 months.
PABIAC audit	Dec 1999	Audit team agree mills to be audited against standard HSG (65).
PABIAC audits	Jan – Mar 2000	Nine audits of paper mills completed – overall and individual reports produced.
Fatal accident	Jan 2000	Fatal accident at Smurfit, Burnley.
HSE inspector meeting	May 2000	Meeting to discuss progress with PABIAC initiative and proposals for the introduction of Making Paper Safely.
Revision of mill action plans	Aug 2000	As a result of Making Paper Safely, all mills are charged with revising their current action plan.

Table 3.2: PABIAC chronology adapted from HSC, 2001a

3.3.3.1 Research carried out

PABIAC requested that Health and Safety Laboratories (HSL) carry out research to examine the high rate of incidents within the paper industry. Horbury and Hurst (1997) produced an interim report and precursor to the final study (Horbury & Bottomley, 1998). It was felt within PABIAC that the factors that contributed to high or low accident rates within mills could be safety, culture maturity, and SMS maturity (HSC, 2001a).

3.3.3.2 Research findings

The findings of Horbury and Bottomley (1998, ibid) justified the PABIAC view, regarding accident rates, safety culture levels and the maturity of SMSs. The research findings are discussed more fully within Chapter 4.

3.3.4 Making Paper Safely and PABIAC targets

Whilst the HSL research in to the industry was occurring, the HSE enforcement stance was to continue inspecting mills in a conventional manner and singling out the worst ten mills for special attention by inspectors. Mill One was one of these mills singled out.

PABIAC established a small working group in December 1997 (HSC, 2001a) to establish key criteria for the industry and the constituent mills to achieve. The key objective was to reduce accident rates in the industry by 50% over 3 years, whilst promoting a culture of continuous improvement.

To further aid the companies and individual mills the following objectives were established:

1. "To raise health and safety awareness within the industry, with programmes targeting senior managers, supervisors and workforce by a process of information, consultation and communication.
2. For senior management in the industry to demonstrate commitment to proper risk control and continuous improvement through company safety policies, the application of effective management systems, and implementation of specific mill action plans.

3. To identify the necessary knowledge and skills required to enable managers, supervisors and workforce in the papermaking industry to implement these aims and objectives and carry out their duties, providing appropriate information, guidance, tools and training.
4. To ensure that technological risk levels are reduced to as low as reasonably practicable – using statutory obligations, PABIAC and HSE guidance as a minimum for the industry…The programme of risk control shall be guided by the Sector Strategic Plan and individual mill risk assessments.
5. To monitor the implementation of these objectives by means of routine progress reports to PABIAC and to review and update the PABIAC Action Plan and Sector Strategic Plan according to lessons learned.
6. To ensure all contractors, transport companies, suppliers and other manufacturers servicing the industry adopt similar objectives and high standards when working with the papermaking industry."

(HSC, 2001a ibid)

3.3.5 Paper industry accident statistics

"Accidents will occur in the best-regulated families."

Dickens (1850)

Accidents can be defined as, "an unexpected, unplanned event in a sequence of events, that occurs through a combination of causes; it results in physical harm (injury or disease) to an individual, damage to property, a near miss, a loss, or any combination of these effects" (Ridley, 1994).

The number of employees working within the papermaking industry within the periods outlined within Table 3.3 ranged between 23,000 and 18,500. The numbers employed have been in steady decline for a number of years. The accident rate for fatality and major accidents remained high, despite the employee numbers falling.

Year	Fatalities	Major RIDDOR	+3 day RIDDOR	Total RIDDOR
1996/7	1	99	457	557
1997/8	3	87	470	560
1998/9	1	66	445	512
1999/2000	2	90	408	500

Table 3.3: Paper industry accident figures 1996/7 – 1999/2000

3.3.6 The Paper Company position pre and during the PABIAC Initiative

Year	Fatalities	Major RIDDOR	+3 day RIDDOR	Total RIDDOR
1995/6	1	6	92	98
1996/7	1	18	100	118
1997/8	0	12	69	81
1998/9	0	9	63	72
1999/2000	0	14	39	53

Table 3.4: The Paper Company specific accident information 1996/7 – 1999/2000

The Paper Company accident information (Table 3.4) contains an extra year in comparison with the Paper Federation figures. The 1995/6 year has been added because in the latter part of 1995 there was a fatality within Mill One. There are no accurate paper industry figures to compare with this year, but this was the single incident of fatality within UK papermaking within that year.

The accident figures within Table 3.4 predate the author's employment within the paper company, and therefore accurate accident figure analysis is difficult. It can be stated however that the major RIDDOR figures remained high whilst the +3 day RIDDOR figures fell significantly over the given period. The paper company had reducing staff numbers over this period of time and so some reduction in accidents is easily explained.

It can be postulated that one reason why major RIDDOR accidents remain high and +3 day accidents could reduce, is that major accidents are more difficult to hide or disguise. +3 day RIDDOR accidents are sometimes not reported – such things as giving the injured person time off, bringing them in to work on light duties (eg an engineer seconded to office duties where no heavy lifting is required) are techniques that are sometimes used. It is the author's opinion however that this was not the case at the paper company

and therefore reasons for the reduction of +3 day accidents are not raised within this section.

To better understand the percentage of accidents within the industry, paper company employee numbers have been compared with that of the UK papermaking industry. Percentages of employees, of fatality, major accidents and RIDDOR +3 day accidents have all been displayed.

Figures extracted from	Year	Employee No. & (The Paper Company %)	Fatality %	Major RIDDOR %	+3 day RIDDOR %
Paper Fed	1996/7	22,500			
The Paper Company	1996/7	2,468 (10.97%)	100%	18.18%	21.88%
Paper Fed	1997/8	22,000			
The Paper Company	1997/8	2,293 (10.42%)	0%	13.79%	14.68%
Paper Fed	1998/9	20,000			
The Paper Company	1998/9	2,105 (10.53%)	0%	13.64%	14.16%
Paper Fed	1999/2000	18,500			
The Paper Company	1999/2000	1,936 (10.46%)	0%	15.56%	9.56%

Table 3.5: The Paper Company accident data expressed as a percentage of Paper Federation data

3.4 GEORGIA PACIFIC UK

The first year of this research was undertaken at Georgia Pacific's (GP's) mill in Bridgend, South Wales. Bridgend Mill played an important part in the emergence of health and safety within the paper industry, and the author's knowledge as both participant and observer, lends a further insight in to the year 2000 and onwards period within the industry.

3.4.1 Bridgend Mill's profile

Although the numbers have reduced in more modern times, in the year 2000 Bridgend Mill employed circa 450 staff[24]. The mill makes tissue (toilet, facial and kitchen roll) – mainly supermarket own brands and also some of their own label. The mill is what is known as an integrated mill – i.e. the mill makes the paper and also converts it in to the final saleable product.

The papermaking process in tissue and CCM mills is largely the same – the key differences are in the sheet drying methods. Tissue mills use what is termed a yankee or MG drying cylinder in conjunction with hoods, whilst CCM mills use a series of drying cylinders. The tissue drying process is far quicker because their methods use only one cylinder.

3.4.2 Health and safety performance

Health and safety in Bridgend Mill had periods of relative success when investigating its accident figures alone. However by the end of the PABIAC Initiative, the mill accident performance had dipped drastically. This cemented the mill, in addition to its poor accident record, as one that was highlighted by the GPMU for poor health and safety performance[25] (GPMU, 2001a). Table 3.6[26] demonstrates the swing in safety performance when accidents only are measured:

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[24] In 2009 direct employees are below 200.
[25] The GPMU highlighted 20 mills for attention because of poor performance. This extended the worst ten mills list that the HSE inspectors gave special attention to.
[26] Extracted from Brown (2001) – dates chosen as Jan 1999 – Jul 2001 due to time restrictions for thesis completion and available figures from the Paper Federation.

Category	January 1999	July 2001
Major injuries this month	0	1
Other reportable this month	1	2
12 months major total	0	2
12 month +3 day reportable total	13	29
12 month overall total	13	31
Weighted incidence rate[27]	20	69

Table 3.6: Georgia Pacific Bridgend Mill accident performance 1999 and 2001

The Bridgend performance within the period above resembled the overall trend of the industry. The extent to which it worsened however was extreme. In Brown (2001) the reasons for the poor performance were investigated and the main reasons identified for poor performance were: that the reaction to the PABIAC initiative and particularly MPS were too slow (only in the third year of the three year period were risk assessments really tackled); the risk assessments were done by only a few willing volunteers; the risk management team who agreed, actioned and signed off the assessments were not effective in this task, and as such, outstanding actions just built up. PABIAC Bulletin No.9 had suggested a *paralysis by analysis* approach to risk assessment, (HSC, 2003) which was certainly mirrored by GP Bridgend's approach.

The approach to machinery guarding, was the main thrust of the PABIAC Initiative whose aim was to prevent the serious accidents that led to fatalities and major reportable accidents (Wilcock, 2001). A guarding team was set up in 2000 to begin guarding the machines. The timescale for completion of work against MPS, as stated by PABIAC and agreed to by the papermaking companies, was March 1998 to March 2001. The beginning of guarding work in 2000 meant that Bridgend Mill's window of time to risk assess machinery, analyse guarding requirements against MPS and other legislative guides, and to fit the guards, was narrow.

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[27] Weighted incidence rate is the calculation used by the CPI (formerly the Paper Federation) to compare figures between mills by using an hours worked calculation.

The narrow window of opportunity was further exacerbated by the nature of the papermaking process. Papermaking is a continuous process – the only planned breaks in production are based around planned machine maintenance shutdowns which can occur in general between monthly and six weekly[28] time periods. This meant that once the March 2001 deadline was reached, compliance was still not complete. This however did not differ greatly from many other UK mills positions at this time.

The Bridgend position was worsened considerably when a fatality occurred on the 6th July 2001. This meant that the mill, which already received considerable attention from the unions and the HSE, was now under increased scrutiny:

> "The GPMU is to target unsafe mills to demand improvements following the latest death of a paper mill member. Tommy Skye died in July at the Georgia Pacific tissue mill in Bridgend following an accident on Jupiter machine."

(GPMU, 2001b)

3.5 THE ECONOMIC CLIMATE IN UK PAPERMAKING

The economic climate within UK manufacturing has been turbulent during this century. Papermaking is an industry that is indicative of the problems that exist within manufacturing generally. It is fair to state that the problems within papermaking are in fact more acute than in many sectors. The reasons for this are primarily the price fluctuation within the gas and electricity markets. Papermaking is an energy intensive user and this situation has been made worse by the emerging markets such as China and India who are competing with UK paper manufacturers.

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[28] These tend to be based around the life of the machine felt. The felt is the porous continually moving material that travels through the machine carrying the sheet following transfer from the wire. The wire is the plastic sheet used in the forming stage of the papermaking process.
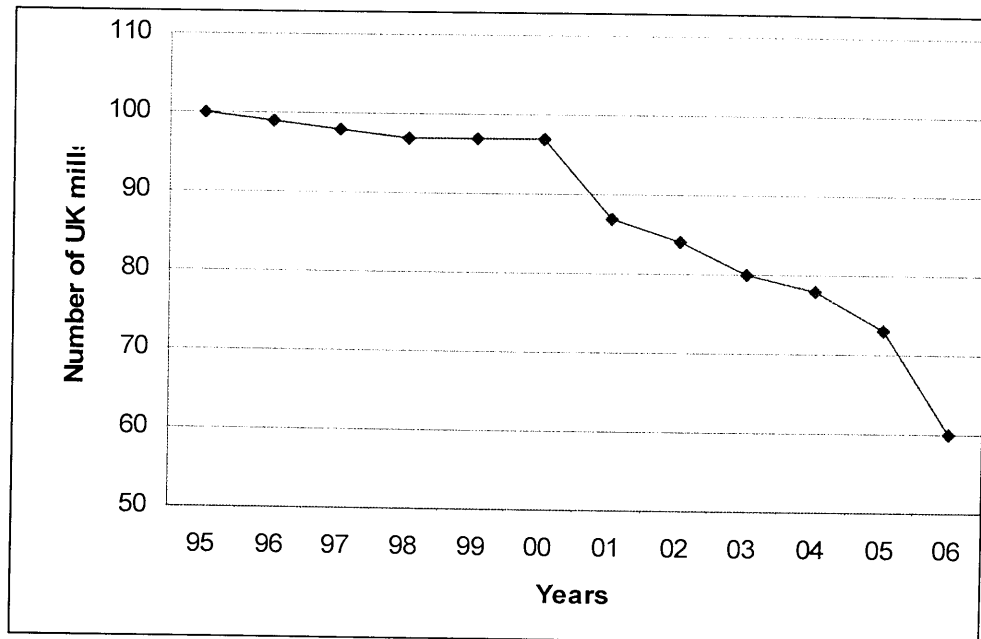
Figure 3.2: Number of UK paper mills 1995 – 2006

The inevitable result of such small profit margins, increased fixed and variable costs and mill closures, is the resultant number of staff who are made redundant either as part of a mill closure, or of expenditure cuts to attempt to avoid closure situations.

3.6 HEALTH AND SAFETY IN THE PAPERMAKING INDUSTRY (post 2001)

The pre 2001 position has been discussed earlier within this chapter. The split of analysis (pre and post 2001) has been carried out in this way to coincide with the 2001 ending of the PABIAC Initiative and the adherence to the MPS deadline.

3.6.1 Making Paper Safely

The build up to the creation of the PABIAC Initiative and the suite of documents entitled MPS, were all established to give UK paper mills paper specific guidance to create action plans against (HSE, 2001), and in order to present common standards for the HSE to establish visit criteria. Within paper mills, management teams referred to the document which detailed

machine guarding requirements as MPS, but this was the sixth document in a suite of six. Table 3.7 illustrates a breakdown of the various components of the MPS suite.

MPS No.	Title
1	Application of the Provision and Use of Work Equipment Regulations to the paper and board industry
2	Risk assessment in paper mills
3	Manual handling in paper mills (including ionising radiations in the paper and board industry)
4	Prevention of heat stress in paper and board mills
5	Control of contractors in paper mills
6	Making paper safely. Managing safety in the papermaking process

Table 3.7: Breakdown and description of MPS sections

Adherence to MPS was closely investigated by the HSE and relationships between all mills and specific area paper specific inspectors were a common feature. Many of the problems within the mills were simple matters of machine guarding, but there were specific problems with meeting certain sections of MPS which were viewed as being too difficult, cost excessive or technically difficult/impossible to adhere to.

The guarding of machines is a practicable duty rather than a reasonably practicable one (HSE, 1992). The author witnessed on many occasions ineffectively guarded machines. From first-hand experience and inter mill liaison (through CPI meetings) poor machine guarding was apparent. Several paper mill management teams guarded machines with little or no communication with operators and engineers, ie those who had cause to work in close proximity to potentially dangerous areas of the machinery.

It is not possible to discuss the costs of shutting down paper machines for interventions because of commercial sensitivity. This is however rarely an option that is practical to ensure operator safety. The high risk situations on paper machines (such as feed up) require the machine to be running. This requires well thought out guarding that allows safe operator interface. Cost

benefit analysis was rarely used to consider whether to guard or not to guard machines – most mills used a blanket guarding policy. Many mills attempted two or three guarding risk assessments on machines in an effort to effectively guard them. The key issue that many mills did not seize on was the design of effective guards that ensure safety for all reasonably foreseeable reasons for machine interventions.

Cost benefit analysis was (in the author's experience) never used in risk assessment when guarding the machines. The use of MPS and its guidance on guarding was used as a prescriptive legal document by both the mills and the HSE inspectors. Machine guarding was very often the subject of mill safety teams and the nominated HSE inspector.

3.6.1.1 Technical issues within MPS

The biggest area of contention from the mills regarding MPS was the section within MPS 6, entitled, 'Safety Related Control Systems' (HSE, 2001). The August 2001 deadline for full adherence to MPS was achievable for most mills, but there was a lack of knowledge in how to make PMs meet the aforementioned section. HSE acknowledged this failing and brought out a subsequent MPS document which gave a more detailed analysis of how to address the issues within safety control systems (HSE, 2007).

The author, from personal knowledge of the industry, both in his role at GP, The Paper Company and his exposure to other paper making companies in various committees, was aware of a lack of understanding regarding this area. The HSE in 2004/5 carried out a series of visits to mills which had volunteered for the study to be undertaken at their premises. The Paper Company Mill Six was one the mills whose safety control systems were investigated.

3.6.1.2 Mill visits

The HSE intention was to run the series of mill visits at twelve mills. The project started far later than the HSE intended and only a handful of mills were actually visited. No interim report or final report has ever been published regarding these visits or indeed on what gaps were found at the mills when compared with MPS guidance.

From personal conversations with one of the team involved in this work the author gleaned that the HSE found large deficiencies between what the mills safety control systems were and what MPS suggested. The problems were not only related to the physical aspects of the safety control systems, but also the competence, knowledge and training of the engineers that they met.

3.6.1.3 Explanations for lack of MPS adherence

Modern PMs are very large, complex and highly expensive machines. It is very rare indeed in such straitened times that a paper company will order a new PM in its entirety. It is far more plausible and common that paper companies will upgrade machine sections. Some PMs within the UK have some parts which are Victorian and when merged with the new sections this is not a simple technical undertaking.

An example the author encountered was that MPS part 6, suggests that the maximum crawl speed for rewinders[29] is 5 metres/minute. GP Mill in Bridgend, when applying MPS to one of their older winders, found this impossible to achieve. The minimum achieved was in the region of 50 metres/minute. The reason for this was the age of the machine's drive system which was made in the 1950s.

Increasingly, technology in safety control systems has been becoming more complex. The rate of complexity has been outstripping the levels of

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[29] Rewinders are machines that slit and wind the paper down to smaller sizes in preparation for the customer.

competence, training and ability of, particularly, electrical engineers. The design criteria within standards such as EN 61508 (BSI, 2002), EN 60204 (BSI, 2006) and EN 13849 (BSI, 2008), which demand complex calculations, which electrical engineers, unless kept abreast of change, are unlikely to be able to understand or work towards.

3.6.2 The HSE approach post 2001

The hands on approach of the HSE in checking and aiding compliance to MPS was a level of hand holding that was felt within the industry to be an absolute requirement. As an anonymous senior delegate discussed with the author in 2002, the industry required a firm hand:

> "The current HSE approach is needed in our industry, one arm around the shoulders and one hand on the throat."

Following the August 2001 deadline, the HSE and mill interface was relaxed somewhat. There were two major programmes from the HSE from 2001 onwards however, namely PABIACtion and the Safe Intervention Programme (SIP). These are discussed to give a flavour of the enforcement environment between late 2001 and 2007. Progress was also made by the HSE, in conjunction with mill and outside expertise, on individual projects. These were aimed at particular areas of concern – for example transport related studies and particular machines which had high accident statistics related to them or high accident potential.

3.6.3 PABIACtion

PABIACtion was the name given to an extended programme of the PABIAC Initiative which has been previously discussed within this chapter. PABIAC felt that due to the industry not hitting the 50 % target set (fatal and major RIDDOR was reduced by 26.6%), that momentum needed to be maintained (HSC, 2004). The extension period was set, to reach the 50 % reduction target by 2004. This was a response to the external research (Horbury et al., 2002) which recommended continuing the PABIAC Initiative. The HSE

gave support to the mills during this period through their membership of bodies such as the Paper Safety Council, PABIAC and various working parties.

The three year target of 50% was identical to that of the oil and gas industry three year target with their Step Change Programme. As with paper the target was not met (Oil and Gas, 2009), although with continued partnership efforts the target was met after the initial intervention period.

3.6.4 The Safe Intervention Programme

The SIP was a project begun by the HSE in 2004, and the project has run up until the time of writing. SIP was not aimed solely at one sector, but did target key industries (of which there were sixteen) which had a history of intervention related major accidents and fatalities (HSE, 2006). The project purpose was based around half day inspector visits, machinery questionnaires to be completed and, where necessary, enforcement action to be undertaken.

Paper mills and recovered paper depots were targeted industries within the SIP, in particular recovered paper depots were targeted due to their accident record being acknowledged as ten times worse than that of general manufacturing. In 2009/10 the waste industry is still one of only four sectors targeted under the SIP programme (HSE, 2009).

3.6.5 Other initiatives undertaken by the HSE

In addition to PABIACtion and SIP, the HSE were involved in many forums and committees – the partnership model was still the key method of working within the industry. One working party worked toward writing new guidance, which extended the principles of MPS to ancillary machinery and was

entitled, *Rewinding Paper Safely*[30] (HSE, 2005). This document was an extension to the MPS suite and tackled the high risk rewinding machinery.

3.7 CONCLUSIONS ON THE PAPER INDUSTRY LEGAL SITUATION

Chapter 3 forms the second part of a two chapter historical review, providing essential industry background, whilst Chapter 4 is a traditional literature review. A brief history of the actual process of making paper up to the modern automated machines methods has been written to give a relatively simplistic brief – particularly to explain the modern machines complexity, size and potential to injure.

The paper industry has had an appalling accident record, and the economic environment has exacerbated this situation. This has potential impact on accident rates when one considers mill closures, the tightening of budgets and the un-measurable but equally negatively impacting loss of worker morale.

The Paper Company, as the largest UK papermaker, has had a difficult time within the safety and health environment when one considers their double fatality and the vilification they then received. This was turned in to something positive because of their positive response and embracing of partnership working (particularly with the HSE and the trade unions). Their accident rates however remained stubbornly high (particularly their serious accidents). The paper company's positive image was born from attempts by the management team to tackle the rising accident rates through TU co-operation, close liaison with HSE and the formulation of an attempted safety management system.

This progress seemed to be unsustainable for the paper company – examples of this are the non completion and non use of the policy

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[30] This was a publication which the author of this thesis co-authored.

documents prepared by the consultant who aided the paper company within the mid to late 1990s.

The HSE position pre and post 2001 has been explained to give an understanding of the environment in which paper mills were managed. Critical safety specific guidance has been explained to further expand understanding of the enforcement protocols and the information that was available to mill management teams.

It is evident that safety difficulties within the paper industry were experienced both by paper companies and the inspectorate. MPS forced the two parties together to attempt to safeguard workers, largely through a risk assessment and machine guarding direction. MPS was followed by PABIACtion and the Safe Intervention Programme – all of which ensured a constant close relationship between the mills and the HSE.

CHAPTER 4 – LITERATURE REVIEW

Chapter 4 is the literature review. It builds on the paper industry specific review contained within Chapters 2 and 3 by providing a traditional review of the literature. This chapter examines several topics whose relationships with each other are vital to the environment in which the various safety interventions are carried out.

This chapter begins by detailing the meaning of organisations and of culture. Their relationship is then explored by the examination of organisational culture and the snapshot of this – organisational climate. The role of communication is vital in any healthy organisation and the role of organisational communication is explained as its *lubrication*. In organisational learning the importance of learning is explained as imperative to successful organisational improvements – this is then explained within the context of an organisation's safety culture. The importance of learning in any institution is vital to the effectiveness of its safety management system. The key safety management systems are explained within this chapter, their components are detailed and comparisons made. An organisation's culture, and hence safety culture, can affect the SMS both positively and negatively – positive safety culture is essential in any learning organisation. Many organisations now utilise BBS in an attempt to improve their safety culture. BBS is explained by detailing its history and its features. Both positive and negative viewpoints of BBS are discussed and a commercial telephone study of BBS is detailed. Finally, BBS within the paper industry is examined, which includes its suitability for the industry.

4.1 ORGANISATIONS

It is essential to understand the meaning of organisations before discussing the relationship they have with culture. The Concise Oxford Dictionary defines an organisation as "the act of being organised" and "an organised

body, esp. a business, government, department, charity etc." (Allen, 1990). From this definition it is clear that if a department is defined as an organised body, then this department must fit within a company, government, charity etc. as a sub-organisation of the parent organisation. Handy (1985) argues that an organisation comprises a collection of individuals and political systems. A further definition of organisations is as follows:

> "...collections of people joining together in some formal association in order to achieve group or individual objectives. At least one set of objectives for any organisation will relate to the production and output of specified goods and services to individuals, groups and other organisations."

(Dawson, 1992)

It can be seen from the above that an organisation must have an output, whether it be goods or services, to meet the definition of organisation as defined by Dawson. The means by which individuals meet their end target of service/goods provision is via the act of being organised. Political systems and departmental/company organisations have defined boundaries to meet specified targets such as quality systems, environmental management systems, safety management systems, financial constraints and legal constraints such as regulations and laws. The individuals that make up the department/company may have their own sets of rules and conditions, but adhere to the parent conditions as defined by the organisation, to meet the particular provision required, be it goods or service provision. There are goals and values that individuals adhere to within an organisation and these are controllable through measures such as supervision, appraisal, disciplinary procedures and reward schemes. Child (1988) defined the major elements of organisations as follows:

1. "Allocation of tasks and responsibilities to individuals;
2. Designation of formal reporting relationships determining the number of levels in hierarchies and the spans of control of managers and supervisors;
3. Grouping together of individuals in sections or departments, the grouping of departments into divisions and larger units, and the overall grouping of units into the total organisations;
4. Design of systems to ensure effective communication of information, integration of effort, and participation in the decision-making process;
5. Delegation of authority, together with associated procedures whereby the use of discretion is monitored and evaluated;

6. Provision of systems for performance appraisal and reward which help to motivate rather that to alienate employees".

4.2 CULTURE

The concept of culture is derived from the field of anthropology and has since been used by organisational researchers. Culture has been defined by Waring (1992) as, "not a *thing* but a complex and dynamic property of human activity systems".

Deal and Kennedy (1982) attempted to establish that culture was an undocumented and unquantifiable reason that explained the turbulent relationship between the control of work activities and the organisation's structure.

4.2.1 Organisational culture

Organisational culture is the starting point regarding culture for this thesis and this has been summarised as follows,

> "a system of shared values (what is important) and beliefs (how things work) that interact with a company's people, organizational structures, and control systems to produce behavioural norms (the way we do things around here)"

> (Uttal, 2001)

Organisational culture became popularised in the 1970s and particularly the 1980s. It is noticeable from the literature that the terms organisational culture and organisational climate are both used – sometimes interchangeably.

There are a number of definitions that describe and detail organisational culture and organisational climate. Some research carried out suggests that the two disciplines are similar and describe the same phenomenon i.e. they are "used interchangeably" (Glendon & Stanton, 2000), whilst other research details differences and suggests that the two are completely

[69]

different disciplines of study. Goodenaugh (1970) defines culture as "in the minds and hearts of men" and Lederach (1995) describes culture as, "the shared knowledge and schemes created by a set of people for perceiving, interpreting, expressing and responding to the social realities around them". So, culture can be thought of as a set of rules and norms that individuals must adhere to, to become part of a collective body comprising at least two persons. This group of persons, by sharing the same ideals and goals, are contributing to and being advised and given direction by the organisational culture or sub-culture that they are members of.

Peters and Waterman (1982), cited in Horbury, (1996) demonstrate a move towards normative control when companies realized that organisational members driven by internal goals was the way forward as a "form of organisational control":

> "Without exception, the dominance and coherence of culture proved to be an essential quality of the excellent companies. Moreover the stronger the culture and the more it was directed toward the marketplace, the less need there was for policy manuals, organisational charts, or detailed procedures and rules. In these companies, people way down the line know what they're supposed to do in most situations because the handful of guiding values is crystal clear."

(Peters & Waterman, 1982)

The birth of the quality movement was born on the premise that quality checks were no longer carried out by a quality department, but by individuals such as line operators who carried out the checks as a part of their everyday role. This is supported by a theory of the workforce entitled the *craftmanship theory* (Hutchins, 1985). This theory is built on the premise that employees take a pride in their work, and that this is led by an inherent desire to do so. Operators, if properly encouraged, will work well, check their work and suggest improvements. The craftmanship theory is one that is indicative of a positive culture. The opposing view of this is the *indifference theory* (Hutchins, 1985 ibid) which propounds that operators have no interest or pride in their work, the worst human traits are assumed. This theory assumes that the only way to ensure quality is to offer

piecework. Assumptions of this sort indicate a poor culture and a strongly hierarchical approach to managing the workforce.

Similar to the above theories are the 'X' and 'Y' theories of management (McGregor, 1960). Theory X resembles the indifference theory – the assumption is made that workers are inherently lazy and the only motivating factor to utilise is that of piecework. Theory Y assumes that ambition may be a trait of the workforce. A theory Y manager assumes that if a worker is given the right conditions they will work well. The two theories are not mutually exclusive however and a manager can apply the two theories. The 'Z' manager has been proposed (Ouchi, 1982), which requires workers to have a good knowledge of the host company, for the manager to get the best productivity returns.

Methods advocated in the field of quality to encourage active workforce participation include *quality circles.* These are teams who meet and are facilitated by one supervisor and a group of persons carrying out similar work. The teams are voluntary and all recommendations to problems are implemented with management approval. Discussions on worker participation are frequent in the management literature (Deetz & Kersten, 1983). Zwerdling distinguishes between four types of worker participation and these are described thus:

> "(1) humanization of work projects, such as team building, work redesign, quality circles; (2) labour management committees in which management and workers design projects to improve the quality of work life, safety and work place design; (3) worker ownership, such as cooperatives, ESO's, and employee-purchased plant; and (4) worker self management, whereby workers own as well as control the organisation".

> (Zwerdling, 1980)

All the above methods and classifications of worker participation stress that the control and power to legislate is held in the hands of the workforce. It can be seen that worker participation can provide huge benefits, "since participation typically improves morale, commitment, communication accuracy, and overall productivity". (Deetz & Kerston, 1983 ibid).

The CBI describes organisational culture as "the mix of shared values, attitudes and patterns of behaviour that give the organisation its particular character", or explained in more succinct terms, "the way we do things around here" (Deal & Kennedy, 1982).

Graves (1986) and Williams et al. (1989) write that the primary function of culture is to make a contribution to the organisation's overall success. There are two broad perspectives of study in the field of organisational culture – these have been described as functionalist and interpretive (Burrell & Morgan, 1979). Waring (1996) writes that the purpose of organisational culture is to act as a template and goal for companies to aim for and aspire to. He believes it is open to corporate manipulation and change to meet and suit the corporation's particular changing needs. This approach can be viewed as top down in that a controlling group uses culture to control the organisation as it requires.

Waring's understanding of the interpretive organisational culture approach is one of an organisational identity – a grouping and collection of individuals and groups beliefs (Waring, 1996 ibid). The interpretive approach can be termed as bottom up in that it is representative of all micro or sub cultures within that organisation.

According to Edgar Schein, culture is the most difficult organisational attribute to change. Schein's culture model is expressed as a series of three layers (Schein, 1992) resembling an onion. On the outside, and most cursory level are *artifacts* – these are easily discerned by outsiders and could be such things as dress, employee interaction.

The next level, termed *espoused values* are conscious strategies such as mission statements, goals and company philosophies. This level can normally be studied by interviewing and the use of questionnaires to gather information about employee and organisational attitudes.

The final and deepest layer is termed *basic underlying assumptions.* These are unseen and often taboo to discuss – those that are aware of their existence can quickly become acclimatised to their attributes, this further cements the invisibility of the assumptions. Because of this invisibility, techniques such as questionnaire and interview cannot properly analyse organisational culture at this level.

Using Schein's model means that at the first and second layer of organisational behaviours there can be positive indications of organisational culture, whilst at the deepest level the culture may be very different than the surface indications.

4.2.2 Organisational climate

De Cock et al. (1984) consider organisational climate, "as a general notion specifying the organisational identity or self image of the organisation: e.g. how members see their organisation work, live, decide, reward, grow". The organisational climate directly impacts on the members' behaviour (De Cock et al., 1984, 1975; Steers, 1977).

Conrad and Sydow define organisational climate as:

> "Organisational climate as a hypothetical construct is (1) a property of the whole organisation or one of its subunits, (2) a differentiating, (3) relatively stable, (4) molar and (5) multidivisional aggregate of subjective perceptions and cognitive processing of situational stimuli reflected by the individuals' description of the organisational context, structure and behaviour and influencing the formation of attitudes towards work and individual work behaviour".

> (Conrad & Sydow, 1981)

Tagiuri (1968) describes climate as "a relatively enduring quality of the total environment that (1) is experienced by occupants, (2) influences their behaviour, and (3) can be described in terms of the values of a particular set of characteristics (or attributes) of the environment". Similarly Payne and Pugh (1976) define climate as, "a molar concept reflecting the content and

strength of the prevalent values, norms, attitudes, behaviors, and feelings of the members of a social system".

Handy (1981) and Harrison (1972) both describe four factors of organisational cultures which De Cock et al. (1984) place in what they term "the competing values framework". The frameworks worth has been demonstrated in a later study by De Witte (1985). The four differing types of organisational identity are described by De Cock et al. as:

> "Top left we place person orientated organisations. In this culture the person is the central point. Values, opinions and emotions of organisational members play an important role. Informal structures dominate. Person orientated organisations exist only to serve and assist the individuals within them. There are no global objectives which transcend individual objectives...Naturally there is as little structure as possible.
>
> Top right we place the open systems model and task orientated organisation...There is a fundamental interdependence between elements in the organisation and between the organisation and its environment. Change in one element leads to change in other elements...Authority is accepted if it is based on knowledge and skill...Rules may be infringed...Control is restricted to a minimum...Conflicts are solved by mutual arrangements. They are seen by the organisational members as opportunities to learn...The organisational climate is highly innovative.
>
> Opposite the task orientated organisation we can place a role orientated organisation...characterised by a centralised structure and a formalised system of rules and procedures. Equilibrium is the central point of interest...This organisation is characterised by procedures for roles, procedures for communications and rules for the settlement of disputes...is controlled by a narrow band of senior management...the organisational climate is characterised by respect for rules.
>
> ...bottom right we place the rational model and the power orientated organisation...often depends on a central power source...These organisations have the ability to move quickly and can react well to threat...the person in the middle plays a crucial role. If the spider moves the whole web trembles. He [the manager] develops the organisation and makes it grow. The leadership style is often task orientated...The organisational climate will be characterised by a strong goal orientated information flow".
>
> (De Cock et al., 1984 ibid)

It is evident from the competing values framework that there are overlaps between the four sections of the model. It is feasible and to be expected that an organisation will bear several of the traits portrayed within the model, but

will have one characteristic that will dominate and shape the organisation's climate.

For the purposes of this research the following distinction has been made. Organisational climate is "a more superficial concept than organisational culture...describing aspects of an organisation's current state" (Glendon & Stanton, 2000).

4.3 COMMUNICATION

Communications play an essential role in acting as the lubrication within an organisation (Booth, 2005). In later discussions and examination of SMS and BBS this theory will be explored further.

Thayer states that, "Definitions of communications are legion". He goes on to propose four definitions of communications "more or less at random" and these are as follows:

> "Communication is the process of effecting an interchange of understanding between two or more people;
> Communication is the mutual interchange of ideas by any effective means;
> ...the imparting or interchange of thoughts, opinions, or information by speech, writing, or signs (American College Dictionary);
> Communication is the arrangement of environmental stimuli to produce certain desired behaviour on the part of the organism"
>
> (Thayer, 1968)

Prior to listing the four definitions Thayer uses the expression "to become wary of them [the definitions]". There are clearly many definitions of communication and there are within those definitions many different meanings and interpretations. So although the definitions are "legion", the usefulness of the definitions as contributors to communication research and theory is questionable and "potentially obscure and misleading" (Thayer, 1968 ibid).

To further explore communication and organisational communications, it is necessary to explore communication theory, including several communication models.

4.3.1 Communication theory

The discipline of communication studies has largely grown out of the work carried out by Shannon and Weaver (1949) cited in Fiske (1990). Shannon and Weaver (1949) and Weaver (1949) carried out communication research during the Second World War in the Bell Telephone Laboratories in the United States (US). Their work investigated channels of communication and how they can best be utilised and used most efficiently. Their model was a simple linear process and is presented as Figure 4.1:

Figure 4.1: Linear communicative process (Shannon & Weaver, 1949)

Shannon and Weaver propose "three levels of problems in the study of communication" and these are as follows:

"Level A (technical problems)

Level B (semantic problems)

Level C (effectiveness problems)

How accurately can the symbols of communication be transmitted?

How precisely do the transmitted symbols convey the desired meaning?

How effectively does the received meaning affect conduct in the desired way?"

(Fiske, 1990 ibid)

Many communication models have taken the above model and expanded and extended it, whilst retaining its linear format (Laswell, 1948; Gerbner, 1956; Westley & Maclean, 1957). Newcomb (1953) introduced a model that is not linear (Figure 4.2). The significance of this change of shape is that this is the first model that introduces the concept of the role of communication within a society. Fiske (1990 ibid) states that, "For Newcomb this role [communication] is simple – it is to maintain equilibrium within the societal system.". The model is called the *ABX* system.

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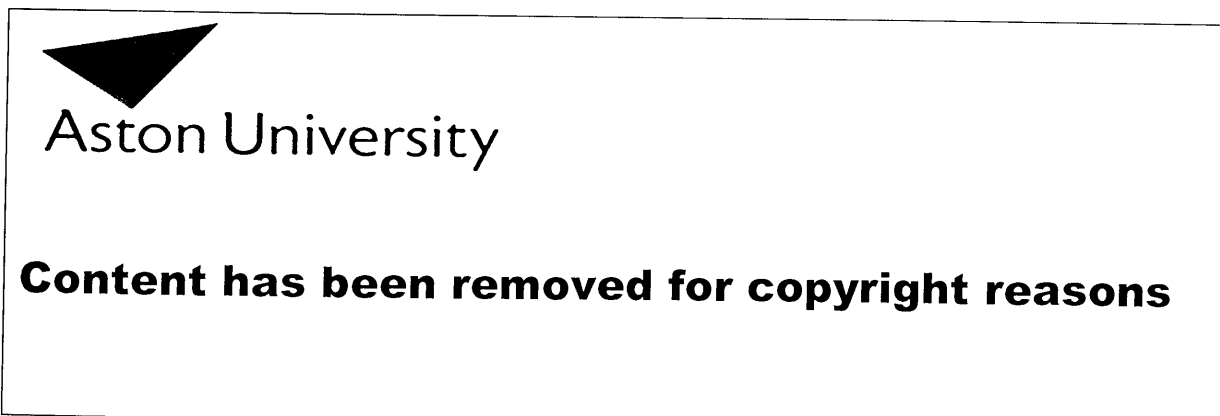
Figure 4.2: Newcomb's ABX system (Newcomb, 1953)

The way that Newcomb's model functions is as follows:

> "A and B are communicator and receiver... X is part of their social environment. ABX is a system, which means that its internal relations are interdependent: if A changes, B and X will change as well; or if A changes her or his relationship to X, B will have to change his or her relationship either with X or with A."

(Fiske, 1990 ibid)

Equilibrium is established and maintained if A and B are, and remain, friends, and their views are broadly common to those of X. If A likes X, but B does not share this view, then A and B will be "under pressure to communicate" (Fiske, 1990). This model demonstrates the importance of the social environment represented by 'X', where persons or groups of individuals communicate together to reach mutually acceptable stances on communicable issues. Fiske (1990 ibid) states that, "this model assumes, though does not explicitly state, that people need information...We must have adequate information about our social environment in order both to know how to react to it and identify in our reaction factors that we can share with the fellow members of our peer group, subculture, or culture.". So we have an innate need to communicate and share information, to pass on messages, and assimilate information that we filter as being important to us (Fisher, 1978).

Fisher (1978 ibid) proposed four conceptual approaches to human communication: mechanistic, psychological, interpretive-symbolic, and systems-interaction perspectives. Horbury (1996) states that, "the basic components of any communication systems are message, channel, sender/receiver/transmission, encoding/decoding, meaning, feedback and communication effects. Elaborated, these are:

Message: refers to the verbal and non-verbal cues each communicator conveys;

channel: vehicle or medium in which a message travels;

sender: individual who sends a message or the generalised source;

receiver: denotes a message's destination, or the person who receives and deciphers the message;

transmission: refers to the actual sending and receiving of messages through designated channels;

encoding and decoding: the process of creating, transforming and deciphering messages;

meaning: developed through making sense of the message;

feedback: a message sent in response to the initial message;

communication effects: a number of specific definitions, but refers to the outcome or general results of the message exchange process.

The mechanistic process views communication as a process that enables a message to travel from one point to another, i.e. sender to receiver (Putnam, 1982). The mechanistic communication process focuses its attention on the transmission and channel of communication and much research in this subject points to where communication breaks down within the process.

The psychological perspective looks at how differing individual inputs can affect the success of communication. The idea of filters which vary according to individuals within the communication process was introduced by Fisher (1978 ibid). Filters can be an individual's preconceptions, attitudes and how the information is processed.

The interpretive-symbolic perspective is characterised by patterns of coordinated behaviour that have the power to shape organisations very existence. The emphasis of this approach is one of communication being shaped by cultural factors.

The final approach, namely the systems-interactive perspective is characterised by external factors. The process focuses on sequential acts of communication and patterns of repeat behaviour.

4.3.2 Organisational communications

Roberts et al. (1974) state that, "organisational communication appears to be mired in an identity crisis". Dance (1970) reviewed ninety five definitions from literature regarding communication and found little agreement from the theorists. From Dance's literature review forming a workable definition amalgamated from what was studied was not possible, and it was concluded that, "we are trying to make the concept [communication] do too much for us". Organisational communication research tends to be carried out as a sub set of other organisational activities such as leadership and motivation (Roberts et al., 1974 ibid) and this is the reason why the field of organisational communication is suffering its crisis of identity.

Communication within organisations was discussed by implication as early as the beginning of the Twentieth Century. Taylor (1911) was interested in the lower levels of staff in organisations, whilst Weber (1957) applied similar research to the higher levels of staff. Both suggested that work was accomplished through adhering to company programmes and procedures in a rigid manner. Davis (1953) states that, "it [communication] is the nervous system of any organised group, providing the information and understanding necessary for high productivity and morale".

Simon (1945) makes the observation that control exists within organisations because it is communication that is influencing their behaviour. So from this statement we can postulate that communications are an essential element in ensuring organisational success. This view is questioned by Roberts et al. (1974 ibid) who asks the question, "Does this mean all organisational phenomena are subsets of communication?". This is clearly not the case, but the subsets of organisational activities are expressed through the act of communication. French et al. (1985) state that communications are "the glue that holds organisations together". Hussey (1998) argues that the modern organisation has an essential need to communicate, but some do so in a less formal way. He goes on to say that communication should be facilitated by management which can lead to improved employee motivation

– this will lead to an inevitable increase in productivity and company performance.

4.4 ORGANISATIONAL LEARNING

"The ability of an organisation to learn from its past experience is essential if the company is to successfully avoid repeating past failures and is to keep ahead of the competition."

(HSE, 2000)

Organisational learning is in a condition which is comparative to communication theory. There is a high level of obscurity when considering definitions – the literature gives varying accounts of what constitutes organisational learning.

Some authors believe that a stimulus is required to trigger learning, which is then considered as an organisational change in behaviour, (Cyert & March, 1963; March, 1989). The conflicting school of thought suggests that learning requires knowledge which is required as a conscious act (Argyris & Schon, 1978; Huber, 1991). The two theories both suggest that organisational learning occurs with the former intimating that learning is almost by luck (i.e. not a conscious act) and the latter suggesting a level of competence in the act of learning.

Two important dimensions, or "paradigmatic distinctions" (Miller, 1996), are "voluntarism vs. determinism and method vs. emergence". The voluntarism vs. determinism axis measures the intelligence of organisations (freedom of thought and action) against a rigid and constrained set of rules and values. Booth (2004) postulates that an organisations safety culture must be extremely mature if its management systems and channels of communication are less rigid than policy, rules and procedures. These corridor discussions he argues assist the lubrication of an organisation.

The second paradigm, method vs. emergence, contrasts whether an organisation makes decisions based on concrete methods of analysis or

based on intuitions and educated guessing. This second paradigm again suggests two very different ways that organisations base their decisions – one defined by its rules and rigidity and the other by its free thinking and arguably risky entrepreneurial methodology.

Shrivasta (1983) considered four different viewpoints regarding organisational learning. These are:

Viewpoint	Summary
Adaptive learning	Incremental learning – goals and decision making are altered to adapt to situations and environments
Assumption sharing	An organisation's theories result from shared assumptions and values
Development of knowledge	The relationship between actions and outcomes – the knowledge that is gleaned from these
Institutionalised experience	Learning acquired through experience and tradition

Table 4.1: Shrivasta's organisational learning

For organisational learning to exist within an organisation – that is to change organisational viewpoints and response mechanisms and actions, the organisation must act on individuals' findings within an organisation, who identify a "mismatch between expected and actual results of action and respond to that mismatch...that leads them to modify their images of organisation or their understandings" (Argyris & Schon, 1996). Crucially it is the correction in the mismatch that leads to institutional learning.

4.4.1 Organisational learning and safety culture

"The chapter of knowledge is a very short, but the chapter of accidents is a very long one."

(Lord Chesterfield, 1753)

Turner (1978), in his seminal work *Man-made Disasters,* emphasised the crucial role that organisational intelligence (learning) has in protecting that organisation from system vulnerabilities. Turner argued that organisational

vulnerability to disaster was easily "subverted by some very familiar and normal processes of organisational life" (Pidgeon & O'Leary, 2000).

Reason (1990) states that there is a tendency, following a disaster or catastrophe, "to blame bad outcomes on an actor's personal inadequacies, rather than attribute them to situational factors beyond his or her control".

Reason's *resident pathogens* and Turner's *incubation period* if overlooked, suggest immature levels of organisational learning - which was epitomised following the Chernobyl explosion, by the United Kingdom Atomic Energy Authority (UKAEA) report which stated that:

> "To us in the West, the sequence of reactor operator errors is incomprehensible. More plausibly, we can speculate that the operators as a matter of habit had broken rules many, many times and got away with it so the safety rules no longer seemed relevant."
>
> (Gittus, 1987)

A mature safety culture should contain at least four key elements (Pidgeon & O'Leary, 1994). The fourth of these is described as "continual reflection upon practice through monitoring, analysis and feedback systems (organisational learning)". This fourth element will be examined in more detail within SMS discussions.

4.4.2 Barriers to organisational learning

The paucity of organisational learning is identified when considering high profile accidents (e.g. Kings Cross train station fire; Challenger space shuttle explosion; Union Carbide's Bhopal plant chemical leak; Zeebrugge roll on, roll off ferry capsizing) where previous knowledge of the causal factors have been in existence but not acted upon. Information difficulties and political difficulties are suggested by Pidgeon & O'Leary (1994 ibid) as being the two barriers to organisational learning.

Sagan (1993) analyses the lack of learning from the US nuclear weapon command and control systems, due to extensive political barriers. Vaughan (1996) neatly defines a lack of organisational learning or perhaps institutional blindness in the National Aeronautics Space Administration (NASA) regarding the Challenger shuttle. NASA's culture "provided a way of seeing that was simultaneously a way of not seeing".

Blame culture is prevalent in large scale accidents and disasters, as stated by Reason (1990 ibid). Rail disasters in the UK are very much in the public eye and their lack of organisational learning, and the link to blame culture, are explained thus:

> "We encountered almost universal agreement amongst respondents that the major incidents at Southall, Ladbroke Grove, Hatfield and Potters Bar, together with subsequent inquiries and legal actions, constituted a major influence in amplifying perceptions of a blame culture within the sector. It was apparent that many of our respondents felt that they were not only 'under siege' in this context, but were vulnerable to attributions of blame and culpability. The high profile (and potentially high personal consequences) of charges of corporate manslaughter was considered to have made personnel within the sector acutely aware of their personal accountability. Blame and culpability were felt to percolate down through individual rail sector businesses impacting upon risk management and management style more generally. A consequence of this was said to be that the management chain tends to become risk averse. Moreover, others cited the proliferation of blame as having the effect of suppressing and obscuring the potential for railway sector learning from accidents and incidents."

(Weyman et al., 2006)

4.4.3 Summary of organisational learning

HSE (2000) *Successful health and safety management* (or *HSG (65)*) builds on a main premise of the HASAWA 1974, in that it suggests safety is managed and given the same importance as other organisational disciplines such as financial control and marketing. To effectively achieve this, an organisation is required to learn from historical errors and be successful both in a commercial sense and a health and safety sense.

Organisational learning is a key element of a successful SMS and failings in SMSs tend to be the learning aspects with companies invariably not suitably auditing, measuring and reviewing their performance.

4.5 SAFETY MANAGEMENT SYSTEMS

Hale et al. (1997) use the term SMS "as a shorthand term to cover the management of all unintended risks to life, health, property and environment". In the absence of SMS definitions within the literature review undertaken for this thesis, Hale's shorthand term is proposed as a workable definition. SMS is a phrase in common usage both in the literature and within the practising safety managers vocabulary, however most texts and research literature, "do not present specific models of the safety management system" (Hale et al., 1997 ibid).

Within the UK and Europe four SMSs are popularised and these are defined within Table 4.2. In these four systems no attempt is made to define what an SMS is, rather they all define what the key elements of a SMS are.

Management system elements	Key elements	HSG (65)	OHSAS18001	BS8800[31]	ILO OHS2001
Step 1	Establish standards for health and safety	Policy, organising	OH & S policy	Initial or periodic status review, policy, organising	Policy, Organising
Step 2	Implement plans to achieve objectives and standards	Planning and implementing	Planning, implementation and operation	Planning and implementing	Planning and implementation
Step 3	Measure progress with plans and compliance with standards	Measuring performance	Checking and corrective action	Measuring performance	Evaluation, action for Improvement
Step 4	Review against objectives and standards	Reviewing performance, auditing	Management review, continual improvement	Reviewing performance, auditing	Audit, continual improvement

Table 4.2 A summary of the four safety management systems

SMSs, whilst differing in their wording and structure, all share similarities in that they all recognise the need to measure and evaluate the system to make improvements. These cyclical management systems all share the properties of Plan – Do – Check - Act (HSE, 2000), which has evolved from the total quality management movement. Four SMSs have been categorised in Table 4.2 and a more detailed examination has been carried out of HSG (65). This SMS has been explained further because attempts within The Paper Company were always to ensure their mill SMSs were designed to HSG (65) layout and standards. Further to this, the external SMS auditors audited management systems using the HSG (65) structure.

---

[31] Note this was superseded by OHSAS 18004 (2008) which is now aligned with OHSAS 18001 (i.e. steps 2-4 inclusive are identical. This entry refers to BS8800: 2004.

Step 1
Establish standards for
health and safety
management based on
risk assessment and legal
requirements

Step 2
Implement plans to
achieve objectives and
standards

Step 4
Review against objectives
and standards and take
appropriate action

Step 3
Measure progress with
plans and compliance
with standards
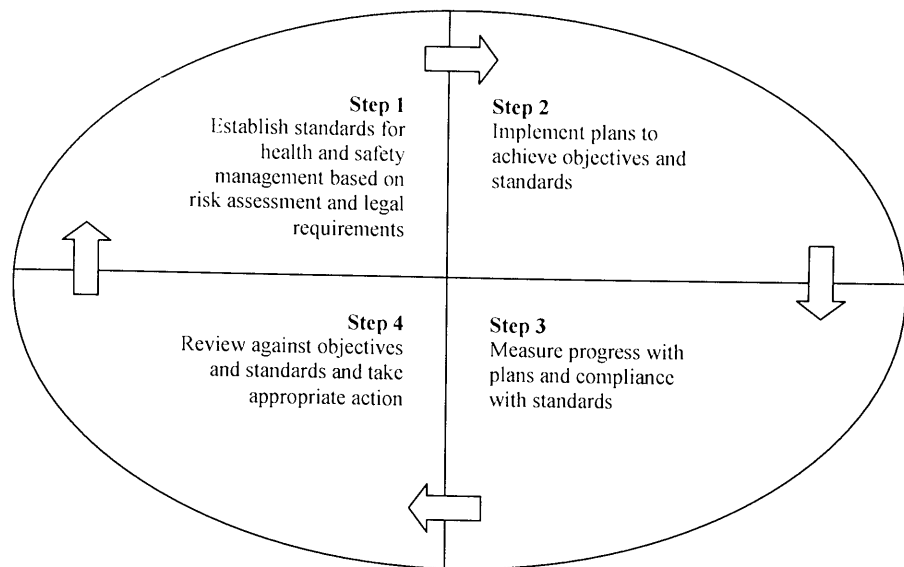
Figure 4.3: Plan – Do – Check - Act (PDCA) adapted from HSG (65)

4.5.1 Successful health and safety management (HSG (65))

"The promotion of safety and health is ... a normal management function –
just as production or marketing is a normal function."

(Robens, 1972)

Successful health and safety management (HSG (65)) sets out the key elements for success regarding health and safety management. Roben's ethos of managing safety as any other business discipline is a key component within the guide. Page 12 lists areas of business that have links with health and safety management or more specifically, "how effective health and safety policies can affect different areas of business thinking" including: corporate strategy and social responsibility; finance; human resources; marketing, product design and product liability; manufacturing and operating policy, and information management and systems.

The detection of latent and active failures has already been discussed (Reason's latency period and Turner's incubation period). The presence of a robust SMS is critical to the avoidance of accidents and the learning from accidents that do occur to avoid reoccurrence. Safety auditing should detect

whether all parts of a SMS are functional and effective in dealing with both the expected and unexpected turn of events. Hale et al. (1991) indicate that:

> "The ultimate goal of any safety management system is to influence and manage the behaviour of those in the company who can predict, prevent and control hazards in designing and operating the company's activities. That behaviour is conditioned by the day-to-day experiences of those people, but also by the policy and rules in the organisation in which they work and by the rules which they themselves have formulated and learned."

Conflicting goals such as production targets and safety goals suggests that it is the policy and senior management commitment to that policy that indicate that safety management is as important as other disciplines. In many cases this is undone by such things as manager and workforce bonuses being linked solely to production figures, with no link to safety performance. Whilst the policy can indicate senior commitment – the reality in this case is very different. As Booth (1993) states:

> "Procedures and systems are necessary elements of an effective safety programme, but that is not the whole story. The critical point is not so much the adequacy of the safety plans as the perceptions and beliefs that people hold about them."

Perrow (1983) argues that the strict adherence to the parameters set with SMS and its policy and procedures can perhaps aid tedium, and does not give individuals enough latitude to act and express themselves using their skills and judgement. This perhaps suggests that an overly rigid and procedurised SMS can have negative attributes, although Perrow does indicate that SMSs discourage violation and can work to enforce compliance with safety rules.

4.5.2 SMS components

The PDCA cycle is a common feature of all of the four SMSs discussed within this thesis. To further analyse the various components, the HSG (65) model has been used for this analysis. Figure 4.4 demonstrates the model

in diagrammatical form. A summary of the HSG (65) elements are described below:
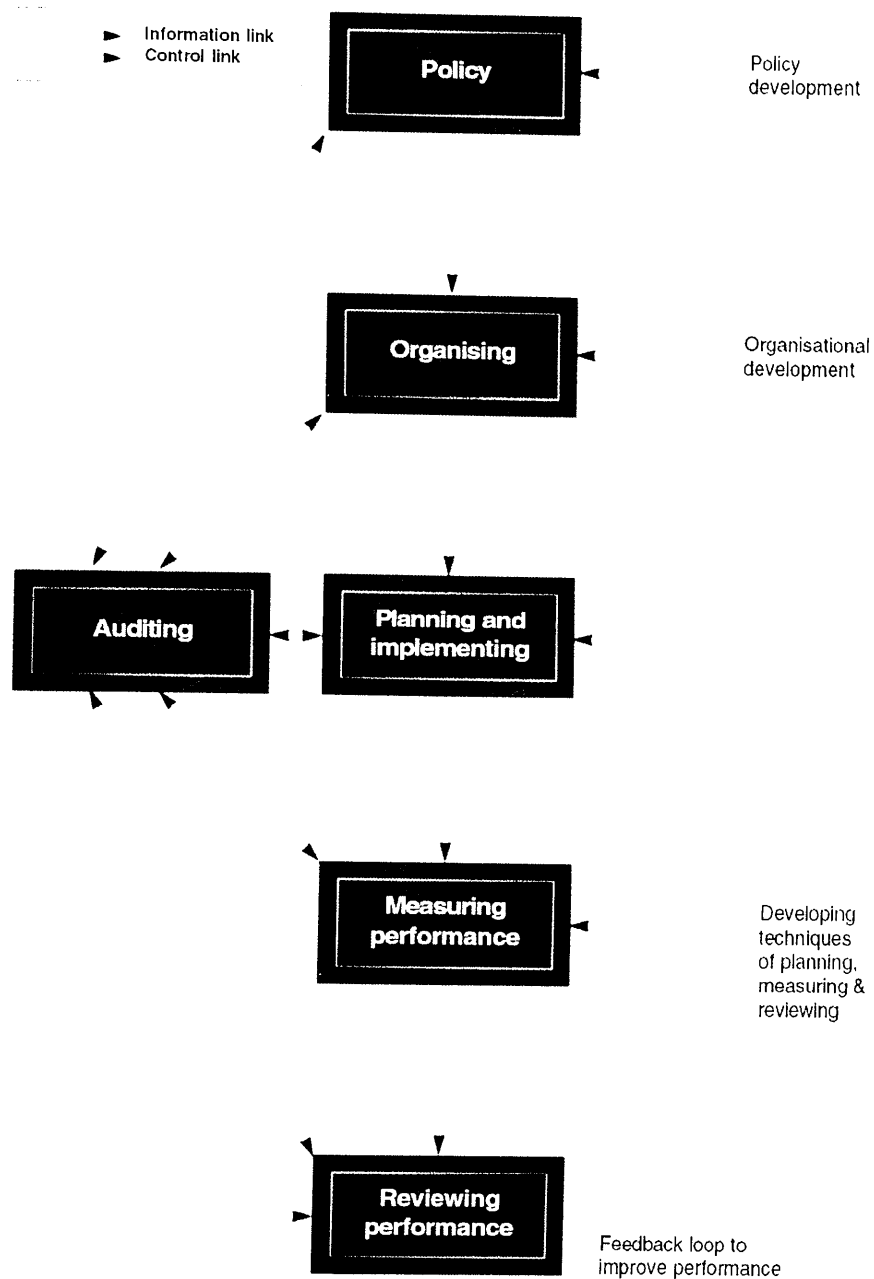
Figure 4.4: A diagrammatic representation of HSG (65), demonstrating the feedback loop to ensure continuous improvement

4.5.2.1 Policy

The HASAWA specifies that a company must have a safety policy (HSE, 1974). Legislative compliance concerning hazards should be covered within

that policy and the policy should be effectively used and communicated to all elements of the workforce. HSG (65) lists key messages and then expands them using case studies, diagrams and examples. The key messages stress integration with other systems, the financial case for positive health and safety, management responsibility, positive cultural attributes, a systematic approach and continuous improvement.

It is stressed that, "the best health and safety policies do not separate health and safety and human resource management", thus emphasising the key role that individuals play in an organisation.

The "total loss approach" is discussed both in terms of injury and ill health and such things as plant and property damage. HSG (65) cites the accident triangle as an accident model to further the case regarding the cost of accidents, by pointing out the relationship between "serious and minor accidents and other minor events" (HSE, 2000). The accident triangle is used by many behaviourists – this is outlined later within this chapter. Essentially the importance of management accepting responsibility for accident causation and accidents being, "seldom random events" is consistently highlighted. The key role that organisational factors play is outline in what is termed, "an effective framework to maximise the contribution of individuals and groups" (HSE, 2000 ibid). It is at this point that the document introduces that, "health and safety objectives...become part of the culture". Senior commitment, boardroom safety discussions, line management responsibility, strong leadership and visible and active support are all grouped in to what is deemed an effective culture.

4.5.2.2 Organising

This involves the promotion of health and safety culture through an organisation's definition of the roles and responsibilities within that organisation. If the policy sets the targets and direction for an organisation, then it is the way the SMS is organised which delivers performance.

Essential to effective organising are the vital responsibilities and relationships to carry out the policy aims and objectives. The effectiveness of the organisation's SMS is dictated by the organisation's culture which is categorised below. Collaboration between all levels of staff must be attained through written procedures, face-to-face discussion and vitally - visible behaviour. Negative visible behaviour, specifically from senior and line management, can have catastrophic implications for the safety culture of an organisation.

Communication of management's philosophy and expectations can be expressed through policy and it is the organisational elements of the SMS that achieve this effective communication.

HSG (65) (HSE, 2000 ibid) indicates that, "the activities necessary to promote a positive health and safety culture are split into:

- methods of **control** within the organisation;
- means of securing **co-operation** between individuals, safety representatives and groups;
- methods of **communication** throughout the organisation;
- **competence** of individuals".

The key elements indicated in bold are then further described again using examples. HSG (65) illustrates the relationship between major, minor and non – injurious accidents within Figure 4.5. This is further expanded in Figure 4.13 in a model which includes unsafe behaviours.

The accident triangle within the paper company did not resemble the model in Figure 4.5. The paper company's triangle ratios were very different to those of the aforementioned - the non injurious accidents or incidents showing relatively low figures. The effect this has on the triangle is to narrow the base significantly. Companies with positive safety cultures resemble the Figure 4.5 model – the wide triangle base demonstrating a positive accident and incident reporting culture.

Figure 4.5: HSG (65) accident triangle (HSE, 2000)

4.5.2.3 Planning and implementing

Planning is essential in effective risk control, in reacting to changing environments and in the sustaining of a positive safety culture. It is within planning and implementation that risk assessment is introduced, "through identifying, eliminating and controlling hazards and risks" (HSE, 2000 ibid). Only an effective SMS can prevent accidents occurring and this is achieved through effective workplace precautions provided and maintained to match the level of hazard and risk within the business. Performance standards or benchmarking should be used to properly evaluate the SMS effectiveness.

To properly plan a SMS that meets the needs of any business, HSG (65) suggests a systematic approach based on three questions, "Where are we now?; Where do we want to be?; How do we get there?" (HSE, 2000 ibid). At no time does HSG (65) specify or offer any prescription regarding a SMS for business - preferred is the indication that a SMS is adequate for the business in that it meets the requirement to identify and control a particular

business's needs i.e., "adequate for the organisation and the range of hazards/risks" (HSE, 2000 ibid).

4.5.2.4 Measuring performance

Measurement is vital in the maintenance and improvement of any company's health and safety performance. The three stages of questioning are essential measurement criteria. To measure performance an organisation must be aware of where it intends to be. Both proactive and reactive systems are required to be measured as a basket of KPIs. Typical reactive measures are accident statistics and ill health measurements. More mature SMSs and organisations use a number of proactive KPIs as measurement tools. Examples of these can be found in OHSAS 18004 (BSI, 2008) and include such things as percentage of risk assessments completed, legislative compliance (these are termed as leading indicators, whilst reactive measures are termed lagging indicators).

A combination of both leading and lagging indicators is required to give an organisation an idea of their levels of conformance against pre-set targets (where do we want to be).

4.5.2.5 Auditing and reviewing performance

It is this part of a SMS in which the more effective and mature systems demonstrate their ability for that organisation to learn from history. Organisational learning is imperative and aids further refinement and improvement of health and safety policy and procedures. HSG (65) uses the following definition to describe an audit:

> "The structured process of collecting independent information on the efficiency, effectiveness and reliability of the total health and safety management system and drawing up plans for corrective information."

> (HSE, 2000 ibid)

An audit is required because an organisation's control systems inevitably deteriorate over time. A SMS should have the means to anticipate changes and even the threat of obsolescence for its constituent parts. An audit is the means by which this is achieved. To be effective an audit can use various means to assess levels of performance. These are suggested within HSG (65) as: collecting information; interviewing individuals; examining documents and visual observation.

The goal of the HSE's HSG (65) is to achieve and sustain a positive safety culture. This should lead to a reduction in accidents and incidents and this is a good business case.

4.5.3 Summary of SMSs

SMS should offer a business a framework to manage health and safety like any other discipline within the organisation. The success of that SMS is dependent on the culture of that organisation, the commitment from all levels of staff, particularly the visible demonstrable leadership of senior managers and line managers. The role of the individual, particularly their attitude and safety perceptions, are not considered within SMS models. It is essential within a SMS that a positive culture is prevalent to ensure a learning model.

The culture can affect the SMS both positively and negatively, this is discussed within safety culture in the following section. The SMS should be fitted to the needs of an organisation and suitable to control the risks within that organisation.

4.6 SAFETY CULTURE

The term *safety culture* was popularised following the Chernobyl explosion of 1986, in which causation was attributed to a breakdown in the organisation's safety culture (IAEA, 1986 ibid; Toft, 1992). Safety culture has now become a constant theme following official enquiry reports into

disasters such as Piper Alpha (Cullen, 1990) and Kings Cross (Fennell, 1988).

A positive safety culture is a goal within any SMS. Following the Chernobyl accident in 1986, the International Nuclear Safety Advisory Group (INSAG) in their accident review stated that, "Formal procedures must be supplemented by the creation of a nuclear safety culture." (IAEA, 1986 ibid). This view has been reflected within the UK, particularly from Lord Cullen within the Piper Alpha offshore installation explosion, and the Ladbroke Grove rail accident inquiries (Cullen, 1990 ibid; 2001).

Definitions of safety culture are numerous, perhaps the most widely used is that provided by ACSNI (The Advisory Committee on the Safety of Nuclear Installations):

> "The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to and the style and proficiency of an organisations health and safety management.
>
> Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventative measures."
>
> (ACSNI, 1993)

Booth and Lee (1995) state that the dominant themes to emerge from the CBI's *Developing a safety culture* are as follows:

> "...the crucial importance of leadership and the commitment of the chief executive; the executive safety role of line management; involvement of all employees; openness of communication; demonstration of care and concern for all those affected by the business..."
>
> CBI (1990)

Numerous papers have been written on the subject of safety culture and climate over the last 10 years – several provide a review of the literature on safety culture, (Glendon & Stanton, 2000; Guldenmund, 2000; Gadd & Collins, 2002). In particular, Guldenmund's review of safety culture has

presented analysis and timelines of safety culture research and has demonstrated, from his review of the literature, seven characteristics of organisational culture and climate. Perhaps the most widely cited paper on safety culture (or climate) was Zohar's seminal study based in twenty industrial organisations in Israel (Zohar, 1980). His findings revealed that the two major dimensions (of a total of eight identified) in determining climate were "workers perceptions of management attitudes about safety and their perceptions regarding the relevance of safety in general production processes". As did Robens (1972), Zohar states that, "safety should be regarded as an integral part of the production system closely related to the overall degree of control management has over production processes".

For safety culture to be advanced, each individual should be of the opinion that safety is their own responsibility and that the safety of co-workers and others is also their responsibility (Minter, 1991).

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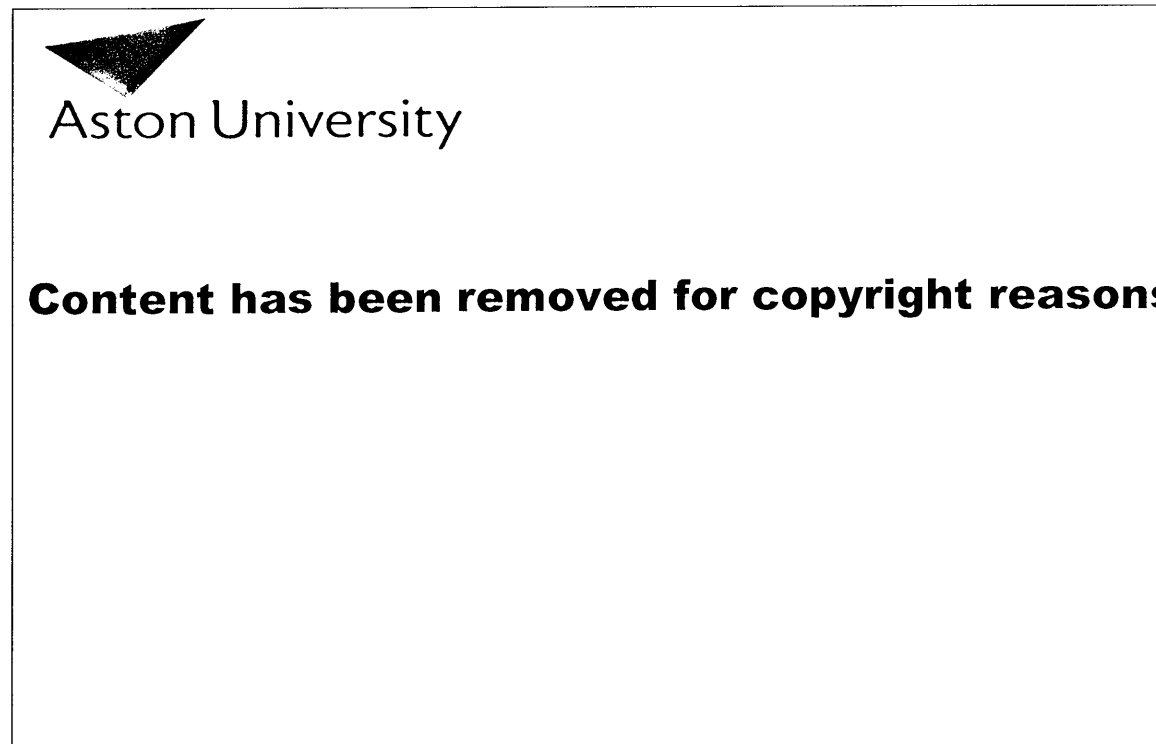
Figure 4.6: A model of safety culture stages (Fleming, 2001)

Various models of safety culture stages have been proposed. Westrum (1993; 1996; 2004) developed a typology of cultures which provided a three stage hierarchy of safety cultural maturity, namely: "pathological; bureaucratic; generative". The three stages can be explained with the simple examples below in Figure 4.3 regarding new idea and messengers, and how they would be treated within an organisation according to their categorisation.

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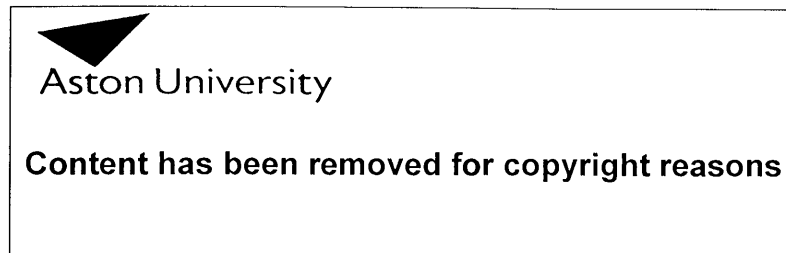
Table 4.3: Culture typology (Westrum, 1996 ibid)

Hudson et al., (1998) cited in Reason & Hobbs (1997) extended Westrum's three stage culture model and added two further stages, adding levels of depth to the model. This was further extended to 14 stages in 1999 (Hudson & Parker ,1999) The new model's five stages became: Pathological; Reactive; Calculative; Proactive and Generative. Parallels can be drawn with Figure 4.6's five stage model, which also suggests a cultural maturity model. Ryder Marsh Ltd. use the five stage model proposed by Hudson et al., (1998) ibid in their initial cultural review of companies when assessing cultural levels and whether a BBS is the correct strategy for an organisation. It should be noted that there is a commercial interest in this assessment and that Ryder Marsh consider all organisations are ready for BBS if there is senior commitment to the BBS programme. Within the results chapter, the findings of the five stage cultural maturity assessment are discussed.

.7 SAFETY CULTURE AND BBS

The attainment of a mature safety culture frequently appears within BBS texts – both commercially based and those of researchers. Cooper (1998) in *Improving Safety Culture* weaves BBS in to SMSs, audit, training and risk

assessment to name a few. Whilst stressing that BBS is not a, "cure all panacea", Cooper argues that BBS pays dividends if carried out at the correct time for the organisation's needs, "Unfortunately...they [BBS interventions] are often implemented before the immediate and intermediate levels of effort have been addressed. Consequently, they often create much unnecessary resistance to safety when there is still much to do to improve the working environment and the organisation's safety systems".

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Figure 4.7: The three factors that influence health and safety performance HSC, 2003)

Geller argues that, "all organisations are ready" (Marsh, 2002). Geller's discounting of the requirement for senior management support makes his view perhaps the most extreme when considering readiness. This lack of requirement of maturity in safety culture, process safety and leadership, was found lacking in the official report following the BP explosion in 2005, where predominance of individual's safety was elevated at the expense of the process safety requirements of a refinery (Baker, 2007).

Geller as a pure behaviourist has stated:

> "So putting up a guard might in fact encourage them (workers) to get closer to the hole that's being guarded or encourage them to take more risks because of the extra perceived safety by that guard".

(Geller, 1997, cited in Lessin, 2002)

Geller's quote summarises the opinions of the trade union movement (in that he is discussing the inversion of the risk hierarchy) and also that of well known behavioural safety professionals, (Cooper, 1998 ibid; Marsh, 2002 ibid). Krause (2002a) however in his paper, *Myths, Misconceptions and Wrongheaded Ideas about Behaviour Based Safety Why Conventional Wisdom is Usually Wrong* is in agreement with Geller regarding BBS readiness. Krause suggests that a common myth is that, "you need a solid safety infrastructure in place before you are ready to implement BBS". Krause in response to the myth that he quotes, suggests that:

> "...behaviour based safety should be taken on when the infrastructure for safety is already in place – that is appropriate for a highly developed and refined safety system, but not appropriate for one that is less developed.
>
> **Actuality**. A solid infrastructure is important to many objectives of BBS, but the key to being successful in this regard is to balance objectives and resources. It does not make sense to require a site to have any particular level of competency in the safety area before they take on BBS. In fact, behaviour-based methods may be the shortest route for the site to take in gaining that competency.
>
> What will vary, depending on the safety level of competency at a given organization, is the way in which they do behaviour-based safety. The organization that is well developed will take a different approach that the organization that is not. In the latter case, the organization may include in its behavioural targets those things that create safety infrastructure".

Marsh (2004) opines that all organisations are ready, with the caveat that senior management commitment is mandatory. If demonstrable senior management commitment is evident BBS can be introduced, although the process may be, "bloodier if the existing company situation is not ideal".

Figure 4.8 demonstrates a proposal which argues that BBS (bottom up) can be introduced simultaneously with top down cultural improvements. This theory runs contrary to the readiness debate for BBS intervention, but does however fit with Geller's theory of readiness – that is BBS can be introduced whatever the maturity of the safety culture.

Figure 4.8: DeJoy's modes of culture change associated with behaviour-change and culture change approaches to safety (DeJoy, 2005)

4.7.1 Behavioural safety – a history

The origins of behavioural safety are attributed to the work of HW Heinrich Heinrich, 1950). Heinrich worked in the 1930s and 1940s for the Travellers Insurance Company in a position of seniority. He studied 12,000 insurance claim accident reports and concluded that 88% of them were the result of unsafe acts (Manuelle, 2002; Miozza & Wyld, 2002). Krause (1997a) proposes that, "in the mid 1980s, behavior-based safety emerged as an alternative to off-the-shelf programs". Krause (2002b) outlines three main areas where modern BBS was born: a 25 week intervention study in a bakery (Komaki et al., 1978); Krause was asked in 1979 to investigate methods of improving safety performance in a California based oil drilling company (Krause, 2002b ibid); Procter and Gamble developed a

behavioural approach to safety and were first to use the phrase, 'behavioral based safety', (Krause, 2002b ibid).

BBS is a recent phenomenon to the UK. The earliest study in the UK was carried out on construction sites in the North West area of England, and this found that BBS, through goal setting and feedback methods, led to significant safety improvements (Duff et al., 1993; Marsh et al., 1995). Subsequent studies have since been completed on industrial applications in the UK, these have included the following industry sectors: manufacturing Makin & Sutherland, 1994); offshore (Fleming & Lardner, 2000) and nuclear (Cox et al., 2004).

1.7.2 What is BBS?

BBS manifests under many different headings. All the variations are accepted as being behaviourally based – either contributing to attitudinal change or in changing behaviours. Modern research and interventions in BBS now focus on behavioural change, attitudinal change being acknowledged as, 'notoriously difficult to change' (Bem, 1967; Marsh, 1997). HSE (2000) in its literature review of behavioural safety undertaken for the offshore industry states that:

> "It is often assumed that the most productive place to start when changing behaviour is with attitudes. If only the 'right attitude' can be fostered, then the right behaviour is sure to follow. Unfortunately, the causal link between attitude and behaviour is weak. The casual link between behaviour and attitudes is however much stronger. If our behaviour changes and our attitudes don't, we feel uncomfortable, a state known as 'cognitive dissonance'. We tend to resolve this discomfort by changing our attitude to be consistent with the newly-adopted behaviour. For these reasons, proponents of behaviour modification recommend targeting change first, not attitudinal change".

Lee and Harrison (2000) continue to debate whether behaviour change does lead to attitudinal change, whilst the theory of reasoned action, proposed by Fishbein and Ajzen (1975) argues that it is necessary to change both attitudes and behaviours.

Krause (1997a) suggests that BBS "refers strictly to use of applied behaviour analysis methods to achieve continuous improvement in safety performance". HSE (2000 ibid) in their literature review of behaviour modification programmes suggest five differing terms which are interchangeable and are all BBS programmes: "behavioural safety; behaviourally-based safety; applied behaviour analysis; behavioural safety management systems and safety observation systems".

1.7.3 Features of a BBS programme

HSE (2000 ibid) suggest the following as basic features of a BBS programme: 'ownership; definition of safe/unsafe behaviours; training; observation; establishing a baseline; feedback; reinforcement; goal setting; review.' Krause (1997a ibid) indicates four critical elements to a BBS system that will offer continual improvement in safety 'identifying and operationally defining critical safety-related behaviours; observing to gather data on the frequency of those observations; providing feedback; and using data for continuous improvement'. Krause further states that the aforementioned critical criteria, "must be implemented and maintained via significant employee involvement".

ure 4.9: Elements of a BBS (HSE, 2000)

ari (1994) proposed that a BBS contains three key elements which are
cifying desired behaviours, communicating those behaviours and using
dback based on "objective measurement". Marsh (2004b) who is
nowledged as the major commercial provider in the UK proposes 'six
ars' which contribute to what he terms 'full (BBS) programmes'. Marsh
s not claim the ideology as his own, but states that it has built on,
ademic research and the quality focused work of Deming, the US

company BST pioneered *full* behavioural safety commercially". The six pillars proposed are, 'root cause analysis; measurement (for continuous improvement); feedback (& goal-setting); awareness raising; workforce ownership; front line supervision.'

Figure 4.10: The behavioural safety process (Cox et al., 2004)

4.7.4 Differing BBS methodologies

There are two main types of BBS scheme, which are known as top down and bottom up. In addition to these are incentive schemes which typically offer rewards to employees for maintaining a length of time accident free. The top down/bottom up approaches are common in the UK, whereas the incentive scheme has not become deep rooted. Incentive scheme systems of BBS are very common within the US – the major criticism being that the reward system drives accident reporting underground:

> "Typical programs reward employees for hiding facts – by encouraging them to not report injuries. Conversely, sound safety incentive programs reward employees who offer input that helps everyone operate more safely."
>
> (Friend, 1997).

4.7.5 Behaviour modification theory

The key element of behaviour modification theory is known as the ABC model (Fleming & Lardner, 2002). Antecedents (A) precede a Behaviour (B) and have a causal link to that behaviour. The Consequences (C) are the behaviour outcome. The model can be best explained through Table 4.4. 'ABC analysis facilitates the identification of ways to change behaviour, by ensuring the appropriate antecedents are in place and that the consequences support the desired behaviour" (Fleming & Lardner, 2002 ibid)

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Table 4.4: ABC analysis (Fleming & Lardner, 2002 ibid).

Antecedents come prior to the behaviour and help to trigger that behaviour, the presence of antecedents however does not ensure the anticipated behaviour will manifest itself. Antecedents are required for behaviours to occur but in themselves will not ensure that expected behaviours are maintained. For long term behaviour to be achieved the HSE state that, "To maintain a behaviour over time also requires significant individual consequences" (Fleming & Lardner, 2002 ibid). Behaviour is driven from anticipated consequences which take three forms, namely, positive reinforcement, negative reinforcement and punishment. For an organisation to achieve constant and uniform desired behaviours, three criteria require consideration: timeframe; predictability and significance. Table 4.5 demonstrates two examples of the relationship between these factors. The consequences for the individual are what is vital in ABC analysis, not the organisational impact of that employees action, be they positive or negative.

e main premise of their argument is best summarised by Figure 4.11, lich turns the hierarchy upside down – that is elimination (through igineering out the risk sits at the bottom) and the less favourable controls ch as the correct use of Personal Protective Equipment (PPE) are placed the top

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Figure 4.11: A slide from the Steelworkers of America regarding the risk control hierarchy

Hazards magazine, a UK based health and safety magazine has included numerous articles both from experts who are against BBS and from trade union viewpoints. When in 2002, the HSE published research that stated that it advocated, "more widespread application of behavioural safety principles to improve health and safety" (HSE, 2002), Hazards magazine printed a number of anti BBS papers and articles. The articles cover such areas as: BBS programmes ignore trade unions; BBS is to control, not to solve problems; BBS does not make lasting changes; the lack of neutrality in research papers (often written by BBS commercial providers) and the suppression of injury reporting (Hazards, 2004 ibid).

4.7.6.2 Academic and systems based criticism of BBS

As previously discussed, the basis of BBS began with HW Heinrich's work. He summised that eighty eight percent of accidents were caused by unsafe acts, ten percent by workplace conditions, and two percent were unavoidable (Manuele, 2002). Maneule's work proposes that the basic premise of Heinrich's work was flawed, due to the fact that all of the reports analysed were written by supervisors. The fault with the use of supervisors' reports is the phenomenon known as *Fundamental Attribution Error* (Nisbett & Ross, 1980; Fiske & Taylor, 1984), whereby senior management blames accidents on an individual's failings, as opposed to an organisation's frailties, which are beyond their control. The trade union frequently cite the failings of Heinrich's work which is seen as the foundation for all BBS, in that most attribute a high percentage of accident causation to human error. Krause (1990) indicates that 80 – 95 % of accidents are caused by employees' unsafe actions.

There is a fundamental problem with the assignment of high proportions of human error as a cause of accidents, which is that most accidents have several causes. The suggestion of mono causality is an overly simplistic one, best defined within Figure 4.12. However, "The fallacy of mono-causality does not by itself account for union antagonism to behavioural safety programmes. There is something else going on that needs to be highlighted." (Hopkins, 2006). Hopkins discusses the inevitable association of BBS to blame the workers and states that, "if behavioural safety programmes are to have any chance of success, they must strenuously oppose this tendency to blame workers for their unsafe behaviour" (Hopkins, 2006 ibid).
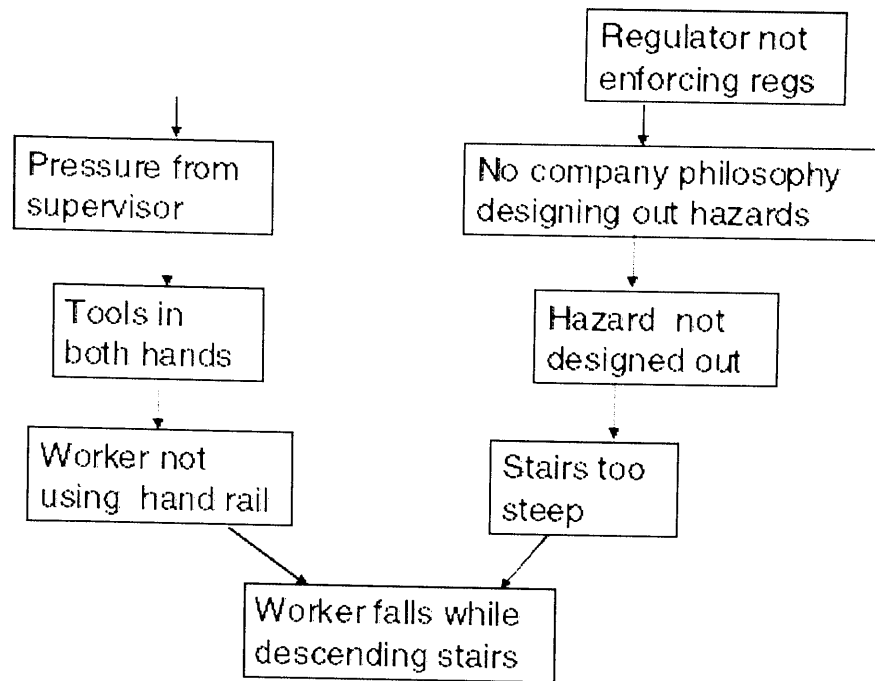
Figure 4.12: Multi causation demonstration of a worker falling down the stairs

The controls at the top of the hierarchy are proposed on the right of Figure 4.12, whilst the lower hierarchical items (i.e. following procedure) are on the left of Figure 4.12. To demonstrate the importance of the hierarchy, and hence the weakness of the behavioural argument, the United Steelworkers of America propose the following analogy, "It is better to slay a dragon that to teach people ways to live peacefully with him!", or simply stated, "Fix hazards, don't blame workers." (Hazards, 2003).

One paper has been written which suggests that BBS can work in a unionised environment. Krause and Hidley (1993) propose that, "people are often surprised to hear that labor unions also favor the behaviour based approach to safety". Proposed reasons for this success are site-wide representation in the process, good communication and particular use of the hourly paid workforce in drawing up the critical behaviours lists. The research is based on ten years of commercial BBS systems introduces by Behavioral Science Technology (BST), of whom the authors are the two senior members of staff. BST is a BBS provider described later within this

chapter by Marsh as a company who implement full BBS including root cause analysis, which he argues should not be tarnished with blame the worker slogans.

T.R. Krause is the chairman of BST - one of the major commercial providers in the world, and in addition to his commercial interests the author of many peer reviewed papers on BBS related subjects (Krause, 1989; 1990; 1992; 1995; 1997a; 1997b; Krause & Hidley, 1989; 1993; Krause et al., 1984; 1999). Krause himself acknowledges that his commercial interests and research may indicate a conflict of interests when presenting papers on BBS which is outlined by his footnote (Krause et al., 1999 ibid):

"While the specific technology described and evaluated in this study is owned by a company for whom the authors work, every effort has been made to conduct and report this evaluation without bias. Nevertheless, readers should be aware of this fact when assessing the findings".

Horbury and Wright (2000) conducted a telephone study following a request from a chemical supply company, who were considering launching BBS in their workplace. The findings are split in to two separate sections, namely general features of BBS (positive and downsides) and a comparison of the pros and cons of the five main commercial providers in the UK, plus one bespoke scheme.

The findings in Figure 4.6, display many positives and negatives, although the researchers indicate that it "is simplistic to critique behavioural safety as a single entity" due to the varying nature of the various schemes (see features of a BBS scheme earlier in the chapter).

Table 4.6: Horbury and Wright's (2000) findings (positives and negatives of BBS)

Safety system specialists' criticisms of BBS, such as James Reason, 'require more detailed consideration" (Marsh, 2003). With this quote Marsh is appointing more validity to Reason's criticisms than that of the uninformed criticisms of BBS. Marsh, in the same article, suggests that Reason isn't criticizing at all, but rather stating, "that resources are better targeted elsewhere". Marsh is of the opinion that poor BBS systems and providers deserve their criticism and are themselves guilty of the fundamental attribution theory and hence blame the workers, without the foresight and knowledge to look to organisational deficiencies.

"Rather than being the main instigators of an accident, operators tend to be the inheritors of system defects created by poor design, incorrect installation, faulty maintenance and bad management decisions. Their part is usually that of adding the final garnish to a lethal brew whose ingredients have already been long in the cooking."

(Reason, 1990)

Marsh (2004) suggests that, "good behavioural safety must have root cause analysis" as a mandatory element. With the root causes being sought, following incidents and accidents, he suggests that BBS can be exempted from most criticism. His opinion seems to be suggesting that a number of companies do BBS, and do it very well, however this number is outstripped by more companies who tarnish the reputation of the aforementioned with their poor BBS practices. Marsh is of the opinion that all BBS programmes are targeted in this way and argues that good *BBS* is likely to improve culture or certainly not hinder its development at the very worst.

Cox et al. (2004) in a study of a BBS intervention within three nuclear reactor sites presented key concepts discovered when they analysed the data. This presented both positive and negative elements and is displayed within Table 4.7. This table in addition to Table 4.6 will be utilised within Chapter 8 and will contribute to the thesis discussion. Not only will the BBS intervention be compared to the aforementioned tables, but the Mill Three SMS and its impacts on the mill will be compared.
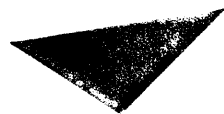
Table 4.7: Strengths/weaknesses/opportunities of using a behavioural programme (Cox et al., 2004)

Krause (1997a) indicates that BBS is in a perilous position in the US and there is a possibility of it becoming defunct as in the case of total quality management. The UK position is less perilous however as BBS is currently in a period of growth, and is seen by some as a panacea or silver bullet. Whatever the position is with BBS as regards its long term future it certainly has a number of advocates and many who oppose it. The key question for many however (both users and those who oppose it) is its sustainability and moving from successful project to *the ways we do things around here* (CBI, 1990 ibid) - or a sustainable safety culture. Those strong advocates of BBS should consider the words of Dan Peterson who stated, "no one has ever bought safety excellence" (Marsh, 1999; p4).

4.7.7 The paper industry and BBS

Within the UK there has been only one study of the paper industry which has included any analysis of BBS. This followed on from the original paper industry study (Horbury & Bottomley, 1998) and studied the effects of the three year PABIAC initiative on the paper industry. The original study correlated poor accident records with poor safety culture and immature

safety management systems. The 2002 study (Horbury et al., 2002) within the safety culture evaluation passed some comments on BBS within the industry. The comments quoted suggested a 'blame the worker campaign' and that the culture was too weak to sustain BBS due to a lack of trust between the workforce and management teams.

"A number of the mills had tried to address improving safety attitudes and safety behaviours through behavioural safety initiatives, however only one out of the eight case studies had successfully implemented a scheme. At one of the mills their 'Behaviour Based Safety' scheme had been labelled: 'Big Brother Spying', and was viewed to be management abdicating responsibility for managing safely".

(Horbury et al., 2002 ibid)

There is a particular problem within papermaking and its continuous process nature. This is because of the observation aspect of behavioural programmes and is discussed in Chapter 8. This issue has not been discussed in the literature review analysed, and hence is not explored at this juncture. The suitability of BBS techniques within papermaking is integral to the debate of the BBS and Mill One's fit.

4.8 SUMMARY OF BBS
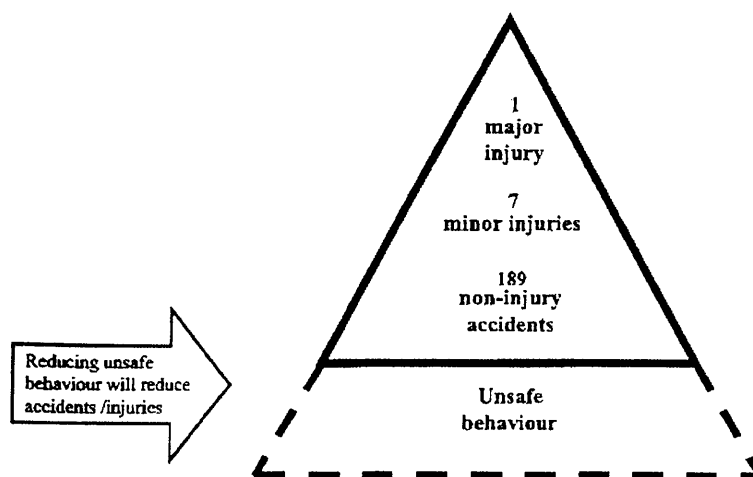
Figure 4.13: Lardner: unsafe behaviour integrated in to the HSG (65) accident triangle

BBS has been a longstanding commercial safety technique in the US since the 1980s, and has become popularised in the UK from the latter 1990s onwards. BBS seeks to target unsafe behaviours (see unsafe behaviours Figure 4.13) – the theory being that this catches unsafe actions and acts on them prior to an accident's occurrence. The use of data and keeping the BBS visual, aids demonstrating the success of any BBS programme to the workforce. The premise of BBS is that it works at changing behaviours because attitudinal change is very difficult to achieve. BBS providers believe that cultural change can be initiated bottom up - if behaviours are changed, then attitudinal change (and hence improved culture) is achieved.

Critics of BBS state that it inverts the risk hierarchy, concentrating on changing workers' behaviour as opposed to protecting workers from a hazard. Many observation categories are based around workers' body positioning, personal protective clothing etc. which further adds to the anti BBS debate. Much criticism is levelled at BBS for being a 'blame the worker campaign', or, 'big brother spying' (Horbury & Wright, 2000). This criticism is levelled at reward schemes where suppression of accidents for worker bonuses is a well known phenomenon (Sawacha et al., 1999; Collinson, 1999). Geller refutes the accusation that incentive or reward schemes attempt to manipulate workers (and accident figures) and states that, "It's critical to realize that rewards or positive reinforcers can be used to motivate behaviours or to support behaviours. When you promise a reward following a certain behaviour, you are offering an incentive to motivate a behaviour". The criticism of blame the worker for observation schemes (within the UK) is one that is not well documented and thus BBS criticisms are vehemently denied by UK - BBS providers, who distance themselves from incentive schemes.

4.9   LITERATURE REVIEW SUMMARY

This literature review has built on the paper industry specific chapters (chapters two and three) and provides a traditional review of the literature. The chapter begins by detailing and defining organisations and the

individuals that make up those organisations. Culture has been described as the most difficult organisational attribute to change (Schein, 1992). The definition of culture and its role in an organisation has been given – this is a vital precursor to a later discussion of organisational safety culture. An important distinction is made between culture and climate – the literature review provided two opposing views. One view was that culture and climate are interchangeable terms and there exist no or little difference. The author's view supported the opposite view which states that culture can be described as, "the way we do things around here" (Deal & Kennedy, 1982) whilst climate was a snapshot of culture at any given juncture. The measure of climate gives an indication of the organisational culture only at the point when the survey or other measurement is carried out.

An essential aspect of a positive culture is a learning organisation – a key feature of effective learning is successful communications. To learn from previous accidents and incidents an organisation must communicate successfully throughout all levels of the corporate body. Poor learning tends to be underlined by an attitude of denial. This lack of acceptance of organisational errors, and inability to learn denies that organisation a chance to prevent incident reoccurrence.

HSG (65) the HSE safety management system is examined in some detail, whilst three other SMS's are compared with it. All share a cyclical pattern which is described as Plan – Do – Check – Act, this model has learning as an essential feature within its structure.

The chapter then details safety specific discussion regarding the aforementioned organisational features and attributes. Safety culture and climate are detailed, culture being described as a normal part of the production process (Zohar, 1980). Two safety culture maturity models are proposed which detail immature culture through to mature, learning organisations, and prevalent features that one would expect to find at each level.

The thesis key objective is to measure a behavioural intervention at a paper mill. This chapter introduces BBS and discusses several theories of BBS and its possible success within organisations. BBS commercial providers are split in their thinking – some feeling that BBS can be commenced whatever the safety cultural maturity levels are, whilst others feel that a level of management support and backing are vital to commencing and sustaining a successful BBS programme. Systems theorists (eg Reason) feel that organisational effort is better supported in ways other than BBS.

CHAPTER 5 – METHODOLOGY

The purpose of the methodology chapter is to describe the steps undertaken during the research and to justify their use. The methodology is structured in two parts. This is the first and describes the justifications for conducting the research. The second part (Chapter 6) describes certain organisational events in the form of a narrative.

5.1 INTRODUCTION

The research uses largely qualitative methods and is multi-method, relying on a number of differing techniques and information sources. For the majority of the research the author was employed directly within the company whom the research was based on. This gave unprecedented access to information at a senior level. The role of participant observer was critical and indeed allowed the opportunity to shape policy and procedure due to the author's role within the company. The gathering of information was carried out over an extended period of time with no time limitations on information gathering. This differs from the research norm, whereby the researcher carries out field work for a limited time in the host company/compa
nies and then leaves to write up.

No comparative study with another company was carried out for the research, although the author's previous employment (in a paper mill) was used for purposes of comparison. Paper mill statistics and information were used from across UK mills to set the scene regarding the industry's health and safety position. Due to the richness of information the lack of comparative study was not foreseen as an issue.

5.2 MULTIPLE FOCUS METHODOLOGY

Date	Intervention or Evaluation	Brief Description
2002	Climate survey	Completed by the author's predecessor who utilised the HSE climate survey which was quantitative
2004 (April)	Pilot study at Mill Three of the safety questionnaire	Pilot study of ten personnel incorporating two managers, two engineers and six shop-floor staff
2004 (April)	Pilot study at Mill Three of the semi-structured interviews	Piloted on six members of staff (one manager, one engineer and four shop-floor staff). The six members of staff were six of the ten staff used for the questionnaire pilot.
2004 (June)	Workforce questionnaire carried out by the author	Safety questionnaire carried out with all levels of Mill One. This utilised the questionnaire used in previous paper mill studies in the late 1990s (Horbury & Hurst, 1998)
2004 (June-July)	Semi-structured interviews carried out by the author at Mill One	These were applied to all levels of the organisation and were directed at individuals and not groups. As with the questionnaire approach above, the question sets from the paper industry research were utilised for the purposes of comparison with other paper mills
2004 (November)	External audit of the SMS (Mill Two)	Quantitative audit carried out which examined the SMS using the HSG (65) model
2005 (May)	External audit of the SMS (Mill One)	Quantitative audit carried out which examined the SMS using the HSG (65) model
2005 (June)	Interviews to establish safety maturity, carried out by an external company (Mill One)	The BBS provider completed group interviews to establish a safety maturity indicator based on a five point qualitative scale, ranging from pathological to generative. Interviews were carried out by two consultants, and six groups of between 5 and 12 were interviewed
2005 (June)	External audit of the SMS (Mill Three)	Quantitative audit carried out which examined the SMS using the HSG (65) model
2007 (June)	Workforce questionnaire carried out by the author (Mill One)	As 2004, to directly compare results between the two years
2007 (June-July)	Semi-structured interviews carried out by the author (Mill One)	Identical base model used as 2004, although the nature of semi-structured interviews means that direct comparison and identical questioning are not possible
2007 (June)	External audit of the SMS (Mill Three)	Quantitative audit carried out which examined the SMS using the HSG (65) model. Note, no changes were made to this approach in order that like for like information was available for comparative purposes
2007 (September)	External audit of the SMS (Mill One)	Quantitative audit carried out which examined the SMS using the HSG

			(65) model. Note, no changes were made to this approach in order that like for like information was available for comparative purposes

Table 5.1: Chronology of measurements and interventions undertaken

A number of methods were used to examine several safety measures at Mill One. Some were carried out by the author and some by consultants employed by the author. Table 5.1 outlines the various forms of measurement and evaluation undertaken. The approach was largely ethnographic, deriving data from behavioural observation. The two primary measures undertaken were an evaluation of the SMS and an evaluation of the safety culture in the mill. This thesis evaluates a BBS intervention and as such evaluates prior and post intervention. This is carried out for each form of measurement.

Description	Pre-intervention	Post-intervention	Comments
External audit of the SMS based on HSG (65) principles	✓	✓	Carried out by an external provider. Quantitative to allow comparison with other mills and other factories within the PLC
Questionnaire carried out by the author based on previous paper research. This afforded comparison with results from previous paper mill studies	✓	✓	Questionnaire fatigue was a possibility, but the technique was used in addition to the interview methodology to add to the richness of data and results
Semi-structured interviews carried out by the author. The same questions were used as in a previous paper study, as with the questionnaire approach	✓	✓	Based on previous paper industry research. A base question set was used, which was tailored according to who was being asked the question
Observation carried out by the author who was in an employed situation for the bulk of the research period. This included shop-floor observation, attendance at meetings, reviews, seminars, investigations and similar forums. This method of evaluation is mainly dealt with in the narrative chapter	✓	✓	This was extensive and is mainly detailed within the narrative chapter
External evaluation of safety culture by use of a safety culture survey and group interviewing	✓		An external BBS provider carried this out through a series of group interviews
Climate survey (HSE tool) carried out at Mill One prior to the author's employment	✓		Quantitative survey carried out by the author's predecessor

Table 5.2: Intervention evaluation methods

5.3 FIELD WORK RESEARCH APPROACH

A typical research approach was not followed for this thesis due to the aforementioned author's employment status. A period of time was not undertaken within a host company to evaluate any data, rather, all phases of research were undertaken when in the employ of the host company. Genuine integration in to the company was achieved, through all levels of the organisation. Field research was undertaken over a period of approximately five years. This time period was essential to fully evaluate the

BBS intervention, but also to study the environment fully prior to that intervention. There were also delays in the BBS intervention which meant that the research period was extended, which lay beyond the author's control. Fieldwork relies on the researcher building a rapport with the host company and the use of observation, unofficial discussions and meeting attendance all add to the richness of the research undertaken.

Malinowski stated that the participant observation was essential for ethnographers to fully understand the everyday life of their subjects:

> "to grasp the native's point of view, his relation to life, to realize *his* vision of *his* world"
>
> (Malinowski, 1922)

Kirk and Miller (1986) suggest that fieldwork consists of four phases. These are summarised in Table 5.3. Whilst the first stage was prepared largely prior to the author's employment in the host company, the latter three stages did not have specific and delineated boundaries. Their timings were all interlinked due the extensive period of time spent carrying out fieldwork. The extensive fieldwork encompassed the ethnography approach, case study, interpretive procedures and qualitative research. However, a quantitative method of measurement was utilised in the measurement of the SMS by the external audit company.

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Table 5.3 Kirk and Miller (Sommer, 1991), four phases of field research

Using several methods of data evaluation, it is essential to describe and evaluate their methods in some detail. Each of the intervention evaluation methods (Table 5.1) is assigned a separate methodological description to fully explain the various methods used.

5.3.1 Safety management system audit

"If the audit has become the yardstick by which financial performance is measured then the safety audit should become the yardstick by which safety performance is measured. Only with such a management tool can the board... be satisfied that all aspects of safety are maintained at the right level."

(Eves & Gummer, 2005)

Two audits were undertaken, one in 2004 (pre BBS intervention) and the other in 2007 (post intervention). The decision to use an external company to audit the SMS was decided upon because it was felt, by both the author and PCM Four, that this would free up valuable time for the safety department and would give impetus to the audit of the business. The decision to use the particular audit company was a largely pragmatic one. The PLC was already using the audit provider within its corrugated section and the company also acted as the PLC's insurance brokers.

A meeting was held between the author and the audit companies risk director to discuss the audit programme and to establish audit methodology. A paper specific audit tool was written for the company by the author to furnish the audit team with some paper specific knowledge (the company had not previously audited any paper mills). A lengthy tour of Mill Six was undertaken to provide the audit company with some knowledge of the environment they would be working within.

The first two mill audits were treated as the audit pilot study, with the intention of meeting the audit provider prior to carrying out the next mill audits to make any necessary changes to the audit process. Following these two mill audits, a senior manager and the author met with the aforementioned risk director to examine the progress. This meeting is described within the narrative in some detail. For the purposes of this methodology chapter, the result of this meeting for the future of the audit process was that the audit methods remained identical to the first two mills.

5.3.1.1 The audit structure

The Paper Company had no previous experience of an external audit programme to evaluate the efficacy of their SMS. The audit scheme undertaken was based on the principles of successful health and safety management (HSG (65)) which is detailed within Chapter 4. The audit was carried out over three days, beginning with a site introduction on day one and climaxing with a verbal feedback session at the close of day three. The three days were considered necessary to carry out a systems audit to the required level of detail.

Audit final reports were supplied in two forms and followed the three day audit at an agreed interval of six weeks. The two reports were in the form of a detailed report which contained the whole audit breakdown and the associated score for each element and sub element, and a short management report by way of a summary and prioritisation tool.

Element	Sub-element	Score available
Policy and organisation	Health and safety policy	1420
	Health and safety forum	580
	Retention of records	490
	Communication channels	400
	Management responsibility	450
Planning and organisation	Risk assessment	1300
	Safe operating systems and procedures	1860
	Permits to work	1790
	Hazardous substances and materials	1270
	Training	1050
	Safety aspects of contractor management	1930
	Personal protective equipment	900
	Work environment	2340
	Occupational health	2550
	Handling of materials, transport and storage	2570
	Noise and vibration	1400
	Fire management	1100
	Emergency preparedness	1620
	Specific risks	4290
Monitoring performance	Planned workplace inspections	3520
	Management accountability	900
	Accident reporting, investigation and statistics	2760
	Management of costs	1290
Audit and review	Health and safety reviews	600
	Learning from reviews	1100

Table 5.4: External audit table of elements and sub elements

Each audit was undertaken by two auditors. To ensure a uniform approach of inter-mill comparison these two auditors remained the same for each mill audited within 2004/5. Part of the audit specification insisted that for the follow up audits in 2007, at least one of the original auditors must lead the process.

5.3.1.2 Pre-audit

Prior to the mill audits a pre-audit pack was sent to each mill explaining the process. A scope of works was included which replicated the areas that would be examined (these are as contained within Table 5.3). A request document was also sent to the mills which detailed auditor required documentation and information to be prepared and ready for evaluation.

This included such things as policies and manuals, accident data, incident/accident investigations, permit to work and Control of Substances Hazardous to Health Regulations (COSHH) assessments. The third document included, was a previous example of an audit carried out within another industry that bore a resemblance to paper mills. Along with the author's communication of the process, the information sent out was detailed, timely and informative.

Little information was given to the auditors regarding standards at any of the mills, particularly the mill where the intervention was being examined. This was done in the interests of seeking neutral opinion on the SMS without influencing that opinion in any way. No detailed information was given to any mill regarding numbers of staff who should be available for the audits or what their roles or seniority would be. It was felt by both the author and PCM Four, that the seniority of staff, trade union involvement, and interest and time shown by the mill in the audit process, would in its own right be a cultural indicator.

5.3.1.3 The Paper Company audit strategy

In November 2003, prior to the author's employment with The Paper Company, a decision had been made to engage in a *robust audit to an agreed standard*. This was decided within a forum attended by the managing director and his senior team, the mill managers and safety advisors. Use of an external auditor, or a particular standard, was not specified.

5.3.2 The mill audit period

During the three days of each mill audit there was little rigidity on timings, areas to be examined, and staff to be interviewed. This was to allow the business to operate with as little disruption as possible to normal operations. There were some elements that remained identical however, which were vital to an effective audit process. Day to day communication of the audit process and findings was decided upon at mill level, to suit the mill

management team. Some mill managers expressed a preference for daily or even twice daily updates, whilst others were happy to simply attend the final day's detailed feedback.

5.3.2.1 Day one and two

Initially the day started with the two auditors meeting with the mill team. In most examples this included the mill manager, chief engineer, trade union official/s and selected departmental managers. Within this initial forum the mill would carry out a short presentation and induction for the auditors – a contact would be appointed to the auditors to ensure that departments could be accessed in a timely fashion and persons were available when required. The contact would remain with the auditors for the duration of their audit.

The audit team would at this stage outline how the audit process was likely to occur, suggested timescales and a list of documentation and key personnel would be requested. Between the mill and the auditors the next three days would be mapped out and a timetable of contacts and times determined.

The remainder of day one and day two would then be determined by the timetable agreed on. This would be a combination of document examination, discussions with the safety contact, discussions with the requested personnel, and direct observation of site activities. The auditors would sometimes work together and sometimes separately. This depended on the size and scope of the topic being investigated. The auditors would meet at least twice per day to compare and correlate their findings. The audit detailed report was filled in during the three day audit period, whilst the management summary was completed off site.

5.3.2.2 Day three

The majority of day three was similar to the previous two, although the marked difference was that the auditors would spend more time together

sharing their findings and honing their report. The final section of the day involved the auditors presenting their findings to the selected mill team usually the same team who attended the opening meeting). It was in this orum that the auditors would provide verbal feedback on the audit and present their key findings. This would then be followed up by the audit report being sent to the mills at a later date. The author in most cases would be present on site for the duration of the audits – and as a minimum the opening and closing sessions. For the mill where the BBS intervention was being evaluated, the author was present for the whole audit process, both pre- and post-intervention. Within the close out, detailed notes were made by the author to compare with the auditors' written findings when received.

5.3.2.3 Audit process review following the pilot

A review of the audit process was requested by a director of The Paper Company. In attendance were the author of this thesis, the audit companies isk director, and the SRP director requesting the review. The meeting was held to address perceived problems with the process that the first mill to be audited (Mill Two) had raised. Following the meeting PCM One wrote to the audit company requesting a change of approach. The details of this meeting and the letter are discussed in detail within the narrative chapter.

The audit approach was not changed for future mill audits because of disagreements between the thesis author and PCM One. This is discussed in more depth within the narrative.

5.4 QUESTIONNAIRE APPROACH VERSUS SEMI-STRUCTURED INTERVIEW

Both the questionnaire approach and semi-structured interviews were used by the author as evaluation tools prior and post BBS intervention. There were few time restraints to govern their use and so the approach was used. There was perhaps a feeling of questionnaire fatigue when carrying out the two questionnaires, which was reflected in the relatively low numbers of

questionnaires returned (see Sections 7.3 and 7.7). It should be noted that questionnaire response rates do tend to be low when comparing similar studies. The average response of the six mills within the Horbury and Bottomley paper industry research was 24% or 443 out of 1,870 employees (Horbury & Bottomley, 1998)

5.4.1 Questionnaire approach

For purposes of inter paper mill comparison a questionnaire was used which formed part of previous paper mill research initiated by PABIAC (Horbury & Bottomley, 1998). This would allow the Mill One results to be compared with the wider industry by means of benchmarking. The questionnaire aimed to evaluate three areas, namely: safety and SMSs; management and communication.

5.4.2 Pilot study

"Do not take the risk. Pilot test first"

(De Vaus, 1993)

A pilot study of the questionnaire was carried out at a separate mill (Mill Three) to ascertain if the questionnaire was suitable, and whether any questions needed to be subtracted, added or altered. Ten persons were asked to complete the questionnaire and no unfavourable comments were found. Two managers, two engineers and six operational staff were asked to complete the questionnaire and comments were gathered. The results of those questionnaires were kept separate from the Mill One results and are not contained in the results of this research.

The pilot study was essential in that it identifies problems prior to the main study and prevents poor data collection from occurring. There were no language difficulties at either mill and hence the need for translation was not required. The pilot study is invaluable in that it gives an early warning about the frailties of the questionnaire itself and whether change needs to be

nstigated. The pilot study does not in itself guarantee success in the main study, it does however significantly increase the likelihood (Baker, 1994).

Peat et al. (2002) suggest nine points for pilot study procedures to improve a questionnaire. These were used as an evaluation tool when examining the responses and discussions from the ten pilot volunteers.

- administer the questionnaire to pilot subjects in exactly the same way as it will be administered in the main study
- ask the subjects for feedback to identify ambiguities and difficult questions
- record the time taken to complete the questionnaire and decide whether it is reasonable
- discard all unnecessary, difficult or ambiguous questions
- assess whether each question gives an adequate range of responses
- establish that replies can be interpreted in terms of the information that is required
- check that all questions are answered
- re-word or re-scale any questions that are not answered as expected
- shorten, revise and, if possible, pilot again.

(Peat et al., 2002)

The ten people who carried out the pilot study of the questionnaire were not randomly chosen, but hand-picked by the author. They were chosen because of their willingness to participate and their honesty in providing constructive criticism. Because of the lack of negative comments, the questionnaire was used at Mill One with no alteration.

5.4.3 Mill One questionnaire process

For both the pre- and post- BBS intervention questionnaires, forms were handed out to the whole workforce and returned on site to an office location. The timings were in 2004 (mid) and 2007 (late). In 2004, sixty questionnaires were received from the mill (287 staff were employed), this was a 21% return. The 2007 questionnaire received thirty eight completed forms (266 staff employed), which equated to a 14% return.

Whilst the forms were all ticked and properly completed, the section that required free text received few comments. In 2004 the whole workforce had been asked to complete a communications survey by an external company (this was general communications) and this was led by the then company

secretary. The questionnaires returned from this exercise were approximately 15%. From the semi-structured interviews it was evident that he personnel felt that they were overloaded with requests for information. Personnel were loath to complete these unless there was an obvious tangible benefit to themselves.

5.5 QUALITATIVE INTERVIEW AND OBSERVATION

This technique uses a participant and ethnography approach in its data collection. Using the timetabled semi-structured interviews and the observation of meetings and actions, a rich source of data was available. For the purposes of this research, an interview is described as:

> "A conversation initiated by an interviewer for the specific purpose of obtaining research relevant information and focused by him/her on content specified by research objectives".

> (Camel & Kahn, cited by Cohen & Manion, 1985)

Semi-structured interviews were utilised because of their lack of rigidity. The tendency for structured interviews is that the interviewer leads with a pre-determined list of questions read out in a particular order. Less structured questions have more flexibility and allow particular issues to be more fully explored. This can have the advantage of information not previously being considered, being introduced to the research by the interviewee.

A basic set of questions was used as a base model and a, "grouping of topics and questions that the interviewer can ask in different ways for different participants" (Lindlof & Taylor, 2002). As with the questionnaire approach, the questions set by Horbury and Bottomley 1998: p56 were used. This again allowed the author to make a comparison with other paper mills when interpreting the data, which enriched the data's uniformity. The 1998 research utilised various sets of questions all based on a generic model. The sets were designed to be relevant to different levels of staff within an organisation such as senior managers, engineers and shop-floor operatives. This manifested itself during interviews by slightly changing

articular questions, to suit the role of the interviewee. An example of this would be when interviewing individuals regarding resources to safety. When questioning a senior manager the question would be, 'do you consult staff about the resources required for safety?', whereas the question to a shop-floor operative would be phrased, 'are you consulted about the resource required for safety?'.

The use of open ended questions was utilised, which is advantageous to data collection (Cohen & Manion, 1989). Although the questions were pre-written, they were sometimes deviated from, if a particular answer merited further investigation. In a similar way, questions were sometimes left out to best tailor the process to an individual.

The approach used allowed freedom of expression from the interviewee and meant that the interviewer did not take complete control. Where interviewees felt strongly regarding a topic they could speak freely and expansively. This approach has advantages in that it does not lead the interviewee with the pre-suppositions and opinions of the interviewer. The approaches taken in 2004 and 2007 were identical for the purposes of data comparison.

5.5.1 Pilot study

A pilot study was used to trial the question sets using the same approach as with the questionnaires. Six of the ten people used to pilot the questionnaire were interviewed using the various question sets. The representation was one senior manager, one engineer and four shop-floor operatives. In addition to the use by Horbury and Bottomley within six paper mills, this gave assurance that the question sets were relevant to Mill One.

5.5.2 Interview structure

The interviews were undertaken by the author alone. The answers were written down during the interview process. An accurate transcription was

;sential for effective data gathering and hence the interviews were well
)aced to allow time for notes to be expanded following the interviews.
articipants were all volunteers chosen randomly according to the author's
te visits. These visits, over time, ensured that all shift patterns were given
ie opportunity to participate which ensured no shift bias regarding
pproaches to safety, or more specifically shift safety cultures. No group
iterviews were held, rather individual interviews were completed and these
'ere based over a period of four months. The 2004 interviews held totalled
venty eight and the 2007 interviews twenty six. This allowed a spread of all
:vels of staff including senior managers, shift managers, supervisors,
iaintenance staff and machine operatives.

\s an introduction to the interviews, the interviewees were given a short
lescription of the process and reasons for the interview. It was stressed that
he interviews were not being carried out by The Paper Company, rather as
)art of a research project by the author. Anonymity was guaranteed to the
ndividuals in an attempt to ensure the freedom to express opinions without
'ear of reprisal. This point was laboured and re-emphasised due to the
author's position in the company.

5.5.3 Interview recording

The transcripts of the interviews were taken down by the author and no
scribe was present. The subject of tape recorded interviews was
considered, but it was felt that these would be overly intrusive and could
lead to less than honest answers. Without a recording medium such as
tape, suitable gaps were built in between each interview in order that the
author could study the notes made and ensure the spirit of the interview had
been captured accurately.

Tape recording has several advantages and disadvantages which were
considered prior to the interview process. The key advantage is that of
accuracy. There is the practical advantage also of the interviewer being free
to concentrate on the interview itself without taking notes. This allows more

digression when following up interviewees answers. Once an interviewee is undertaking an interview, it may become more like a conversation and the recording means may be forgotten.

It is possible that information recorded could at a later date become important. Future interviews could outline some important findings and the replaying of transcripts could demonstrate some correlation and repetition of themes that had previously been missed.

The disadvantages of recording interviews centre mainly on the duration of the transcription process itself. For those not trained in audio typing techniques this can be very labour intensive and it was felt to be a poor use of time. Within Mill One the key reason, as outlined, was one of trust. The company had a history of disciplinary procedures over safety related issues, and individuals questioned stated that they would not be happy being recorded. This discussion point was also debated with two trade union officials who stated that they would prefer their members not to be taped. The issue of confidentiality was the key decider in not using a recording of the interviews.

5.6 BEHAVIOURAL CONSULTANT APPROACH

This section deals with the actual selection of a behavioural provider in addition to the processes used by the behavioural provider including the group interviews held and the approach thereafter.

5.6.1 Behavioural provider – selection process

At a time when the company was debating whether behavioural safety was a possible solution to their safety improvement plans, the author was asked to arrange for three behavioural providers to present to the risk management committee. The risk management committee was made up of senior managers including the managing director, PCM One, two mill managers (one of whom was PCM Three), the environmental manager,

PCM Four, the company legal advisor and the group safety manager (the author). This meeting's purpose was to act as a funnel to feed information in to the parent companies meeting of the same title. These meetings were designed following the findings of the Turnbull report and intended to meet the spirit of its recommendations. The meetings tended to act as health, safety and environmental meetings and usually neglected other key risk areas such as finance and IT.

The author recommended two companies who were major commercial providers in the UK and suggested that the third company to consider should be the company that was already providing a service in Mill Two. This proposition was accepted by the meeting, and the two companies were primed to present for approximately 30-45 minutes. The presentations were made to the meeting in mid 2004. PCM One suggested to the meeting on several occasions that perhaps we as a group should be forceful and prescriptive and push behavioural safety for all the mills. This tactic was never agreed but was given a high level of consideration due to the perceived success of the Mill Two BBS programme. The meeting was torn equally between those that wanted a prescriptive approach and mandated that BBS be implemented as company policy (this was led by PCMs One and Three), and those who stressed the choice be the specific unit managers following an assessment of readiness.

Following the meeting and the two presentations the PCM Two wanted to proceed with initial discussions with one of the providers. His mill (Mill One), as the largest mill by a significant factor, was under pressure to improve its accident figures from the parent company, who frequently talked of culture improvement initiatives. The meeting was arranged by the author and the meeting was held at the mill in August 2004 and attended by PCM One, the author and the BBS provider's managing director (MD). A proposal from the BBS provider had been provided and was a source of discussion for the meeting, in that it provided a way forward for the provision of the behavioural programme.

Agreement was reached that a BBS would be carried out at Mill One. A methodology and costs report was proposed which suggested ideas for the communication mechanism to various levels of staff, and the means of gaining programme volunteers for peer observation and BBS committee members. PCM Two expressed an interest in addressing basic behavioural issues such as slips and trips, manual handling and fork lift movements.

5.6.2 Behavioural provider – communication methodology

The BBS provider's methodology contained a roll out programme to cascade the programme details to the entire workforce. The stages are detailed within Table 5.5 and further expanded within text later within this section. The BBS provider methodology stated that the model met the six pillars required for full behavioural safety, these being: awareness raising; supervision; root cause analysis; measurement; feedback; shop-floor ownership and credibility.

Stage	Title	Description
1 (5.6.2.1)	Executive design and strategy	1 day decision making forum which decides on which BBS programme to follow (i.e. top down or full BBS programme)
2 (5.6.2.2)	Preparation	SWOT[32] analysis which evaluates the cultural profile of the mill
3 (5.6.2.3)	Brief workforce and ask for volunteers	15 minute presentations to the workforce regarding the programme, in which volunteers are sought
4 (5.6.2.4)	Training volunteer team	2 day behavioural theory and practical tools training for the behavioural committee that are chosen
4 (5.6.2.5)	Supervision	Safety leadership briefing to front line managers incorporating techniques such as ABC analysis (Antecedents, Behaviours, Consequences)
5 (5.6.2.6)	Observer training	Peer observation training for volunteers (those outside the BBS committee)
5 (5.6.2.7)	Fully briefing all workforce	Train the trainer for 2 or 3 employees in order that all staff can then be trained in the programme
6 (5.6.2.8)	Follow up (if requested)	Consultant follow up (suggested 6 months) to offer further coaching

Table 5.5: BBS roll out plan from the BBS provider

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[32] SWOT refers to Strengths, Weaknesses, Opportunities and Threats.

5.6.2.1 Stage one

Stage one was the essential stage in deciding on the way forward regarding the type of behavioural programme to be undertaken. The BBS provider, whilst being far more positive regarding full behavioural safety (i.e. incorporating the six pillars), were a commercial company who would support whichever type of BBS programme the host company wished to initiate. The alternative to a full programme was that of a management led or top down programme which is similar in nature to that of the Du Pont STOP programme. Within this section the BBS provider stated that the following stages were not prescriptive if the system chosen was that of considerable ownership (i.e. full programme or bottom up). The following stages suggested were however based on previous interventions. The difficulty in prescriptively stating the next stages was that with full ownership, the BBS committee would decide on the structure of the programme.

5.6.2.2 Stage two

The preparation stage was initially kick-started by a SWOT (strengths, weaknesses, opportunities, threats) analysis to evaluate the mill status in readiness for behavioural safety. The stages of preparation were discussed as follows:

- Orientation
- Review of accident data and near miss data (or such items as STOP cards)
- Interviews with experts
- Interviews with a cross section of the shop-floor
- Preparation of draft support material (items such as photographs which suggest borderline acceptance – e.g. housekeeping levels which are not perfect, but acceptable in a paper mill environment).

Interviews with experts were aimed at all engineering departments, the laboratories and paper making experts. The key information utilised however was the data gleaned from the group interviews held with a cross section of the shop-floor personnel. The aim of these interviews was a feasibility study to measure the company's readiness for BBS. The tool used was referred to as an, *organisational safety culture maturity* model which scored the site on twenty safety measures derived from the interviewees' replies. The purpose of the tool was to identify issues and barriers facing the site which could hamper the commencement of BBS.

A group interview task is to, "facilitate a comprehensive exchange of views in which participants are able to speak their minds and respond to the ideas of others" (Walker, 1985).

The interviews were held throughout mid 2005, and consisted of two consultants interviewing groups of between five and twelve, chosen to represent a cross section of the workforce. One acted as a scribe and evaluator and the other as a facilitator. Six groups were interviewed in total.

The interview data was then scored on a five point scale which matched statements with maturity scores. Each subsection was allocated a score and this was analysed to provide a total site safety culture maturity score. The findings of the interviews and subsequent safety maturity score were then expressed in a report for the management team and a presentation was made. The five discreet stages of cultural maturity were expanded upon to define and justify the scores allocated to the mill. Table 5.6 describes the five stages outlined in the report, whilst the results chapter explores the actual interview findings, scores allocated and suggested next steps.

The interview findings were categorised in to twenty distinct areas of performance which are designed by the BBS provider to reflect a wide spread of cultural indicators. The report also made reference and comparison to a safety culture survey carried out internally by the then group health and safety manager in 2002. This was done by comparing the

qualitative findings of the interview findings with the quantitative results of the HSE culture survey. This was a broad approach and did not explore themes in depth, but rather explored basic concepts and relationships.

Pathological
An organisation with a pathological level of maturity would tend to be characterised, as seeing accidents as an unavoidable part of the job, where safety is something that directly interferes with operational aspects of the business. As such, management commitment to safety is often low and safety will only receive priority when there is pressure from legislation and the threat of enforcement from regulators such as the HSE. Typically an organisation at this level of maturity will view safety as something that is not important as long as we do not get caught. As such, employee trust in management will tend to be low and information to senior management will be distorted to show the correct results.
Reactive
An organisation with a reactive level of maturity would tend to be characterised with development of some basic formal procedures that seek to remedy safety concerns only once an incident has occurred. Incidents are seen to be attributable to front line staff, often not following procedures, and poor engineering controls. Investigations therefore tend to focus on finding who or what was to blame and little or no consideration is paid to root causes. The reporting of incidents and audits are seen as something that should be avoided as they may incur costs once a problem has been identified. Typically, an organisation at this level of maturity will view safety as something that has importance once an accident has occurred. As such, employees will tend to view messages with scepticism and information will not be offered willingly as it will be thought that it will not be acted upon.
Calculative
An organisation with a calculative level of maturity would tend to be characterised by well developed procedures and engineering controls designed to manage safety. Safety is managed on a risk basis and incidents tend to step from root causes that are examined, to a basic level. Typically it is felt that the company has systems in place to manage hazards and employees perceive that there is a lot of paper work involved in safety. Trust in management is starting to develop to a stage where they may be listened to. Information based on a wide range of hazard type measures (based on numbered indicators) will start to be reliable, although people will tend to have some reservations about the measures used.
Proactive
An organisation with a proactive level of maturity would tend to be characterised by going beyond formal procedures and looking at a broader range of indicators, both soft and hard, using lead as well as trail indicators of safety performance. Safety is managed on the basis of working out the problems that may still exist. Typically the organisation will seek to improve further on previous performance. Employees will tend to be open about the problems they experience and more accurate information will be attained. Management commitment will be seen as sincere and deviation from the safety message and daily working practices will be viewed more as a management failure. Management will tend to start acknowledging their role in facilitating the front line workforce as the next stage in safety development.
Generative
An organisation with a generative level of maturity would tend to be characterised by a need to seek further improvement in the absence of incidents. A full range of indicators are used, but safety is not driven by figures, but by a core value that safety is an integral part of the operation. Safety is not seen as a number one priority, but a number one concern in all activities. Any manager not sharing this value would not feel comfortable within the organisation, as essentially safety is how the organisation runs its business. Safety improvement is felt to be an investment, not a cost. Typically, employees would feel comfortable and safe in airing issues and would have an almost absolute confidence and trust in their management team.

Table 5.6: BBS provider's five stages of cultural maturity descriptions

The group interviews sought to explore the safety maturity of Mill One through probing questions, the answers given were then compared with model factors for each of the twenty points. For each entry on the twenty point scale a description was given for each of the qualitative scores and the best fit for those answers were allocated. Table 5.7 details three examples of the twenty factor elements, these are chosen randomly to simply illustrate the qualitative scoring mechanism.

Safety maturity factor	Qualitative score	Description
2. Audits and reviews	Pathological	Operators are audited after serious or fatal accidents in the field. May be audited by regulators or audit contractors, but don't usually audit themselves. If there is self audit, they will focus on the recognised higher risk areas. No fixed schedule for audits and reviews as they are seen by the field as punishments
	Reactive	Basic regulatory requirements are met and financial audits are carried out. No need for HSE audits except after a major incident
	Calculative	There is a regular scheduled audit programme which generally concentrates on recognised high hazard areas. Audit processes do not include third party audits by others, but willing participation in audits by others when requested
	Proactive	Extensive audit programme including cross auditing within the organisation. Audits are seen as positive
	Generative	Search for non-obvious problems with self and cross audits. There is good follow up of audits. There are fewer audits of hardware and systems and more at the level of behaviour
3. Incident/accident reporting. Investigation and analysis	Pathological	Many incidents are not reported. Investigation generally takes place after a serious accident. Don't consider human factors, don't do more than is legally required, don't look beyond protecting the company and its profit
	Reactive	Define zero accidents as the desired state. Incidents are investigated and extensive records of the investigation are maintained. Has some informal reporting system. There is no systematic follow through, and no process to identify previous similar events
	Calculative	Lots of information is collected and filed. The company has detailed investigative procedures, but may not be able to process and use all the information. The company pays attention to root causes. There is no systematic follow through on the findings and recommendations. The investigation and the results do not go beyond the local workforce
	Proactive	Reports are sent company-wide in order to share information and lessons learned. There are trained investigators, and a systematic follow up process to check that change has occurred and

		been maintained, but this is not always done. There is no focus on incident potential, or looking at the total of hazard reports, incidents and accidents
	Generative	Data are agreed across business functions to look for trends and issues that need to be addressed. There is a systematic follow up to check that change has occurred and has been maintained, which is always used
14. Balance between safety and profitability	Pathological	Profitability is the only concern. Safety is seen as costing money, and the only priority is to avoid extra costs
	Reactive	Safety and profitability are juggled rather than balanced. Safety is seen as a discretionary expense. If all contractors are unacceptable, the least bad is taken
	Calculative	Cost is important but there is some investment in preventative maintenance. Operational factors dominate
	Proactive	The company tries to make safety the top priority, while making a positive connection between safety and financial return. The company is better at juggling the two, and accepts delays to get contractors up to standard in terms of safety. Money still counts
	Generative	The two are in balance, so that this becomes a non-issue that is not discussed. The company accepts delays to get contractors up to standard in terms of safety. Management believes that safety makes money

Table 5.7: BBS provider's safety culture maturity examples

5.6.2.3 Stage three

The workforce brief is the mechanism used to outline in 15 minute presentations, the BBS programme to the workforce. It is within these sessions that volunteers are requested to assist and drive the BBS programme. The two types of volunteer are committee members (those who shape and decide on BBS strategy) and observers (persons who will carry out behavioural observations on their peers). Within these sessions approximately 40 staff were presented to by the BBS provider's representative and at least one senior member of mill staff was present in each session to facilitate.

5.6.2.4 Stage four

Stage four involves the training of the selected BBS committee in various behavioural theory tools and techniques for use on site. The training is carried out over two consecutive days and utilises roll play and video techniques to ensure interesting and stimulating materials and discussions. The two days training topics are outlined within Table 5.8

Day 1	Day 2
Behavioural theory	Team working skills
Behavioural methodologies (alternatives and strengths and weaknesses of each)	Root-cause analysis skills
Goal-setting and feedback	Problem solving skills
Reasons for unsafe acts and behaviour	Communication skills (generic)
Scoring items (observation skills)	Communication skills (specific)
How to overcome colleague's scepticism and get them to buy-in to the process	Approaching and talking to colleagues
	Presentation skills

Table 5.8: Two day training detail

Following the two days, the attendees are asked if they wish to continue with the training. The question is genuine and is asked to ensure commitment. Day three involves design and action planning for the BBS programme and culminates with the BBS committee sitting around the table with management and outlining the programme that has been designed.

Six weeks after this, a follow up training exercise is carried out which acts as a review of what progress has occurred over the last six weeks, and a number of on site exercises are done to hone volunteers' skills.

5.6.2.5 Stage four (part 2)

This section of the BBS methodology is aimed at the front line managers and supervisors. This was carried out through half day briefing sessions. The BBS providers recognised that front line supervisors were vital to BBS success and tailored this briefing accordingly.

The presentation outlined what the behavioural process at Mill One would aim to achieve, how it would function, and a specific description of the behaviours required to support and facilitate the process. The BBS provider stated that the mill MUST enforce the recognised behaviours through both praise and admonishment where necessary. The training was carried out in groups of up to ten, and was dependent on the numbers that the business could release at any one time.

5.6.2.6 Stage five

Stage five training was designed for those volunteers who were not included in the committee. This course was over two days and concentrated on both behavioural theory and observational techniques for peer interviews and observation.

5.6.2.7 Stage five (part 2)

It was impossible to train all staff because of various shift patterns, illness, holidays and other logistical problems. To cater for this factor, two staff were trained in train the trainer techniques for behavioural safety. This then allowed all staff on site to be eventually trained.

5.6.2.8 Stage six

Stage six is designed as a follow up and is intended to evaluate, monitor and assist and improve the BBS programme. The optimum period for this return visit to site was felt by the BBS provider to be circa six months. This day's consultancy was to be defined by the Mill One behavioural team themselves. Possible uses were explained as a progress review, discussion of problems encountered, or refresher training for the behavioural trainers on site.

5.6.2.9 Further BBS support

In addition to the services provided to the site during roll-out and the site revisits, the BBS provider did provide ongoing support through telephone and email support indefinitely. An invitation to the annual European behavioural safety user conference was also extended to an unlimited number of staff from the mill. This was also an indefinite invitation, regardless of the last time the mill paid for any commercial behavioural services from the provider.

This section has outlined the approach taken at Mill One by the BBS provider. This is only half the BBS methodology however and the next part of this chapter explores the actual approach taken by the BBS team who volunteered to run the bottom up programme.

5.7 BEHAVIOURAL APPROACH BY THE MILL TEAM

The team selection was a fairly arduous one and the team known as CASE (Creating A Safer Environment) was chaired by two persons - the total number of members (including the aforementioned) was nine. This number was disappointing – the BBS provider had wanted a committee of about 12 people and any extra volunteers to act as observers. Essentially because of these low numbers the committee members had to act as both committee member and behavioural observer.

5.7.1 Team make-up

The nine individuals were all from the shop-floor (one of whom was a trade union safety representative from the transport union). The team (with the exception of the trade union representative) had no real history of involvement with health and safety within the mill, and the BBS provider suggested to the mill management team that this was a positive factor – i.e. there was a fresh intake of personnel with an interest in health and safety

and these could run separately allowing the already established teams to continue with their appointed employees.

With the support of an appointed BBS provider's consultant, who gave assistance as required, the team of nine commenced their programme's roll out. The results of the behavioural team presented to the mill are contained within the results chapter. The CASE team approach is discussed more fully within the narrative chapter (Chapter 6).

5.7.2 Behavioural observations

Initially in 2006, 17 observations were made by CASE and these were presented to the management as part of a summary of BBS initial progress. The observation subjects chosen were: zone areas; PPE; pedestrians; driver behaviour; manual handling and mechanical handling. The 17 observations were used as pre-launch information and acted as practice for the newly trained observers.

Following this period the planned launch had to be delayed because the conditions within the mill were considered unsuitable (see Section 6.7 for a full description of this). In 2007, during weeks 1 – 34, observations were carried out on five topics which differed from the aforementioned. Chapter 8 discusses the suitability of these topics, whilst Chapter 7 displays the results of the observations. The observations carried out within 2007 were on the following: drain covers in place; guarding in place; handrails in place; hoses properly stored, and walkways.

5.7.3 CASE work methods

The BBS team were set up as a separate entity to any other safety team within the mill. Because of this factor the team were perceived as being secretive and disjointed from the mill's workings. This isolated the BBS programme from the mill and any findings from the team such as observations data were not communicated or poorly communicated. With

the exception of the BBS team members, no other staff member was privy to the team's meetings. The lack of transparency also made it difficult for the author to ascertain the team's methodology and approach.

5.7.4 Just culture

The BBS were advised by the BBS provider to insist on a just culture to enable BBS to properly function. This is in contrast to *no name no blame* which offers no opportunity for organisations to go through its disciplinary procedures.

The BBS provider communicated a just culture decision tree to be used in the cases of personnel making safety infringements. The intention was to enable decisions to be made which directed investigators or possible disciplinary team members to decide if there were other failures aside from employee based ones.
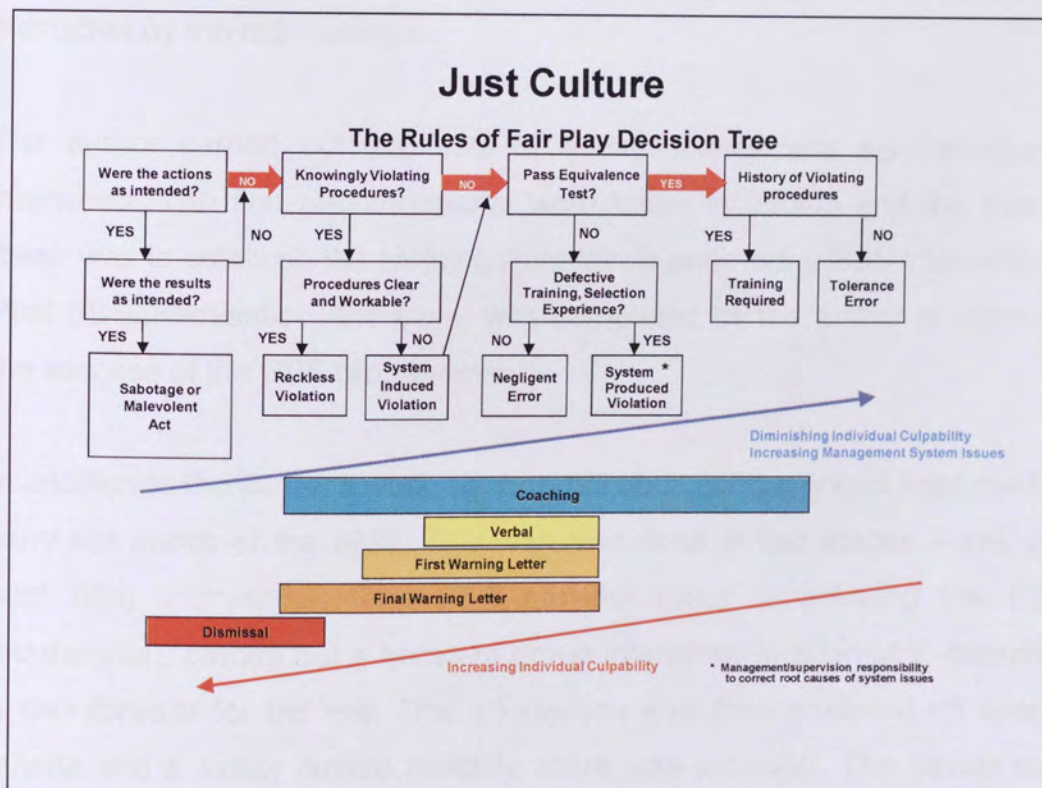
Figure 5.1: Just culture tree

The just culture tree and its use at the mill is discussed within Chapter 8. A particular incident in which an employee was sacked invoked the use of the tree by the trade union conveners in their arguments against the employee's termination.

5.8 METHODOLOGY SUMMARY

The multi-method methodology has been outlined within this chapter – both for the author-led research and the involvement of the external parties. The work undertaken is continued in the form of a narrative within Chapter 6, which serves to further enhance understanding of the environment in which the research was carried out.

Within this chapter, Table 5.1 details the various interventions and measurements carried out within the Paper Company. The key intervention was the BBS programme initiated at Mill One – this was consultant led and instructed by the mill manager.

The author carried out two sets of questionnaires and semi-structured interviews. The first measurements were taken in 2004/5 and the role of these was to establish the safety culture levels prior to the BBS intervention. Post BBS intervention, the same was completed by the author to examine the success of the BBS programme.

In addition to the author's work, an external audit company was instructed to carry out audits of the SMS. This was also done in two stages – pre and post BBS intervention. The BBS provider (prior to initiating the BBS programme), carried out a series of group interviews to attempt to establish a way forward for the mill. This information was then analysed on twenty criteria and a safety culture maturity score was provided. The advice was that a BBS programme could offer safety benefits to the mill. To complete the chapter, the process of the BBS company attending site and the actual site BBS team dynamics are detailed.

The role of the author as both participant and observer is discussed within this chapter. It was felt that this role greatly assisted the gathering of key data which was richer than the use of questionnaires. The author's complete absorption in to the mill as an employee aided evidence gathering through meeting attendance, observation and an intimate knowledge of the organisation.

Chapter 7 expands on the methodology by displaying the results gained from the multi method data gathering techniques.

CHAPTER 6 – NARRATIVE

The purpose of this chapter is to describe the research period in the form of a narrative. This is written in the first person to best portray the author's viewpoint. The content of this chapter describes details and recollections of specific events from the formulation of the research through to its completion. The chapter also describes the fact that whilst carrying out the research I worked in two different companies and thus changed the research direction on moving company, whilst maintaining the value of the work completed when in the employ of the first.

It is within this chapter that the organisation where the BBS intervention was carried out is detailed, and problems expounded and expanded. The narrative form is useful in that it can explain more fully than other chapters, the job role that I undertook and the importance of the dual role of both participant and observer whilst undertaking this research.

6.1 RESEARCH COMMENCEMENT

I registered for a PhD within the Health and Safety Unit at Aston University in October 2002. At the time of registration I was working for a tissue manufacturer, based in Bridgend, South Wales, GP – a Fortune 500 giant from the US. My role primarily was to lead a risk management project aimed at meeting the new papermaking standard, MPS. The primary outcome of the works was to guard the two PMs and associated plant. During this period of time I was enrolled at Glamorgan University as a part-time student on the Master of Science (MSc) degree in Safety Health and Environmental Management.

The dissertation for the MSc was entitled, *A Comparison of the Pre and Post Fatality Approach To Safety Management At Bridgend Paper Mill.* This followed a fatality which occurred on one of the PMs in July 2001. The

Bridgend site had investigated and attempted to launch a behavioural safety programme prior to my period of employment which had been cancelled following its launch due to the perceived excessive workload for the line managers and supervisors. Similar to The Paper Company, there was no formalised SMS.

The Bridgend launch of BBS was withdrawn for reasons as described. It was evident from speaking with various levels of the organisation that the programme would have failed if it had not been withdrawn. The site at Bridgend was perceived to have a very poor organisational and safety culture and a lack of a recognised SMS (e.g. risk assessment was not used at the mill when the behavioural programme was launched).

The interest from The Paper Company in behavioural safety intrigued me from a research perspective, in that both organisations had immature systems and procedures and very little in the way of formalised safety management. It appeared to me from an early stage that there were parallels between the two companies and that my aims of improving the SMS in tandem with the company's wish to instil behavioural safety presented a unique research opportunity.

6.2 RESEARCH AIMS

The requirement to create a better SMS was a professional requirement for my job. I found the position of no or very poor risk assessment a disturbing one. The need to begin a risk assessment programme was a matter of meeting the requirements of legislation, and also a primary tool to successfully manage safety and health risks to the business.

My interest lays in answering the question that many behaviouralists debate – that is, when is the best time to instigate a behavioural programme. Some behavioural practitioners for example state that companies with no safety systems can support a behavioural programme. Further to this however, I was interested to investigate whether a SMS being simultaneously improved

to a behavioural launch would hamper, improve or have a neutral effect on the behavioural launch. The questions also may be posed the other way around – i.e. does the BBS system hamper, improve or have a neutral effect on the emergent SMS.

The research is largely explorative therefore because of the measurement and analysis of two different aspects of safety management and their interaction with each other.

6.3 GEORGIA PACIFIC

My employment with GP Bridgend Mill began in the year 2000, and the role was based around project managing the mill's compliance against the forthcoming new guidance document MPS (HSC, 2001b). The project was to lead the risk assessment programme in the papermaking and engineering departments. At a later date, the management and coordination of the conversion department was added to my remit.

MPS is largely based around the Provision and Use of Work Equipment Regulations (PUWER), 1992 (HSE, 1992) and the requirements of this set of regulations and other pertinent ones is put together in a comprehensive folder in chapter format to make the document a useable one. MPS uses photographs and line drawings where possible to explain its requirements in as easy a format as possible. The final version was printed and published in 2001, but from 1999 onwards there were draft versions available for the industry to comment on and contribute to. The papermaking mentality regarding this document has been explained within the literature review, the views in short were negative and that the ideals of the guidance were unachievable.

Bridgend Mill's view of the guidance was that compliance with it was mandatory – however there was a commonly held view by both the engineering function and production department that the document was unworkable. My impression and understanding when beginning the project

was that the project probably had the wrong title – working on the premise that risk assessment is a tool constantly analysing and reviewing business risks. The mill's viewpoint however, was that the risk assessments were indeed a project, with a start date and end date. It was explained to me that the risk assessment process was sixty percent complete and the expectation was that I would continue from the work already completed.

My first role was to review the quality and scope of assessments completed. My initial feedback to the mill management team was that my opinion was that the work completed (within engineering) was not in fact risk assessments, but rather some generic lifting plans for pumps, motors and other equipment. The quality of assessment in production was not very detailed with no action plan produced to steer the course of capital and revenue spend.

The PMs were guarded with lift off guards that fitted in to sockets mounted in to the floor or raised platforms. It was explained that the guards were lift off for easy access to the machine when required. My view that these were not actually fixed guards as defined within MPS (HSC, 2001b ibid) due to there being no requirement to use a tool to remove them. Several persons felt that my comments were not practical and would hamper the papermaking process.

There were several attempts at guarding the machines and the ones on the machines at the point of my leaving in 2004 were sometimes the third attempt. Until the risk assessment project began, guards were recognised as being a requirement and placed on the machine to protect from a specific hazard, but without any realisation of what production needs were denied by their placement. The risk assessment project pushed the mill to coordinate the assessment process through myself, but to utilise operators and engineers to aid understanding of the needs for machine access. This then allowed pragmatic and well designed machinery guarding to prevent access to moving machinery, whilst allowing certain tasks to be carried out on the run.

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My move to The Paper Company was a logical professional employment move for me. The role was strategic and the company was well regarded within the paper industry.

6.4 THE PAPER COMPANY

The perception of The Paper Company within the paper industry was a very positive one. The double fatality at Mill One in 1995 and 1996 had essentially vilified the company, but their response to this situation was favourably viewed. The strength of the response was based around the moving away from the *us and them* management style that had been prevalent in the company.

One response that the company installed was to recruit a safety consultant in 1996 from a chemical background to assist with aiding the safety management process. The consultant devised a plan of key policies (named *Minimum Requirements*) covering four disciplines within the business. In total fifty two policies were identified and broken down as follows: safety (22); loss prevention (16); security (7) and occupational hygiene (7).

When I began my job role in January 2004, my belief was that The Paper Company would have a mature management system based around a recognised standard such as HSG (65). Of the fifty two policies identified only twenty five had ever been written and by February 2004 when I investigated the policy manual, only one (*Risk Analysis and Risk Assessment*) was within its review date. This left me with the view that The Paper Company did not have any formal documented polices and systems of review.

I was informed by two different members of the safety department that the consultant had set out high standards of achievement for The Paper Company. The response from the business was not favourable – i.e. the speed was pedestrian, the quality of some documentation was not satisfactory and documents were being written to achieve policies to simply

tick the box that a policy was complete. The consultant left the business in 1998 or 1999 convinced that the business was not serious about managing health and safety.

My initial meetings with a senior operational member of staff (PCM One) left me dissatisfied about the competence and knowledge within The Paper Company regarding safety management. The aforementioned person was very passionate regarding health and safety and keen to press the safety first message. There was a great deal of pressure in 2004 and 2005 to implement a BBS system in all the mills. This was to emulate the perceived success of the safety performance at Mill Two I decided not to pursue behavioural safety in the other mills, believing the culture to be too immature and the SMS to be in its relative infancy. In short, I felt that the infrastructure to support behavioural safety was not in place.

I mentioned above Mill Two which was felt by some senior operational staff to be a safety exemplar within The Paper Company. There was a behavioural programme running at the mill based on peer auditing. The perceived success of the mill was based on a run of over one year without a reportable accident. My view of the mill was that the mill manager was a passionate advocate of safety and that his enthusiasm would be welcome in all units within The Paper Company. Unfortunately the infrastructure was not in place at this mill to suggest that safety was being managed successfully. There were no policies, no risk assessment, poor quality of safe systems of work, no measurement of leading indicators and no inspection and audit systems, apart from the behavioural monitoring, which was sporadic and required constant encouragement to maintain audits.

The Mill Two example is an interesting case in point. I queried when first working for The Paper Company, how safe systems of work were in existence with no risk assessments. The response was that guidance had been given by a previous incumbent in my position to write safe systems of work followed by risk assessments. This grave misunderstanding of risk identification and control further exacerbated my concerns regarding the

maturity of SMSs and competency and understanding of the risk management process at many levels of the business.

6.5 THE PROCESS OF RESEARCH

My role as a researcher was one of participant observer. My employment as Group Health and Safety Manager meant that I had a presence and was known to most individuals in the business. There are both positive and negative connotations to this situation. The main positive aspects are that in my role I could influence policy and direction regarding health and safety and be involved in the whole process from inception. This added valuable insight for the purposes of research, in that I was party to several discussions which had a direct bearing on the content on this research.

On a negative note, when conducting interviews it was sometimes difficult to gauge if participants were holding back the truth or diluting the truth for fear of recrimination from a senior member of staff. Assurances were given regarding the research question sets and interviews being anonymous but some people were not entirely candid with me. The dual role of independent researcher and senior member of staff on the whole did not negatively affect the research direction and content and quality. It is my opinion that most interviewees, when questioned, were open and honest and accepted the promise of anonymity. When describing certain job roles in any analysis within this thesis, some roles and staff levels have been grouped together. The reasons are that some positions have relatively few staff members in their ranks and the comments could be attributed to one individual. An example of this is that Mill Manager, Senior Engineer, Machine Managers, and similar ranks are all called the *senior team*.

At no time within the research process and the writing up of this thesis did any member of staff from The Paper Company request to see a copy or discuss the findings. The role of Group Health and Safety Manager existed separately to that of my role as researcher, despite the potential learning for the business within this thesis.

6.6 SPECIFIC EPISODES OF NOTE (Indicative of Organisational / Safety Culture and Readiness for Behavioural Safety)

6.6.1 Safety meeting June 2004

In June 2004 a meeting was held between myself and two senior members of staff with responsibilities for health and safety (PCMs One and Three). The timing of this meeting was two months after my employment commenced. In this meeting some pressure was put on me to begin to explore behavioural safety as an option to further improve safety performance (the accident figures were in a plateau at this time).

I explained my concerns with the timely launch of behavioural safety and the need for an evaluation of the readiness prior to any BBS launch. My explanation was seen as being not constructive but was accepted grudgingly. The need to build systems was worked on with the above two individuals and the events below all form part of a chronology in driving a systems based approach as a possible foundation for behavioural safety. I suggested that the first action to be taken should be that of gap analysis between what The Paper Company did and what legislative requirements were not being met.

6.6.2 Corporate Rotweilers

To construct a plan for a way forward I decided that the tool to help achieve this would be an external audit examining all the key areas of HSG (65). The reason for this had already been established within a 2003 health and safety senior conference.

I interviewed three different audit companies and decided on the risk management arm of The Paper Company's insurers. The audit was held at two mills, chosen by PCM One. The mills chosen were Mill Two and Mill Six. The mill choices were made on the basis that Mill Six was considered an

average mill in terms of safety performance and Mill Two was considered an exceptional mill within some quarters of The Paper Company. The descriptions of mill status were the sentiment of PCM One and not my own.

Mill Two was audited first. The mill was 240 miles away from my home and travelling to the mill in the morning I was delayed in heavy traffic resulting in arriving two hours after the audit's opening. On walking in to the mill I was approached by the mill manager who explained to me in rather agitated terms that the auditors were incompetent and that he wasn't happy with their aggressive approach. I spoke with the auditors who explained that they were using their usual approach, were mild mannered but challenging and had spent a few hours with the safety manager who was very unhelpful.

I stayed at the mill for the duration of the audit to understand the process followed and to calm any issues that may arise. The prime reason for the poor perception of the auditors is detailed below.

6.6.2.1 Auditor expectations

The mill manager of Mill Two was hugely passionate about health and safety and welcomed the chance to prove his methods when the external auditor arrived at the site. The standard mill presentation of the mill manager's safety philosophy (much of which centred around visible, demonstrable leadership), was delivered to the two auditors - who were impressed with the content and passion from the mill manager. The auditors began a site tour with the safety manager and the first thing they commented on was two contractors working on a sloping roof. An enquiry was made of the safety manager about the following: did the contractors have a roof permit; should they be standing on the electrical cables and trays on the side of the building; should they be climbing out of the scissor lift with no fall from height personal protective equipment; and did they have a hot work permit for the roofing work they were about to begin? The safety manager was non-committal and was asked if he was going to challenge the seemingly unsafe actions. He replied in the negative and continued with

the mill tour. The visible demonstrative leadership that had been so pleasing in the mill presentation was not proven to be a reality in this instance. The safety manager shadowed the two auditors at all times when they went out on to site, to witness behaviours and to verify any paperwork. The auditors' view was that this caused employees to behave in a fashion that they perhaps would not normally behave. A further view held by the auditors was that the presence of the safety manager, whenever the auditors wanted to speak with employees or contractors, resulted in false answers being given. The suggestion was that answers indicated a safe mill with a happy workforce, comfortable to question safety in order to make improvements – in short a positive safety culture.

The mill safety manager had contacted the mill manager and described the incident with the roofers working. He was unhappy being challenged by the auditors and expressed this opinion to the mill manager. The auditors view was that from this moment any work they carried out within the mill was negatively affected by this initial incident.

A feedback meeting was held on the third and final day of the audit, which the senior mill management team attended along with myself. A balanced feedback session was held by the two auditors detailing both highlights and areas where improvements could be achieved, in non-challenging but factual language and tone. The delivery went unchallenged, and the senior auditor on closing his remarks invited questions, which was greeted by a long silence. The mill manager then thanked the audit team and the whole mill management team filed out of the room. I remained within the meeting room with the auditors to discuss the three days – the mill response was obviously discussed and reasons for this were debated. During the audit feedback I made detailed notes of the auditors' comments, in order that I could compare them to the finalised reports.

Mill Two was held up as an exemplar within The Paper Company and no negative comments had been directed towards it. The mill manager spoke at external conferences about the positive safety culture of his mill and the

mill was previously managed by PCM One. This first real examination of the safety framework pointed to some major deficiencies in the safety management of the mill and these results were not viewed favourably.

The feelings of the mill manager were explained to me when the auditors left the site following their feedback session. He felt that they were incompetent to judge the mill (negative comments had been made during the feedback regarding the safety culture) and that the audit was for purposes of insurance. Assurances were given by me to the mill manager that the auditors had a strong pedigree in safety auditing and the lead auditor had a nuclear safety background which included a two year secondment researching safety culture in the nuclear industry.

The report that was issued to me in draft format for consideration was strongly worded but factual. I gave the go ahead for the auditors to release the report to the mill. An excerpt from the report is contained below which is taken from the management summary (Audit One, 2004):

> 'The audit commenced with a presentation from the General Manager detailing the work undertaken on site since his appointment, to realign the attitudes and beliefs of many employees regarding health and safety. This was an extremely positive start to the audit process and left the audit team in no doubt regarding the serious intent to drive forward a positive safety culture.
>
> It was then, with considerable disappointment, that during the following few days, the high standards of operational health and safety that were expected, were not evident. On the contrary, several significant areas of concern were uncovered. This suggested that in pursuance of laudable safety culture objectives, the management team had failed to establish and embed the fundamental facets of an effective safety management system.
>
> The principal driving force behind the culture changing approach was without question the General Manager, who has worked tirelessly in fostering and developing the support of others. This effort is commendable and has a place within organisations that have an established and effective safety management system. However, it was considered that without the continuous effort of a few senior managers, the standards of the site would descend to less than acceptable levels. Following discussions with employees and through direct observations, it cannot be said with any degree of confidence that a sustained positive safety culture has been embedded within the business.'

6.6.2.2 Second pilot mill audit

Following the second audit at Mill Six there were no adverse reactions to the audit methodology (which remained the same as the first audit). The feedback to the mill was constructive and was used to aid action planning. It was considered that the feedback balance was correct between praise and pointing out noteworthy areas of improvement. The following quote from the audit report sums up the mood of the auditors and their relationship with the mill, 'we were encouraged throughout the audit, even during negative feedback to the management team, by the positive attitudes displayed and by the willingness to learn and improve from the process.' (Audit Two, 2004)

6.6.2.3 Post-audit pilot strategy

Late in 2004, a meeting was requested with the senior auditor, myself and PCM One. Within this meeting, an attempt was made to belittle the auditor's credibility and to suggest that audit methods were changed between the first and second audits. The senior auditor did not accept this view and refused to change his audit methods, which I backed. Once the auditor had left, I suggested that perhaps the mill manager of Mill Two and PCM One did not accept bad news very well[33], and made attempts to try and insist that the systems type of audit was required due to The Paper Company's poor safety management. It was agreed that the audit programme would continue to measure all mills against each other. I stressed at this point that The Paper Company was not ready to begin a behavioural programme citing the auditor's report, 'Only once robust and self-supporting management systems have been established, should the business seek to introduce behavioural based safety programmes.'.

The Mill Two mill manager had expressed frustration that the auditor's report did not reflect the feedback given at the audit's day three feedback

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[33] Mill Two had been positively marketed as a good performing mill with a positive safety culture and staff from the other mills were frequently told to visit this mill to witness how a behavioural programme could improve safety at all other mills.

session. I refuted this statement, citing my own notes which demonstrated that the audit feedback was exactly the same as that of the final day's feedback. PCM One sent a letter to the audit company's risk director insisting on changes that had not been agreed in our meeting – the tone of the letter was by way of remonstration.

The demand from PCM One to instil behavioural safety did not desist following the negative report of Mill Two, but my professional view was that at this stage, the need for a robust SMS had finally been recognised and if necessary (and if insisted upon) behavioural safety could also be launched slightly later or simultaneously.

Whilst it had been recognised by The Paper Company hierarchy that the need for SMSs was mandatory, the feeling from PCMs One and Three was that this was simply to tick some boxes regarding legislation. A good example of this lack of understanding was the application of risk assessment. The Mill Two site had developed a series of safe systems of work and felt that these were sufficient for control and identification of hazards. Following external audit the mill manager stated that he would, "tackle risk assessment and finish it in one year" – the implication being that risk assessment was a project not an ongoing assessment and evaluation management tool to identify, quantify, prioritise and deal with hazards.

6.6.2.4 The Paper Company's wider views on external audit

The findings of the external audit were discussed in several forums such as mill manager meetings and risk management forums. The views of the mill managers and senior managers were that the audit had confirmed their views of Mill Two. Many of them had been directed to go to the mill to investigate the behavioural programme in place and spend some time there evaluating the mill's success. One senior manager who was being prepared for mill management spent one month in the mill working on shift. His view was that the audit fairly reflected the actual safety levels at the mill. The author's view was that there was some pleasure taken by the other mill

managers, who had been constantly reminded about how good the mill was compared to their own.

6.6.3 Safety forums

A management conference was held in November 2005, which was a strategy setting conference. The two day event was a biannual event and was on its third cycle. The first day concentrated on all units – mills, logistics and waste recycling, presenting what had been done of note to improve health and safety performance in particular units. The second day concentrated on what The Paper Company needed to focus on as a corporate action plan. I asked Professor Richard Booth to attend, with the primary intention of reinforcing the requirement for systems in safety and the benefits of a strong SMS. His presentation was entitled *The Importance of a Sound Foundation* (Booth, 2005). The essence of the message was that SMSs needed to be strong and build on good policy, clarity of roles and responsibilities, risk assessment, measurement (both leading and lagging indicators), inspection, audit and review.

From this workshop six corporate objectives were agreed on, these were all items that were contained within Professor Booth's presentation and were as follows: risk assessment (new policy to be written, training to be carried out); internal audit and inspection (new policy to be written and to begin with inspection initially followed by audit once inspection is a way of life); operator competencies to be clearly defined along with roles and responsibilities (to be linked to relevant items such as safe systems of work); a series of leading indicators to be identified and defined within policy; OHSAS 18001 to be worked towards and finally an electronic database to be standard to all units to improve communication and ensure documentary access is simple.

6.6.4 Specific incidents of note

Table 6.1 outlines some serious incidents and accidents, both injurious and non-injurious. These are important in that they indicate the environment of The Paper Company, both in the build up to the BBS intervention and any incidents and their implications following the intervention. The incidents and accidents are not purely confined to Mill One, but all the paper mills within The Paper Company. All incidents outside the paper mills (i.e. recycling and logistics) have not been included – Table 6.1 outlines only machinery related incidents.

Year	Mill	Result	Description
1995	One	Fatality	The FOC, who was a member of maintenance, was found wrapped around an unguarded slow moving drive shaft at the back of a PM
1996	One	Fatality	The deceased person was caught in the drive rolls of a rewinder machine
1999	One	Major RIDDOR (permanent disability of upper limb). The injured person has not worked since the accident	The injured person was pulled in to the drive rolls section of the machine. This was during the feed up of a rewind – the arm was pulled in to the in-running nip up to the shoulder
2004	One	+3 day RIDDOR	The injured person was pulled in to the rewinder past their wrist. There were no broken bones or permanent disability
2004	Two	No injury - (observation)	The author discovered an open guard at the backside of one of the PMs. This seemed to be a regular practice, despite the unguarded drive shafts in the vicinity
2004	Three	No injury – (observation)	The author, when carrying out a PM guard audit, discovered distance guarding not close guarding to protect from drive shafts (contrary to PUWER Regulations). On closer inspection the guards were not fixed to the floor and allowed full access to the machine backside. It was explained to the author that they were not fixed to allow the lubrication engineer access to the drive shafts on the run
2005	One	+3 day RIDDOR	A major mechanical protective device was not used (contrary to a

			safe system of work). This resulted in a rewinder man rewinding his assistant in between the paper roll and drive roll section. The assistant had to be rescued. There was no permanent injury to the injured party
2006	Three	No injury – (observation)	The trade union FOC was discovered behind the guards on the rewinder – the machine was live and the person was in a significant position of danger in the drive roll section and paper reel area, where several major nips exist
2006	Six	Major RIDDOR – permanent disability (the injured person who was 27 years of age will never work again)	The interlock guard protecting this rewinder had been overridden to allow access to the machine without interlocked protection. This resulted in the injured person being caught between the rewinder table and the drive roll section. The injuries included a shattered pelvis, an amputated leg and spinal injuries.
2007	Four	Major RIDDOR – permanent disability. The injured person in his mid 50's will never work again	Due to poor guarding design the injured person energised the rewinder and a pneumatically powered support arm pinned him to the machine frame – there was a risk of losing the leg within the first few days, although this was not acted on following hospital intervention
2007	One	No injury – (observation)	During the external safety management audit of the mill, one of the external auditors discovered a machine operator behind a guard, whilst the machine was in full run mode.

Table 6.1: Chronology of machine related incidents within The Paper Company

There were several incidents which occurred prior to and within my tenure as group safety manager at The Paper Company. I have detailed a few within this section to give a flavour of the culture of the business and accident and incident types. As the literature review pointed out, the accident rate within papermaking was significantly higher that manufacturing (by a factor of three). The Paper Company, within 1995/1996, was considered a poor performer within the industry (see Table 3.5). It is vital to demonstrate the numbers and severity of machine related accidents and

incidents – these are to be considered according to the debate of when can one initiate BBS. At any time, as suggested in previous chapters (e.g. Geller or Marsh), or when a company has mature systems of risk assessment and a positive safety culture?

6.6.4.1 Mill One- working behind a guard

An incident occurred during 2007 at the time when an external health and safety audit was being undertaken within the mill. On the first day of the audit, one of the auditors went on to the site to verify some paperwork and to meet some key staff. Walking through the machine house, which contains two large PMs, he noticed a worker behind some guards clearing a blockage with the machine in full run mode.

The auditor questioned what he saw, and a line manager was called by the auditor's appointed contact, whose response was less than favourable. The line manager sent a fairly junior supervisor to deal with the issue and did not commit any time to the issue himself. This incident, and more so the way it was handled, indicated to the auditor that there were cultural issues at the mill and that these problems lay within middle management.

The problem, once elevated to more senior staff, was given its due significance and a full enquiry was held. Following investigation it became evident that this was not the first time this guard breach had occurred and indeed was the only way in which this particular job could be undertaken. The operator found behind the guards was interviewed but not disciplined in any way. The line manager was held accountable, because the incident was common practice and there was full awareness of this and other issues occurring. No operator or shift manager had ever raised an incident form about the lack of safe access when carrying out this particular task.

6.6.4.2 Mill Three – working behind a guard

Mill Three is a small mill which is rare in that it has far more reliance on employed staff that the use of engineering contractors. Parts are still fabricated on site and much of the machine maintenance labour is sourced in house. The mill is very different to the other mills within the group, in that it makes coloured papers not CCM, and the entire business function (e.g. sales and marketing) is contained in house with little or no reliance on central functions. This mill therefore feels sometimes at odds with the group and does have a strong sense of doing what is best for the mill and not the group.

On a weekend in 2006, an operator who happened to be the FOC was caught working behind a rewinder guard with the machine live. A senior manager caught him in position and proceeded to speak to him in rather agitated, voluminous and frustrated tones. The operator was not disciplined, and the incident not elevated to group. The instant way the incident was dealt with did achieve root cause findings and machinery modifications followed, without any discipline. The informal methods ensured union and management relations were maintained and that improvements were initiated. The incident was not common practice, but did occur on the odd occasion – on these occasions operators felt they had to enter the machine to manually eject the paper when the machine malfunctioned. This requirement to enter the machine had never been reported as an issue, and being a rare occurrence, no members of management had previously witnessed this problem.

6.6.4.3 Serious accident - Mill Six

Mill Six in late 2005 was earmarked for closure and the relevant announcements and trade union period of negotiations had been completed. The final closure date was established for mid April 2006. On the 6th April 2006 a serious accident occurred on the rewinder on the night shift.

An operator was caught between the eject table and the frame of the machine and was taken to hospital unconscious. The subsequent injuries were extensive, and the operator was not expected to live. The injuries included a shattered pelvis, an amputated leg and serious spinal damage.

6.6.4.4 Serious accident - Mill Four

An employee became trapped by a pneumatic support arm which became energised and moved in to position. There was a twenty second delay between pressing the controls for the arms movement and the actual pneumatics moving. It became common practice for operators to go in the machine area and clean and remove paper prior to the arm's movement. The arm pinned the operator to the machine frame and almost resulted in the need to amputate his leg. The injured person has not worked since the accident.

6.6.4.5 Mill Two - open guard situation

On commencing my employment I travelled to all the business units over the first few months of my tenure. My visit to Mill Two was one I particularly looked forward to. The mill had a positive reputation within the paper industry and the management team frequently invited other mill employees to come and view their behavioural model. After meeting the senior team and trade union staff members I went for a mill tour with a shift manager. At the back of one of the PMs I noticed a hinged guard which was wide open. The padlock was open and attached to the gate. The area accessible housed four drive shafts which were turning (the machine was in full run conditions). Above the gate opening was a strip light fitted to a low ceiling which was half inside the guarded area and half outside. I made the assumption that somebody was refitting a new bulb as the old one was on the floor along with some hand tools. I asked the shift manager with me to

remain in situ until the maintenance technician returned to fit the bulb. Once fitted, I asked that the gate be locked immediately.

I was surprised that with the behavioural system running at the mill that this easily rectified problem was putting people in a position of danger. My expectation was that staff would question the opening of a guard with the machine live, or that a peer when auditing would pick this up as a problem.

My concern was heightened when I discussed this with the mill manager who stated that he didn't believe me and that his staff worked safely. When presented with the shift manager's name and a photograph of the open gate, he still appeared distracted and disinterested. On returning to the area I found the gate closed but not padlocked – I informed the mill manager by telephone and left the site, dissatisfied by what I had been party to. The situation could have been easily rectified by closing the gate, applying the padlock and then moving the light outside the guarded area once the machine had stopped.

6.7 BEHAVIOURAL LAUNCH DELAY

A decision was made to launch a BBS programme in early 2005 at Mill One. The mill manager felt that the conditions were not suitable for the launch of a shop-floor led behavioural programme. The accident outlined within Table 6.1, which occurred in 2005, had had wide ranging implications. The operator who ignored the safety device and the terms of the safe system of work was, after a prolonged disciplinary process, dismissed. The full time trade union officials were involved in the later stages of the process and asked for leniency from the site management. The author was involved in the various meetings. The trade union took a vote to strike which was not supported by their members and the feeling of the mill manager was that any intervention at this time would not succeed.

6.8 THE TRADE UNION AT MILL ONE

The trade union movement within papermaking production is the GPMU Amicus which was formed by the amalgamation of the GPMU (Graphical Paper and Media Union) and Amicus. The GPMU was formed from the merger of the Society Of Graphical and Allied Trades (SOGAT) and the National Graphical Association (NGA) in 1991 (Amicus, 2008). Historically, the print unions have been powerful and membership of the GPMU was over 90% at Mill One. The GPMU was instrumental in forcing the HSE's hand in targeting papermaking due to their poor accident figures.

6.8.1 The trade union and the proposed behavioural programme

The GPMU officials at Mill One were wary of the proposed BBS, this was in line with the GPMU's stance on any behavioural programme (although more specifically safety incentive or reward schemes). The FOC held conversations with his full time on-site officials who warned against any official trade union support. When the teams for the behavioural scheme were chosen, there were no GPMU members involved. One member did express an interest, and did attend initial meetings and team presentations, but he left after some pressure from the union officials and his colleagues. The mill level trade union representatives were doubtful that the culture in the mill was suitable for behavioural safety and felt that there was a blame culture in place from the management. Several examples of how this manifested itself were discussed with the author.

6.8.2 The behavioural provider's trade union stance

In discussions between the Mill One senior team and the behavioural consultant, the issue of trade union involvement was brought up by the author. I was involved in discussions between the aforementioned parties and was aware of the GPMU stance against behavioural programmes. The behavioural consultant's representative stated that it may be better not to involve the trade union representatives, in the interests of getting 'new

blood' involved in safety. Furthermore, it was stated by the same consultant, that the behavioural team should run in parallel with the other safety teams working at the mill. I was surprised at this tactic of steering the senior team not to involve the trade union officials at all, and felt that this could alienate the behavioural team.

When recruiting members of the behavioural team, the senior team did not actively avoid recruiting trade union members, but did not encourage them. The combination of behavioural provider's advice on non recruitment and the GPMU's stance on BBS led to the forming of the BBS steering group having no GPMU interest or membership. This undermined the group instantly, and in post intervention interviews persons interviewed were clear about this point. There were strong feelings expressed that the team who volunteered for the BBS steering group were not of the required calibre to initiate change.

6.8.3 The Trade Union Congress (TUC) and strategy

In a 2003 paper entitled *Better Behaviour or More Consultation?*, in response to the HSC/E research plan (HSE, 2002) the TUC submission to the draft plan pointed to some areas of major disagreement. The HSC/E had apportioned a significant sum of research money to behavioural research within the human factors area of study.

(TUC, 2003)

The TUC suggested in a statement that the BBS providers who supply commercial behavioural programmes are also the companies who carry out the research which labels the behavioural programmes as successful. The

[171]

TUC suggested some research into the failing behavioural programmes to, "redress the balance" of research priority:

> "We are especially concerned that the HSE's ethical systems are not preventing organisations with a commercial interest in proving the effectiveness of behavioural safety securing contracts to research into precisely that."

(TUC, 2003 ibid)

The final published HSE strategy document removed the behavioural safety elements from its documentation.

6.9 BEHAVIOURAL TEAM - MILL ONE

The methodology chapter discussed the process of BBS from the provider's initial sell to the workforce, to the selection and training of the BBS team (named CASE).

The progress of the BBS team was delayed, as indicated in Section 5.7, due to the possible strike action and the associated morale issues. In 2006 the programme commenced with some reticence from the team members, who appeared to feel that if the team failed to produce positive results, they would be subjected to negative treatment. An excerpt from the contract between the CASE team is detailed below which indicates the concerns that the team members held:

"Creating **A S**afer **E**nvironment

Contract

We the steering committee share the vision expressed by the senior management team for a Safe environment in which to work. We are prepared to demonstrate this commitment by our active participation in this Behavioural Safety Project.

Some concerns have been voiced which we believe must be addressed before we can proceed, these being:

'No Name No Blame' (Just Culture) policy being strictly adhered to at all times

Steering Committee or Observers must be able to withdraw from the Behavioural Safety Project at any time if they feel the need to do so for whatever reason without any repercussion

If any member of the Steering Committee or Observers have cause to complain about the conduct or behaviour of any management member as a direct result of their involvement with the Behavioural Safety Project, then the Steering Committee and Observers reserve the right to decide if the Behavioural Safety Project can continue and what if any precaution or actions need to be implemented as 'safeguards'

No member of the Steering Committee or Observers can be held responsible if the Behavioural Safety Project fails or reaches any conclusions which are uncomfortable or unfavourable for the management team "No Scapegoats"

No pressure is to be exerted by any management member to try and influence the Steering Committee or Observers

All levels of management must be reminded that they still have ownership of Health and Safety - that does not belong to the team members

Adequate and realistic time must be given to the members to carry out tasks associated with the Behavioural Safety Project as they are in addition to their normal roles within the Mill

The necessary tools to function as an effective Committee must be available to all members of Steering Committee and Observers."

Figure 6.1 Mill One - BBS contract between the senior team and BBS team members

Once the contract was signed, a poster was distributed within a matter of weeks, which was placed in several prominent areas around the mill. Some elements of this have been changed to anonymise the content. The poster

is displayed below which details the progress of the CASE team and indicates the plans for the next stages of work:

ON THE

CREATING **A S**AFER **E**NVIRONMENT

Less Blame, More Action!

✓ On Monday 14th November, the CASE Steering Committee met for the first time to discuss the launch of our Behavioural Safety project.

✓ Three senior managers attended the meeting, and the committee put forward a proposed contract addressing concerns we had about embarking on this project.

✓ The mill manager readily agreed to our proposal and the contract was signed.

✓ The committee have been assigned a £20,000 budget to make any changes around site to improve our safety at work.

✓ The committee have been provided with a secure office to work from and keep paperwork safe.

✓ The next thing we will be doing, is drafting a list of measures for observation. This will be distributed to you, and your constructive comments would be greatly appreciated.

✓ This approach to safety is completely different to anything tried at Mill one before. It focuses on a 'bottom up' approach as opposed to 'top down'.

✓ The purpose of this project is to work alongside existing Health and Safety Management Systems in the Mill, not to overhaul them.

✓ Our next committee meeting is on Monday 28th November at 2pm where we will be drafting measures for observation and discussing dividing the Mill into zones.

✓ Anybody who would like to get involved with observing around site, please let us know. Your support would be appreciated.

Figure 6.2 CASE team poster

6.9.1 CASE Progress

It was evident to anyone reading Figure's 6.1 and 6.2 that there was some apprehension in even going ahead and launching the BBS programme. Terms and headings such as: *less blame more action; concerns, no name no blame; repercussion; held responsible; scapegoat,* used in the two figures, indicated to both management and shop-floor staff that the programme was unlikely to succeed. Following the disciplinary procedures from an accident (see Section 6.7 and Table 6.1) a decision was made to delay the official BBS launch. Abandoning the programme was discussed but ruled out.

"Due to recent events in the Mill regarding Heath and Safety, the CASE steering committee met with *the mill manager* to discuss the progression of the Behavioural Safety Project.

It has been decided that the implementation of the project will be put on hold until April, when the climate in the mill will be reviewed and a decision will be made as to whether or not the CASE Team will continue to operate.

In the mean time, the committee will continue to meet to discuss points of focus in the mill for behavioural safety implementation.

The plan is to look at historical health and safety data, such as accident statistics to identify areas which hold the greatest amount of risk on site.

During this three month period, hopefully the Safe Systems of Work will have been looked into at great length by operators and management, creating much safer and workable procedures.

The committee would like to invite any comments or suggestions in regard to the Behavioural Safety Project and its future. Please direct your thoughts to [name erased]."

6.9.2 CASH not CASE

The shop-floor and management views of the CASE team were not favourable, and the title of this chapter section highlights one key reason for this. The team were not seen as being productive – there was little evidence of behavioural auditing, there was no indication of statistics displayed within

the mill and most importantly the BBS team were seen as a closed book. No management member of staff was on the team, no trade union staff from GPMU Amicus were involved and nobody who was seen as proactive in health and safety was included (e.g. persons in fire teams, risk assessment teams etc.).

The BBS programme suggested by the provider was completely autonomous from the more established SMSs of the mill. In 2007 the team started to be called CASH by the shop-floor – their lunch and meeting budget was considerably high and it was felt by senior management that this was unacceptable. The staff (at any level) view of the BBS team members was either one of indifference (i.e. with little activity and no visual signs of activity it was thought by many that the programme was not running) or that they were taking advantage of overtime perks, avoiding their day jobs and "taking bl**** liberties" (Anon, 2007).

6.10 NARRATIVE SUMMARY

Much of the above descriptions could not be told in such detail, were it not for the dual role of corporate safety manager and participant observer research student.

It is my hope that this chapter has given an insight in to the safety and organisational culture of the company, and the environment in which this thesis was written. There was an overwhelming desire to do the correct thing regarding health and safety, but too much emphasis was placed on Mill Two and its zero accidents by some senior operational staff members. My professional drive within the company was to initiate a strong SMS with safety culture inherent within - or culture being 'the treacle in the biscuit tin', Booth (2005).

CHAPTER 7 – RESULTS

The purpose of the results chapter is to display the results obtained from the research carried out. Due to the multi-method approach utilised there are several sources of data to display (these are contained in Tables 5.1 and 5.2), although there is no analysis of the results within this chapter. Chapter 8 will present the results analysis in the form of a discussion chapter.

7.1 INTRODUCTION

All the measurements and interventions given in Table 5.1 are examined within this chapter, with the exception of the 2002 HSE climate survey. The reason for the lack of representation from this survey is that it was carried out prior to the start point of this thesis. However, the 2002 results are compared to the BBS company's climate survey, although the comparisons are qualitative versus quantitative (the comparisons are made by the BBS provider).

7.2 PILOT STUDY RESULTS (MILL THREE)

Mill Three was chosen for pilot studies of both the questionnaire and semi-structured interviews. This mill was selected for several reasons, the main ones being the mill's close proximity to the author's office and the author's knowledge of the staff at all levels. Mill Three's safety manager was very forward in requesting corporate safety assistance, and as such the author had close links with the mill at an early stage of employment.

Ten members of staff were chosen by the author to complete the questionnaire and six of these went on to complete the semi-structured interviews with the author. As indicated in Table 5.1, there was an even spread of staff levels in the groups of ten and six, and the staff levels and numbers were considered proportionate. The mill staff were first given the

questionnaire, and completed the forms, in the training room. The author remained in the room to answer any questions that the staff may have had. The form, aside from one question, was filled in by all, and its presentation and content was agreed on as being straightforward and useable. The one question raised is discussed in Section 7.2.1.2.

7.2.1 Questionnaire results (pilot)

The pilot study held at the mill was held in controlled conditions within the training room. All ten staff completed the questionnaire at the same time in order to properly consider the questionnaire structure through group discussion. There were several discussions around the answers the employees gave and general topics such as safety culture, guarding and senior management approaches were discussed. The phraseology of the questionnaire however was not questioned by the staff, who were comfortable with the questions and found them straightforward. Considering the previous use of the questionnaire by Horbury and Hurst (1998) and this pilot study, it was decided to utilise the questionnaire at Mill One in its entirety.

Due to the low number of persons completing the form, analysis of various levels of staff has not been made or presented within the results or discussion chapter. The information is presented as the number of persons responding and not converted to percentages, again due to the low number of respondents. The questionnaire was evaluated on a five point scale (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree). The results for Mill Three have been collapsed in to three measures, namely - agree, neither agree nor disagree and disagree. In the display of results for Mill One later within this chapter, this is expressed using both three and five column answers.

The purpose of the pilot was to establish that the questionnaire was suitable for the business and easily understood by all those who would be filling in their details. The results from Mill Three are displayed however, for the of

comparison with those of Mill One. The results may have little validity because they are selected specifically by the author, but they do indicate mostly strong positive feelings about the mill and its management of safety.

7.2.1.1 Section One – safety management systems

The SMS section examines the SMS efficacy through 15 questions, which are expressed within Table 7.1. Most grouping occurred in the positive, with the occasional disagreement with one or two personnel out of the ten. The answers were evaluated and discussed between the ten personnel and the author, once the papers were handed in.

Question	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
On the whole, safety is very good here	10 (100%)	0 (0%)	0 (0%)
Safety is less important than productivity	3 (30%)	0 (0%)	7 (70%)
Safety systems (e.g. lock-out systems, rules etc.) exist to protect the workforce	10 (100%)	0 (0%)	0 (0%)
Safety systems can sometimes stop me doing my job safely	1 (10%)	0 (0%)	9 (90%)
I always report accidents when they happen	9 (90%)	0 (0%)	1 (10%)
Accident forms are a waste of time	1 (10%)	1 (10%)	8 (80%)
There are times when safety is as important as production	10 (100%)	0 (0%)	0 (0%)
The benefits of safety outweigh the costs	7 (70%)	1 (10%)	2 (20%)
No monetary value can be placed on human life	9 (90%)	0 (0%)	1 (10%)
Complaints about safety are dealt with swiftly	7 (70%)	2 (20%)	1 (10%)
Ignoring the safety rules is unacceptable	7 (70%)	0 (0%)	3 (30%)
I am frequently worried for my personal safety from unsafe equipment and machinery	0 (0%)	0 (0%)	10 (100%)
I am happy with the safety rules here	8 (80%)	0 (0%)	2 (20%)
I am happy with the fire regulations here	7 (70%)	1 (10%)	2 (20%)
Breaking the safety rules is fine as long as you're not caught	1 (10%)	1 (10%)	8 (80%)

Table 7.1: SMS questionnaire elements (pilot mill)

7.2.1.2 Section Two – management

Section Two evaluates the management of safety – i.e. how the management team implement the SMS on site. During the pilot there was some discussion regarding this section from the actual managers in the group who stated that they didn't feel they could answer these questions about themselves. The author stated that everyone was accountable to a manager, and that the question should be applied to everyone. There was

agreement in the room that this was the case. It was only this section that sustained some debate regarding the questionnaire suitability. Because of this, all managers at Mill One were briefed prior to completing their questionnaires through a short note stating that all should report on their higher management structures, who they report through. This was illustrated by demonstrating suggested reporting lines from supervisors up to the mill manager and his report to the board.

Question	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
On the whole, management makes fair decisions	9 (90%)	1 (10%)	0 (0%)
On the whole, management do not understand the difficulties of my job	4 (40%)	2 (20%)	1 (10%)
Company management have a clear sense of direction	9 (90%)	1 (10%)	0 (0%)
The Trade Unions play an important role in providing a safe and healthy workplace	9 (90%)	0 (0%)	0 (0%)
The management are important in keeping the workplace safe	8 (80%)	2 (20%)	0 (0%)
The management are committed to health and safety	4 (40%)	3 (30%)	3 (30%)
The management have good management skills	5 (50%)	4 (40%)	1 (10%)
The management are honest and state their intentions	9 (90%)	1 (10%)	0 (0%)

Table 7.2: Questionnaire (pilot) Section Two – management

7.2.1.3 Section Three – communication

The examination of a company's communication is the final examination of their safety management in practice. The SMS offers the structure and rules and procedures that are established for the company, whilst its management team act within the systems boundaries and bring the SMS to life. The method to achieve this can be examined by a communication survey. The system may be very strong, but without good management

techniques to utilise it and communicate its messages, this can be almost an academic exercise. Ultimately the understanding of the company's safety management rests with the shop-floor members of any organisation.

Question	Agree (%)	Neither agree nor disagree (%)	Disagree (%)
I usually hear about important matters first through rumours	7 (70%)	0 (0%)	3 (30%)
I am seriously considering leaving the company	0 (0%)	0 (0%)	10 (100%)
Morale is high here	6 (60%)	2 (20%)	2 (20%)
Management consult the workforce on topics which involve us such as changes to the safety rules and modifications to the safety equipment	7 (70%)	2 (20%)	1 (10%)
Line management make sure we're informed of organisational events	9 (10%)	1 (10%)	0 (0%)
Official communications are poor within this company	5 (50%)	1 (10%)	4 (40%)

Table 7.3: Questionnaire (pilot) Section Three – communication

7.2.2 Semi-structured interview results (pilot)

The semi-structured interviews held at Mill Three were held with only the author and interviewee in the room. To replicate the main study at Mill One no recording was undertaken, simply author notes and well spaced interviews to allow accurate writing up.

The base question set was used and adapted to best fit the interviewee's job role and position in the company. There were no issues with the use of this question set which was designed to analyse SMSs and safety culture.

The majority opinion expressed in interviews regarding Mill Three tended to be related to a chronic lack of investment at the mill, but there was a pride from the mill staff about their place of work. The following is a transcript from one of the managers at Mill Three:

"We are left to do our thing at this mill. I don't think we figure in *[The Paper Company's - company anonymised]* grand plans, and there are always rumours that we are up for sale. *[Mill one - mill made anonymous]* spend more on posters than we spend on engineering...despite our position here at the mill I really think we have a strong unit that has run independently for years, we have the staff to keep us going well past the probable closures of several mills."

The shop-floor opinion was also one of relative confidence despite the mill's position within The Paper Company and the overall economic climate in papermaking:

"Yes we could close, but yes every other mill within *[the paper company]* could also close, apart from *[Mill one]*. Any small mill is vulnerable in today's climate. We often talk about our future in the mill, but most people think that we are in better shape than most... our main French competitors are in receivership and we are still trading strongly."

7.3 QUESTIONNAIRE RESULTS (MILL ONE)

In the original questionnaire, sixty people returned their responses. This information is displayed within this section using five column displays, however, the results are also collapsed in to three columns and demonstrate percentage findings within Chapter 8 to aid the discussion. The information is split in to three sections, as the pilot study questionnaire information was (SMS, management and communication), for ease of comparison.

7.3.1 Safety management system

The results within this section portray a generally negative or neutral view of the SMS at Mill One. There was strong opinion however, in the importance of lock out systems – these were felt not to be a management imposition but rather an important control for the benefit of the workforce. Similarly a majority of employees agreed that no monetary value could be placed on a life and most agreed that the benefits of safety outweighed those of production. The employee view to most rule based areas, such as

procedural areas, were worrying in that most people saw safety as being an imposition and something that existed for bureaucracy's sake.

"There is risk assessment, there are safe systems of work and there are signatures to say that I have seen them. Have I or my colleagues paid them any attention however – no, but the company is covered."

Question	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
On the whole, safety is very good here	9 (15%)	20 (33%)	7 (12%)	12 (20%)	12 (20%)
Safety is less important than productivity	13 (22%)	23 (38%)	3 (5%)	10 (8%)	11 (18%)
Safety systems (e.g. lock-out systems, rules etc.) exist to protect the workforce	28 (47%)	22 (37%)	3 (5%)	6 (10%)	1 (2%)
Safety systems can sometimes stop me doing my job safely	5 (8%)	9 (15%)	17 (28%)	22 (37%)	7 (12%)
I always report accidents when they happen	3 (5%)	16 (27%)	12 (20%)	8 (13%)	21 (35%)
Accident forms are a waste of time	5 (8%)	8 (13%)	16 (27%)	20 (33%)	11 (18%)
There are times when safety is as important as production	9 (15%)	20 (33%)	18 (30%)	11 (18%)	2 (3%)
The benefits of safety outweigh the costs	4 (7%)	31 (52%)	12 (20%)	6 (10%)	7 (12%)
No monetary value can be placed on human life	29 (48%)	8 (13%)	18 (30%)	4 (7%)	1 (2%)
Complaints about safety are dealt with swiftly	5 (8%)	12 (20%)	15 (25%)	22 (37%)	6 (10%)
Ignoring the safety rules is unacceptable	10 (17%)	9 (15%)	18 (30%)	18 (30%)	5 (8%)
I am frequently worried for my personal safety from unsafe equipment and machinery	6 (10%)	6 (10%)	9 (15%)	36 (60%)	3 (5%)
I am happy with the safety rules here	8 (13%)	17 (28%)	12 (20%)	7 (12%)	16 (27%)
I am happy with the fire regulations here	5 (8%)	7 (12%)	15 (25%)	18 (30%)	17 (28%)

Breaking the safety rules is fine as long as you're not caught	6 (10%)	18 (30%)	17 (28%)	12 (20%)	7 (12%)

Table 7.4: SMS questionnaire results - Mill One

7.3.2 Management

The application of the SMSs by the management team is portrayed within this section of the questionnaire. As with the SMSs results, the overriding theme is one of negativity or at best neutrality.

Question	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
On the whole, management makes fair decisions	7 (12%)	6 (10%)	19 (32%)	10 (17%)	18 (30%)
On the whole, management do not understand the difficulties of my job	17 (28%)	19 (32%)	13 (22%)	6 (10%)	5 (8%)
Company management have a clear sense of direction	5 (8%)	8 (13%)	17 (28%)	20 (33%)	10 (17%)
The Trade Unions play an important role in providing a safe and healthy workplace	10 (17%)	20 (33%)	13 (22%)	5 (8%)	12 (20%)
The management are important in keeping the workplace safe	9 (15%)	10 (17%)	12 (20%)	21 (35%)	8 (13%)
The management are committed to health and safety	6 (10%)	23 (38%)	15 (25%)	6 (10%)	10 (17%)
The management have good management skills	6 (10%)	7 (12%)	19 (32%)	8 (13%)	20 (33%)
The management are honest and state their intentions	2 (3%)	4 (7%)	13 (22%)	15 (25%)	26 (43%)

Table 7.5: Questionnaire results (management) – Mill One.

This section demonstrates a lack of faith in the management team, although there was significant support for the mill manager and some senior staff within the section of the questionnaire that invited extra comments. The

overwhelming opinion of middle managers and supervisors is the key area of weakness, and Chapter 8 will discuss this area as regards the implementation of BBS where middle management has significant perceived weaknesses.

7.3.3 Communication

The communication section of the questionnaire presents similar results to those within the management section. The only positive result is the one referring to thoughts about staff thinking of leaving the mill. It was clear from the semi-structured interview process that this was rarely considered by staff due to the relative high pay within papermaking and Mill One's strong position in a commercial sense. With an average workforce time spent at Mill One of over twenty years, there were significant pension and salary considerations. The overall sentiment was that things weren't great and morale was low, but the options were limited. This has been referred to as *Golden Cage* syndrome (Nguyen, 2001).

Question	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
I usually hear about important matters first through rumours	31 (52%)	20 (33%)	4 (7%)	3 (5%)	2 (3%)
I am seriously considering leaving the company	3 (5%)	8 (13%)	6 (10%)	10 (17%)	33 (55%)
Morale is high here	5 (8%)	12 (20%)	18 (30%)	12 (20%)	13 (22%)
Management consult the workforce on topics which involve us such as changes to the safety rules and modifications to the safety equipment	4 (7%)	10 (17%)	13 (22%)	20 (33%)	13 (22%)
Line management make sure we're informed of organisational events	7 (12%)	10 (17%)	19 (32%)	14 (23%)	10 (17%)
Official communications are poor within this company	26 (43%)	11 (18%)	17 (28%)	2 (3%)	4 (7%)

Table 7.6: Questionnaire results – Mill One communication

7.4 SEMI-STRUCTURED INTERVIEW RESULTS (MILL ONE)

Richer data was gleaned from the interview process than the use of the questionnaire. The skill of the interviewer is vital in expanding on answers, and more specifically part answers, to extract full meaning from the person being questioned. The semi-structured process means that the lack of rigid questioning allows the interviewers skill to be fully utilised in making the interviewee feel relaxed in providing full, frank and honest discussion. The interviews aimed to examine both SMSs and safety culture.

7.4.1 Safety management systems

SMSs were categorised within two sections – hazards in normal operations and hazards in maintenance activities. Some examples of answers given are presented within this section, although greater detail is provided in the discussion chapter (Chapter 8).

7.4.1.1 Hazards in normal operations

> "The machines seem well guarded but we keep having accidents on them. Unfortunately when you make contact with a paper machine there is only going to be one winner."

There were many expressions of exasperation at the level of machinery accidents by those interviewed. There were discussions regarding slips and trips, falls from the same level but these seemed to be almost acceptable to the workforce. The PMs are very wet and produce a slime which is very slippery. The cleaning of machines is an aqueous process (i.e. the constant use of hose pipes is necessary and the process itself at the machine wet end[35] uses tonnes of water per hour) and there was acceptance by staff that the machines were as good as they could be without dedicated cleaning staff working on the machines 24 hours per day. The view on the low level accidents was largely pragmatic, with operators being accepting of their role in the cleaning process, although this was countered by many answers which outlined the consistently falling numbers of staff in the mill.

> "If I have an accident on the machine, it is generally my fault that I did. The cleaning of the machine is my role and my assistants role...I do get frustrated though by the management expectations of cleaning on the machines – they are comparing us to 10 and 15 years ago when we had full time cleaning gangs on the machines."

7.4.1.2 Hazards in maintenance activities

Although this section of questioning is designed for engineers, this and the hazards in normal operations section were asked to both engineers and operators. The reasons for this were two-fold, namely that the operators do carry out basic maintenance operations (whilst the engineers also assist the operators) and secondly that each category of worker observes the other on a daily basis. Throughout the questioning each category of employee referred to colleagues within both operations and engineering:

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[35] The wet end of the machine is the first part of the machine where the wet sheet of paper is formed with a high water content and is transferred on a nylon fast moving wire.

"...take [name erased], he is constantly behind the guards on nights. Don't tell me no manager has seen this happening. I've told him he's a bloody fool but he won't listen."

The answers given by the engineers demonstrated more hazard awareness that by that of the operators. Many engineers explained that they learned about safety through their apprenticeship, and the working on potentially live equipment (be it mechanical or electrical) ensured they were very safety aware of their own actions and of those around them, including the environmental hazards posed by the mill.

"I am responsible for my own safety ... our permit to work system is okay but does not require operators who request an isolation to check the isolation I apply for them. If I was in their shoes I would be going to the switch room and checking and double checking the correct isolator has been thrown and locked off."

The basis of most of the questions was in regards to risk assessment (in both normal situations and maintenance situations). There was acceptance that risk assessment had been poor, but quite a strong feeling that it was improving, with more shop-floor involvement:

"Risk assessment is much better now that we [the shop-floor] have an input. There is a long way to go and we need our shift managers to take ownership of the process to really make it work."

7.4.2 Safety culture

Safety culture was evaluated on 11 factors using semi-structured interviews (Appendices 1). The overriding feeling from non-management responses was that there was a morale problem and lack of trust in management. The discussions regarding the mill manager were positive and most felt that he cared about his employee's safety. The perceived problems were outlined as being the line managers (particularly at machine manager and shift manager level), these results were in line with the findings of the questionnaire responses:

"If we had 30 of him (reference to mill manager) we'd be a safe mill".

There was strong opinion that middle managers were causing communication blockages between senior managers and the shop-floor. To counter balance this argument some expressed almost pity for the shift manager's position which they felt was a sometimes precarious one:

> "The position of the shift managers is one of sitting on the fence and not making decisions. This way they can't be blamed for any wrong actions that they commit. [Name deleted] worked on the machine with me and he has aged since becoming shift manager ... I don't blame him not making decisions, he is expected to cover the whole plant on nights as plant manager, HR manager, safety manager, counsellor, and policeman and yet he has had no training for any of those roles. When the day managers come in they will criticize him − usually for running the machine a little slower or producing a few less tonnes, but they never praise a clean accident record."

7.5 SMS AUDIT RESULTS (ALL MILLS)

Whilst this thesis concentrates largely on the Mill One intervention, it is relevant to make comparisons with the other mills, each of which received an identical SMS audit. All mill scores from the 2004/5 and 2007 audits are presented within this section, significant detail is given to Mill One in particular, but also the details of Mills Two and Three are included. These mills are represented in extra detail because they form useful points of comparison (Mill Two being a site where there was a behavioural programme running already and Mill Three which was used as a pilot study).

Mill Three was subjected to particular focused SMS improvements by the author and the mill's safety manager − the results of this are used to compare with those of Mill One's behavioural intervention.

7.5.1 Mill audit results

Figure 7.1: SMS audit comparisons (% scores)

Figure 7.1 demonstrates the inter-mill comparisons for each of the years audited and also the percentage change in any one mill. Both Mills Five and Six closed or had their closure announced in the interim period, hence they both display only a score for the 2004/5 audit. The Mill Four score was seen as a surprise within The Paper Company and by the safety teams, it was felt that perhaps the authors had been led quite strongly by the site safety manager, and perhaps taken verbal commentary and documents witnessed as fact with too little verification. The figure for the Mill Four 2007 audit showed a four percent fall (following improvements in several areas of the mill's SMS) which may indicate a falsely high 2004/5 score. No further qualification is given to this opinion regarding Mill Four because it sits outside the parameters of the thesis, however based on the author's position in the company and his observations and knowledge of the mill, the opinion is offered to aid understanding of the overall safety of all the mills. Mill Four had significant weaknesses in risk assessment, COSHH, fire, machinery to name a few – these became apparent after a major redundancy programme when the author investigated the mill's safety status in 2006/7.

7.5.2 Mill One element specific

The external audit examining the company's SMS was based on a system which was designed to reflect the requirements of HSG (65). The audit was collapsed in to four major elements which were namely: policy and organisation; planning and organisation; monitoring performance; audit and review. Each element contained a number of sub elements, and each of these was examined by a series of questions. The loading of the marks was heavily in favour of planning and organisation which contained 14 sub-elements, whilst the total number of sub-elements in the other three combined categories was 11. The elements and sub-elements are itemised within Table 5.3.

Table 7.7 displays the quantitative score for each element and sub-element. Examples of how these were derived and a discussion regarding these is contained in Chapter 8.

Element	% Score	Sub element	% Score
Policy and organisation	68	Health and safety policy	75
		Health and safety forum	48
		Retention of records	57
		Communication channels	100
		Management responsibility	56
Planning and organisation	68	Risk assessment	48
		Safe operating systems and procedures	46
		Permits to work	79
		Hazardous substances and materials	15
		Training	70
		Safety aspects of contractor management	72
		Personal protective equipment	91
		Work environment	80
		Occupational health	79
		Handling of materials, transport and storage	69
		Noise and vibration	34
		Fire management	100[36]
		Emergency preparedness	75
		Specific risks	77
Monitoring performance	45	Planned workplace inspections	7
		Management accountability	100
		Accident reporting, investigation and statistics	92
		Management of costs	12
Audit and review	0	Health and safety reviews	0
TOTAL %	60	Learning from reviews	0

Table 7.7: Mill One - SMS scores 2005

7.5.3 Mill Three element specific

Whilst the primary purpose of this thesis is to evaluate a BBS intervention at Mill One, this is also compared and contrasted with Mill Three which was subjected to directed SMS improvements by both the author in his group safety capacity and the Mill Three safety manager. This involved a two year action plan, designed to address the weaknesses outlined within the 2005 external audit, whose results are contained within Table 7.8.

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[36] It was possible to score 100% in certain categories which tended to be ones that contained a limited number of questions. Eg fire management contained only three questions and hence a high score was highly possible.

Mill Three has what is often thought of as a family feeling to it. Staff members are long standing, from the locality and often siblings or related to other staff members. This is certainly true of Mill One also, although the commercial strategic position of Mill One far exceeds that of Mill Three. Because Mill Three manufactures educational papers and not CCM like all the other mills within The Paper Company, it has often been left out of group initiatives historically. Mill Three is also commercially independent, having its own sales and marketing department who are expert in the unique product it makes. All of these factors combine to isolate Mill Three from group activity.

The safety manager of Mill Three carried out several roles in addition to health and safety management – in particular HR manager, IT work and senior manager on rota (1 weekend in 3). For these reasons the safety manager was very approachable and amenable to the author's suggestions regarding safety improvements. Prior to the first external audit, both the author and the mill safety manager were aware of the mill's health and safety deficiencies and an action plan was designed for a two year period. The external audit further cemented this plan, and gave added impetus to the improvements underway.

Element	% Score	Sub element	% Score
Policy and organisation	65	Health and safety policy	65
		Health and safety forum	66
		Retention of records	41
		Communication channels	100
		Management responsibility	56
Planning and organisation	50	Risk assessment	22
		Safe operating systems and procedures	24
		Permits to work	23
		Hazardous substances and materials	38
		Training	62
		Safety aspects of contractor management	51
		Personal protective equipment	80
		Work environment	82
		Occupational health	48
		Handling of materials, transport and storage	61
		Noise and vibration	34
		Fire management	100
		Emergency preparedness	79
		Specific risks	30
Monitoring performance	52	Planned workplace inspections	36
		Management accountability	100
		Accident reporting, investigation and statistics	71
		Management of costs	25
Audit and review	63	Health and safety reviews	40
TOTAL	52	Learning from reviews	73

Table 7.8: Mill Three - SMS scores 2005

7.6 BBS PROVIDER SAFETY MATURITY SURVEY RESULTS

The BBS provider's approach was based on qualitative data gathering through group interviews with mainly shop-floor staff. The qualitative scoring was based around five safety maturity categories, which each had a model description attributed to it. This meant that for each of the twenty questions there were 5 model or base answers for each aspect of the safety maturity score. Tables 5.6 and 5.7 best describe the five point scale and examples of the base answers.

The BBS provider's report was based on a summary of key findings, including 'quick wins', the methodology used, the results, results analysis, and an appendix which offered comparisons with the HSE 2002 climate survey.
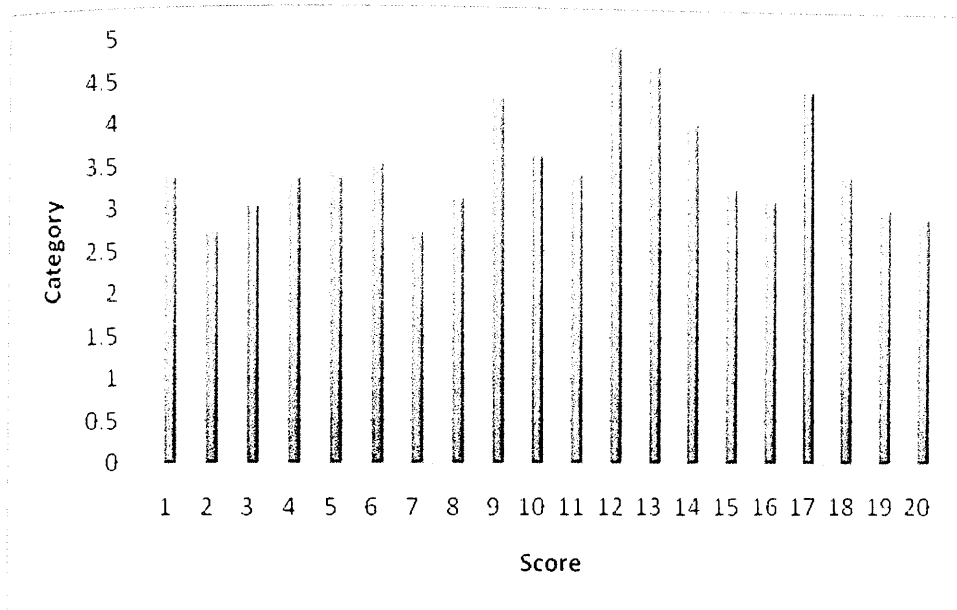
Figure 7.2: BBS safety maturity profile

Figure 7.2 replicates the findings of the BBS interview findings, whilst Table 7.9 outlines the twenty category types and the qualitative score or verb to describe the level of cultural maturity for that constituent part.

Rounded scores	Categories	Maturity level
3	1) Benchmarking trends and statistics	Calculative
3	2) Audits and reviews	Reactive
3	3) Incident/accident reporting, investigation and analysis	Calculative
3	4) Safety reports	Calculative
3	5) Who causes accidents in the eyes of management?	Calculative
4	6) What happens after an accident? Is the feedback loop closed?	Proactive
3	7) How do safety meetings feel?	Reactive
3	8) Work planning	Calculative
4	9) Contractor management	Proactive
4	10) Standard setting and by whom?	Proactive
3	11) Competency/training – are workers interested?	Calculative
5	12) Work site hazard management	Generative
5	13) Who checks safety on a day to day basis?	Generative
4	14) Balance between safety and profitability	Proactive
3	15) Is management interested in informing the workforce about safety issues?	Calculative
3	16) Commitment level of the workforce and care for colleagues	Calculative
4	17) How do you get new/improved procedures?	Proactive
3	18) What is the purpose of procedures?	Calculative
3	19) What is the size/status of the HSE department?	Calculative
3	20) What are the rewards of good safety performance?	Reactive

Table 7.9: Safety culture maturity scores by category

The majority of questions answered fell in to the calculative level of safety culture maturity with 13 of the 20 questions (after rounding[37] up or down) scoring 3. Calculative suggests that the mill has systems in place but improvements can be made. On the negative side 3 scores were reactive, whilst 2 were proactive and 2 were generative, both categories suggesting the workforce feel that their input is valued, that there is genuine ownership and a level of trust in management. There were no scores recorded for any of the twenty categories as pathological – i.e. an organisation that sees accidents as part of the job.

The BBS provider's culture analysis indicated that safety culture was improved from the previous 6-12 months and that, "the direction of travel is positive". Two statements were expressed within the executive summary which indicated two areas of concern, these being:

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[37] Rounding up or down was decided by 0.5 and upwards being rounded up and 0.4 and lower being rounded down.

"Some doubts expressed about the ability of the organisation to close out actions identified from audits and existing structures, allied to feelings of lack of feedback if and when the actions are closed out, especially on other than major issues." and

"Despite progress there is still some concern in some places that following an incident there is still a residual tendency to apportioning blame rather that considering the wider system and management role."

The BBS report nevertheless recommended using BBS as a vehicle for safety improvement. In the report's executive summary under the heading *Strategic development to Proactive level*, the following recommendation is made:

"Build on existing momentum by looking at human factors...undertake a programme to identify people wishing to take the ownership of safety by setting up a Behavioural Based safety programme at the *Mill one* plant."

7.6.1 The BBS provider's comparison with the HSE survey 2002

Whilst the HSE survey of 2002 sits outside the scope of this thesis, it nevertheless provides a useful comparison with that of the survey undertaken by the BBS provider and also the work completed by the author. The BBS provider's comparisons only relate to the areas where direct correlations and comparisons could be made. The primary reason for this was the difference in methodology in data extraction – i.e. the HSE survey has different titles to that of the BBS provider's maturity tool and the HSE survey is a quantitative questionnaire, whist the BBS provider's methods utilised qualitative group interview techniques. The BBS provider however did have significant experience in making comparisons with those of the HSE culture survey.

The correlation between the two surveys was presented on six factors, namely: organisational commitment and communication; workmates influence/risk taking behaviour[38]; competence; obstacles to safe behaviour; permit to work and reporting. The comparisons made are outlined below to outline any areas of improvement in the mill or perhaps areas where there is

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[38] Note workmates' influence and risk taking behaviour are separate factors within the HSE survey, although for ease of comparison these were combined by the BBS provider.

stagnancy in mill progress. The BBS survey did suggest that there was no area where things had grown worse in the three years between the two surveys.

7.6.1.1 Organisational commitment and communication

The 2002 survey suggested that this was a problem for the workforce rather that the supervisors and managers. The 2005 survey indicated that key management messages were getting through to the workforce and that, "communication inside workgroups on matters of safety is strong". The BBS provider statement summed up that there was progress from 2002 to 2005, however there was an opportunity for the mill to "ensure that a robust channel from the workforce back to senior management needs to be open and maintained".

It was apparent that the production/safety balance had improved between the 3 years of surveys. Several reasons for this are discussed within Chapter 8 and these emanate from the author's role in the company and knowledge of the company politics and history. The BBS providers report did not propose reasons for the improvement, just stated that an improvement existed.

The 2002 survey found a "disturbingly high belief in the workforce and supervisors that H&S [Health & Safety] procedures would be breached to get the job done". This was also evident in the 2005 survey, although it was felt that this sentiment was not as deep as previously. There was a feeling from the workforce that procedures acted as theoretical documents and that reality was not reflected within them. It was also felt by the workforce that there were "multiple interpretations" of many of the procedures.

There was a marked difference between the results of the 2002 survey and that of the 2005 survey, when analysing opinions regarding accidents and blame. The opinion was that even though there was no quantitative measure in the 2005 survey, that opinion had shifted from a complete lack

of trust in the reasons for accident investigation by the workforce, to a higher level of trust. This element was summarised thus, "given that the direction of travel appears to be in the positive direction it is likely that with consistent approach to the issue the progress will continue".

7.6.1.2 Workmates' influence/risk taking behaviour

There were strong similarities in these areas between the two surveys. It appeared in the 2002 results and the 2005 interviews that there was a belief that workers' colleagues worked unsafely, especially when working unsupervised. There was a distinct lack of trust from respondents in both surveys, for workers towards their colleagues. The BBS report suggested that lack of trust and workers' unsafe acts were strongly linked factors.

7.6.1.3 Competence

The lack of formal staff appraisal was evident from both surveys, although it was noted that training recognition of courses had moved from "has attended" to "has achieved" – i.e. staff were not simply ticking boxes to meet requirements. The lack of appraisal meant that training needs analysis was not carried out for staff and opportunities and needs were being missed.

7.6.1.4 Obstacles to safe behaviour

The 2002 survey was particularly negative for this factor and showed good improvements in the 2005 survey. The BBS provider suggested that this might be attributable to "the programme of revising procedures currently underway". The BBS report provided a caveat to the apparent improvements in that the mill had to ensure that the pace of improvement was maintained to ensure the current staff optimism did not deteriorate. The BBS report proposed (as a means of alleviating this lack of deterioration) that:

"This is one area where a Behavioural Safety approach can ensure that shortcuts are properly identified and appropriate changes made based on the actual situation in the mill, rather than any idealised view on how a particular operation might be carried out."

This point will be considered within Chapter 8 when the procedural improvements at Mill One are discussed by examining the two SMS audits completed in 2005 and 2007, the impact of the BBS programme on the mill procedures and the use of BBS as a mechanism to improve and communicate procedural issues.

7.6.1.5 Permit to work

There was a feeling that the negative perceptions regarding permit to work, from all sectors of the workforce, from the 2002 survey, were still in existence. The BBS provider's report stated that, "whilst the raw score in the current survey is not an obvious cause for alarm, neither is there an overwhelming case that the issues picked up in 2002 have gone away". A recommendation was made within the report for a review of the permit to work system at Mill One.[39]

7.6.1.6 Reporting

The two surveys demonstrated an overwhelming feeling that near misses were not always reported. No mention of minor accidents and their reporting was made within this report. The 2002 survey comparison appendix was finalised with the note that if BBS was adopted then the answer to the question, why weren't near misses reported, would be "answered by those who know best – the workforce". This was suggested if a top down programme from management wasn't initiated – rather that if a full BBS programme was commenced which involved substantial amounts of workforce ownership.

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[39] Note, the author on commencing work at The Paper Company initiated a permit to work and isolation audit and review from an independent consultant. The problems identified were the over concentration of electrical lock off whilst paying little attention to other energy sources. The permit to work system was heavily criticised and at the time of the 2005 survey was under evaluation and undergoing significant changes.

7.7 QUESTIONNAIRE RESULTS (MILL ONE - PART 2)

Mill One's 2007 results were based on 38 questionnaires returned to the author. For ease of comparison these are displayed using the five column method to enable simple comparison with those of the 2004 survey. Within the discussion chapter, these are displayed using three columns, expressed as pure staff numbers and also percentages to best triangulate the results.

7.7.1 Safety management system

Results within this questionnaire largely mirror those of 2004 although it was clear that the overall impressions of safety had gone from one of neutrality to a strong majority of employees stating that safety was not good at Mill One, and that safety was less important than production. The questionnaire results demonstrated no areas where employees felt that there had been safety improvements at the mill. This negativity existed at all levels of staff – i.e. managers, supervisors and shop-floor workers.

It was also apparent that the workforce felt less safe at Mill One than they had previously. The statement *I am frequently worried for my personal safety from unsafe equipment and machinery* rose to 16 employees agreeing or strongly agreeing with the statement, whilst the agree/strongly agree statements from 2004 were 12. It should be noted that the 2004 questionnaire returns were 60 whilst the 2007 returns were 38 – suggesting a significant downturn in confidence from employees about their own safety.

Question	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
On the whole, safety is very good here	3 (8%)	7 (18%)	3 (8%)	13 (34%)	12 (32%)
Safety is less important than productivity	11 (29%)	20 (53%)	2 (5%)	4 (7%)	1 (3%)
Safety systems (e.g. lock-out systems, rules etc.) exist to protect the workforce	2 (5%)	19 (50%)	6 (16%)	6 (16%)	5 (13%)
Safety systems can sometimes stop me doing my job safely	2 (5%)	9 (24%)	11 (29%)	10 (26%)	2 (5%)
I always report accidents when they happen	2 (5%)	7 (18%)	2 (5%)	17 (45%)	10 (26%)
Accident forms are a waste of time	10 (26%)	12 (32%)	6 (16%)	4 (11%)	4 (11%)
There are times when safety is as important as production	5 (13%)	12 (32%)	3 (8%)	9 (24%)	9 (24%)
The benefits of safety outweigh the costs	5 (13%)	19 (50%)	4 (11%)	7 (18%)	3 (8%)
No monetary value can be placed on human life	7 (18%)	7 (18%)	14 (37%)	4 (11%)	6 (16%)
Complaints about safety are dealt with swiftly	5 (13%)	6 (16%)	3 (8%)	15 (39%)	9 (24%)
Ignoring the safety rules is unacceptable	12 (32%)	15 (39%)	2 (5%)	2 (5%)	7 (18%)
I am frequently worried for my personal safety from unsafe equipment and machinery	10 (26%)	6 (16%)	6 (16%)	2 (5%)	12 (32%)
I am happy with the safety rules here	6 (16%)	3 (8%)	3 (8%)	7 (18%)	20 (53%)
I am happy with the fire regulations here	7 (18%)	15 (39%)	5 (13%)	6 (16%)	6 (16%)
Breaking the safety rules is fine as long as you're not caught	20 (53%)	9 (24%)	7 (18%)	0 (0%)	3 (8%)

Table 7.10: Questionnaire results Mill One – SMS 2007

7.7.2 Management

As with the SMSs questionnaire results, this section demonstrated no areas of improvements from 2004. The deterioration is best summed up by the falling scores for both management and also the trade union. The mill manager and some senior staff were praised but the problem again (from the interviews and the questionnaire free written page) was focused on middle managers from machine managers down to some supervisors. There was strong feeling that the management were more confrontational with them and this came from pressure which was being applied from more senior managers on to the middle managers. There were some comments on the questionnaires related to "witch hunts" which indicated that root cause was not being properly applied. Some comments also noted that the mill safety manager had also been allocated some significant personnel department duties and these included disciplinary procures – many felt that accident investigation and sitting on a disciplinary panel or team were a conflict of interests.

Question	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
On the whole, management makes fair decisions	2 (5%)	3 (8%)	3 (8%)	19 (50%)	11 (29%)
On the whole, management do not understand the difficulties of my job	15 (39%)	15 (39%)	1 (3%)	3 (8%)	4 (11%)
Company management have a clear sense of direction	3 (8%)	1 (3%)	3 (8%)	11 (29%)	20 (53%)
The Trade Unions play an important role in providing a safe and healthy workplace	3 (8%)	3 (8%)	3 (8%)	7 (18%)	22 (58%)
The management are important in keeping the workplace safe	5 (13%)	2 (5%)	1 (3%)	20 (53%)	8 (21%)
The management are committed to health and safety	3 (8%)	7 (18%)	7 (18%)	11 (29%)	10 (26%)
The management have good management skills	2 (5%)	2 (5%)	2 (5%)	12 (32%)	20 (53%)
The management are honest and state their intentions	1 (3%)	2 (5%)	2 (5%)	17 (45%)	16 (42%)

Table 7.11: Questionnaire results Mill One – management 2007

7.7.3 Communication

The statement regarding high morale at the mill indicated a serious drop from the workforce, although the numbers considering leaving the mill (on a percentage basis) dropped – refer to Section 7.3.3 for further detail on this point. All other areas showed a slight regression in their scores.

Question	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
I usually hear about important matters first through rumours	17 (45%)	11 (29%)	2 (5%)	1 (3%)	6 (16%)
I am seriously considering leaving the company	1 (3%)	3 (8%)	2 (5%)	12 (32%)	20 (53%)
Morale is high here	4 (7%)	0 (0%)	0 (0%)	7 (18%)	27 (71%)
Management consult the workforce on topics which involve us such as changes to the safety rules and modifications to the safety equipment	3 (8%)	1 (3%)	1 (3%)	13 (34%)	19 (50%)
Line management make sure we're informed of organisational events	4 (7%)	0 (0%)	3 (8%)	20 (53%)	11 (29%)
Official communications are poor within this company	19 (50%)	7 (18%)	6 (16%)	1 (3%)	5 (13%)

Table 7.12: Questionnaire results Mill One – communications 2007

7.8 SEMI STRUCTURED INTERVIEW RESULTS (MILL ONE - PART 2)

For purposes of comparison, the semi structured interview base models for differing levels of staff remained identical to those used originally in 2004. As with the 2004 results expressed in Section 7.4, this section is split in to SMSs (hazards in normal operations and hazards in maintenance activities) and safety culture. The author considered the data source from the 2007 interviews as being richer than that gleaned from the questionnaire approach for the same reasons as the 2004 process followed.

7.8.1 Safety management systems

To best illustrate any similar sentiment, worsening or improving employee views when compared with 2004, some quotations are used to best underline common employee thinking. As with all sections of the results

chapter, the results are simply outlined and detail is then furnished in the form of a discussion within Chapter 8.

7.8.1.1 Hazards in normal operations

The sentiment displayed in the interviews, mostly by the shop-floor staff, indicated that the views of hazards (when the plant is running), has worsened. There was strong criticism of line management – in particular the conscious ignorance of unsafe acts and the participation in any disciplinary procedure by a senior manager, that the person acting unsafely, would face if caught. It appeared from speaking with many of the shop-floor staff that they felt that a majority of line managers were very much aware of procedural violations being carried out by staff and were in fact encouraging such actions:

> "[Name erased] knows that the risk assessment is boll***'s and so it suits him to turn his back when I go in there [refers to behind a machines guards]. There is a risk assessment and safe system of work for the task but these are impossible to follow. If I do what it says in the safe system of work it would shut the machine down, because the only entry is through an interlocked guard."

When the same person as above was asked by the author whether he had the opportunity to assist in risk assessment, he replied:

> "This is getting better and we are asked to help, but risk assessment hasn't really started on this machine yet...maybe because it's the oldest ... if I raise the issue of breaching the guards with my shift manager he tells me not to create a fuss and just to carry on as always. I don't think I am in danger from the machinery and so I do it ... I thought that the risk assessment should tell us a safer way to carry out the task – maybe change the guards so we don't need to work behind an interlock on the run."

Machinery accidents were discussed at length in many of the interviews. Since 2004 serious machinery accidents (and disciplinary procedures associated with them) had escalated. It was within this atmosphere of little trust and low morale that the BBS programme was initiated. Comments about the BBS programme ranged from neutral comments to a majority of disparaging views. There were no positive comments about the BBS

programme – one of the BBS steering committee members was interviewed and spoke candidly about the BBS failures as he saw them and also how he felt the programme was perceived by both management and the shop-floor workers:

> "The atmosphere in the company is wrong for any initiative such as this. The senior management don't believe in it, the middle managers won't believe in it and the workforce feel they can't believe or support it because of the trade union stance. The culture at this place is way off being able to support a worker led programme like this...it was poisoned from the start and its only a matter time before this is shelved and replaced by the next in vogue safety initiative."

7.8.1.2 Hazards in maintenance activities

Views within this section were less negative than hazards in normal operations. Discussions - particularly with engineers, indicated some perceived improvements in safety management, particularly the improvement of risk assessments and method statements and the availability of these on the computerised maintenance system, were acknowledged as being improved. There was a degree of comfort from engineers regarding the permit to work and isolation procedures, although some were fearful of the shop-floor workers being given the ability to carry out simple isolations. This was a reality due to staff cuts, but was strongly opposed by all engineers who spoke with the author:

> "You think we've got high accident records now...just wait until you've got [name erased] from Number One machine isolating a valve ... it doesn't bear thinking about".

7.8.2 Safety climate

Safety climate seemed to have worsened and this was reflected by shop-floor, supervisory and management levels. The previous faith in the mill manager had been replaced by exasperation at the changes in senior mill management. Whilst there had been general expectations that the mill manager was going to be promoted out of the mill, there was little anticipation that following his departure, three more mill managers would fill the position within a matter of months. This matter will be expanded upon

[208]

within the next chapter. The constant changing of senior manager was cited as a contributory factor in the British Petroleum (BP) refinery explosion in Texas (CSB, 2009).

Opinion on middle managers indicated that their role was pressurised because of a "senior management spotlight placed on them", but there was little sympathy for their position. The shop-floor interviews suggested that little support was forthcoming from middle management and that they just wanted to concentrate on tonnes of paper – this was perceived to be due to senior management pressure and difficult economic conditions.

7.9 MILL THREE SMS AUDIT RESULTS (PART 2)

Mill Three audit results showed significant improvements in all elements and a significant percentage of sub-elements. The management summary of the audit process was written in positive tones and used phrases such as, "significant advances in health and safety" and:

> "much work had been done in promoting and driving forward more ownership of health and safety which was evident at shop floor level and supported by a genuine enthusiasm by line managers ... clearly defined thought processes and involvement was indicative of a cultural shift, with health and safety being driven not just from the management team but from the shop floor as well".

The results which indicated a cultural shift clearly oppose the results gained at Mill One where the BBS programme was running. This paradox is explored in depth within Chapter 8. The paradigm is that the systems approach of health and safety management, and not the behavioural based programme appeared to improve workforce ownership and subsequent safe actions. A vast difference is apparent when comparing the middle management of both Mills One and Three.

Mill Three did suffer some criticism within the management summary, but these tended to be individual actions and not systematic failures. These were such things as: "Hi Vis [High Visibility clothing] not being worn by risk

managers/co-ordinators; hearing protection not being worn by employees in designated hearing protection zones and a comment on the event form – health and safety what a joke". The negative impact of these statements however did not impact on the overall auditor impression of a vastly improved health and safety management system and a, "definitive shift in ownership and accountability". In summary however the report did mention an adverse observation which was a significant point carried over from the previous audit held in 2005, this was particularly sobering considering the machinery accident record of The Paper Company:

"It was noted during the last audit that the guarding for machinery within the workshop had been removed and was being stored out the back of the workshop. During this audit's site inspection the guards were found in the same location, covered with more weeds. The management team should be aware of their personal liabilities in this respect and of the statutory breaches in failing to adequately guard machinery."

Element	% Score	Sub element	% Score
Policy and organisation	91	Health and safety policy	100
		Health and safety forum	100
		Retention of records	41
		Communication channels	100
		Management responsibility	100
Planning and organisation	69	Risk assessment	89
		Safe operating systems and procedures	58
		Permits to work	62
		Hazardous substances and materials	94
		Training	100
		Safety aspects of contractor management	46
		Personal protective equipment	94
		Work environment	83
		Occupational health	94
		Handling of materials, transport and storage	64
		Noise and vibration	56
		Fire management	100
		Emergency preparedness	79
		Specific risks	30
Monitoring performance	62	Planned workplace inspections	54
		Management accountability	100
		Accident reporting, investigation and statistics	60
		Management of costs	47
Audit and review	81	Health and safety reviews	100
		Learning from reviews	73

Table 7.13: Audit results – Mill Three 2007

7.10 MILL ONE SMS AUDIT RESULTS (PART 2)

The second Mill One audit showed some improvement, but not a hugely significant one. Of the four main elements, all demonstrated improvements, however the element with the majority of the marks available (i.e. planning an organisation) showed only a one percent rise. It is this relative stagnation that led to the fairly meagre percentage rise overall. This should be compared with that of Mill Three (Section 7.9) which demonstrated significant rises in all elements of its SMS.

The four percent overall raise was overshadowed by an incident on the first day of the audit where an operator was found working behind a guard. From speaking with the auditors, the author had the impression that little effort had been made to improve safety management at Mill One. The auditors felt strongly that the BBS programme wasn't working, and that a programme of working on the basics was what the mill required. There was an indication that the mill management team were attempting too much and that this was not being well translated at shop-floor level. Furthermore it was evident from the author's questionnaires and interviews, that the safety culture was not yet showing any marked improvements. From author questioning and observation and the external auditor reports, there was significant evidence that the BBS intervention was not making any lasting changes at Mill One.

Element	% Score	Sub element	% Score
Policy and organisation	78	Health and safety policy	77
		Health and safety forum	81
		Retention of records	51
		Communication channels	100
		Management responsibility	89
Planning and organisation	72	Risk assessment	100
		Safe operating systems and procedures	68
		Permits to work	70
		Hazardous substances and materials	36
		Training	70
		Safety aspects of contractor management	72
		Personal protective equipment	100
		Work environment	55
		Occupational health	79
		Handling of materials, transport and storage	76
		Noise and vibration	34
		Fire management	98
		Emergency preparedness	76
		Specific risks	81
Monitoring performance	45	Planned workplace inspections	21
		Management accountability	100
		Accident reporting, investigation and statistics	71
		Management of costs	12
Audit and review	13	Health and safety reviews	40
		Learning from reviews	0

Table 7.14: Audit results – Mill One 2007

7.11 CASE TEAM RESULTS[40]

The CASE team targeted several activities to be subject to peer review and observation. The team began to display results from January 2007 and their plan was to observe several different activities, as listed in Chapter 5. The results were not high profile in the mill and the ones contained within this chapter were not readily shared with the mill workforce. Of the topics chosen, five were decided to be targeted initially, these being: handrails being in place; drain covers in place; walkways being adhered to; hoses

[40] Note the CASE results are the results of the Mill One BBS team. These have not been critically analysed by the author.

stowed away and machinery guards being in place. The merits of whether these topics were wise or effective are discussed within Chapter 8. The results of each of these is displayed within this section and measures from weeks 1 – 34 inclusive within 2007. Within the mill this was the only measurement information displayed. As with other results, little discussion is in place at this juncture.

7.11.1 BBS measure – handrails being in place

This behavioural measure concentrated largely on the handrails of the three PMs. It also extended to the many access platforms and areas around the mill's various other areas such as fire escapes, roof access etc. The bulk of handrails were however in the machine areas, which made simple, high numbers of measurements in relatively short spaces of time. Typically there could be in excess of perhaps 100 different sets of handrails on a PM and its associated plant such as the rewinder, pulper etc .

The results displayed within Figure 7.3 demonstrate scores that tend to be 100% showing occasional deviation (particularly week one at 91%). More minor deviation only dips below 100% by one to two percent in any week.

The machine handrails are very much on display to anybody who walks through the machine buildings. They were also subject to regular inspections from several levels of staff.
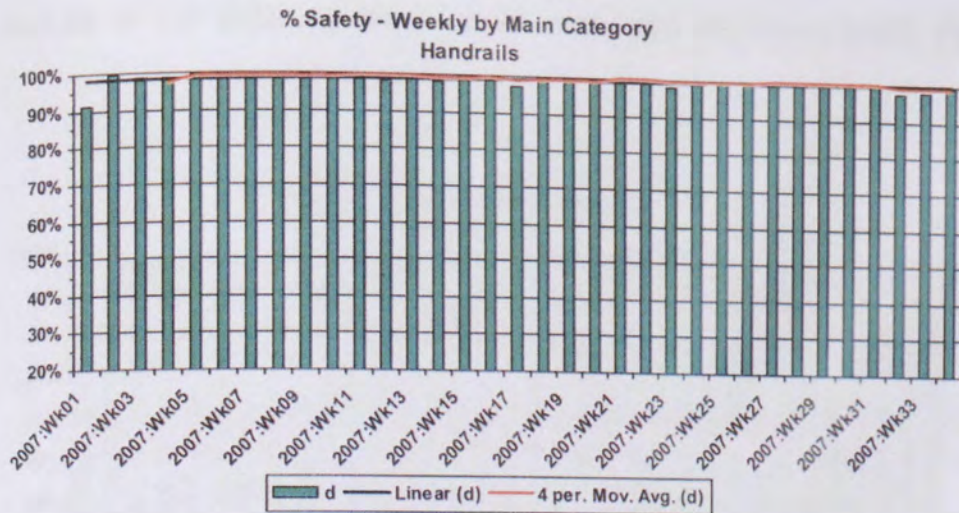
% Safety - Weekly by Main Category
Handrails

Figure 7.3: BBS measures of handrails being in place

7.11.2 BBS measure – drain covers being in place

The drain covers tend to be spread throughout a paper mill to drain the tonnes of water away from the machine itself and the basement areas, which include vast amounts of pipelines, steam lines, vessels and vats. Table 2.1 shows that in 2004/5 600,000 Tonnes of paper were produced at Mill One. In 2009 the purchase of the adjacent machine on the M Real site (Section 2.3.6.2 and associated footnote) has now increased the mill production to 850,000 tonnes (The Paper Company, 2009). The typical water content left in finished paper can be from 2 – 10 % (Paperonline, 2009) and ten litres of water goes in to one A4 piece of paper (Waterfootprint, 2009).

Many of the accidents within papermaking tend to be falls from the same level and there was a particular accident in the adjacent mill to Mill One which led to a leg being amputated when a machine roll trolley was made unstable and crushed a contractor when a drain cover broke (Amicus, 2007).

The results of the drain covers being in place are displayed within Figure 7.4.

% Safety - Weekly by Main Category
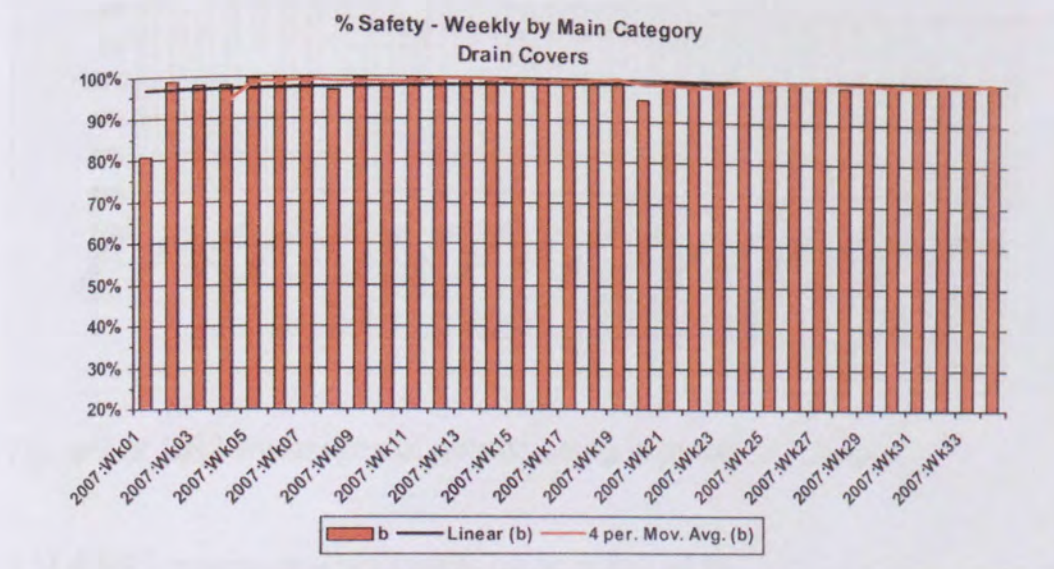**Drain Covers**

Figure 7.4: BBS measures of drain covers being in place

The results displayed within Figure 7.4 demonstrate a norm of 100% compliance, with troughs in particularly week one (80%) and week 21 (95%). The linear and moving average trend lines demonstrate very little movement, moving from 98% upwards.

7.11.3 BBS measure – guarding being in place

As with handrails, the large concentration of guarding is within the machine buildings on the PMs and associated plant. The guards will be a combination of close fixed, distance fixed and interlocked, dependent on their position and operator access requirements. As with handrails, the guards will be subjected to regular inspections and are easily viewed by any member of staff within the machine area. The compliance for guarding barely wavers from 100%. Accidents involving guarding are still prevalent in the rapidly shrinking paper industry and do require high profile scrutiny. Accidents which occurred in 2009 demonstrate this ongoing necessity (Printweek, 2009a; Printweek, 2009b).
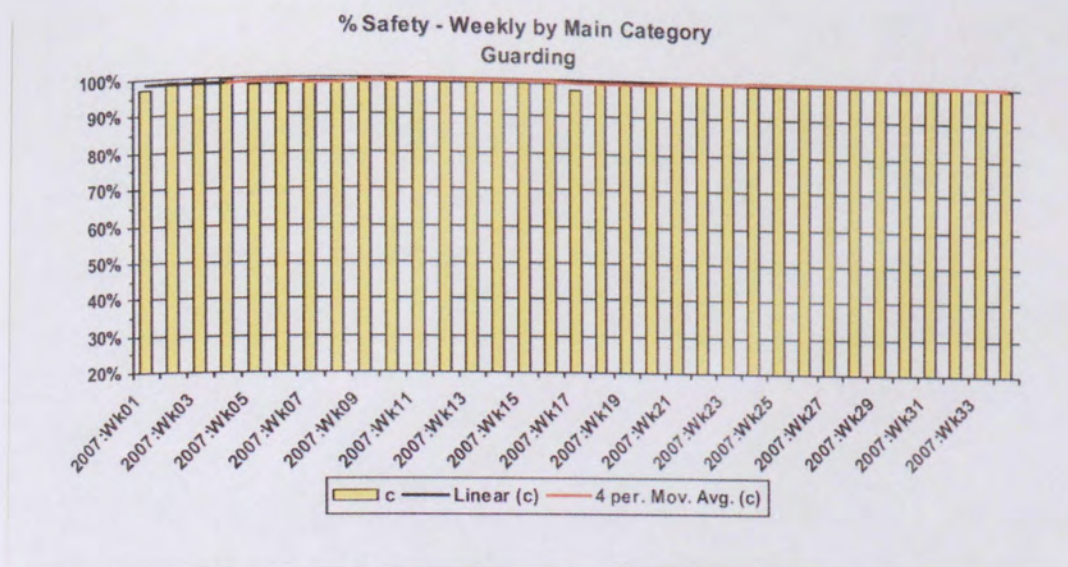
Figure 7.5: BBS measures of guards being in place

7.11.4 BBS measure – walkways being adhered to

The use of walkways is essential in paper mills because of the possibility of contact between pedestrians and, particularly, fork lift trucks. Paper mills tend to be older buildings and not custom made for producing modern tonnages. The modern vehicles used in the paper industry sometimes have difficulty in manoeuvring safely.

Figure 7.6 illustrates the trend in walkway adherence, which on a linear basis demonstrates a minimal improvement of two percent.

% Safety - Weekly by Main Category
Walkways

Figure 7.6: BBS measures of walkways being adhered to

7.11.5 BBS measure – hoses being stowed properly

There is a high requirement within papermaking to continually use hosepipes to clean down machines and walkways, which can become dangerously slippery because of the slime a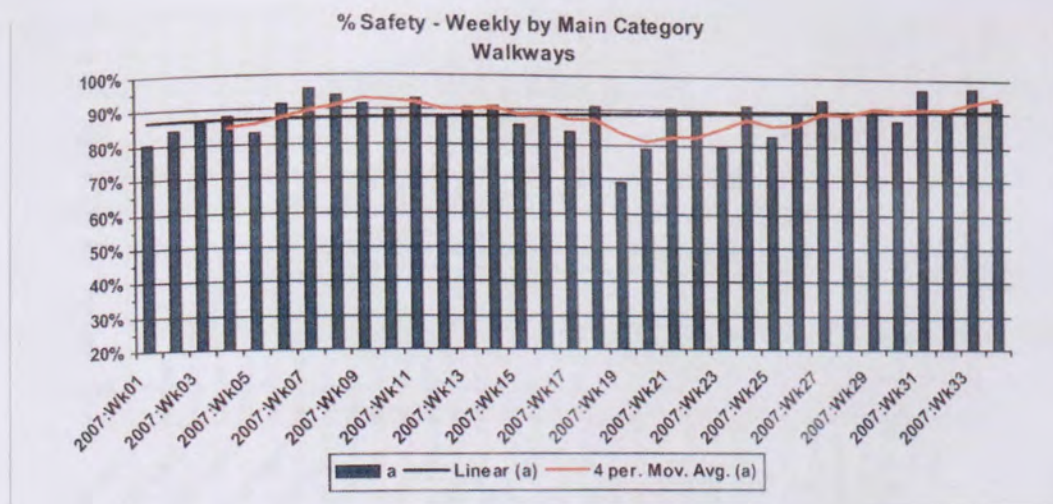nd waste from the process. This tends to be concentrated on the PMs wet end, where the sheet is formed, and prior to the drying process. From the dry end of the machines to the rewinders the process is dry and involves the use of air to blow the dusts ready for clearing. This means that the dry end will also have air hoses being used regularly.

The wet, slimy and dusty conditions all lead to a fall potential and must be regularly cleaned. Very often the hoses are left uncoiled after use and present a trip hazard. The pressure on PMs and rewinders can be high and is made worse with falling employee numbers. Specific cleaners are now a luxury which the industry can ill afford in such straitened times, and the duty falls to machine operators.

The results demonstrate a linear improvement of 22% over the measurement period. The undulations of the moving average trend-line were not analysed by the CASE team, but possible explanations for the peaks and troughs will be put forward by the author in the next chapter.
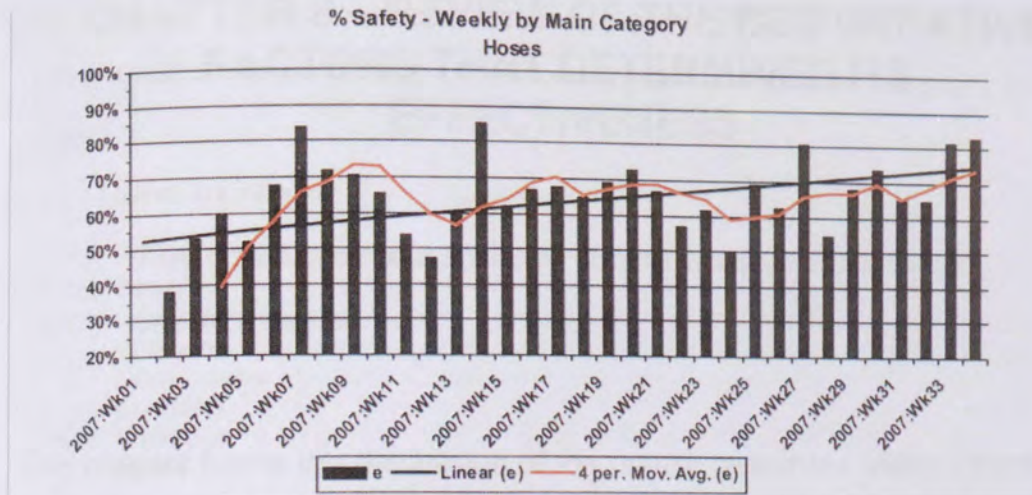
% Safety - Weekly by Main Category
Hoses

Figure 7.7: BBS measure of the proper stowing away of hoses

7.12 RESULTS SUMMARY

The results have been displayed in a chronological order, to aid understanding in the various interventions and methods of mill health and safety management. The results are presented in a mechanical format with little description, where the results are quantified by raw numbers or percentage points scored. Where the results have been gained from qualitative sources such as interviews and observations, these are explained by direct quotations or textual descriptions.

The analysis of the results is undertaken in the next chapter, which is a discussion chapter. The purpose of this is to expand on the results gained and to make results comparisons between the various mills and various interventions. The discussion element is focused on the intervention being measured, which is the BBS intervention at Mill One, however the other interventions, as presented within the results chapter, are used to offer explanation and analysis of the successes and/or failures of the BBS programme. The discussion chapter also draws on the narrative chapter (Chapter 6) which utilises the author's observations and company knowledge to further add to the results discussion.

CHAPTER 8 – REVIEW OF THE BBS INITIATIVE: FACTORS THAT DETERMINED ITS EFFECTIVENESS

"Trust is the lubrication that makes it possible for organisations to work."

Warren G. Benner

This chapter forms the discussion of the results presented within Chapter 7. The results however only form part of the story, and because the author was employed by the company, the narrative (Chapter 6) has also been used to add to the richness of the discussion. The narrative forms an essential element of understanding in aiding explanation of the results and the atmosphere and corporate climate of The Paper Company. Chapter 8 then, presents a partly traditional discussion, whilst additionally enriching the background detail using information gleaned from interviews, observation and author/staff discussions.

Whilst several interventions have been implemented at three mills, it is the BBS intervention at Mill One that is the focal point for the purposes of this thesis. The discussion draws on these other interventions to aid explanation of the results gleaned from the BBS intervention.

8.1 BBS READINESS

The key discussion point is that of readiness - that is the readiness of an organisation to implement BBS within its structure. There are three schools of thought on this matter, namely the thinking that BBS should never be implemented (trade union thinking or systems theorists such as Reason), those that believe BBS can be implemented in any organisation (i.e. readiness is not a factor e.g. Geller), and the BBS providers who believe that senior management belief must exist in the programme prior to instigating BBS (e.g. Marsh).

The purpose of this thesis is not to debate whether or not BBS works or does not work in principle, nor is it to state that the particular BBS provider was effective or ineffective. The purpose is rather to examine if the BBS intervention worked at Mill One and to discuss reasons for the successes and/or failures. At no time does this thesis discuss the SMS audits as being agents to improve safety culture, although this could be pursued at Mill Three where the SMS was significantly improved – this has been recently researched in an industrial case study (Baird, 2005). However the methods used at Mill Three to improve safety are compared with those of Mill One – two diametrically opposed methods of implementing safety improvements that had vastly different results.

8.2 POLITICAL CLIMATE

This section discusses the environment that was prevalent in all levels of the business prior to and during the implementation of the BBS programmes running at The Paper Company. The aim of this is to describe and discuss possible reasons for the implementations themselves and their apparent success or failure.

8.2.1 The PLC

It was evident that when accident rates were high in any division or particular factory unit within the PLC, that pressure was put upon that business from the senior team. The only measure of health and safety or KPI was accident figures. Unfortunately this meant that this measure was crude at best and in many cases somewhat misleading. Without any competent corporate safety leadership, the use of positive KPIs to evaluate good practice and areas of concern was not realised. In many forums, both the author and the packaging division's safety manager attempted to explain the benefits of using other measures, as well as accident data (both leading and lagging data). The problems with only using accident data manifested themselves in several different ways – namely: that accident reporting was

in some circumstances not standardised and units were using different interpretations of the PLC's reporting guidelines; that the use of accident-only data encourages an atmosphere for less than honest reporting; that previously successful sites (based on a lack of accident reports) could find themselves under pressure from the group to reduce their suddenly rising accident rate.

When a factory was put under the corporate spotlight regarding health and safety, pressure was placed on the senior team by the PLC board. No guidance was given to suggest ideas of where improvements could be made and generally immediate responses and action plans were required by the unit, suggesting what was wrong and how that would be remedied. It was this environment that led many units to address problems by suggesting that BBS was to be pursued.

8.2.2 The Paper Company

The Paper Company and its three constituent parts (i.e. mills, recycling and logistics) had investigated the use of BBS at a corporate level for many years. This was led by PCM One who had witnessed what he perceived as improving safety culture and an improving accident trend at Mill Two. This was offset by the views of the majority of the mill managers who did not wish to have specific safety methodologies forced upon them. When the author joined The Paper Company in 2004, both logistics and recycling were managed by one MD (the two were split in 2005). The MD for recycled had no inclination to pursue BBS and was only answerable to The Paper Company MD. Therefore no pressure was placed upon recycling to utilise BBS, although their accident rates were a topic of conversation in many strategic meetings. The recycled industries accident figures were poor (HSE, 2009) and the fix of using BBS had been discussed in several forums. The use of BBS was not thought by the author to be a suitable next strategic step for the recycling division for various reasons – the main ones being that many of the employees were drivers (and BBS does not lend itself to lone work such as this) and that the workforce was paid a minimum

wage and was transient (the improvement of behaviours/attitudes would have been only temporary if ever achieved). The logistics business was similar to the aforementioned but the emphasis within this section was on drivers – again BBS was not suitable for this work activity.

8.2.2.1 Mill One

Mill One was the most strategically important site within the PLC. The risk management committee analysis of business losses held product loss from Mill One as the most important factor in their business risk assessments. The mill therefore was always foremost in the corporate thinking and this intensity was also apparent for the mill's health and safety performance. The author's questionnaire results were negative and worsened significantly between the first and second measurements taken. The 21% and 14% rates of returns could be construed as indicators of poor culture in their own right. There was a feeling of questionnaire fatigue within the Paper Company and this was a factor in the low returns. The author was told in the semi-structured interviews that questionnaires were not completed because completion of similar tools in the past had never yielded any positive results to the employees. The poor (and worsening results) from the two author surveys indicated not only poor safety at the mill but also low morale and little hope for improvement.

The results from the author's semi-structured interviews and questionnaires and the BBS providers group interviews gave differing results. The BBS provider results provided a more positive indication of safety culture. A reason for this could be attributed to Schein's three layered culture model. It is possible that the more positive results from the BBS provider were at the *espoused level*. This level can typically be examined by the use of interviews and questionnaires. The author's more negative results mainly originated at the deepest (or *basic underlying assumptions*) level. This level of information was gleaned from the author's role as both participant and observer through the interview process and perhaps more importantly as a member of staff observing organisational occurrences and relationships.

Using Schein's model then, one can understand paradoxical organisational behaviours more readily. Safety culture examination at the first and second levels (questionnaire and interview) can give very different cultural indicators to those at the third and deepest level (observation and organisational integration).

The record of serious accidents and the relationship with the commencement of the PABIAC drive for improvement (Section 3.3), meant that Mill One was also a previously targeted worst performing mill by the HSE and the trade unions. Coupled with a strong trade union presence locally within the mill, Mill One was always under a spotlight effect. Table 6.1 illustrates a list of serious incidents and accidents which occurred at The Paper Company, the entry for 2005 at Mill One (Table 6.1), led to the branch trade union officials becoming embroiled in a battle over the handling of the matter. The mill management, following the accident, went through their disciplinary procedures which resulted in the person who wound his colleague in to the machine, having his employment terminated. The employee had a clean disciplinary record and had been employed by the company for over 20 years. On discovering the strong company stance, a meeting was convened by the trade union full time officials, the mill trade union officials, the mill management, PCM Four and the author.

The trade union officials made claims that the accident had occurred because of system weaknesses such as lack of inspection and audits from middle managers. They asked that the decision from the mill to terminate the employee's contract be reversed and that he be given a final written warning, citing the systems weaknesses. The decision was made by the management team to uphold the original decision to terminate the employee's contract. This decision made the already difficult trade union and mill management relationship more precarious – it was this environment that the BBS was eventually implemented within.

If one examines the accident in question, it can be quickly surmised that under Reason's accident typology (Reason, 1990) this was a routine

violation, which are typified by an operator regularly taking the simple option (it is a human trait to take the path of least resistance) and in an environment where indifference means that violations are rarely punished. Reason suggests that an operator transgressing the rules in these circumstances is almost inevitable.

The trade union stance and The Paper Company stance represented conflicting views of accident causation. The trade union opinion was one that suggested multi causation (see 4.7.6.2) – part human error (from their member) and largely system based errors (see Reason, 1990 ibid). The Paper Company stance was one that suggested solely human error on account of the operator and hence the disciplinary findings.

The original intention to launch BBS in 2005 was delayed because of the aforementioned incident. However when the launch did occur in mid 2006, the environment had not improved. The foundations for BBS launch appeared to be too weak to instigate any intervention which required the support of the middle management and the inclusion of the shop-floor.

The delay of the BBS launch adds a level of interest to the BBS readiness debate. The mill management were aware that the optimal time for launch was not when there were trade union difficulties, when morale was low. There can be no doubt that if a climate survey were taken at this time, the findings would have demonstrated that indicators such as trust in management and communications would have scored relatively poorly.

8.2.2.2 Other mills

The five other mills were not placed under a similar intensity from the PLC (as was Mill One). Because of their relatively small volumes of tonnages produced (Table 2.1) each mill could not affect the business in the same way as Mill One. This was reflected in the business risk analysis from the PLC.

The mills were running in difficult economic times, and two mills (Mills Five and Six) were closed for reasons related to non-profitability and soaring costs. Economically, times were difficult for all mills and indeed recycling and logistics.

8.2.2.3 The recycling business

The demand from China for recovered paper meant that the recovered paper side of the business saw soaring profits. Whilst pressure was not as strong economically on the recycling business, the pressure on them for safety performance was strong from the PLC.

The PLC risk management committee used a basic indicator to alert them of poor safety performance at any of the sites. This was three lost-time accidents[39] in any one year's quarter. This very crude measure compared the various factory units against each other. This in effect meant that an office environment employing perhaps 20 staff was compared to the high risk environment of 19 recycling depots, employing over 600 staff.

The author was asked in a risk management meeting why the recycling business was always on the company's poor performing list. The author suggested two methods of removing the company from the list, one immediately and one which could take years, which were as follows:

> "If you want to remove the recovered business from the bottom ten list, there are two methods which could pay dividends [author asked to expand on these]. Firstly, we could simply split up the 19 depots in to their separate identities – none have that many accidents in one quarter and this would measure them the same as all other business units within the PLC. Secondly, I could put a capital proposal together for several millions of pounds to request the neglected infrastructure be improved … I would prefer to keep the depots grouped as one entity, because this keeps welcome pressure on their performance, the spend however is long overdue and should be prioritised and stepped over many years".

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[39] This refers to a lost time injury within the PLC which means the loss of one or more shifts by an injured party.

The measurement of over 600 staff (recycling business) against 30 staff (in some of the smaller packaging companies), when not using a frequency rate, is obviously flawed, as is the measuring of high risk environments[40] against office environments.

The type of accidents that occurred in the recovered paper depots were largely attributable to the poor infrastructure. None of the depots were custom-built and were simply bought because the location and acreage was suitable. This created problems with such things as: narrow sites which meant that hauliers had to drive on site and then reverse off site; poor condition concrete which was the root cause for many fork lift trucks overturning; injured backs from fork lift drivers hitting pot holes, and tens of serous slip related injuries from persons slipping on extremely wet paper (there was no indoor storage).

To aid the health and safety department, the PCM Four and the author employed (on a seconded six month basis), a HSE inspector from the Kent area. The inspector had experience of the paper industry from the MPS inspections regime. The inspector worked to a timetable (provided by the PCM Four and the author) and focused their attention on the recovered and logistics sections of the business. The findings from the reports were very critical of the conditions of the recovered depots and suggested significant change including capital spend. This was used to apply pressure on The Paper Company and the PLC to achieve site infrastructure improvements. The safety manager for the recovered business ably led and managed the improvement plan for the business, which included substantial funds.

8.2.2.4 Logistics

The logistics business was run at a loss as a support function to The Paper Company mills. The political pressure on the company was not as

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[40] The recovered industry demonstrated in 2001-2 a fatality rate of ten times worse than the national average and accident rates four times worse than the national average (Bomel, 2004).

significant as that applied to the mills and to the recovered paper depots. However, the safety performance of logistics was also seen as being poor within both The Paper Company and the PLC. The approach from the safety manager however was a sensible one, concentrating on systems focused health and safety, good driver training and a good sense of risk priorities. Although often in the spotlight, the author always found the defence of the logistics safety record a relatively simple one.

8.3 BBS AND PAPERMAKING

Most BBS programmes contain a large element of behavioural observations as the backbone of their strategy. This was seen by the author to be problematic, because of the economic dynamics of the paper industry and its continuous process nature. In Mill Two (which used a top down programme which utilised supervisory staff), the problems of observation were clearly significant for the aforementioned reasons. When the PMs run well, the machine operators are either in the control room monitoring the machine's performance from the abundant electronic data available through computers and process camera shots or are on the machine floor observing the machine. At this stage of the process there are trained observers available, but there is nothing potentially hazardous to observe. The standard problem on a PM is when there is a paper break, which is when the sheet tears somewhere on the machine. A paper break, due to the machine speed leads to a very rapid build up of paper on the floor, in the middle of the machine and in the basements, and also presents higher fire risks. At this time, because the paper industry relies on very low numbers of staff, all available personnel immediately tend to the machine paper break to reduce the paper build up and to get the machine producing paper as soon as is feasible.

It can be argued that the paper process does not simply include the PM, but a far wider process. This is of course true, however the problems in the industry were related to machinery accidents and it is these that the industry was making attempts to reduce through the partnership model with PABIAC.

It can be argued that papermaking, with its relatively small and declining numbers of staff (for detailed information see Chapters 2 and 3), is not suited to BBS programmes. The situation when the machine is running well is one that presents no hazards – there are observers available, but no potentially hazardous situations to observe. The flip side of this is when the machine is running poorly and displays typical indicators such as several sheet breaks. The staffing numbers within the industry are such that in instances such as these, there are too few operators to carry out observations because it is necessary to aid the machine operators. This is best illustrated by the following quotation from a machine operator at Mill One:

"The last thing I need when there is a sheet break, is one of those idiots [refers to CASE team members] watching me work."

8.3.1 Mill Two and the BBS and papermaking fit

The BBS programme at Mill Two shaped behavioural thinking at The Paper Company, due to the already documented perceived success of its tenure. The top down programme's perceived success was acknowledged within both The Paper Company and the wider paper industry. The sharing of information between mills regarding health and safety was promoted through the Paper Federation (and later CPI) to encourage the widening of good practice. Many mill representatives from both The Paper Company and other paper companies visited the mill to view the reasons for its good name. The author interviewed several of these persons and through chance meetings, conversations and observations at various forums, built up a picture of people's view of the mill safety. This information has been used in conjunction with the information provided within the narrative chapter to detail other's views of the mill.

In 2005, the author examined the BBS programme in some detail in Mill Two. The programme was one that was provided by one of the UK's major commercial providers. The BBS was based on safe and unsafe observations which were carried out by trained supervisors. Prior to this

training, the company had held workshops and presentations to explain the process that was to be followed and the mill had carried out biannual safety climate surveys (using the HSE model). On close examination the programme had started off with high levels of observation, but by 2005 these had tailed off, and by 2006 were virtually defunct. Several accident graphs were used in mill presentations demonstrating the BBS programme and its effects on reducing the accident rate. The HSE safety climate surveys also demonstrated similar results in safety culture improvements. The data however was flawed because the Safe UnSafe Acts (SUSA) programme was not enacted and could therefore not be having any effect on the accident rate or safety culture.

The author held discussions with the BBS provider regarding BBS in a continuous process such as papermaking. The problem of having no available observers (when the risk level was high), was discussed at length. A proposal was suggested which the provider entitled *virtual observations*. This was explained as a desk-top exercise where observers would, in a group, discuss with the workforce areas of concern they had about their job roles. The BBS provider felt that this was a suitable BBS approach to alleviate the lack of BBS – papermaking fit.

The author suggested that this approach was no more than an organisation should be carrying out within their risk assessment programme. Mill Two, however, had no programme of risk assessments, and only had some poor quality safe systems of work which obviously had not been derived from an initial risk assessment. Following the 2005 safety conference (see Chapter 6) the author, with an awareness of the immaturity of risk assessment at The Paper Company, presented a corporate strategy for risk assessment. This was then accepted as an element of part of the company health and safety strategy. The BBS company were then only used at Mill Two, on the mill manager's instruction, for presentations and culture awareness days, where the management team (in conjunction with the BBS provider) presented on various health and safety topics.

The lack of suitability for BBS within the papermaking industry would appear to reduce its possible effectiveness. However it can be utilised for high frequency activities and incidents such as fork lift use, PPE suitability and use, and falls from the same level where observation and feedback techniques can be utilised. The limited results of these measures undertaken can be seen in the results chapter (Section 7.11).

8.3.2 Mill One and the BBS and papermaking fit

At Mill One the BBS programme was defined as being utilised primarily for the activities outlined in Section 8.3.1. The mill however suffered from the same fate as Mill Two, but arguably to a larger extent. Mill One, because of its commercial importance, was a very fast moving, high technology mill. When the PMs were not producing paper, it was culturally frowned upon not to be helping to get the machines back to production mode. This tonne first culture made an observation scheme very difficult to implement.

The relatively small team of observers and their perceived lowly status in the mill, meant that there was a very low output of activity from them. The lack of communication from the BBS team meant that many in the mill were not even aware that the BBS programme had started after over a year of the programme running.

8.3.3 The Mill Two BBS provider

In 2003, a senior representative from the Mill Two BBS provider presented in The Paper Company health and safety biannual event, to discuss BBS and the extension of its use within the other mills. Within this forum significant pressure was placed upon the mill attendees to use BBS to improve their safety culture. The Mill Two BBS programme was used as an example of a culture being transformed from negative to positive by the use of BBS.

The conference was run some months prior to the author being employed, but information was gleaned regarding the conference from minutes and anecdotes relayed to the author by senior attendees. The use of BBS was presented to the attendees, and supported by PCMs One and Three. Within this presentation there was no hint of assessing mill readiness or levels of cultural maturity. Most of the mills had very little or no levels of legislative compliance for such things as risk assessment, safe systems of work, guarding levels, COSHH management, permit to work and isolation to name a few.

When the author started working at The Paper Company, he held a meeting with the presenter from the BBS provider. The discussion at no time centred on sites having a basic level of legal safety compliance prior to undertaking a BBS programme.

The author's final face to face contact with the BBS providers at Mill Two was in a safety conference which they hosted for their clients. The author attended, as did the Mill Two safety manager and mill manager. The tone of the conference was one that had an almost evangelical zeal to it – the tone and feeling for a *non believer* was one that would not suffer any criticism of its client's success stories.

The author was alarmed at one point, at a presenter discussing unsafe driving in a warehouse environment, and how the application of 'behavioural science' enabled the site to greatly improve safety. The example being spoken of related to fork lift drivers behaviour within the warehouse environment – in particular the amount of premises damage from the trucks, the high proportion of near miss reports and the high speed of the trucks. The speaker spoke of observation and poster campaigns which changed the attitudes of the speeding drivers. The presentation was well received and questions were invited. The author declared that he was new to behavioural safety conferences and then stated the following:

"I am glad to hear of your success regarding the fork lift driver's behaviour. I have two questions. One, why was a solution chosen at the bottom of the risk hierarchy i.e. information through posters and the use of observation as opposed to such things as speed limiters on the trucks and preventing entry to the warehouse to pedestrians. Secondly, you stated that attitudes have changed – have you ever witnessed the fork lift drivers on nights when there is no observation of their behaviour and is it the same as in the day?"

The response to the questions was not coherently argued and the author sensed a level of annoyance from the both the presenter and the audience at the asking of such a question. This experience further cemented the view of the author that BBS is one dimensional in that its commercial providers only offer one solution to a host of several very different safety problems – that is the provision of an observation and measurement behavioural programme. The belief that BBS providers invert the risk hierarchy is discussed in Section 4.7.6.1

8.3.4 The Mill One BBS provider

The BBS provider was proposed by the author after an evaluation was made regarding three commercial providers. The choice was made because the Mill One provider advocated the 'six pillar approach' which incorporated root cause analysis. After discussion with the provider, it was felt by the author and the mill manager that if BBS was to be pursued, that this was the best fit. The author advised that BBS was not the correct pathway for the mill at this stage, but if it were to occur, this provider had good credentials (see Section 6.4 for reasons as to why BBS was not a good solution).

The key reason for the choice of provider was related to the integration of BBS in to the other elements of the SMS that the mill had prioritised following the 2005 conference (see Section 6.6.4 for a more detailed discussion of this forum). The use of this BBS company was ultimately decided upon by the mill manager who anticipated a seamless fit with the mill's SMS constituent parts, such as the risk assessment improvement programme.

Once employed, the BBS company started to indicate that it may be better not to include the trade unions and the usual persons who were involved with other safety teams. This approach instantly split BBS from the other teams approach and dictated who would join the BBS team as a committee member/observer. A senior manager joked with the author that, "the remaining gene pool available for the behavioural team was limited to the dross and the unwanted, because all the other teams have nabbed the good ones".

The BBS quote for the role out plan discussed the optimal committee as being 12 persons, with the remaining volunteers being observers. The presentations of the BBS programme however gained only 12 volunteers in total and these acted as committee members plus observers, after three months this number dropped down to nine members.

8.3.4.1 CASE

CASE was the name chosen by the BBS committee. The results chapter clearly demonstrated that the BBS intervention was not a success; this discussion element proposes reasons for this failure.

The members of CASE were perhaps in the eyes of mill staff never going to succeed. The trade union standpoint has already been discussed in some detail (Section 6.8) and coupled with the lack of safety positive middle managers (Section 7.7.2) the lack of positive impact was perhaps inevitable. Although survey results demonstrated broad support for the mill manager, and the launch of BBS was led by him, this was simply not enough impetus and momentum to even commence a BBS programme and certainly not to maintain the BBS effort. The CASE team put forward a contract to the mill manager expressing concerns they had, primarily with their own positions in the company, should the BBS programme fail. Figures 6.1 and 6.2 indicate the negative portrayal of the CASE team in the mill and this is further underlined by the statement made by the same when a decision was made to delay the team activities and launch (Section 6.9).

The contracts and statements published as detailed above suggested to anyone that read them in the mill that there was a high level of negativity and mistrust from the BBS team and their hopes for intervention success. The relationship with, or certainly the team's expectation of management lack of support and potential vilification following failure, was tangible within the text. The following section examines reasons why the intervention failed, using a BBS providers features of a BBS programme as the benchmarks. It goes on to indicate key issues that cannot be present if BBS is going to succeed and makes suggestions as to how a programme may succeed and what the environment should resemble to give the programme the best conditions for success.

8.4 BBS MEASURES OF SUCCESS

Krause (1997) suggested four features of a BBS programme (Section 4.7.3). These are replicated from Chapter 4 and placed in Table 8.1 with a narrative on how the CASE team performed on each of the four criteria. Other features have been proposed as being essential features of a BBS programme including those of Marsh (six pillars), the HSE (2000) Figure 4.9 and its nine components.

The four key elements proposed by Krause have been chosen because: he is a highly successful (and the first) commercial BBS provider through his company BST; he is a widely published author in peer reviewed journals and because he has completed the largest BBS study whereby 73 companies' interventions were measured. Krause (1997) does stress that the four criteria, "must be implemented and maintained via significant employee involvement".

Behavioural programme feature	CASE performance against feature
Identifying and operationally defining critical safety related behaviours	This was completed and six areas of critical safety related behaviours were chosen (See Chapter 5 methodology for a full description of these)
Observing to gather data on the frequency of those observations	This was unfortunately only done 17 times initially (2006) and then weekly observations in weeks 1-34 (2007) , that people were aware of – there may have been more but if so these were not communicated
Providing feedback	There was feedback on the initial 17 observations (2006) and the weeks 1-34 (2007). There was little visibility around the mill indicating BBS team activity
Using data for continuous improvement	The data was never communicated – the author noticed a distinct lack of programme visibility and lack of workforce awareness regarding the programme

Table 8.1: CASE performance measured against Krause BBS programme features

8.5 BBS INTERVENTION AND SAFETY CULTURE

At the beginning of this chapter, the organisational readiness of a workplace to initiate BBS, was discussed. The results from Mill One's several climate surveys (Table 5.1) demonstrated worrying areas of poor safety culture in critical areas.

The BBS providers interviewing resulted in a score being produced on 20 topics of mill health and safety performance (Figure 7.2 and Table 7.9). The scoring produced a level of cultural maturity entitled calculative. Calculative is described within Section 7.6, but to reiterate suggests that:

"An organisation with a calculative level of maturity would tend to be characterised by well developed procedures and engineering controls designed to manage safety. Safety is managed on a risk basis and incidents tend to step from root causes that are examined to a basic level. Typically it is felt that the company has systems in place to manage hazards, and employees perceive that there is a lot of paperwork involved in safety. Trust in management is starting to develop to a stage where they may be listened to. Information based on a wide range of hazard type measures (based on numbered indicators) will start to be reliable, although people will tend to have some reservations about the measures used."