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Title: A Paradigm Shift - An Applied Systems Thinking Approach to Health and Safety Management

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A PARADIGM SHIFT - AN APPLIED SYSTEMS THINKING APPROACH TO HEALTH AND SAFETY MANAGEMENT

Introduction

Commercial organisations predominantly focus on business outputs such as productivity and service as the primary measures of business performance and value. High quality and high volume outputs appropriately positioned in a thriving market can command impressive returns. However, commercial threats and business pressures such as those posed by new competitors and the ever increasing need demonstrate added value to customers, forces many businesses to seek out opportunities to establish competitive advantage and commercial differentiation. Occupational health and safety performance offers commercial organisations an opportunity for differentiation and assists in its pursuit to establish competitive advantage through increasing its business value. Research has already shown that businesses with integrated business management with occupational health and safety management systems (OH&SMS) successfully differentiate themselves whilst enjoying increase in profitability and operating performance according to Gilding *et al* (2002); Biddle *et al* (2005) and Linhard (2005).

Traditionally, health and safety performance and business value are managed as independent functions sometimes in opposition with each other (Veltri *et al*, 2007). According to the authors the prevailing views amongst business owners and investors is that the rising cost associated with increasing regulation only provides social (worker) benefit at the expense of the business' profitability. However, since the 1990's there has been increasing awareness of the need for interdependence between business operations and health and safety management which increasingly highlights the need for research into this area (Brown, 1996; European Agency for Health and Safety at Work, 2004; Shannon et al, 2001).

Being able to articulate the relationship between occupational health and safety and business process has always been an elusive undertaking (Veltri *et.al.*, 2007). Although research carried out by the European Agency for Health and Safety at Work (2004) highlights the business benefits associated with fully integrated systems of management, there is no research into successful methods of integration, not only in terms of documentation, but also in terms of integrating health and safety into strategic and operational decision making.

Objectives

This paper explores how the philosophy of applied systems thinking and the practicality of Interactive Planning (IP), a decision making and problem solving tool emanating from the

management sciences discipline, enables the interlacing of OH&SMS with business management systems. In doing so the positive contributions to strategic and operating performance will shift the financial motivator normally associated with health and safety away from the paradigm of loss control to one that increases business value and thus profitability.

This objective is achieved by observing an action research programme implemented at Eggborough Power Station (EPS), the only coal fired power station in the British Energy fleet. Underpinning this action research were the local Station Director's key objectives in relation to overcoming the current health and safety challenges at his station by:

- (a) Aligning health and safety objectives with business objectives;
- (b) Making health and safety sufficiently attractive to be 'owned' by most people;
- (c) Improving departmental coordination and co-operation;
- (d) Promoting inclusive thinking;
- (e) Seamlessly integrating health and safety with management decision making;
- (f) Changing the perception of health and safety across the site; and
- (g) Instilling personal responsibility.

At this point, traditional health and safety management gurus would question both the academic and practical value of this paper. Why would a researcher waste a valuable research opportunity when management models such as BS OHSAS 18001, HS(G)65, ILO-OSH 2001, ANSI Z10 and so on exist to perform precisely that function? The next section answers this question and many others.

Current thinking

OH&SMS are designed to deliver safe working practices to the shop floor in a systematic and co-ordinated fashion. Regulators, national and international standards agencies have collaborated on determining the composition, underpinning theory and structure of various health and safety policy models, management system models and specifications. Organisations use these to provide a sustainable way of working that protects their staff from sources of harm. Despite this collaboration, standards based management systems adopted by organisations have failed to reduce the number of catastrophic events worldwide. Researchers, regulators and government review boards argue that the dysfunction between health and safety management systems and

business process is one of the key reasons for such events. Let us review some of the criticisms levelled at traditional health and safety management system models widely published by researchers in the fields of health, safety and management.

Widely published researchers such as Else (1994), Quinlan & Bohle (1991) and Rahimi (1995) cite the lack of integration into broader workplace management systems, as one of the reasons leading to its failure. Else (1994 p.21) cites business integration as a precondition '*...to make health and safety happen in the workplace*'.

The assessment of Rasmussen and Jensen (1994 p.46) regarding a Scandinavian experience of integrating OH&SMS at a large manufacturing facility is largely negative. They find,

'...Safety department establishes a formalised system with reference to the Du Pont system, ISO 9000, Eco-audit or another accepted, formalised system. In such systems the importance of the relations to other management systems are often stressed, but in practice, these links are weak. Many decisions with relevance for working conditions are taken without involving the safety management system. Neither major nor minor changes in production processes are dealt with in the safety management system, even though they can have a major impact on working environment. The 'working environment management system' has been uncoupled or isolated from the decision making system in the organisation.

Gallagher, Underhill and Rimmer (2001) cite another study carried out by Kamp and Le Blansch (2000) analysing the integration of health and safety and environmental management systems in Denmark and the Netherlands.

They conclude that, '*the authors explored the implications for health and safety of linkages with the higher priority issue of the environment. Similarities relating to problem causation, implementation issues and prevention-based solutions underscore the potential for synergy.*'

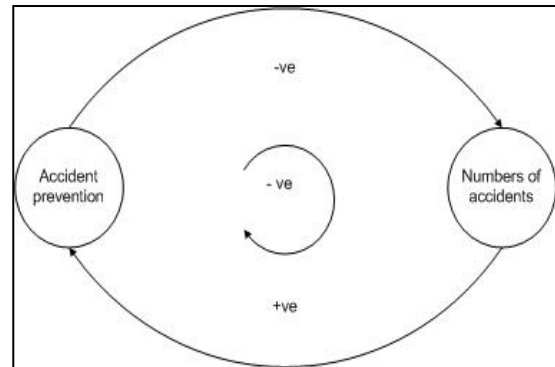
Kamp and Le Blansch (2000) argue that standards based management systems result in more attention given to 'complying' with the standard and less attention to the strategic, tactical, and operational synergies between business process and the standard itself.

Juxtaposing these findings against criticisms of business management systems presents startling results. Prof Mike Jackson (2004), an applied systems and management science theorist, claims that narrowly focussed or simple management solutions fail because they are not holistic or creative enough. He further argues that such solutions are not holistic because they concentrate on parts (functions) of the organisation rather than on the organisation as a whole.

For example, consider the simple casual loop linking accident prevention and accident frequencies in Figure 1. It shows that as the number of accidents increases, the amount of accident prevention activity increases; and as the accident prevention activity increases, the number of accidents decreases.

Figure 1: Causal Loop Diagram (Adapted from Waring 1996)

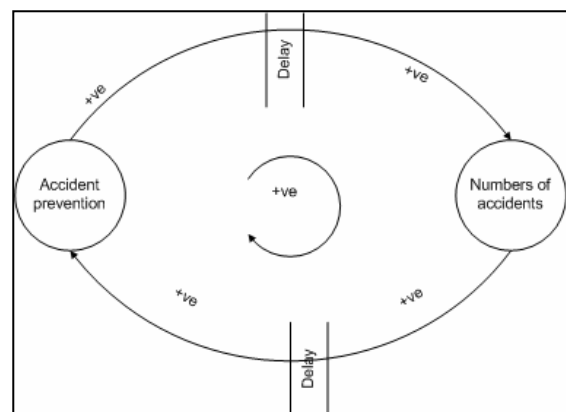
Systems thinkers will recognise that the causal loop in Figure 1 is balanced because it represents a relationship in a highly controlled environment. In systems terms, referred to as a ‘closed’ system. Closed systems are easily balanced because they not take into account the effects of external factors such as human factors, employee interpretation of the accident prevention message, modes of communication and monitoring of the accident prevention programme on the causal loop. Accommodating external factors, as ‘delays’ in a causal loop diagram will yield a positive outcome – thus creating an ‘open’ system which is imbalanced – see Figure 2.



Fundamental human characteristics like multiple perceptions and unpredictable human factors are too complex for closed systems or closed loop systems thinking of which HS(G)65, BSI OHSAS 18001 and ANZI Z10 and ILO OSH 2001 are classic examples.

Figure 2: Imbalanced Causal Loop Diagram with Delays

Closed loop systems cannot be reliably used to develop systems of management involving people because by definition, closed systems thinking is essentially desensitised to the multiple perceptions, views and beliefs of stakeholders within an organisation.



In this study, EPS required a business focussed OH&SMS that fully incorporated the activities, systems, perceptions and behaviours of its term contractors, employees, stakeholders and corporate policies.

Selecting a closed systems approach as a transformation technique would fail to meet the expectations of EPS in relation integrating OH&SMS with business processes within an organisation which in itself operates as an ‘open system’.

Other business management researchers also heavily criticise other possible modes of integration. In 1997, the HSE commissioned the European Centre for Total Quality Management (TQM) to study the ‘link’ between TQM and OH&SM by using an adaptation of the Quality Award assessment criteria (Osborne and Zairi 1997 p.1). According to this study, while a number of reasons for a company using TQ in the management of health and safety exist, there are also many barriers to achieving full integration – see Table 1.

Table 1: Comparing reasons and potential barriers to integrating TQ and OH&SM (Osborne and Zairi 1997)

Reasons for integration	Barriers to integration
<ul style="list-style-type: none"> • A demonstrable executive identity and understanding of health and safety will increase the probability of OH&SM being integrated into the core business. • The high intrinsic value for safety and welfare of stakeholders encourages health and safety to be managed [alongside] other business processes. • Customers demand that the supply chain develops similar practices, values and practices as themselves. • Strategic goals of business excellence require that a consistent approach is adopted throughout the business; • In a business that already adopts TQM, it is the perceived importance of health and safety to the business as a whole that will drive the integration of health and safety with business process. 	<ul style="list-style-type: none"> • TQM has a positive motivator that is to delight the customer as opposed to health and safety which is driven by a negative motivator e.g. compliance with legislation. • Executive value, knowledge and leadership are more focussed on the positive aspects of TQM than the negative outcomes associated with health and safety to an extent that this could result in a leadership ‘vacuum’ at board level. • The measurement of performance in TQM is associated with outward facing factors such as customer satisfaction, product and finance and in health and safety; measurement of performance is associated with inward facing factors such as reducing the risk of failure or the value of loss.

From the findings of the HSE commissioned study, it was evident that TQM was not a natural enabler for health and safety integration. Co-incidentally, a parallel argument against TQM emerged from the management and social sciences disciplines almost a decade earlier.

Flood (1990) and Ackoff (1999) eloquently criticised of the founding principles of TQM in relation to modern business. Flood (1990) argued that organisations aspiring towards the effective implementation of TQM fail to accept the fundamental changes in management style required.

He argues that managers cannot really accept the devolution of power expected by TQM and furthermore, organisational politics only pays *'lip-service'* to the process of TQM.

Ackoff's (1999) comments on the failures of TQM are scathing. He argues that with TQM originating from statistical quality control, it has evolved into a heterogeneous set of components *'...which do not hang together as a cohesive whole'* as it tends to be an *'aggregation of interdependent systemic set of tools, techniques and methods'*.

This raises a number of questions of a multidimensional organisation, with multiple interrelated problems, that TQM is not equipped to answer. For example, TQM tries to change management's activity from supervision to leadership without providing both theoretical and practical direction to managers to bring about this change. Ackoff (1999) also claims that the time taken between multiple reorganisations of most companies in the US is less than the time required to install TQM.

Ackoff's (1999 p.266) criticism of TQM is fundamental from a health and safety standpoint. He argues that TQM assumes a management that learns and adapts rapidly and efficiently, but it provides no concept of the management-support system required to accomplish this. To compound this deficiency, health and safety legislation in the UK does not place a positive or overt regulatory obligation on organisations to adjust their operating practices as a means of learning from failures in order to prevent repeated injuries, diseases or fatalities. Without legal or management system direction, the question *'How will an organisation become an integrated learning organisation?'* must be asked and TQM, according to Flood (1990) and Ackoff (1999), will not provide the answer.

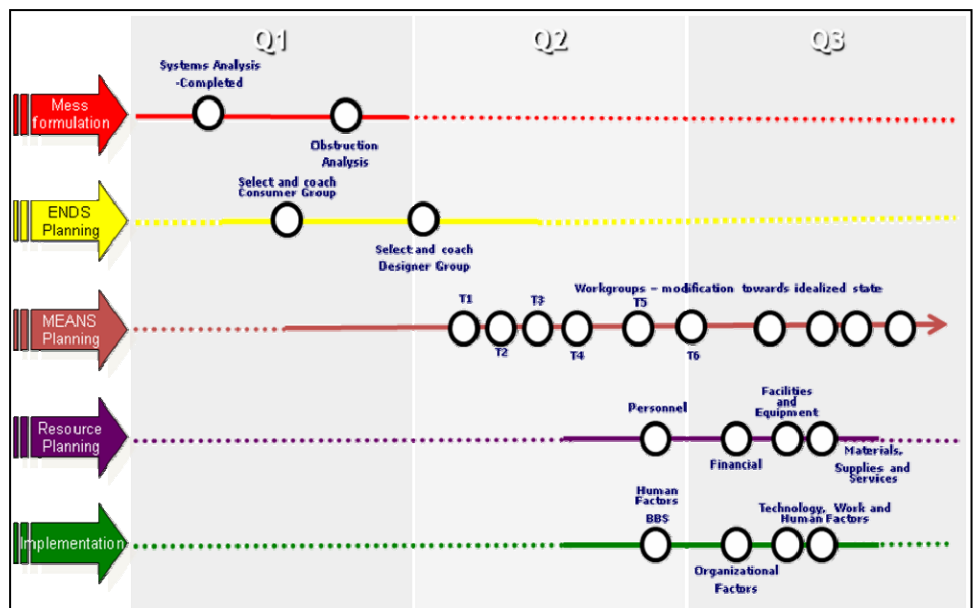
Given the compelling evidence published by researchers above, I concluded that the solutions to the problems faced by EPS could not be solved using customary models and specifications. I had to look outside the health and safety discipline for a solution that would solve complex pluralistic problems such as enabling creativity and lateral thinking amongst management and the workforce; developing a system for managing health and safety that could never be independent of the business management system; and creating a new way of thinking amongst everyone at the power station that facilitated sustainable commercial decisions, albeit in a responsible and progressive manner. Finding a transformation technique to achieve this proved challenging. Most OH&SMS transformation techniques are systems focussed or behaviourally focussed but rarely combination of the two. To achieve the Station Director's objectives, the ideal transformation technique should be able to achieve a combined transformation. After reviewing the advantages and disadvantages of techniques and speaking to lecturers on an MBA course, I approached an applied systems thinking lecturer, Dr Giles Hindle, previously a student of Prof Mike Jackson, who suggested that generally, the discipline of applied systems

methodology and more specifically, the Interactive Planning technique would possibly meet all the Station Directors stipulations.

My research into Interactive Planning (IP) revealed that Wharton Emeritus Professor Russell Ackoff – one of the world’s top management thinkers and author of more than 20 titles on Management Systems developed it. Prof James Leeman, a SHE Director at DuPont Speciality Chemicals in the US used IP to resolve a major OHSMS problem by modifying IP under Ackoff’s instruction and successfully used it to transform DuPont’s OH&SMS when the speciality chemicals division decentralised its various US operations.

I discussed this idea with the Station Director and some of his senior managers who agreed that IP was a suitable technique for EPS. Approval for the 9 - month transformation programme was obtained and based on the graphical plan alongside.

Figure 3: The EPS Action Research Plan



The Transformation

Systems thinking is a conceptual framework based upon a corresponding body of knowledge that make patterns of behaviour explicit (Jackson and Gregory 2003 p.25). Senge (1990) recognises that systems thinking is important to managers because the nature of systems incorporates multiple chains of interrelated actions often with unforeseen, long-term effects. This argument potentially makes systems thinking a very effective transformation method because it seeks to extract and interlink health and safety interactions with the business as a whole as opposed to adopting an inward focussed approach

Interactive Planning achieves this by creating a platform for driving change from the bottom up, allowing input from those, the end-users, whose work is ultimately affected by the health and safety management system. One of the true strengths of the Interactive Planning is being able to

take into account the impacts of external influences on the company and vice versa. For example, it will factor in impact(s) of the British Energy Corporate Safety Policy. This will enable the company to function within the corporate framework for safety and health, but will equally enable the company to develop management system components independently to fulfil its unique needs.

In its methodology, Interactive Planning uses a five-stage process to facilitate change within the organisation. The five-stage process consists of

- 1) Mess Formulation: which makes sense of the organisational and management situation;
- 2) Ends Planning: which facilitates the creation of an idealised system of management;
- 3) Means Planning: which identifies barriers to implementing the idealised system and devises strategies to overcome these barriers or adjusting the idealised design to deliver the same outcome through an alternate route;
- 4) Resource Planning: which determines what resources are needed to seamlessly implement the idealised system; and
- 5) Implementing and controlling the idealised (or proximate) designs.

Whilst the detail of the five-stage process is outside the scope of this paper, it is worth considering the key commercial and operational benefits of this transformation process.

Findings

On completion of the action research component of the study, I found that using IP not only transformed health and safety management at Eggborough Power Station but it also contributed to business value through linking in with corresponding operational and organisational improvements.

These contributions are discussed in a two dimensional context. The first dimension describes the operational and organisational improvements brought about by the transformation process and the second describes the sustained value contributions to the business through the idealised OH&SMS design. However, it is necessary to explore the health and safety outputs from the IP process. The idealisation phase of IP resulted in the creation of ten 'Directives' that aligned health and safety with EPS business, operations and work processes. The company's definition of a Directive is, *'A set of guiding principles that determines everything we do at EPS'*. Those

developing the idealised design found that structure and content of the Directives naturally deviated from the traditional ‘policy- responsibility-arrangements’ approach of HS(G)65 and modular structure of the OHSAS 18001 specification. Table 2 lists the ten Directives and their respective purposes.

Table 2: The EPS Idealised Directives

Directive No.	Title	Purpose	Ownership
1	Risk Management	<i>‘The purpose of this Directive is to identify risk control systems required to manage business risk and where practicable, reduce them to an acceptable level.’</i>	All
2	Regulatory and Operational Mapping	<i>‘To enable correct interpretation of health and safety legislation changes in relation to each department and its operations.’</i>	Industrial Safety
3.	Training	<i>‘To ensure that sufficient and suitable training is provided in order to make effective and safe use of hardware and software resources within EPS.’</i>	HR/Training with input from all Departments
4	Personal Skill and Competence	<i>‘To provide clear standards and guidance to all departments with regard to minimum skills and competence required by all staff and contractors at EPS.’</i>	All
5.	Front End Project Loading	<i>‘To effectively plan all projects (and in particular Outage works) prior to its commencement. This directive outlines the procedures and measures to achieve these aims’</i>	Outage and Work Planning
6	Work Planning Interface	<i>‘To create a systematic approach to ensure that all stakeholders (contractors) are fully involved and committed to all forms of work planning and effective sharing of information between stakeholders’</i>	Work Planning and Maintenance
7	Service Provider Partnerships	<i>‘To foster excellent working relationships with Contract Partners in order to ensure that works are undertaken to a consistently high standard, safely and efficiently’</i>	Supply Chain, Operations, F&SP, Work Planning and Maintenance

Directive No.	Title	Purpose	Ownership
8	Knowledge Management	<i>'To ensure that appropriate, necessary, and up-to-date information is available to all who require it so that work is undertaken in an effective and efficient way throughout the entire company.'</i>	TSSD with the support of all Departments
9	Staff Selection	<i>'To ensure that appropriate and capable staff are employed or selected by EPS or Contract Partners'</i>	Led by HR but delivered by all Department Heads and Contract Partners
10	Performance Monitoring and Auditing	<i>'To monitor and audit the performance of the following aspects of the business:</i> <ul style="list-style-type: none"> • <i>Quality;</i> • <i>Health and Safety;</i> • <i>Environment;</i> • <i>Business Efficiency and</i> • <i>Contractor Performance</i> 	TSSD, Supply Chain, Industrial Safety and Performance Optimisation Group

Characteristics of the Idealised Design

The idealised OH&SMS design is unique to EPS. Its characteristics are entirely business focussed suggesting that the OH&SMS is led by EPS business operations and vice versa. One may argue that the Regulatory and Operational Mapping Directive is regulatory focussed. In reality, the intention behind this design is to interpret new legislation in the context of respective operations and if modifications are required then changes will occur at a systemic level or work design level as opposed to implementing a temporary and potentially costly compliance measures.

In keeping with Leeman's (2002, p.93) study, each Directive was developed with a purpose, function, process and structure in mind. Each Directive adopts a distributed model with respect to ownership by making the department(s) accountable for its implementation. This distributed ownership is vital to the idealised OH&SMS making sustained operational contributions.

Functionality of the Idealised Design

Sustained contribution to business value is also assured through the creation of integrated work instructions. The idealised OH&SMS takes a view that holistic integration will dispel the separatist mentality that exists amongst staff. It also enables new joiners to espouse the EPS holistic approach to work philosophy.

In order to maintain the principle of inclusive working, each department will audit the effectiveness of the idealised design as part of their operational plan and not through separate health and safety inspections or audits.

Perhaps the most elusive solution to health and safety practitioners is to secure maximum investment in a change process. The idealised OH&SMS achieves this from the outset by using the feedback from the coalface to construct the OH&SMS. The outputs from the OH&SMS will be those specified by its end users and not imposed by management, thereby countering resistance to its implementation.

Business Benefits

A fundamental contribution to business value is realised from the re-organisation and repositioning of health and safety ownership within EPS. Moving health and safety away from a regulatory domain aligns health and safety with all forms of business activity. This enables better integration with EPS operations and decision-making processes (Maharaj, 2007). The main beneficiaries of this re-organisation and repositioning are employees and contractors working at EPS. They will have included within their training, skills development, apprenticeships, mentoring, job planning, job execution and job promotion – an element of health and safety that is relevant to them at the appropriate time. They will avoid the barrage of health and safety information and if necessary, training, that is normally associated with working on a hazardous site. Having access to the relevant information, coupled with the skill to analyse and apply it will engender responsible strategic, tactical and operational decisions that would otherwise have cost the business time, money and perhaps damage its reputation.

Table 3 overleaf summarises additional business benefits by comparing the characteristics, functionality and value adding potential contribution of the idealised OH&SMS design to the previous OH&SMS.

Table 3: Previous OH&SMS vs. Idealised Design

Previous Design	Idealised State
Characteristics	
<ul style="list-style-type: none"> • Complex. • Unclear policy. • Policy not aligned to business. • Based on HS(G)65 model. • Policy and procedures (LMIs) were disjointed. • 'Owned' by TSSD (Support Department). • Reactive and interventionist. • Perceived as a 'cost'. 	<ul style="list-style-type: none"> • Simple and functional. • Business focussed policy statement. • Directives are business specific. • Based on EPS Consumer and Designer model. • Procedures are directive lead and not regulatory led. • Owned by key departments across the entire organisation. • Proactive and supportive. • Perceived as an 'investment' as it directs operations – not just health and safety.
Functionality	
<ul style="list-style-type: none"> • Three-part document supported by numerous conflicting procedures. • Separate to work instructions and operating procedures. • Centrally audited and monitored with specific focus on health and safety. • Relies on H&S Advisor, Technicians and Assistants within TSSD. • Imposed need for controls and procedures. 	<ul style="list-style-type: none"> • One procedure per directive supported by specific guidance. • Integrated work instructions. • Audited and monitored by all departments according to operational plans. • Each Department has a Business Efficiency Team (BET) which consists of a H&S HR, work planning, supply chain and maintenance specialist. • Controls and procedures specified by end users reducing resistance to implementation.
Value adding	
<ul style="list-style-type: none"> • Satisfies regulatory obligation 	<ul style="list-style-type: none"> • Does not restrict but contributes to operational decision-making. • Enables effective work planning. • Simple problem solving structures. • Business Efficiency Teams resolve problems locally allowing H&S professionals to focus on 'high value' improvements. • Reduces costs associated with

Previous Design	Idealised State
	<p data-bbox="954 257 1337 369">supply chain wastage and pre-empting tactical challenges such as large scale maintenance works e.g. outages.</p> <ul data-bbox="906 403 1327 672" style="list-style-type: none"> <li data-bbox="906 403 1327 459">• Owned by Departmental Heads as opposed to 'support team'. <li data-bbox="906 481 1327 526">• Improves employee participation. <li data-bbox="906 548 1327 593">• Integrates skills and competence. <li data-bbox="906 616 1327 672">• Instils interdepartmental co-ordination.

Operational Contributions

Improving health and safety practice within EPS was not the sole intent of this action research study. For health and safety to be recognised as integral to EPS's business, the action research had to deliver business improvements in order to clearly demonstrate that effective safety management is about a systematic approach to management and operational decision making.

Operational contributions to business value were identified through the Ends Planning stage of IP. I mirrored Leeman's (2002) approach by subdividing this stage into two parts, namely the Consumer Group phase and Designer Group phase. Members of the Consumer Group undertook positionality mapping of individuals with their departments and the respective job functions by using their 'mapping' tools, and through a co-operative inquiry interview process, extracted **42 operational** improvements from all departments and term contractors on site. Although the Consumer Group identified operational improvements, the Designer Group transposed these into idealised designs. These designs were then subject to ratification by the respective Project Teams during the Means Planning phase.

Although these operational improvements all have health and safety implications, hazards are eliminated or risk is reduced through task modification or redesign. Value gains from a commercial standpoint are realised through designing the task in accordance with the needs of those people carrying out the task (local operators). Redesigning or modifying tasks according to local operator requirements enables more efficient and effective execution. In the case of EPS, Senior Management adopted all 42 operational improvements.

Organisational Contributions

Organisational contributions made by the transformation process include the realignment of health and safety ownership; recognition of departmental interdependency and work integration; and consultation and participation. These organisational factors are fundamental in delivering the strategy for any organisation regardless of the type of business it is or sector it to which it belongs (Maharaj, 2007). The individual contributions made to each of these organisational factors appear in Table 4 below.

Table 4: Organisational Contributions

	H&S Ownership	Departmental interdependency and work integration	Consultation and participation
Contributions	<ul style="list-style-type: none"> Widespread self-realisation that H&S is not a support function. H&S is a function of the task and staff are empowered to make decisions holistically. All departments are accountable for controlling risk created by their operations and providing detailed information on risks transferred to other departments. 	<ul style="list-style-type: none"> IP helped overcome an isolationist view of departmental operations. Departments realised that better interaction will allow for effective planning and risk control. Improved interaction between outage and work planning functions will enable adequate resourcing of long term or high hazard projects. Skills (including health and safety) needs analysis and apprenticeships will be a partnership function between each department and the training department. 	<ul style="list-style-type: none"> Staff felt more engaged in the bottom-up transformation process and IP allowed them to contribute freely and constructively without fear of reprisals. Knowing that the consumer idealised design process in IP would allow them to be creative, many participants began to realise that their jobs affected tasks around them. Many staff previously worked in isolation and had very little knowledge of where information pockets existed around the power station. IP broke down those barriers and staff now know who the subject matter specialists are and will call upon them in time of need.

Conclusions

Not dissimilar to the Leeman (2002) study, EPS has successfully designed a sustainable system of management that centres on the identification and elimination or control of threats to processes and overall business performance.

Such compelling evidence that health and safety does deliver business value will silence those sceptics who take a purely economic perspective on occupational safety and health. It also adds greater credibility to the commercial and economic motivators for good health and safety management by shifting the safety-business relationship from a loss control paradigm towards one that achieves operational effectiveness and competitive advantage.

These findings conclude that the study has addressed a major shortcoming in health and safety literature by adding to the growing body of evidence that integrating health and safety management can contribute to the business value of an organisation, both at operational and organisational levels. Perhaps public facing entrepreneurs such as Easyjet's founder Sir Stelios Haji-loannou who, BBC Radio 4's On the Ropes programme in 2003 said; *'If you think safety is expensive, try an accident'* should champion this change in paradigm.

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