

Development of Standardised Key Performance Indicators within the Dry Bulk Terminals Industry

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Abstract

The primary objective of my research project was to work with five worldwide dry bulk terminals to assist them to adopt and/or extend Key Performance Indicators (KPIs) to improve their business performance. The project also explores the case for standardisation of KPIs within the wider Dry Bulk Terminals sector.

The project aims to answer a number of business and academic research questions. On the business front, these include: does effectiveness dimension improve performance of KPIs; how does organisational culture affect implementation of KPIs; and what role do stakeholders play in planning and implementation of KPIs? On the academic front, these include: how do management style and organisational culture interact during the change process; what role do information systems play in the planning and implementation of KPIs; to what extent were planned PAR stages followed in practice; and challenges in becoming an insider researcher?

In answering above questions, the project uses PAR as a research framework through a single research cycle with multiple stages. Representatives from each organisation actively participated during each stage of the project. Even though I was an outsider to participating organisations, I played a leading role and directly participated during each stage of the project.

The project makes a novel contribution in a number of areas. First, it has focused on dry bulk terminals rather than ports in general, therefore bringing forward the important role of this industry sector as well as addressing a gap existed in this area in previous research. Secondly, it has introduced the effectiveness dimension into the planning and implementation of KPIs in addition to the efficiency in order to bring in key stakeholders' expectations and views into the picture. Thirdly, it focussed on dry bulk terminals which are significantly more complex and diverse in nature in comparison with container terminals where the majority of previous research concentrated. Fourthly, the project examined a large number of areas where performance KPIs are utilised, led by the participants rather than by a limited or predetermined set of KPIs primarily driven by efficiency parameters. Finally, the project worked with multiple categories stakeholders, driven by the participating terminals rather than limiting those to two or three traditionally recognised stakeholder categories.

As a result of adding an effectiveness dimension to performance KPIs, the project made a positive impact at participating terminals in areas such as competitiveness, stakeholder relationships, business continuity and performance. Participating terminals made effective use of elements of their organisational culture and adjusted their management style during the project to ensure success. Stakeholders played a pivotal role in the success of the project by actively participating in it. Information systems played an important role in the implementation of KPIs in coordination with the organisational culture in each participating organisation. The level of standardisation of KPIs in participating terminals was high and this in turn provided a positive platform to explore options for wider standardisation within the industry sector.

Chapter 1. The project environment and objectives

The current research study examines a particular aspect of the business undertaken in ports. Ports form an important link in the global shipping supply chain. Many ports provide services to cater for a variety of commodities including containerised, ro-ro (roll-on-roll-off), dry bulk, liquid bulk, general cargo and project cargoes. Terminals form part of a broad service delivery structure within ports and are generally dedicated to providing services for one or more type of commodities subject to availability and suitability of structure and assets such as berths and handling equipment. In some cases, ports are dedicated to serve a certain supply chain structure and therefore some may have multiple terminals handling the same commodity.

Performance evaluation is an important consideration for the ports. It can be used for different purposes including assisting organisational change, assessing historical performance and setting targets for the future. It provides a decision-making tool for the management in the organisations to help them improve their competitiveness. Key performance indicators (KPIs) are widely used to assist with the performance evaluation in many industries. KPIs can be defined in a number of areas in each industry which aligns with the specific requirements for performance evaluation. For example, in automotive industry they can be used to measure manufacturing performance (Amrina & Yusuf, 2011), in large scale processing industries such as chemical and steel making, they are used to evaluate technical performance, maintenance efficiency and business profits (Zhang et al., 2017). The ports industry use performance KPIs in several areas including operational performance, technical excellence, health and safety and environmental compliance.

Most of the previous research in performance management KPIs considers a port in its entirety and concentrates primarily on container ports. My project focuses on the Dry Bulk Terminals within the ports industry. The participating terminals in my project are either dedicated dry bulk terminals or terminals operating in a port providing wider services including handling dry bulk cargoes. Dry Bulk Terminals handle minor and major bulk commodities, provide cargo handling services to their clients, and offer additional value-added services within the shipping logistics chain. Terminals most of the time choose to partner with third party service providers to deliver value-added services such as transportation and warehouse management to their clients. The major bulk commodities mainly consist of coal and iron ore and the minor bulk commodities include grains, fertilisers, cereals, clinker and cement. Over 70% of movement of major and minor commodities around the world are performed by sea. Dry bulk seaborne trade has shown a steady growth over the years. Figure 1 shows the trend in growth of minor and major commodities over the last four decades.

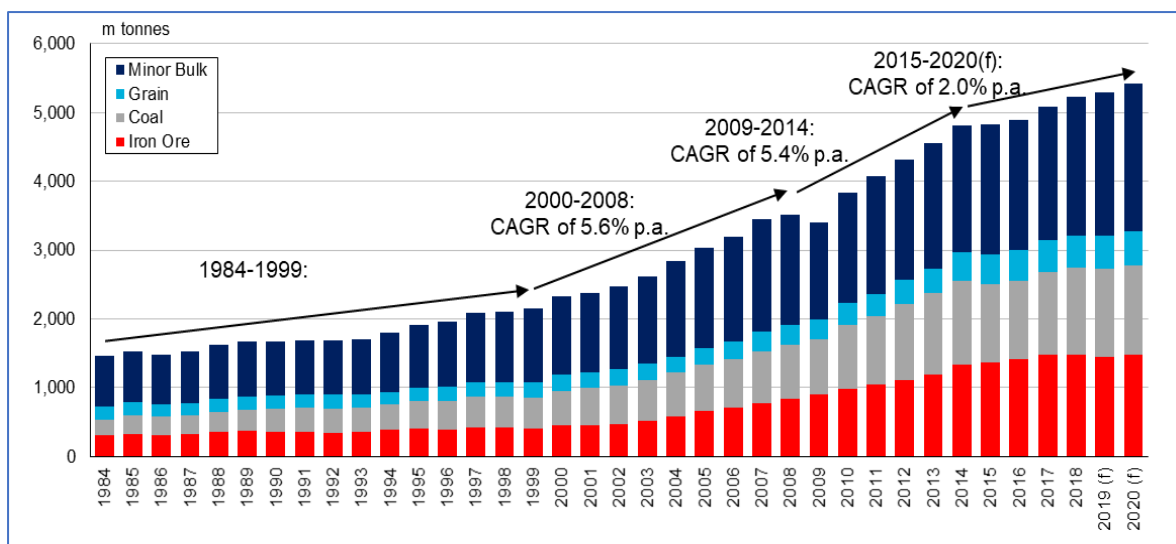


Figure 1 - Bulk Seaborne Trade Development (Source – Clarkson Research Services)

Coal and iron ore are the two major bulk commodities that drove the growth in seaborne dry bulk trade in the early 2000's. Since 2014 the growth has slowed down. Grain and minor bulk commodities continue to grow at a steady pace. As a result, the overall compound annual growth rate for the seaborne trade slowed down from 5.4% between 2009 and 2014 to 2.0 % during the last 4 years.

My company (Nectar Group) operates in a number of developing countries around the world, primarily in ports handling bulk commodities. I have been with the company for 21 years and I am currently one of the Directors of the company. The main expertise of Nectar Group is handling bulk commodities in dry bulk terminals. We deal with a wide variety of commodities in both major and minor bulk sectors. Over the last 48 years the company has operated in 72 different countries at 152 different ports and locations. We handle over 10 million tonnes of bulk commodities each year. Nectar provides services in six business areas; bulk handling and bagging of commodities in ports, development and management of dry bulk terminals, provision of logistics services such as warehouse management and transport, manufacturing and sale of bagging units, aftersales support and consultancy services for dry bulk handling facilities. My current role in Nectar as the operations and technical director has focused on development and management of dry bulk terminals over the last ten years.

1.1 Project objectives

The Dry Bulk Terminals Industry is fragmented, with over 1500 terminals worldwide handling bulk commodities and providing terminal handling services to their clients. Some of the terminals utilise key performance indicators (KPIs) with varying degree of success. Terminals mainly utilise KPIs to monitor various aspects of their operation such as throughput, equipment reliability as well as anticipate and meet their clients' expectations and needs. There are few previous studies that focus on the standardisation of KPIs used in dry bulk terminals. One of the objectives of my project is to assess the level of standardisation of KPIs among the participating terminals. If there are similarities in areas and categories where the KPIs are used among the participating terminals, then there is potential for standardising some of the KPIs among the wider dry bulk terminals community. The standardisation provides two major benefits; it allows benchmarking of performance in several areas such as operations, health and safety among the terminals and it assists in raising standards in these areas. Most of the KPIs used by the terminals are efficiency KPIs. They are developed and put into place by the participants in these terminals and are used to monitor the efficiency of various aspects of their performance including operations, engineering, health and safety and environment. My

project examines these areas and specific KPIs across the participating terminals, but it also brings into consideration the effectiveness dimension. The effectiveness dimension aims to bring into the picture the areas of performance that are important for the key stakeholders of the participating terminals and their assessment of the terminals' performance in these areas. The project explores the efficiency dimension through the participants from each terminal and by semi-structured interviews, the effectiveness is explored through specific key stakeholder surveys administered by the participants from the participating terminals. My project adopts a participatory Action Research (PAR) approach as outlined in Chapter 2 in exploring above objectives working together with the representatives from the terminals participating in the project. After establishing existing performance measurement KPIs in participating terminals, the project focuses on initiating change by introducing the effectiveness dimension of the KPIs in participating terminals which leads to introduction of amended or new KPIs within participating terminals. I categorised objectives for my project in three different areas: organisational, personal and professional, and academic objectives. There are other models, such as Boud et al's (1987) "for me, for us and for them" structure where research for me represents the motivation to perform research for personal development, us represents community of people and them community of scholars. I decided that the structure I used as described below for project objectives is the most suitable for my project. My project seeks to achieve outcomes in three different areas as follows.

1.1.1 Organisational objectives

This project aimed to provide organisational benefit in two areas. The first relates to the industry level organisations such as the International Dry Bulk Terminals Association (DBTG). The second is to be found at my own company (Nectar Group). My project is expected to provide a number of benefits at an industry level including:

- Improving standards of operation and service quality among the terminals leading to improved customer satisfaction.
- Improving operational, technical, health and safety and environmental standards within the industry to help close ship to shore interface gap and improve operational efficiency.
- Assist terminals in making the right strategic investment decisions in type and scope of services and facilities to develop to ensure client satisfaction.
- Generalisation of standardised KPIs across the industry as much as possible to enable benchmarking.

The project addressed these objectives in a number of ways as outlined below:

- Incorporating results of the analysis of stakeholder surveys into planning and implementation stage for the new and amended KPIs in participating terminals provided improvement in stakeholder engagement and satisfaction.
- During the planning and implementation stages, participating terminals prepared and implemented improved parameters in their KPIs which in turn improved standards of KPIs in various areas.
- During the implementation stage a number of participating terminals linked new and amended KPIs to their medium- and long-term decision process.
- A high percentage of similar KPIs utilised by the participating terminals in different areas provide a positive platform for wider standardisation across the industry sector.

Dry Bulk Terminal operators always strive to improve standards and provide excellent service to their clients. To this aim, as far back as 1998, the international Dry Bulk Terminals Association (DBTG) was formed by a number of Dry Bulk Terminals. DBTG helps terminals to improve standards in several areas including operational performance, equipment availability and utilisation, health & safety and environmental compliance. This is achieved by sharing of knowledge and experience in such areas among the member terminals therefore enabling learning and progress. Nectar Group is a member of DBTG and has been instrumental in establishing a benchmarking process amongst a group of member terminals. The current research project adds to this initiative by collaborating with a handful of terminals in developing and implementing standardised KPIs. My project is neither a conventional observational study nor an advisory study. Rather it is one in which I will be actively collaborating with a selection of terminals to implement new KPIs and/or enhance their existing KPIs with a goal of helping them improve their terminal's performance. The details of my research approach is explained further in Chapter 2.

It is intended that subsequent progress towards an industry benchmark, which the current project will lead, will provide terminals with an opportunity to brand themselves in line with an established benchmark and demonstrate the level of quality standard achieved within their organisations.

At my own company level, we have been developing terminal management activities over the last decade and I have been personally leading these developments. The project provides a number of organisational benefits, including:

- Opportunity for cross learning and sharing of experiences by applying KPIs among our terminals.
- Ability to incorporate KPIs into new development projects at early stages in consultation with our clients.
- Benchmarking of KPIs in different geographical and cultural settings of the terminals we operate and develop.
- Improve operating standards across the terminals we manage.
- Improve and monitor effectiveness of our services to our clients through the appropriate use of KPIs.
- Opportunity to share the learning and the new knowledge developed throughout the project among our terminals.
- Benefit from significant performance improvements in the organisation as a result of implementing improved KPIs.

In section 8.1, I provide a detailed reflection of how I implemented some of the outcomes from the project in the context of my own organisation.

1.1.2 Personal and professional objectives

Personal and professional objectives include:

- Sharing new knowledge and learning from the project within the professional community I am a part of.
- Sharing new knowledge and learning within organisations I am involved in.

I have been leading the terminal management activities within my organisation for the last decade. I am keen to utilise the learning and knowledge I have accumulated during this time and build on that with the DBA research project. Achieving the objectives set out in the project will enable me to share such new knowledge within the professional community that I am a part of. I have been representing my company at the DBTG since 2000 and I have been the chairman of the association since 2011. I

have therefore been able to interact with the members of the association representing up to 100 terminals worldwide over the past 21 years. I have also been instrumental in brokering early discussions within the DBTG in relation to the development of KPIs among group members. The project will assist in progressing these discussions within the group.

I also currently Chair the Ports and Terminals Group (PTG) within the Society of Maritime Industries (SMI) which promotes British expertise internationally. This is another platform through which I intend to share the knowledge and experience emerging from the project.

My role in the project is different to that where a practitioner-researcher leads a business change within their own organisation. However, because of my dual relationship as business partner with the terminal operators and the chair of DBTG I will not be acting as an ordinary external consultant. I will have an intermediary change agent role in which I have a close working relationship with the terminals in which I will be co-leading change without having a line management authority to enact change from within. For this reason, a participatory approach to change will be adopted as described in section 2.1.

1.1.3 Academic research objectives and Contribution to Knowledge

My project seeks to address a number of gaps in previous research. The first one relates to the lack of research targeting terminals and specifically dry bulk terminals. Most of the research undertaken in relation to the development of KPIs within the shipping industry concentrates on ports rather than on terminals as a subject of study (Woo et al., 2011; Notteboom et al., 2001). Ports normally represent a number of clustered terminals each providing different services such as Dry Bulk, Wet cargoes, Ro-Ro and passenger traffic. Therefore, research targeting an entire port does not necessarily capture the specific issues relevant to the dry bulk terminals. This project specifically concentrates on performance KPIs related to dry bulk terminals, hence bringing them to the forefront of research in this area.

The second gap exists where there is a focus on container terminals primarily because of the standard practices in these terminals that makes easier to study them. My research tackles the more difficult task of researching Dry Bulk Terminals where diversity is the norm in terms of operating practices, handling methods and variety of cargoes handled. Previous research on standardisation of port performance KPIs has tended to concentrate on container terminals and ports (de Langen et al., 2013; Cullinane et al., 2006; Notteboom et al., 2000). The main reason for this tendency is the relatively standard operating practices that exist among the different container terminals which provides a more convenient platform to develop standardised KPIs. This project specifically considers similar applications within dry bulk terminals.

Previous research in developing performance KPIs in ports and terminals has also mainly concentrated on efficiency aspect of the KPIs (Tongzon & Jose, 1995; UNCTAD, 1976). There are very few examples of research that tries to incorporate both efficiency and effectiveness aspect of development and implementation of the performance KPIs in terminals (Brooks et al., 2011; Martilla et al., 1977). This project addresses that gap by bringing efficiency and effectiveness dimensions together. My project addresses another gap in knowledge in this area by bringing in stakeholders' expectations in order to elevate the effectiveness of performance KPIs. In previous research, stakeholders were pre-determined by the researcher, whereas in my research the stakeholders approached were determined by the participants, thereby enabling the project to capture a wide variety of stakeholders.

The terminals participating in the project are in different countries and geographical regions therefore they represent different cultural approaches. As a result, another aim of the project is to explore the relationship between the organisational culture and KPIs employed in participating terminals. The

participating terminals also have different management styles, the project explores the relationship between different management styles and organisational culture in planning and implementation of KPIs. The participating terminals have developed corporate objectives linked to their vision and mission in their organisations. The project also examines the relationship between the corporate objectives and development of KPIs in the participating terminals.

1.2 My role as a change agent

I worked as an outsider in my role as a change agent with the participating terminals in my project. This presented a number of challenges in different stages of the project such as gaining access to the organisations, acceptance by the participants and degree of control and ability to steer the project at diagnosis, planning and implementation stages. Ideally, I would have had the insider track if I were directly associated with the participating terminals. However, I used a number of tools to ensure that I could deliver the required level of steering and control at different stages of the project. I had site visits over a number of days at crucial points during the project and participated and led discussions which guided the decisions in relation to selection and implementation of KPIs. These tools enabled me to directly contribute to the decision-making process throughout the project. My position also enabled me to be objective and independent during the discussions with the participants and ask questions which I may not have been able to ask if I was one of the team. Consequently, although I was an outsider, I was able to reflect in action as well as on action during different stages of the project (Schon, 2002). I provided a detailed discussion of my position and the challenges in section 8.5. I believed it was important to check and confirm that my perception and expectations as to my involvement with that of the participants from each terminal during each stage of the project. The better they were aligned the smoother the collaboration would be during the project. I did this by means of group discussions with the participants at each stage of the project as well as individual meetings with project sponsors from each terminal.

In line with my professional experience and taking into consideration my active participation with the participants at all stages of the project, I use the first person throughout the thesis. This enabled me to express my contribution more clearly, and to provide critical commentary and self-appraisal from the perspective of a practitioner-researcher.

1.3 Research questions

Normand et al. (2003) suggest that it may not be possible or desirable to clarify the research questions at the start of a project particularly when adopting an action research approach. However, based entirely on the literature review I carried out at the start of the project and the experience I have of the subject area of the project I was able to define a number of research questions. Table 1 outlines the research questions and how they link with the data gathering methods used throughout the project.

Research Question	Data gathering methods	Description
Does the effectiveness dimension improve performance of KPIs?	Semi-structured interviews Group discussions Online calls Stakeholder surveys	Assess effect of new and amended KPIs in areas they are implemented
How does organisational culture affect implementation of KPIs?	Site visits Group discussions Semi-structured interviews	Explore differences in approach among participating terminals
How does management style and organisational culture interact during planning and implementation stages?	Semi-structured interviews Group discussions Site visits	Explore any changes in management style, decision making and level of autonomy
What role do stakeholders play in planning and implementation of KPIs?	Semi-structured interviews Group discussions Stakeholder surveys	Explore stakeholders' expectations and their view of terminals performance
What role do Information Systems play in the planning and implementation of KPIs?	Semi-structured interviews Group discussions	Explore interaction between IS, organisational culture and corporate objectives
How effective are multiple methods of communication used during the project?	Site visits Online calls Semi-structured interviews	Assess against geographical, language challenges presented
To what extent were planned PAR stages followed in practice?	Site visits Semi-structured interviews Group discussions Online interactions	Assess participants approach against the planned stages

Table 1- Research questions and Rationale with data gathering methods

Different data gathering methods will assist as tools in answering the research questions as outlined in Table 1. They will work together with my active participation with management of participating terminals in designing, implementing and evaluating new and amended KPIs. The characteristics of this approach will be developed in the next chapter.

Chapter 2. The Research Approach

I adopted an action research framework in order to achieve the organisational and academic objectives of my project. Action research fosters an understanding of organisations through a deliberate change process that is based on experience and is subject to observation and evaluation. The approach involves collaborative problem solving in which I as the researcher and the participating organisations work together as active participants in the project. It facilitates problem solving while at the same time generating new knowledge which contributes both to participants in the project and the wider professional and academic communities.

The notion of action research was initially introduced back in 1946 by (Lewin, 1946). He envisaged that an action research framework in relation to the intercommunity relationships and problems he was examining would involve planning, fact finding and action. A researcher involved in action research does not only discover new knowledge but also engages in application of the new knowledge in a society (Chein et al., 1948). My project demonstrates the new knowledge through the implementation of new or amended KPIs. Another important aspect of action research is the way practical and scientific research elements are brought together. Action within the project is aimed at resolving a real-world problem. Information is gathered on the ways in which the organisation and its stakeholders respond during the change implementation process, and this provides evidence to confirm the efficacy of the change, and to contribute to theory generation and/or theory testing. The manner in which the professional knowledge of a practitioner and theoretical expertise of a researcher come together during an action research has been demonstrated in a number of ways by different types of action research. Dialogical action research is probably the closest type of action research to the participatory action research being used in my project. This aims to contribute to the academic knowledge whilst at the same time aiming to solve a real-world problem. It recognises the different approaches taken by a researcher and a practitioner in terms of how they make use of the knowledge. It also recognises the importance of one-to-one dialog between a researcher and a practitioner as equal partners in exploring issues (Martensson & Lee, 2004).

2.1 Participatory Action Research and action cycles

The action research I adopted in my project is participatory. The purpose of participatory action research (PAR) is to enable action; the researcher and the participants are partners throughout the process, and the researcher is actively involved in the process and influences the outcome of the process. At the centre of participatory action research is the collective and self-reflective inquiry which is directly linked to the action and undertaken by researcher and participants. Characteristics of participatory action research include a specific purpose to enable action, sharing of control between researcher and participants, and the participants being actively involved in the process (Baum et al., 2006). Gray (2004) emphasized the authentic participation of people in the project and collection and analysis of data. McTaggart (1994) indicated that the people who are affected by the planned changes in a PAR project, should have the primary responsibility for deciding courses of action to be taken. In my project, the participants from the terminals have taken a leading role in a number of areas including collection and analysis of data and making decisions to change KPIs to be included in the project. One of the important roles for the researcher in PAR is being a process facilitator, creating a trust within the participating group., Even though each participant may have a different idea of a problem, if the group has a shared understanding of what the research is intended to establish it helps in the process (Fox et al.,2007). I discussed the research process separately with each participating terminal using several tools such as introductory presentations to ensure that a common understanding of the objectives of the project is achieved by each terminal.

PAR is different from conventional research in a number of ways; it works by enabling action, it employs reflective cycles where the participants collect data within an action cycle then analyse and evaluate the results in order to see the outcome of the action. PAR aims to work by empowering the participants (McTaggart, 1994). In my project representatives from the participating terminals are acting as the participants. Although the participants were selected by the participating terminals, I took time to explain the objectives of the project and their role as well as potential benefits they are likely to gain from it during my first visit to each participating terminal. The organisational change initiated in my project through the participants from each terminal is put into place through an action cycle which consists of four stages as shown on Figure 2. As most of the terminals participating in the study have KPIs in place, I expect that the implementation of any changes can be explored through a single action cycle. A second action cycle may be necessary in some of the terminals if the initial change parameters require further adjustment.

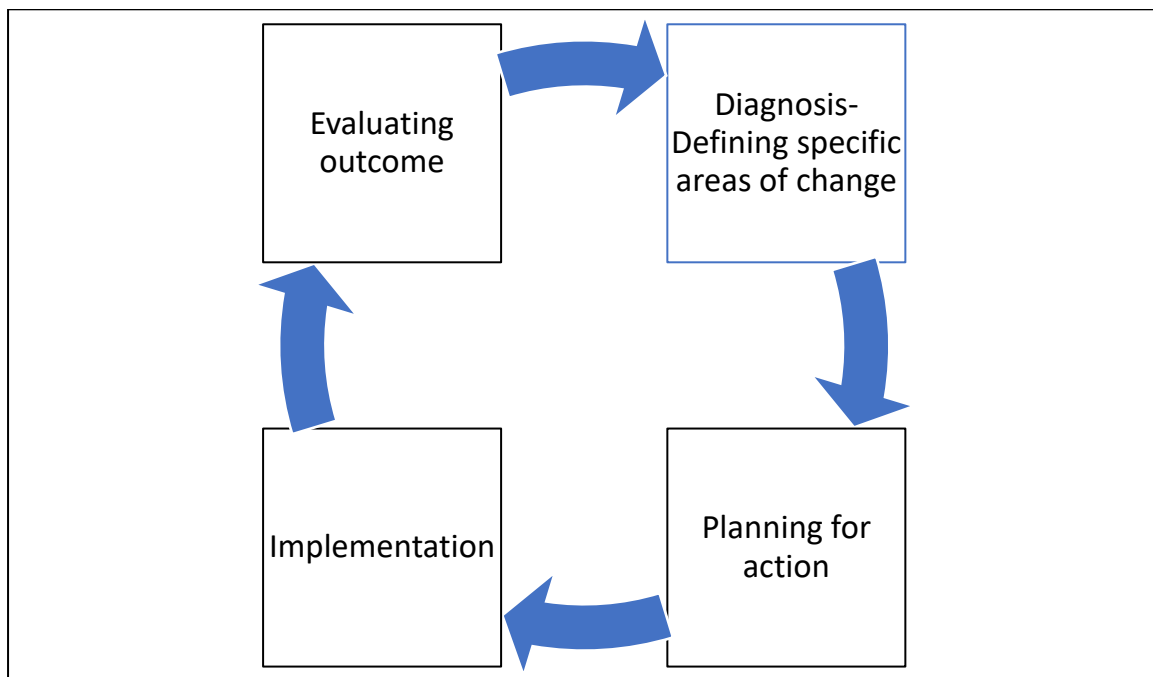


Figure 2 - Sequence of action cycle stages (Based on Lewin, 1946)

Each action cycle consists of four stages, starting with the diagnosis which aims to determine the need for change and to define specific areas of change. In my project, this takes place following the initial visit to the participating terminals during which I established the areas where current KPIs are utilised as well as the specific KPIs used in these areas. The next stage, planning for action, is when I engage with the participants in order to identify specific areas of change, they intend to put into action. During these conversations we work to answer what, why, when and how to ensure that the actions selected have a specific purpose, and any preparations that may be required before putting them into action are discussed, and a time frame for implementation this is agreed by everyone. The third stage is implementation, where agreed actions are put to work, and information about the change process is gathered and analysed. During my project I worked with the participants from the terminals throughout the agreed implementation period, they shared information and results with me periodically which then enabled me to make suggestions or ask questions where appropriate. The final stage is the evaluation of any outcomes of the changes implemented. At this stage participants had the opportunity to analyse and discuss outcome of the actions and to answer questions as to whether they delivered the outcome that was expected and useful for the participants to continue

implementing them for the future. At the same time, they explored whether there was a need to make amendments to any of the changes implemented and run them through a further cycle.

Applying PAR to my project provides several advantages. First, PAR has a level of flexibility which allows the researcher to change focus or direction in response to the changing circumstances as the project progresses. Such a change can take place under a number of circumstances. Sometimes the research environment within the organisational set up changes due to outside factors, or change can happen as a result of an unexpected outcome of a research cycle. Such unexpected changes provide the researcher with an opportunity to incorporate them into the research activity. Secondly, the new knowledge gained during each research cycle is put into use immediately therefore delivering immediate benefit to the project participants from an organisational point of view. Finally, it allows the researcher to use different research methods during different cycles of the research if that suits the specific aims of that cycle (Gray, 2004).

2.1.1 Research methods used in answering the research questions

The project uses several data gathering and data analysis methods to answer the research questions posed in subsection 1.3. These are mapped out in Figure 3.

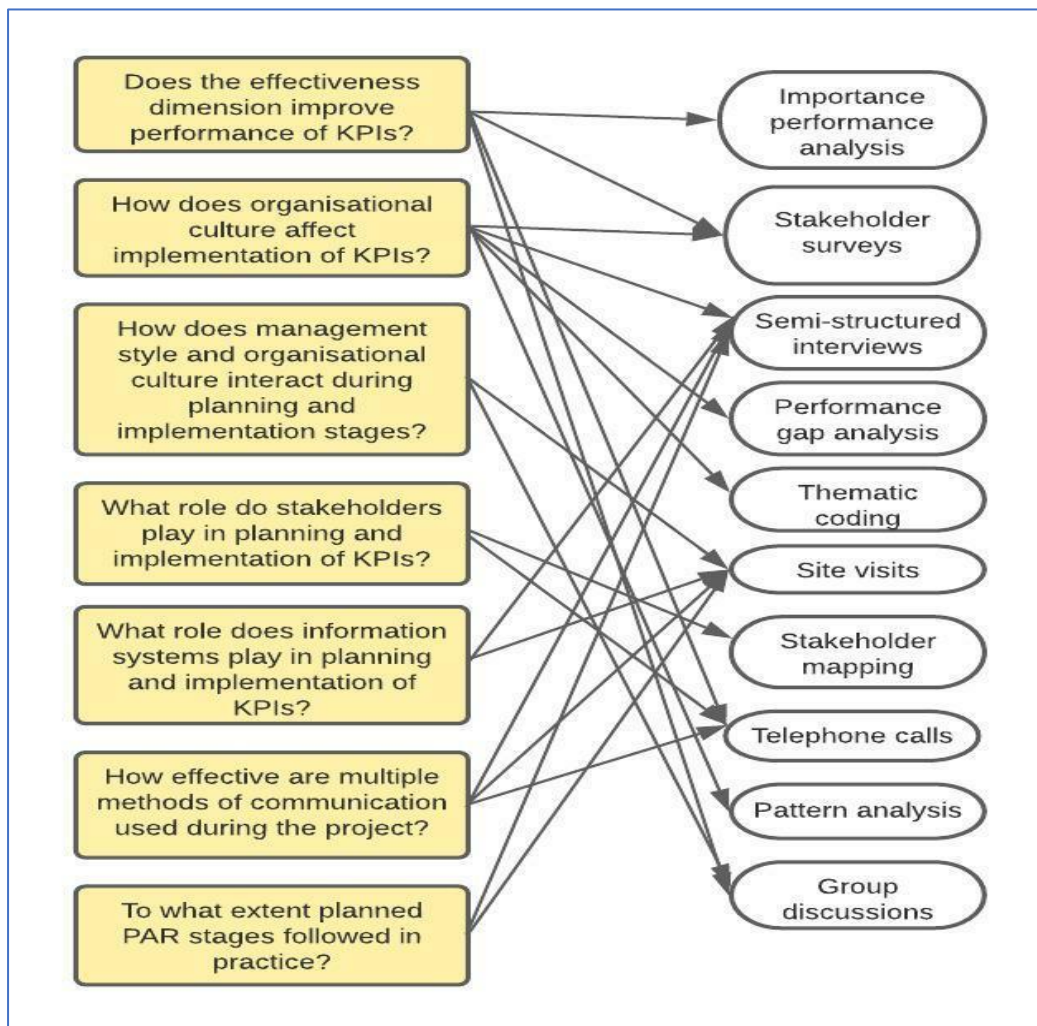


Figure 3- Data gathering and analysis methods used to answer research questions

In exploring whether the effectiveness dimension improve performance of KPIs, I used importance performance analysis following the stakeholder surveys as well as calls and group discussions with the participants following the implementation stage.

Semi structured interviews and stakeholder survey analysis (performance gap, pattern analysis) are used during the planning and implementation stage to explore the effect of organisational culture in planning and implementation of KPIs. Thematic coding analysis also contributed to exploring this area.

Site visits and group discussions held with the participants are used to explore the interaction between the management style and organisational culture during the planning and implementation stage.

Stakeholder mapping analysis and telephone calls with the participants during the implementation stage are used to explore the role and influence of stakeholders in planning and implementation of KPIs as well as the areas where significant gaps existed between stakeholders' expectations and terminals' performance.

Semi-structured face to face interviews and interaction with the participants during the site visits are used to explore the interaction between IS, management style and organisational culture.

Records of semi structured interviews, scripts of telephone calls and notes from face-to-face meetings helped with exploring effectiveness of different communication methods as well as levels of engagement by the participants in the project from different terminals.

I have included a number of quotations from the participants in the planning, implementation and evaluation stages of the thesis. I selected the quotations for a number of reasons: they illustrated a prevailing cultural trait or management style; they demonstrated strength of an existing or newly implemented practice emerged during the project; or supported the conclusions I have drawn from the analysis. The quotations I used fall into two main categories. The first category illustrates and supports the conclusions I drew in a number of areas. I included twenty four quotes in this category which relate to a number of areas:

- Illustrating the strength of the relationship between the corporate objectives and KPIs.
- Demonstrating the level of autonomy and teamwork within a participating terminal.
- The relationship between the culture and the management style and how it is affected during the project.
- The nature of relationship and level of positive and negative engagement of stakeholders during the project.
- Demonstrating the impact of the project in improving processes and performance as well as generating a momentum within the organisation.

The second category of quotes supported the data and helped draw conclusions in a number of areas. I included seventeen such quotes.

- Provide supporting evidence of weaknesses in areas such as maintenance activities, equipment efficiency.
- Provide supporting evidence of strong organisational practices and culture as demonstrated by data in areas such as health and safety and environment.
- Illustrate improvements demonstrated by data in process and data collection as a result of new or amended KPIs put into practice.
- Demonstrate the importance of planning horizons within the organisation coupled with strong stakeholder engagement.

- Support implementation of technology to move towards a better information systems (IS) use in support of KPIs.

2.2 Evaluation and Rationale for Data Gathering Methods

I used a number of data gathering methods during each stage of the project as outlined in Table 2.

Method	Stage	Purpose
Site visits	Diagnosis, planning	<ul style="list-style-type: none"> • Establishing facts • Understanding current systems in place • Developing options for KPIs
Semi structured interviews	Diagnosis, planning	<ul style="list-style-type: none"> • Understanding the organisations, culture, existing systems, and management style • Building trust with the participants
Stakeholder Surveys	Diagnosis, planning	<ul style="list-style-type: none"> • Establishing parameters for the effectiveness dimension of KPIs • Securing stakeholders' participation in the project
Group meetings	Planning, implementation	<ul style="list-style-type: none"> • Generating options for KPIs • Deciding on KPIs to implement • Securing buy in from participants

Table 2- Use of data gathering methods

Data gathering methods served different purposes at each stage of the project and supported both decision making and further analysis I carried out during the project.

I considered alternatives before I decided which data gathering method to use. Site visits were absolutely essential at the diagnosis stage of the project in order establish a face-to-face contact with the participants, gain their trust, understand each terminal and ensure that participants were well informed about the project.

I had six different types of interviews to consider. I outlined advantages and disadvantages for each one of them in relation to my project in Table 3.

Interview type	Advantages	Disadvantages
Structured interviews	Prep prepared and standardised questions Direct contact in comparison with questionnaires	Lacks flexibility in terms of exploring emerging discussion areas and ability to explore wider scope
Semi structured interviews	Starts with guiding questions but offers flexibility to allow discussion to develop more freely Offers direct contact	
Non-directive interviews	Questions are not generally pre-planned Used to explore an issue or a topic in depth Participants can talk freely	Too much focus on a pre-determined area Not enough flexibility to explore around the wider topics
Focused interviews	Focuses on specific issues related to the respondent	Not enough flexibility to explore emerging areas
Informal conversational interviews	Provides freedom to explore the issues Interviewer may influence the direction of the discussion	Does not offer some direction in order for intended areas to be covered
Problem centered interviews	Combines open questioning with a semi structured interview later on	The focus on the subject matter can be lost from the start reducing effectiveness in my project

Table 3- Advantages and disadvantages of different types of interviews (Based on Gray, 2004)

Semi-structured interviews offered the most flexibility in exploring the important areas such as the organisational structure, existing KPIs and key stakeholders with the participants in my project. These also provided the face-to-face interaction which I could not have with alternatives such as surveys.

The main purpose of interaction with the key stakeholders from participating terminals was to bring in the effectiveness dimension to the project. In the first instance semi-structured interviews appeared to be an option but I have decided against this for a number of reasons. First, at the outset of the project, I did not have a relationship with the stakeholders, and it was important for them to have a considered and unhindered response to the questions. Secondly, an interview would not have provided them for an opportunity to think about the questions raised and would not have the structured approach required to consider expectation and performance areas. And thirdly, stakeholder surveys enabled a representative from each participating terminal to engage with the stakeholders to ensure positive response to the surveys. Surveys also enabled specific data to be collected in response to the questions to enable further analysis thereafter.

The group discussions were similar to a focus group and followed on from stakeholder surveys. Initially the options were developed for KPIs in different areas then representatives from each area such as operations, environment joined the meetings to narrow the options and decide on final KPIs to be implemented. The group discussions differed from a typical focus group in the sense that representatives from more than one area got together in the discussions. Group meetings were the

most appropriate platform not only for taking decisions on implementation but also engaging wider participants in the process ahead of it.

2.2 Literature Review

The literature review covers seven areas, in line with the research questions posed in section 1.3. These are: the efficiency and effectiveness dimensions of performance KPIs; the interaction between the organisational culture and KPIs; the interaction between organisational culture and management style in relation to planning and implementation of KPIs; the roles of stakeholders and KPIs; information systems (IS), organisational culture and KPIs; effectiveness of different communication methods; the sequence of PAR stages.

2.2.1 Efficiency and effectiveness dimension of performance KPIs

In the context of the ports and terminals, efficiency is primarily related to productivity. Therefore, efficiency KPIs measured by the ports and explored in previous research typically concentrate on parameters such as vessel discharge speed, cargo throughput and vessel turnaround rates. There is no direct connection of feedback by key stakeholders into this process and efficiency KPIs are typically decided and implemented by the ports based on their judgement only. I describe the effectiveness dimension in the context of my project as the level of satisfaction of key stakeholders. Therefore, whilst efficiency is more focused on the economic criteria, effectiveness is more focused on marketing and reputation. One of the novel approaches of my research is to bring in the effectiveness dimension in order to improve existing KPIs in the participating terminals.

In the context of dry bulk terminals, the efficiency dimension of performance KPIs covers performance measurement KPIs put in place by the terminals primarily as a result of internal assessment of their needs. The effectiveness dimension seeks to bring the main stakeholders of terminals into the process by actively seeking their feedback on terminals' performance and collaboration in putting in place new or amended KPIs. Terminals operate in an environment where they interact with different stakeholders. These stakeholders have different levels of interaction with terminals. Some provide services to a terminal; others expect terminals to deliver services to them. They may also have a stake in the ownership of the organisation. Therefore, each may have different demands and expectations. The effectiveness of a terminal's service delivery has a close connection to its operating environment and interaction with different groups of stakeholders. Previous research makes a distinction between efficiency and effectiveness of port performance KPIs (Brooks et al., 2015) (Schellinck & Brooks, 2014). Informally, efficiency can be seen as doing things right and effectiveness is doing the right things. Ideally efficiency and effectiveness should go hand in hand. Where there is a significant gap between the two, it is usually an indication of problems in service delivery. The use of performance KPIs reflecting efficiency and effectiveness parameters can assist a terminal in a number of ways. It can improve competitiveness by increasing the satisfaction of key stakeholders on the one hand, and it can assist decision makers in deciding long term investment requirements for operational and service improvements on the other. Increased stakeholder satisfaction and loyalty in turn leads to growth in new or repeat business and assists terminals to achieve their corporate objectives.

Early research in this area mainly concentrated on efficiency factors. Tongzon (1995) provided a model of port performance and efficiency for selected container ports and tested underlying factors that affected it. His model looked at the turnaround as the primary factor for measuring terminal performance whilst a vessel is alongside. He took the berth productivity as a primary indicator of terminal efficiency. In a container terminal environment where handling of unitised cargo can be highly organised these factors provide a clear picture of performance; however, in dry bulk terminals handling multiple commodities further factors may need to be considered. Other studies, such as

Notteboom et al.(2000) looked at measuring container terminal efficiency by incorporating multiple parameters comparing European and Far Eastern terminals. Gonzalez & Trujillo (2009) carried out a comparative analysis of previous research on port efficiency primarily on container terminals and highlighted links between efficiency and type of ownership, port size and port reforms. This study pointed out various methodologies used in different research and tried to suggest most appropriate methodology to achieve different objectives. It established that terminal efficiency was an important contributor to the port performance. Cullinane & Wang (2006) examined container port efficiency within an industry context and explored use of data envelopment analysis (DEA) to assist in doing so. They indicated that this could be a useful approach for a port to benchmark its performance against other similar ports but also highlighted that this approach has so far been used for container port analysis only. A study carried out by Oliveira & Cariou (2011) considered the efficiency of coal and iron ore terminals is the only study I have identified which tried to assess dry bulk terminals. It indicated a strong relationship between efficiency and annual throughput and used throughput as the main indicator of efficiency.

Over the last decade, some research has started to bring an effectiveness dimension into the analysis. Brooks et al. (2011) approached three groups of port users (carriers, cargo interests and suppliers of port services) with a view to finding out how those users rated the performance of the port they studied along a number of dimensions. The study pointed out that results of such an approach could be used by ports in improving their service delivery and performance for the users as well as benchmarking their performance across several parameters with other ports. The change in how ports integrate and contribute to the environment which they operate especially in terms of value-added services they deliver to the supply chains they are a part of has made an impact on thinking in this research area. Woo et al. (2011) recognised this change in their research and proposed a port performance measurement framework which comprised of multiple elements as against earlier research which concentrated on a single element as a measure of performance. Brooks & Schellinck (2015) in a further study looked at a number of container terminals and assessed service delivery performance from cargo owners and agents' point of view. The outcome of this study suggested that participating ports could use their strengths and weaknesses to make investment decisions and differentiate themselves from competitors. Baltazar & Brooks (2006) looked at the relationship between governance structures and efficiency and effectiveness measures in ports. The study pointed to different governance structures which allow varying degrees of flexibility for terminals. Other related studies suggested that governance decisions at terminal or government level were mainly based on limited information on port performance and efficiency and effectiveness dimensions are rarely brought together (Brooks & Pallis, 2008). Brooks & Cullinane (2006) examined the distribution of responsibilities in areas such as customs, port security, marketing activities in different port governance models such as landlord port and private ports. In my project, I concentrated at the terminal level but acknowledge that the relationship between a terminal and the port authority as a stakeholder is important in making sure that each party take care of their responsibilities for the mutual benefit of both.

Most studies assessing port performance parameters are based on container terminals. The earlier studies mainly concentrate on efficiency parameters whereas the later studies try to incorporate effectiveness parameters. Table 4 lists the port performance parameters identified by previous studies and illustrates that different studies use different representative parameters with little overlap between them.

Performance Parameters	Tongzon (1995)	Cullinane&Wang (2006)	Oliveira&Cariou (2011)	UNCTAD (1976)	Brooks & Schellink (2015)
Container mix	√				
Crane efficiency	√				
Vessel size	√				
Stowage of cargo	√				
Quay length		√	√		
Terminal area		√			
No of cranes		√			
No of yard gantries		√			
No of straddle carriers		√			
Draught			√		
Throughput			√		
Load rates			√		
Stockyard capacity			√		
Berth occupancy				√	
Revenue per unit				√	
Capex per metric tonne				√	
Turnaround time				√	
No of gangs				√	
Port reliability					√
Employee capability					√
Information flow					√
Response to special needs					√
Port connectivity					√
Cost of using the port					√

Table 4: Sample port performance parameters

In my project I used the current KPIs being implemented by participating terminals as a starting point and these mainly consisted of efficiency KPIs. The effectiveness dimension was added through stakeholder surveys and subsequent analysis. My project did not limit the stakeholders to a specific category but included stakeholders identified as important by each participating terminal during the interviews.

2.2.2 Organisational Culture and KPIs

There are a number of different organisational culture definitions in the literature. Cameron et al., (2006) pointed to four major types of culture. Hierarchy, market, clan and adhocracy however I used Harrison's (1987) definition of cultures as outlined below as they fitted better in the context of my project. This study indicated that the cultural change took place over a long period of time linked to the changes that took place in industry over the last century. Other studies started with a description of culture and recognised that there were different levels of culture within an organisation grouped under artefacts, espoused beliefs and values and basic underlying assumptions (Schein, 2010). This idea is discussed further below and in section 3.5.2. In my project the geographical and national diversity of the participating terminals, provide an interesting opportunity to consider the relationship between national and organisational cultures when making decisions for implementing KPIs. I have also witnessed the examples of different levels culture within participating terminals in terms of

artefacts and beliefs and values as suggested by Schein. Hofstede (2001) provided a framework and a model that compares national cultures. The framework and model developed by this study was criticised by some researchers in relation to its use of surveys, selection of nations as units for studying cultures, reliance of his research on a single organisation and the number of dimensions suggested (McSweeney, 2002; Hofstede, 2002). Others saw his work as a useful framework in linking culture and business (Chapman, 1996). The five-dimensional model introduced by Hofstede consists of:

1. Power distance, considers solutions to the human inequality problem
2. Uncertainty avoidance, considers the level of stress generated in a society as a result of an unknown future
3. Individualism versus collectivism, looks at integration of individuals within groups
4. Masculinity versus femininity, looks at male and female roles in a society
5. Long term versus short term orientation, considers choices when making decision between now and the future

Three of these dimensions are of particular interest for my project. The power distance index (PDI), which looks at the style of decision making is relevant in analysing how the participants in my project make decisions in introducing KPIs in their organisation. There is also an additional dimension which is the level of autonomy in decision making and how far down the organisation it spreads. The long-term and short-term orientation is significant in considering relationship between organisational objectives of the participating terminals and the decisions they take in which KPIs to introduce in their organisations. The individualism Index (IDV) is relevant in considering team versus individual decision making in implementing KPIs. Therefore, I decided to refer to those three dimensions of Hofstede's model in my project. Hofstede's model assumes that culture is a reliable predictor of action that can be expected within the boundaries of the model. In some cases, during my discussions with the participating terminals the actions suggested by the rankings in dimensions did not completely match the actions taken by the participants. This can be explained by the fact that culture is rather complex and dynamic in nature. Culture exists within the interaction of people have with each other and that is affected by a number of factors at organisational level which shows that it can differ from the suggested national norms (Langstedt, 2018). At the same time individuals are presented with several frameworks when making decisions which include, professional and personal experiences. Therefore, in these circumstances actions that individuals take may become less predictable or conform to norms (Nathan, 2015).

Layers of organisational culture and KPIs

In implementing performance measurements and KPIs in an organisation, there is a need to consider different levels of organisational culture that manifest themselves. This was suggested by (Schein, 2010), who considered three levels of organisational culture. The first level is the artefacts that we will see, hear and experience when we encounter a new organisation. These include physical symbols within an organisation such as layout, dress code, rituals. I observed the different ways in which participating terminals projected such physical symbols during my first visit to each site. In some terminals, such artefacts reflected the traditional values not only within an organisational context but also national level and in others proud history of progress and service to stakeholders and community were visible.

Schein's (2010) second layer consisted of espoused values and documentation of goals and aspiration of organisations. I also observed examples of these during my site visits to participating terminals. Each participating terminal has either a slogan or a combination of a vision, mission and objectives clearly displayed. These are in a number of occasions clearly displayed around the site. These signs seem to serve a purpose to remind or guide employees of the common values and beliefs. In some

terminals these displays manifest themselves as actual action or warning signs which demonstrate application of values and beliefs within the organisation.

Finally, Schein's (2010) third layer consisted of basic assumptions which shows how those organisational beliefs and values translate into learned responses by the people within the organisation. During the discussions I had with the participating terminals, I heard examples of how each organisation was trying to change and adopt the behaviour of the people in line with changing priorities of their objectives and using the visual symbols and artefacts to reinforce the message in the direction they would like people to think and act. The existence of different layers of culture within an organisation was also evident during the semi-structured interviews I carried out in some of the organisations. Participants at management level expressed similar views on application and benefits of existing KPIs in their organisation whereas participants at supervisory level in some cases had different opinions on the same issues. In other cases, participants had different views as to how such KPIs should be utilised and in most cases, they based their views on traditions and values that existed within their organisation. I noticed that in most cases participants who have been in an organisation for a long period of time and served in a number of positions had strong views as to how implementation of KPIs should be undertaken. I also noticed during the semi-structured interviews that management team members participating in my project had similar approach to several issues because they shared similar concerns or experiences. This is probably an indication of the executive subculture Schein, (2010) mentioned which is represented typically by CEO or in most cases the management team in an organisation. During the discussions I had with the participants from the terminals, each terminal had different levels of success in trying to change the existing basic assumptions when they were trying to implement changes to the existing KPIs.

It is worth mentioning in relation to national culture that the dynamics of a group of international participants in the same group as to how they make use of cultural norms is different to a group of individuals from the same background and nationality. Barinaga, (2007) followed an international project group and his findings suggest that the group members developed the project by using the discourses on national culture and cultural diversity to their advantage. In my project, even though I worked with different groups from different nationalities each group worked as a unit on their own and there was no interaction among the groups, therefore this consideration did not materialise.

2.2.3 Management style and KPIs

Management style is a key input in understanding an organisation's culture. A particular management style may be more prominent than others in a certain organisational culture. (Cameron & Quinn, 2006) examined the relationship between certain characteristics of management systems such as motivation, types of communication, decision making and goal setting process and management style. I discussed the changes some of the participating terminals made to their management style during implementation stage in section 5.3.3, these changes included shift in reporting and decision-making structure within the organisations. Their work points to a need for alignment between a management style and organisational culture. Harrison (1987) identified four types of organisational cultures with reference to the work done by Hofstede on national cultures. I examined the relationship between organisational cultures and suggested management styles at participating terminals during the diagnosis, planning and implementation stages of the project in sections 3.5.3, 4.5.3 and 5.3.3. Table 5 provides a link between different types of culture and characteristics generally associated with each one.

Type of culture	Characterised By
Role Culture	Invisible and impersonal leadership Power of leadership linked to the office Tight control on information management and documentation
Power Culture	Work is performed and linked to reward or punishment Control and power are in the hands of a leader/management
Achievement Culture	Management, leadership provide direction and encourages participation of employees Belief in employees' ability and motivation
Support Culture	Concern for others as well as common values and needs Involvement in decision making mutual respect and trust Conflict management and consensus building

Table 5: Characteristics of Organisational Cultures (Harrison, 1987)

Pheysey (1993) studied types of control associated with different organisational cultures. On the one side there is *control by regulation* and this can be demonstrated in areas such as cash control, quality control or inventory control. This is commonly associated with a role culture. On the other side *control by appreciation* recognises the specific knowledge and expertise of individuals and empowers them to make decision in areas of control. This is more closely associated with achievement or support cultures. I explored these further specifically from a decision making and autonomy point of view at the participating terminals in section 5.3.2. During the interviews I carried out with participants from the terminals in my project, I noticed a general desire towards empowering people. In some of the terminals, volunteers were sought after and in others, teams formed with specific objectives to achieve the targets set for projects. There is certainly a recognition of role specific expertise that participants have in their organisations. As a consequence of this, they have been given control over making decisions in their specific areas of expertise in relation to KPIs. On the other hand, KPI targets in certain areas such as cost control or profitability are more regulated, or the direction comes from the management. This seems to indicate that both types of control could be present in an organisation with a specific organisational culture. Table 6 summarises the suggested management styles for each type of organisational culture outlined in Harrison's research.

Type of organisational Culture	Suggested Management style
Role culture	Laissez-faire
Power culture	Autocratic
Achievement Culture	Consultative
Support Culture	Participative

Table 6: Types of organisational culture and suggested management styles (Harrison, 1987)

In a further study, Bititci et al. (2006) looked at the implementation of performance measurement systems across five different industrial companies with a particular emphasis on the interaction between organisational culture and management style during such a process. The findings suggested

that there was a mutual relationship between culture and management style during such an implementation period. The study also suggested that different management styles may be required at different stages of implementation and organisational culture evolves simultaneously as the process matures. I observed similar changes in management style during the implementation period in some of the participating terminals as explained in section 5.3.3.

2.2.4 Stakeholders and KPIs

The role of key stakeholders in improving port effectiveness has been referred to in previous research. Cheon (2017) studied economic and social performance of the ports taking into consideration stakeholder positions. Primary stakeholders have a direct and mostly contractual relationship with an organisation, and they range from employees to agents, secondary stakeholders may not be directly connected to an organisation but may affect the organisation in the long term. In the context of my project, primary stakeholders participated in the projects by means of stakeholder surveys during the implementation stage of the project. Participating terminals were very much aware of secondary stakeholders' interest and influence (community groups, local authorities) particularly in areas such as environmental management and community relationships. These have been explored during the semi structured interviews. Brooks et al. (2011) make a reference to port users when they talk about stakeholders and argue that the user's perceptions were overlooked prior to 2001 because prior to this date primarily efficiency KPIs were studied stakeholders' views were rarely taken into consideration. Brooks & Schellinck (2015) concentrated on different cargo interests in their research as a group of stakeholders and they examined important factors for these stakeholders in assessing port effectiveness. It is not clear whether the selection of a category of stakeholders such as the cargo interests or shipping lines in these studies were made by the researchers or in collaboration with the ports. In my project, a pool of key stakeholders for each participating terminal were identified during the semi structured interviews therefore the participating terminals identified categories as well as specific stakeholders to be included in the project. A number of previous research studies (e.g. Slack (1985), Tongzong (2002) concentrate on a specific group of pre-determined stakeholders such as shipping lines, agents or cargo owners. Most studies consider shipping lines as the primary client for a port. A second group of stakeholders are identified as parties who are involved in logistics chain activities connected to a port (Brooks & Pallis, 2008). The role and influence of a specific stakeholder or group of stakeholders depend on a number of factors. The relationship between a stakeholder and a terminal is a key factor. For example: if a shipper or a receiver has a significant throughput of cargo handled at the terminal, they are likely to have an influence in relation to the performance KPIs. In certain circumstances a stakeholder may have a role in the governing structure of a terminal which leads to increased level of influence in terminal operation. In other cases, geographical location of a stakeholder such as a community adjacent to a terminal will uplift the status of that stakeholder in relation to a certain performance area such as the environmental performance. These relationships are unique for each organisation therefore I believe that selection of certain categories of stakeholders which omits others as used in some of the research above is not likely to provide a full picture of different types of stakeholders' expectations for an organisation.

2.2.5 Information systems (IS), organisational culture and KPIs

IS and information technology (IT) are often mentioned in the same context therefore it is useful to clarify the difference between them. IS enables data analysis and dissemination of results to participants who can then make informed business decisions. IT is the technological component within IS which comprises of databases, networks and computers. IS uses three ingredients to reach the results: data, people and supporting systems. The people element is where the interaction with the organisational culture comes into play. People who are affected by the IS in an organisation are either

the ones who carry out the analysis and distribute the results or the users who utilise the results in their area of responsibility. If the IS and the organisational culture are in line with each other than the use of IS delivers a number of benefits for an organisation. It lays down the rules for use of technology, creates a medium for internal and external communications and creates social cohesion within the organisation. (Claver et al., 2001)

Southern and Murray (1992) emphasized that the quality of decision making based on the output from an IS system requires good data input in the first instance. This points to a requirement to have appropriate IT structure within the organisation. Some researchers, such as Allard (1998), support the notion that the organisational culture lays the foundations for shaping the IT structure and the development of IS in an organisation. Others, such as Boland et al. (1994), believe that the IT and IS play a leading role in shaping the organisational culture. Claver et al. (2001) believe that both approaches work hand in hand and a specific culture in an organisation may influence or may be influenced by IS. They refer to informatic and informational cultures within an organisation; an informatic culture accepts the use of IT in an organisation as an important element, information culture sees IT as a route to establishing an IS. When there is an agreement between the organisational culture and the implementation of IS then the longer-term outlook of cultural decisions and shorter-term decisions for IT/IS implementation can be reconciled easily with each other. An organisation with informatic culture prefers to make short term decisions in the application of IT. These decisions are most of the time not linked to longer term strategic decisions taken within the organisation. The underlying consideration is the cost benefit for any decisions taken in this area. An organisation with an informational culture considers the role of IT and IS together in the context of strategic aims and objectives of an organisation therefore adds an element of qualitative measurement to the decision-making process. The three layers of organisational culture explored in section 3.5.3 also has a bearing as to how performance information is used in an organisation. Taylor (2014) suggests that the use of performance information is influenced by an organisation's artefacts, espoused values and underlying basic assumptions. The failure to align the three layers of organisational culture may lead to ineffective use of performance information in an organisation.

2.2.6 Effectiveness of different communication methods

I used different types of communication during each stage of the project. At the diagnosis stage, data collection and establishing of current status of KPIs in each participating terminal was important. Therefore, I used site visits which involved face to face interaction with the participants including semi structured interviews. Gray (2004), points out that the selection of interview technique largely depends on the objectives of the research project. He also points out that the semi structured interviews allow a certain degree of flexibility in expanding on views and opinions of participants. Roulson (2010) links the type of interview to the philosophical position of the researcher hence suggests that a constructivist approach where a researcher and participant co-construct data working together would suit semi structured interviews. I continued to use the site visits and face to face interaction with the participants during the planning stage of the project. Email and teleconference were the main methods of communication during the implementation stage of the project. The choice of method of communication was influenced by a number of factors including the purpose of the communication and what needed to be established by the communication, availability of time and circumstances of the participants and practicality of selecting a communication method taking into consideration geographical location and time zones of the participating terminals.

2.2.7 Sequence of PAR stages

Lewin (1946), argued that action research should be focused on problems and a resolution to those in the process of the research by analysing the causes of problems through the intervention of the

researcher taking into consideration the change and looking at the effects of the intervention. The project as outlined in section 2.1 follows sequence of action cycle events. During the project I will be observing participants approach to progression from one stage to other particularly among diagnosis, planning and implementation and see whether in practice they follow a clear distinction between the stages.

2.3 Ethical Issues

The ethical issues that may be encountered in carrying out an AR project have been documented in a number of different ways. Normand et al., (2003) confirm the need for any research to be conducted in a framework of well-defined ethics framework in their study. They point to four ethical principles that apply to research undertaken involving human beings:

- Do no harm
- Do positive good
- Autonomy (show respect for rights of self-determination)
- Justice (treat people fairly)

In the context of my project these principles were well observed. The active participation of the participants from each of the terminals in the evaluation of options and selection of change KPIs to implement made sure that any changes implemented were implemented with their support and consent hence not causing any harm to their area of responsibility or their objectives but help improve their performance and help them solve issues and problems going forward. Although I provided guidance and suggestions during the semi structured interviews and other conversations and calls throughout the project the final selection of the KPIs to be implemented were decided by the participants, therefore providing them with an autonomy in making the final decisions. I also made sure that I maintained communication and contact as much as possible with all the participants to the project within each terminal ensuring that the participants from any level within each organisation had an opportunity to positively contribute to the project.

Bell and Bryman (2007) carried out a content analysis of ethics codes produced by research associations in the UK and USA and identified eleven categories of ethical principles. These included harm to participants, respecting the dignity, informed consent, protection of privacy, ensuring confidentiality of data, protecting anonymity of individuals and organisations, need to declare any professional affiliation, honesty and transparency and reciprocity.

The project considered and addressed a number of ethical issues throughout its implementation. Gelling and Munn-Giddings (2011) recognise that action research presents additional challenges when it comes to ethical review, however they suggest that the ethical principles to be considered when undertaking an ethical review of any research project are similar. They propose seven requirements to be taken into consideration, as follows:

Value: It is important that the project contributes to the increasing of knowledge through the changes implemented by the participating terminals. The objectives of the project were outlined in section one. The project fulfils the objectives by bringing in dry bulk terminals industry sector into this type of research and by covering efficiency and effectiveness dimensions of KPIs together. On the professional front, the final selection of areas and specific KPIs to be implemented as a part of the change process are decided by the participants from each terminal in the project. This has ensured that they realised the value in implementing certain changes to benefit their organisation. Khanlou and Peter (2005) emphasize the need for PAR project to empower the participants and their commitment and interest in the issues to be explored.

Scientific validity: The project followed a participatory action research approach as outlined in section 2.1. Semi structure interviews with the participants from each participating terminal were carried out in order to collect qualitative data. The project used thematic coding as a process to encode the data gathered through the semi structured interviews. Coding was done by using NVivo (Version11). Treemaps were used to illustrate the coded themes. The stakeholder surveys provided valued information that contributed to the project. A performance gap was carried out in order to highlight the differences between the importance and performance results from the surveys. A pattern analysis was carried out in order to examine the existence or otherwise of a consistent pattern in a criterion across the stakeholders for each terminal. The project also carried out a stakeholder mapping exercise to enable the participants to see their strengths and weaknesses in different areas from the results of the stakeholder surveys.

Fair participant selection: The project followed a certain process in relation to the selection of particular participants from each participating terminal. The potential participants were provided with a presentation of the project which outlined the objectives of the project, a framework which outlined the process of PAR, their expected participation in the project and information collection methods. Because I was not familiar with the potential participants in the project from each terminal, it was logical to allow the coordinators from each terminal to select the participants to be involved in the project. The coordinators from each terminal were either senior managers or board level representatives. The coordinators were informed that the selection should include as much variety as possible in terms of position and roles of participants in the organisation in order to generate best contribution and benefit to the participants. Emmanuel et al. (2000) suggest that the participants in a project who carry the burden and the risk should also be able to benefit from the outcome of that project.

Favourable risk benefit ratio: The project sought to minimise risks in a number of ways. At the start of the engagement with each participating terminal, they were extensively briefed about the objectives of the project, the process involved in carrying out the project, what specific role they are expected to play to contribute to the project as well as the expected benefits for their organisations. The participants were given an opportunity to discuss and question the project before they were committed to participate. This meant that the participating terminals were genuinely interested in participating in the project. The participants selected from each terminal by the terminal represented roles from the senior management level to quayside employees. This meant that representation from each level of employees within the organisation were sought. Throughout the project the participants from each terminal engaged with other employees bringing them into the project in various roles such as collection of information, observation of new practices or analysis of information which tried to ensure that they have not been left out.

Independent review: The project used a variety of data collection methods including semi structured interviews, published literature and company brochures to strengthen the validity and reliability of the information collected. Semi structured interviews provided a structured approach collection of data, the interviews were recorded prior to the analysis to ensure reliable record keeping improving the validity of the data prior to and during the analysis. I sought feedback from the participating terminals at regular intervals in terms of accuracy of the information during data collection process. In addition to above I sought self-validation. I worked to be inclusive during the research and listened to ideas and views of the participants openly even if they differed from my own and when necessary, tried to question my own assumptions. This was not different to the style I adopt during day-to-day management of my business. I also relied on the feedback from the participants in terms of how actions taken during the project have had an impact on them in terms of improving their experiences.

Informed consent: Gelling and Giddings (2011) describe the informed consent as the provision of information to participants about the purpose, potential risks, benefits and procedures so that they understand and can make informed and voluntary choices. I prepared a project presentation for the participating terminals which outlined the objectives of the project, the action research framework, the process, the expected role and participation of the representatives from each terminal. I delivered the presentation at the start of my interaction with the participants from each terminal during my first meeting with them face to face. This allowed the participants to engage in a discussion and ask questions about the project. To follow up I also prepared a consent form for each participant to read and acknowledge prior to engaging in the project. The consent form reinforced their understanding of the project and confirmed their voluntary participation in the project. The research consent form is included in Annex 7.

Respect for enrolled participants: Cornwall and Jewkes (1995) state the importance of the participatory research in respecting and understanding the participants involved in the research. The confidentiality of the information and anonymity of the participants were discussed during the initial stages of the project with all the participants and these points were also confirmed on the consent forms issued to the participants. The participants were fully aware that they could voluntarily drop out of the project at any point and that the knowledge and experience they contribute to the project were appreciated.

Chapter 3. Diagnosis

Diagnosis was the first stage of the action research cycle of my project. This stage was key to evaluating areas where key KPIs are utilised within each of the participating terminals as well as identifying the type of KPIs used and the extent of their use within each organisation. I performed a number of tasks at this stage of the cycle using different methods as appropriate. These are illustrated in Table 7.

Tasks	Objectives
Phone calls	Gauge initial interest from potential terminals
Site visits	Gather factual data and build trust
Semi-structured interviews	Understand organisational set up; Establish status of current KPIs
Group discussions	Align participants' expectations with my role in the project

Table 7 - Initial tasks during the diagnosis stage

To start with, I approached a number of potential terminals by way of email and/or telephone calls in order to determine the level of interest in the project. This helped me to select a group of terminals to participate in the study. I then planned site visits with each participating terminal in order to meet the participants and discuss the current status of their performance measurement KPIs. I used semi-structured interviews to guide me during these visits. I also gathered relevant information and documents to help me understand the context of how KPIs were used within each participating terminal. Following on from my role and positionality as an outsider to the participating terminals as I referred to in section 1.2, I used the initial site visits to have preparatory meetings with the participants in order to explain the scope of the project, the framework and their role in the project prior to carrying out face to face interviews. These were useful building blocks for me to be accepted and included as part of the participating teams in each terminal at the start of the project. I provided a more detailed explanation of activities in section 3.4. It was important to make sure that my view and expectation of my responsibilities and those of participants in relation to understanding of the use of current KPIs, preparation of stakeholder surveys and administering stakeholder surveys at this stage of the project were aligned. I held group discussions with the participants and asked them how they saw my involvement would be in these areas. There was a meeting of expectations between me and the participants. At this stage I also met up with the project sponsors who were typically the top-level management representative in each terminal and asked them how they saw my level of involvement to make sure that there was a meeting of minds. The full support offered by the project sponsors in each organisation and the green light they have given to the participants to be open in their relationships with me helped me to build an early trust in relationships. Following initial site visits, I carried out an analysis of the resulting information in order to identify what KPIs were used and how they were used by the terminals.

3.1 Selection of Terminals

I followed a four-stage sampling process suggested by Robinson (2014) in deciding which terminals to include in the project. First stage was defining a sampling frame which needed to include specific inclusion or exclusion criteria, second stage was deciding on a sample size, third stage involved devising a sample strategy and the fourth stage was sourcing the sample. The sampling process is illustrated in Figure 4.

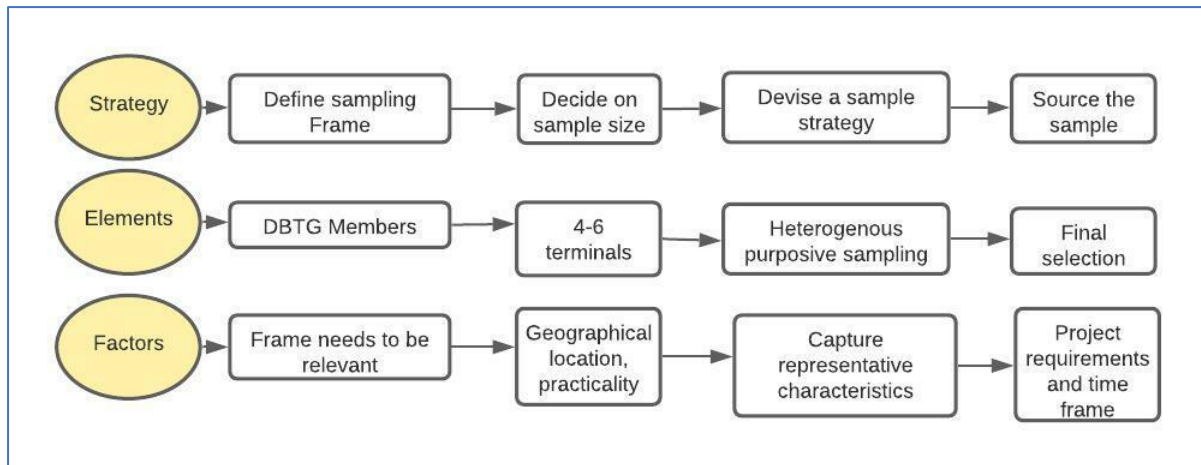


Figure 4- Sampling Process -Based on Robinson(2014)

I started by defining the sampling frame. In general terms, ports with dry bulk cargo terminals would constitute the entire sampling frame. From a practical point of view, I limited the sampling frame to dry bulk terminals that my organisation has connections with and that included members of the DBTG. Taking into consideration the objectives of my study I wanted the sampling frame to have heterogenous characteristics in terms of geographical locations of potential terminals and the countries in which they are located. DBTG members constituted a sampling frame of about 100 terminals. I also did not make a distinction between export and import terminals therefore the sampling frame included terminals handling both export and import cargoes.

Next, I had to consider practicalities of the project when deciding on a sample size. The project required at least a couple of site visits to the participating terminals during the action cycle. I therefore aimed to work with a sample of 4-6 terminals taking into consideration the time constraints and a need to complete the project within a reasonable time period. In addition to practicality of the sample size, it needed to have diversity in a number of areas such as geographical location of terminals. I examined the two main options for a sampling strategy: convenience and purposive sampling. I did not feel that a convenience selection strategy would serve the purpose of the project well, as the selected participants may not deliver on the specific objectives of the project. A heterogenous purposive sampling strategy suited the objectives of the project better as it helped to ensure that geographical and country-wise variety I was looking for was achieved. I believe that the final sample of terminals which resulted from a relationship between the sampling frame, sample size and selection of sampling strategy had the capability to support all the information required for the project therefore ensuring sufficient rigour in the process.

The specific objectives of the project in relation to the Key Performance Indicators (KPIs) required me to understand the current status as well as objectives of the participants in depth in this area. I used semi-structured interviews with the participants from each terminal during the diagnosis stage of the project, and this strategy worked well as the commitment of the participants was an important factor in the success of the project. The participants were selected by each participating terminal, the only guidance I provided to them was to make sure areas where they are currently implementing performance KPIs within their organisations were represented. During the semi-structured interviews, I explored multiple themes with each participant even if that participant was representing a certain area within the organisation to ensure that a saturation point was achieved in terms of exploring all aspects of KPIs utilised within the organisations. In total I carried out 39 semi-structured interviews with the five participating terminals during this stage of the project. The sample of individuals selected

by the participating terminals were fairly representative in terms of areas of involvement within one organisation as well as similarity of positions selected among all the participating terminals.

I initially approached eight terminals with an introductory project document (Annex 1) which outlined the project scope, research methodology, expectations from participating terminals, benefits to stakeholders and ethical and privacy considerations. I had telephone conversations with the contacts I established in each terminal in order to explain the project further. Five terminals agreed to participate in the project. One of the participating terminals is a part of my own organisation and the remaining four are terminals outside the organisation. The participating terminals represent a diverse group in terms of their characteristics as follows:

- Each terminal is based in a different country, in four different continents.
- Terminals represent both private and public enterprises in terms of ownership structure.
- Terminals represent varying duration of existence from relatively new ones to over hundred years of operational experience.
- There are various categories of stakeholders represented in each terminal including, clients, Port authorities, logistics companies, financial institutions and shipowners.
- Terminals handle a variety of bulk commodities and process cargo throughput ranging from a few million tonnes to over one hundred million tonnes per annum.
- Terminals deliver both import and export cargo handling activities.

Geographical location, ownership structure and operational characteristics of the participating terminals in Table 8.

Characteristic	Terminal A	Terminal B	Terminal C	Terminal D	Terminal E
Country	Sweden	Spain	Australia	Philippines	USA
Ownership Structure	Stakeholder	Private & stakeholder	Unlisted public company	Private	Public company
Type of Operation	Import & export	Primarily import	Export	Primarily import	Import & export
Approximate Annual throughput	6 million tonnes	1 million tonnes	Over 100 million tonnes	1 million tonnes	2 million tonnes

Table 8: Main characteristics of the participating terminals

The contrasting characteristics of the terminals participating in the project provided some challenges as well as opportunities within the framework of the project. Different geographical locations of the terminals provided an opportunity to observe how different cultural approaches affected the planning and implementation of the KPIs. The inclusion of terminals with different ownership structure provided an insight into the interaction between management style and organisational structure and the use of KPIs in the terminals. It also provided an opportunity to examine the influence of key stakeholders in the planning and implementation of KPIs. The project included terminals operating with primarily import, export or both cargoes. Although the sequence of handling import and export cargoes are different within a terminal for most bulk cargoes it follows a similar pattern of receiving, storing and then either loading the product to a ship or to trucks or wagons. Having this diversity in the project was important to observe the similarities of KPIs implemented by the terminals operating

in different modes. Terminals participating in the project handled different levels of throughput, they also used slightly different handling equipment and methods from each other. This was important in two respects: on the one hand, it allowed the project to examine the role of IT and IS in the development and use of KPIs in terminals operating at different levels of automation, and on the other hand I had an opportunity to see whether the terminals with different levels of throughput used similar KPIs in similar areas to each other. The fact that the participating terminals had different characteristics such as throughput, mode of operation, type of ownership has enabled the project to observe whether these characteristics have contributed or otherwise to them implementing similar KPIs to each other.

3.2 Preparation for Terminal Visits

I carried out initial visits to each participating terminal at the start of the action research cycle with the aim of exploring a number of areas, including:

- Understanding the KPIs currently in place at each terminal.
- The type of KPIs collected and measured at the terminal.
- The purpose of the current KPIs and how are they utilised in the terminal.
- Level of current stakeholder exposure to KPIs .

I chose to carry out semi-structured interviews with a number of representatives from each participating terminal during the initial visits. This approach allowed me to:

- Explore issues in detail with the participants which was important for the subsequent stages of the research.
- Provide a degree of flexibility during the discussions where we could deviate from a set question to explore related issues.
- Help to engage participants in a positive manner in the process and encouraged their participation.

In preparation for the semi-structured interviews, I put together a number of questions in different areas of business where a participating terminal may have KPIs in existence. I used these questions as thought starters in conversations with the participants. I intended to cover the following key areas:

1. Corporate: aim to explore objectives, strategy, decision making and use of KPIs at the strategic level.
2. Terminal factual information: aim to establish boundaries for cargo volumes, service portfolio, vessel sizes and facilities in use.
3. Evaluation of current KPIs within the business: aim to establish the extent of KPIs used, as well as current benefits and bottlenecks.
4. Key Stakeholders: aim to establish the key stakeholders involved in the terminal
5. Organisational Culture: aim to explore the decision-making process and degree of autonomy within each organisation in relation to the implementation and control of KPIs.

The set of starter questions I used during the interviews is provided in Annex 2.

3.3 Selection and briefing of Participants from participating terminals

I shared the introductory project document I prepared for the terminals ahead of my visit with them. I discussed the role that participants from each terminal would play in the project from start to finish. I also mentioned the scope of discussions that I hoped to have during the semi-structured interviews at the terminals. My expectation was that there would be participants from different areas within

each terminal and at different levels of authority. At this point the initial contact I had with each terminal became the liaison person for that terminal. Each liaison person had a manager or director role with the terminal. I left the decision to nominate suitable participants for the project to the liaison person within each terminal. They in turn discussed the project internally and selected a number of suitable participants within each organisation.

Terminals selected participants ahead of my visit. Participants selected by each terminal covered multiple roles and included both decision making and action capabilities. Table 9 illustrates the disciplines of participants and number of participants from each discipline who took part in the project from each terminal.

Participant	Term A	Term B	Term C	Term D	Term E
President/CEO/General Manager	1	1	1	1	1
Operations Manager	1	1	1	1	1
Finance Manager	1	1	1	1	1
Business Development Manager	1	1			1
Maintenance/Technical Manager	1	1	1	1	
IT Manager		1	1	1	
Health & Safety Representative		1	1	1	1
Operations supervisor/foreman	1		1		
Technical supervisor/foreman				1	1
Service Assurance Manager		1	1		
Environmental Manager		1	1		1
Warehouse Manager		1			
Stevedoring process leader	1				
TOTAL (Out of 13)	7	10	9	7	7

Table 9: Categories and number of participants in the project

Some of the terminals nominated more than one participant in a category, and each terminal participated in the project with seven to ten participants. I had a total of 40 participants from the five terminals. The participants indicated in Table 5 were the key personnel within each terminal, but these participants agreed to engage other employees within their area of responsibility during the implementation of change KPIs in order to collate, prepare, analyse and disseminate information.

3.4 Terminal Visits and semi-structured interviews

I arranged a two to three days site visit to each terminal during the diagnosis stage of the project. I followed the same procedure during each visit. The first morning of the visit provided an opportunity to explain the project to the terminal participants. I had two main objectives: to ensure that the participants understood the project objectives; and to explain the scope of their participation throughout the project. We also discussed whether they needed to reconsider their selection of project participants within their organisation. In addition, the visits allowed me to explore and agree the boundaries of involvement for each terminal where they had operations other than dry bulk. Each

terminal visit involved a physical tour around the site with different participants focusing on their area of involvement and expertise, and these provided me with a clear understanding of facilities, resources and processes as well as how they linked to the existing KPIs utilised at the terminal.

I carried out individual interviews with each of the participants from the terminals during my visit. Each interview took about an hour. I recorded the interviews with the permission of the participants. I used the starter questions referred to in Annex 2 to develop a conversation with each participant. The discussions with participants were conducted in English and in the main there were no issues with understanding and interaction between the parties. On a minority of occasions where we felt there may be some difficulties, another participant joined the conversation to ensure clarity of discussion and understanding. On a couple of occasions there was a group of participants representing different disciplines and roles within an organisation present during an interview. Each participant contributed to the discussion in relation to their specific role in response to questions related to that specific area. I collected information regarding processes and procedures that involved the use of KPIs within the organisation and was provided with examples during or after the interviews.

During the interviews, I explored a number of key areas identified in section 3.2. The discussions around corporate objectives and values helped to identify the organisational structure, decision making process and the link between the strategic decisions and introduction and/or use of KPIs within the organisation. The discussions around the extent of the service offering of each terminal helped to identify the level of interaction between the stakeholders and terminals in the introduction and use of KPIs. Discussions surrounding management style and decision making shed a light on how KPIs were developed within each terminal and for what purpose they were utilised. The factual information collected during the discussions in relation to type of cargoes, volumes and type of services offered to clients provided a comparative framework between participating terminals. At the same time, it provided an indication of the level of interaction between terminals and their key stakeholders. Discussion on current KPIs were aimed at understanding the extent of the KPIs currently used within each terminal, the history and purpose of their introduction and how widely they were understood and used within each organisation. Discussion in this area also sought to understand the drivers behind introduction of existing KPIs, whether they were driven by outside influences such as regulation and industry standards or by the decisions taken within each organisation.

I asked each participant to identify who they thought the key stakeholders were in relation to their organisation. This provided an interesting insight as the stakeholders identified by different participants differed in order of importance subject to their role and responsibilities within the organisation. The extent and similarity of stakeholders identified by different participants also provided an understanding of how well the objectives of each organisation were understood by the participants at different levels within them. Discussions around the organisational structure and decision making helped to explain reporting structures and level of autonomy of participants in identifying and implementing KPIs within each organisation. Discussions also explored the level of flexibility versus guidelines that existed in each terminal in the implementation of KPIs. Finally, discussions provided an insight as to how each organisation dealt with success or failure in their implementation of KPIs.

3.5 Evaluation of Semi-structured Interviews

This section discusses existing structures and practices within participating terminals in relation to corporate objectives and KPIs, organisational culture and KPIs, management style and KPIs, stakeholders and KPIs and information systems and KPIs, on the basis of information emerging from semi-structured interviews.

3.5.1 Corporate Objectives and KPIs

Corporate level discussions identified a set of vision, mission and objectives for each participating terminal. One of the objectives of the discussion in this area was to explore the relationship between corporate objectives, management style and the way KPIs were implemented by each participating terminal. Table 10 provides a comparison of corporate objectives amongst participating terminals.

corporate Objectives	Term A	Term B	Term C	Term D	Term E
Delivering added value services	√	√		√	
Following lean management practices	√				
Continued efficiency improvements	√	√	√		√
Throughput growth	√	√		√	√
Improved environmental performance	√	√	√	√	√
Service quality & customer satisfaction	√	√	√	√	√
Corporate social responsibility	√	√	√	√	√
Cost effective & reliable service delivery	√	√	√	√	√
Contractual performance	√	√	√	√	√
Safe Working environment	√	√	√	√	√

Table 10: Corporate objectives of the participating terminals

There are a number of common areas that emerge among the participating terminals. There is a strong emphasis on a safe working environment, environmental performance and social responsibility among the participating terminals. These areas are not only reflected in how they manifest themselves within KPIs adopted by the terminals but are also reflected in actions that terminals take in practice ranging from training and development opportunities within the organisation to community projects they undertake regularly. Service quality and customer satisfaction is another area of common importance among the terminals. The CEO of Terminal E describes their approach: “We see ourselves as economic development agencies, all the infrastructure such as the ship channel, docks, roads and rail need to ensure competitive flow to our customers to deliver a good service standard”. Terminal A’s finance manager describes their stakeholders’ expectations: “Customers expect quality service, no damages, quick turnaround of ships, they also want flexible working hours”. The way that this is reflected in their KPIs is influenced by the role that stakeholders play in the ownership structure of the terminals. Different emphasis on stakeholders’ requirements such as performance, reliability or cost control has an influence on how the KPIs are constructed by the terminals. In other areas, such as delivering added value services or following lean management techniques, there is less common ground among the participating terminals. Terminal A embraced lean management practices a number of years ago, the stevedoring process leader of Terminal A reflects back at times prior to implementation: “Six years ago figures were not clear, we did not have a performance system, therefore it was not possible to calculate potential benefits”. Some terminals do not have the necessary resources, or their objectives do not necessarily prioritise these particular approaches. It is good to see that some of the corporate objectives such as the contractual and environmental performance, service quality, cost effectiveness and safe working practices were taken on board by all the participating terminals. Some of the other objectives, such as the throughput growth, added value services and efficiency improvements, are

influenced by several factors including ownership structure and the influence of the key stakeholders in the management of the terminal.

3.5.2 Organisational Culture and KPIs

Each participating terminal is based in a different country, therefore the organisational culture in each are different. In contrast, organisational structures in participating terminals are similar to each other and include representatives fulfilling management, supervisory and lower-level roles covering the main areas of the organisational framework in the terminal including operations, maintenance, health and safety and environmental management. Dimensions of organisational culture in turn have an influence on how each terminal approach in setting, managing, monitoring and evaluating KPIs they employ within the organisation.

I made a reference to Hofstede's work on national cultures in section 2.2.2. Various aspects of the validity of his work has been criticised by others. McSweeney (2002) argues that Hofstede's treatment of nations as single entities is not correct as national cultures are made up of a number of sub-cultures. In the same manner his work does not compare individuals but rather works on the basis of comparing central tendencies. Hofstede's assumption that there is a singular organisational culture within his sampling universe ignores the existence of conflicting cultures within an organisation. Although he acknowledges the existence of cultural variety between units of organisations in his later work. Hofstede's assertion of the existence of a national workplace culture in each country is also criticised as having a specific national culture is not the same as a national workplace culture Mcsweeney, (2002). Related to this issue there is also criticism of the size of his database being representative in each of the countries he conducted his study. There is also criticism of Hofstede's dimensions. Robinson (1983) argues that Power distance Index (PDI) does not scale for individuals or sexes, and it is measured from a subordinate point of view as to the interpersonal power between a boss and an employee. Parameters that make up the individualism index are described as 'hodge podge' of items. The fifth dimension that Hofstede added to his previous study later on related to short- or long-term orientation which was taken from another study in China does not correlate with the other four dimensions. Being aware of criticism of aspects of Hofstede's work I decided to refer to three of his dimensions in my analysis in this section with caution because they refer to three areas which are relevant in the context of my project; style of decision making and the level of autonomy, long or short-term orientation of organisational objectives and individual versus team based decision making in setting KPIs. In addition, Organisational culture in each participating terminal in my study is influenced by national norms to a certain extent, however at organisational level I observed that the participants in their practices are affected by different layers of culture within their organisation as well as relationships they have with their colleagues. Through my observations as each stage of my project I will have an opportunity to compare them with the findings of Hofstede's dimensions. The first of Hofstede's dimensions, the power distance index (PDI) is compiled using three distinctive survey questions;

- How often employees are afraid to express their disagreement with their managers
- Employees perception of their boss's decision-making style (autocratic or paternalistic)
- Employees preference of their boss's decision-making style

The study ranked 74 countries along a relative ranking order. A smaller PDI ranking country indicates less dependence of employees to their bosses and a preference for a more consultative decision-making process. A higher PDI ranking country indicates a higher level of dependence and a preference to more autocratic style decision making. At the same time low PDI countries try to minimise inequality whereas in high PDI countries this is seen as a part of the order within society. Hofstede

(2001) made a reference to Aston Group researchers who looked at two dimensions of organisational structure, concentration of authority and structuring of activities. There is a relationship between PDI and the concentration of authority in an organisational structure. I believe this in turn manifests itself in the management style of an organisation. Table 11 shows an extract of PDI values which refer to the countries that participating terminals in my project are located.

Country	PDI Value	Corresponding Terminal
Philippines	94	D
Spain	57	B
USA	40	E
Australia	36	C
Sweden	31	A

Table 11: PDI ranking of the participating terminals

PDI rankings on the table above match some of the decision-making preferences emerged during the semi-structured interviews I carried out with participating terminals but in other cases they diverge from the suggested index value. Participants who are not at the management level from terminal D whilst had some contribution to the ideas in terms of development of KPIs, looked for guidance and decision making to the management. The Human resources manager describes the system: "Supervisors get input from the employees in terms of any suggestions, they can put it to management and then management decides". The degree of decision-making authority provided to some of the lower level employees in this terminal suggests a lower value than what Hofstede's index suggests. In terminals B and E participants were active in discussions and decision making especially in areas of their expertise. In terminal B, the operations director emphasizes the importance of collective effort: "Monday meetings are important for representatives to make suggestions for new ideas, we then agree whether to test them or not". The management in these terminals trusted the participants to plan, prepare and implement any change actions following a decision. Terminal C had a continuous development framework running through the organisation which encouraged individuals to take responsibility to support the objectives of the organisation in a number of areas hence pushing teamwork to the front. The community liaison manager describes it: "We want to get people to talk if they see that something is not right. Ultimately, that's where we want to get to. Safety leads are best placed to identify any shortcomings also developing people's courage". The ideas for business plans are discussed and prepared by the management for approval at board level. Thereafter, the team is responsible for delivering what is agreed within the parameters and the time frame agreed by everyone. However, there was still a degree of control by senior management where the final decisions were taken in these organisations suggesting a higher degree PDI distance than what the index suggests. Terminal A adopted lean management techniques which required employees to constantly strive for savings and efficiency improvements and encouraged them to experiment with new methods to that effect. The marketing manager of Terminal A points to the importance of this: "Ideas for development comes from diversion from process, employers can make suggestions to the area managers for changes". Teamwork is an important element of implementation in this terminal, there is trust in team leaders to deliver on what is agreed and that is also reflective of a wider culture within the country. The Drybulk manager emphasizes: "Having support of employees is very important for success, important to have them on board".

Once a decision is made and a system is implemented, the way that participants behave within the organisation is likely to influence the progress and success of KPIs. Another dimension of Hofstede’s model is the individualism index which looks at individualist and collectivist tendencies among different nations at a society level rather than an individual level, as well as organisational level in terms of practices. Hofstede points out that the degree of individualism within an organisation depends on various factors such as organisation’s history, organisational culture and literacy level of employees. I extracted Individualism Index (IDV) values for the participating terminals in my project in Table 12.

Country	IDV Value	Corresponding Terminal
USA	91	E
Australia	90	C
Sweden	71	A
Spain	51	B
Philippines	32	D

Table 12: IDV ranking of the participating terminals

The relationship between the PDI and IDV rankings points to a trend that countries with higher PDI value tend to have a lower IDV value and are therefore likely to be more collectivist. There are different dimensions that relate to the measurement of individualism, but within the context of my project I am considering it from an organisational point of view. All participating terminals recognise the need for collective effort in order to increase the chances of success in implementing KPIs in their organisations. Terminals with lower IDV values are more reluctant to put in place individual incentive schemes directly linked to the performance of the KPIs within the organisation. Terminal D has the lowest IDV ranking on the table. It promotes teamwork and team effort in achieving success although individual responsibilities are acknowledged when making decisions. However, in contrast to the IDV ranking there is a level of individual recognition and reward system in place. Terminal B has the second lowest IDV value, it has an emphasis on collective approach but there is a recognition of the expertise within the management and individuals have been given responsibilities in making decisions to match their area of expertise once again there is a deviation from the approach suggested by the index. The president of Terminal B describes their approach: “In terms of selection of what KPIs to be utilised the area managers in charge of operations, maintenance etc. can choose which measure they want to implement and monitor. I time to time provide my views on that to them”. Terminal A is in the middle of the table and it has a similar approach to terminal B, however individuals are trusted to deliver on the decisions they have taken. The quay foreman describes: “Team take responsibility in discharge of vessels and try to solve problems. It helps grow self-confidence”. Terminal C has the second highest IDV ranking. It has specific incentive schemes in place that rewards individuals for their contribution to the KPIs set out within the business in line with their role and responsibilities. At the same time, it emphasizes the responsibility of individuals to care for themselves as well as those around them. Therefore, there is a greater emphasis on individual responsibility, but the team effort is still very important. This terminal has the highest number of specialist teams in areas such as service quality, conformity which promotes, and prizes teamwork therefore somehow contrasts with the national IDV ranking assigned in the index. Terminal E has the highest IDV value. It recognises collective achievements of teams in achieving goals in relation to KPIs in different areas. However, it uses the skills and dedication of voluntary individuals (champions) who encourage teams in different areas to achieve organisational goals and follow KPIs. The environmental director suggests: “We try not to

reward individual behaviour, try to give opportunities for collective recognition especially in areas of safety”.

The third dimension which is of interest to my project is the long- and short-term orientation of national cultures. Hofstede describes long-term orientation as supporting beliefs orientated towards future developments, whereas short term orientation as more looking towards past and present endeavours. An extract of long-term orientation Index (LTO) values that correspond to terminals participating in my project is shown in Table 13.

Country	LTO Value	Corresponding Terminal
Sweden	33	A
Australia	31	C
USA	29	E
Philippines	19	D
Spain	19	B

Table 13: LTO ranking of the participating terminals

Higher LTO values tend to indicate a more long-term orientation, on the original table with all the participating countries, the highest score is 118. This indicates that all the participating terminals have scores on a relatively low spectrum. All the participating terminals have long-term strategic plans linked to their organisational vision. Terminal A had a long tradition of serving key clients, however the organisation recognised the changing market conditions and set strategic plans in place to develop and grow the business within a three to five-year plan tied to annual objectives and targets. Terminal C relies on long term client relationships as well as new business development but has a long-term outlook in terms of business planning and forecasts within five to ten-year horizon. This suggests that it should have a much higher LTO index value in terms of national value than what is suggested in the index. Terminal E, D and B have similar 3 to 5-year objectives that they put into action. Therefore, all participants in the project whilst having an appreciation of the past and present factors in their organisation have a very focused approach to where they want to be in the medium-term development in their business. The terminals D and B are in a most competitive environment in terms of having to secure continued business. The terminal D is also a relatively new venture with the shortest life span. Therefore, it has the more focused approach to a one to three-year time frame.

The position and influence of key stakeholders in participating terminals have an influence on their long-term objectives. Long-term objectives of terminals provide a guidance as to the key KPIs they follow and monitor in their organisations. Table 14 illustrates the type of key stakeholders for each participating terminal who has a stake or governance power in the organisation.

A	B	C	D	E
Clients	Private Venture	Clients	Private Venture	Public Entity
Community	Financial institution	Suppliers		

Table 14: Key Stakeholders with influence

Terminal A has a strong focus on sustainability, performance as well as environmental compliance with the clients and the community having a strong influence in the organisation. Terminal B has a focus on competitiveness, growth and financial stability as a private venture with financial institutions

as key stakeholders. Terminal C has a focus on reliable service delivery to meet its commitments to clients as well as maintaining a strong environmental compliance as clients and suppliers feature as key stakeholders. Terminal D has a focus on growth of business and profitability as a relatively new venture with private interests. Terminal E focuses on having the facilities in place to service and maintain service quality for the long-term clients.

Culture building artefacts

Following on from the discussion in section 2.2.2, Taylor (2014) examined cultural effects of using performance information building on the multiple layers of organisational culture and put forward a number of propositions. These suggest that the use of performance information within an organisation is influenced by the organisation’s artefacts and espoused values. Organisations tend to use a number of artefacts such as incentives, communications, learning forums to engage and ensure participation of employees. Espoused values of an organisation in most cases are reflected in their vision statement and objectives. In my project, I have identified a number of uses of such artefacts within the participating terminals during the initial semi-structured interviews in order to help implement KPIs. These are summarised in Table 15.

Artefacts/values	A	B	C	D	E
Corporate Vision	√	√	√	√	√
Organisational Mottos		√	√		√
Targeted slogans	√	√	√	√	√
Team incentives	√		√		√
Individual incentives	√		√		
Setting benchmarks/targets	√		√		√
Corporate Social Responsibility Programmes	√	√	√	√	√
Individual policy cards					√
Objective/value posters	√	√	√		√
Targeted employee training	√	√	√		√
Team toolbox meetings	√	√	√	√	√
Employee surveys	√		√		√
Newsletters			√		

Table 15: Use of artefacts and espoused values at the participating terminals

These artefacts and espoused values also relate to Schein’s (2010) three levels of organisational culture. Different use of slogans, depicting of mottos around the terminals and different types of dress code among the participating terminals demonstrated the first level. For example, use of a standard uniform with name tags was implemented throughout Terminal C including all the office staff, and employees were expected to demonstrate adherence to company values by practising them, whereas in Terminal D the enforcement was through regular meetings. Participating terminals were consistent

in documenting their vision and corporate objectives. In terms of encouraging employee responses terminals used a variety of tools such as individual or team incentives as shown on Table 13.

All the participating terminals have a corporate vision which helps drive them forward, some terminals use additional organisational mottos, and all of them have targeted slogans in one or more areas where they use KPIs. Some terminals use both team and individual incentives, and one terminal prefers to encourage team incentives only. All the terminals have community engagement activities under corporate social responsibility programmes. The terminals use different tools such as posters, policy cards, targeted training and employee surveys to inform and train employees.

3.5.3 Management style and KPIs

The literature review (section 2.2.3) highlighted the relationship between the organisational culture and management style. I explored the relationship between the organisational culture and the management style in the participating terminals during the semi-structured interviews I carried out with the participants. The discussions with the participants below management level explored the emergence and implementation of existing KPIs and the level of involvement of individuals in developing ideas. The discussions with management level participants involved similarly the emergence of ideas, the level of support provided by them in the process, and the way that the final decisions are taken whether to implement a KPI within the organisation. I also observed activities during my site visits which involved interaction among the participants around the implementation, control and reporting of the KPIs within the organisations. Table 16 shows the dominant organisational cultures and management styles I observed in the participating terminals using Harrison’s (1987) suggested model.

Terminals	Organisational culture	Management Style
A	Support	Participative
B	Achievement	Consultative
C	Achievement	Consultative
D	Role	Authoritative
E	Achievement	Consultative

Table 16: Organisational culture and management style of the participating terminals

Although Table 16 is representative of organisational culture and management style of the participating terminals in general, I witnessed that the management style in some of the terminals changed at the implementation stage of the project in response to changing circumstances and priorities within the organisations. Terminal A is characterised by a support culture where there is respect and trust among the employees, and this leads on to a participative management style where the trust theme continues. The quay foreman proudly says: “It is important to give back positive feedback to the gang after a good shift”. However, in circumstances where there is a need to implement certain change in order to improve existing practices, the managers decided to move towards a consultative management style where they maintained a level of control on implementation of new practices. Terminal B promotes an achievement culture and a consultative management style where there is support and a degree of control but during the implementation stage of the project where it is vital to ensure implementation of a change initiative the representatives decided to follow an authoritative management style. Terminal C promotes an achievement culture and a consultative management style. The general manager describes the culture: “We have a culture that encourages

engagement, encouraging leadership among the employees. Employees know how they contribute to KPIs". Role culture is dominant in terminal D as a result there is an expectation of an authoritative management style by the participants outside the management. The quay supervisor states: "We put suggestions to the management in monthly meetings and then the management decides on implementation". However, the management also uses a consultative management style from time to time. Terminal E supports an achievement culture and a consultative management style is prominent. However, at times an authoritative management style is used to drive changes.

3.5.4 Stakeholders and KPIs

Discussions during the semi-structured interviews also covered participants' views as to who the key stakeholders were in relation to their terminal and area of involvement. Some of the participating terminals identified internal stakeholders as well as external stakeholders during the discussions. Table 17 summarises the range of external stakeholders of importance to each participating terminal.

Stakeholders	A	B	C	D	E
Clients	√	√	√	√	√
Shipowners	√				
Logistics Partners	√	√	√	√	√
Ship agents	√	√			
Port Authority		√	√	√	
Community			√	√	√
Financial institution		√			
Regulatory Authorities			√		√

Table 17: Major stakeholders of the participating terminals

Clients and logistics partners are the two categories of stakeholders mentioned by the participants across all participating terminals. Shipowner was mentioned as an important stakeholder by one of the terminals as they had a dedicated relationship with them. Although the local community was important for all the participating terminals, not all of them mentioned it as an important stakeholder in the conversations. Financial institution was an important stakeholder for one of the participating terminals as they had a stake in the ownership of the organisation. Regulatory authorities featured heavily for couple of the participating terminals because of the level of their power and how they exercised it.

The stakeholder surveys administered by the participating terminals at the planning stage of the project included clients, port authorities, shareholders, ship agents and logistics providers/partners. Each of these stakeholders are defined as follows:

Clients

Clients are either shippers of commodities exported through a participating terminal or receivers of a commodity imported through a participating terminal. The range of terminal services engaged by clients vary among the participating terminals. The main determining factor for this is the strategy of a participating terminal as to the type of services they like to offer to the clients. In some cases, clients have a stronger voice in such decisions as they play a dual role in their relationship with the terminal and they have a shareholding in the organisation as well as being a client.

Port Authority

Port authorities are mainly providers of marine services such as pilotage and tugs and in some cases, they also provide stevedoring labour to the terminals.

Shareholders

Shareholders in the terminals participating in the project are made up of private investors, financial institutions, government authorities, clients and communities.

Ship agents

The ship agents interact with terminals mainly as representatives of shipowners. In some of the participating terminals, the ship agents also have a close relationship with the clients and influence on logistics arrangements including the throughput directed through the terminal.

Logistics provider/partner

Participating terminals utilise logistics providers in different capacities which include transport services, stockyard and warehouse management and planning of logistics chain activities. Some of the terminals have logistics providers providing and managing storage capacity for the terminal and in some cases, they also provide transfer of commodities between the quayside and storage facilities. In the other terminals the clients also fulfil the role of logistics provider by receiving, storing and delivering the commodity to the quayside for loading operations. In some cases, the logistics partners represent multiple clients as a part of a logistics chain and are responsible for planning and allocation of capacity and services within the logistics chain.

I used following abbreviations for each category of stakeholders throughout the analysis of stakeholder surveys during the project.

Client – C

Port Authority – P

Shareholder – SH

Ships Agent – A

Logistics Partner – LP

In relation to the efficiency and effectiveness dimensions of KPIs discussed in section 2.2.1, I mentioned that the previous research mostly worked with certain categories of stakeholders such as shippers or cargo owners and agents. The approach I have taken in my project ensures that all the stakeholders in different categories for each participating terminal are captured. This provides a more balanced picture of expectations of stakeholders as well as feedback on performance of terminals.

3.5.5 Information systems, Organisational culture and KPIs

The use of IS and IT is an important area for all the participating terminals. This has a direct effect on a number of activities within the organisations for monitoring performance management;

- The level of automation in operation of terminal equipment which also affects the level of human resources and the interaction between equipment and human resources.
- The way that the information is processed and recorded by the personnel and the level of paperwork involved in the process.
- The use of mobile technology in recording and reporting information within the terminals.
- The capture of just in time information within the organisation.
- Sharing of just in time information with the stakeholders.

- Improving health and safety as well as employee wellbeing and reducing risks.

As discussed in section 2.2.5 organisational culture, IT structure and IS development within an organisation interact with each other very closely (Claver et al., 2001). Most of the participating terminals realise the advantages of developing an IS structure within the organisation to harness the power of efficient use of information internally as well as with their stakeholders. However, each organisation has a cultural approach which either favours the development of IS within the organisation or it does not. Terminals with successful IS structure used their corporate objectives to drive this change successfully. Table 18 illustrates the current level of use of information systems and technology, the intention and the driver for change for each of the participating terminals.

Terminals	Current IS-IT	Planned IS-IT	Drivers for change
A	Low-medium	Medium - high	Business objectives
B	Low-medium	Medium-high	Business objectives
C	Medium-high	High	Business objectives
D	Low-medium	Medium-high	Business objectives
E	Low	medium	IT Initiatives

Table 18: IS-IT implementation at the participating terminals

Terminal A's desire to implement better information systems and technology is driven by their intention to improve productivity and it is linked to drivers within their lean management system. The implementation requires verification of the long-term benefits of any proposals before they can be put into action. The implementation also requires significant number of resources and time to be allocated to the project, this is in short supply and is seen as one of the blockers for the progress. Terminal A prefers acceptance of employees before implementing a system and see the acceptance of a new system by the employees as one of the biggest hurdles to progress. They believe that once acceptance is achieved than the implementation should not require any further incentives within the organisation. This points to an existence of an informatic culture as referred to in section 2.2.5 in Terminal A.

Terminal B uses strategic change as a driver to implement better information systems and technology. The acceptance by the employees is seen as the most important factor and team leaders are used within the organisation to implement the process of acceptance. Terminal B is in favour of adapting a consultative management style during the implementation process to ensure successful implementation. They also believe that the implementation should be tied to specific KPIs to demonstrate the benefits of change as well as driving it.

Terminal C perceives implementation of information systems and technology as a strategic decision based on long term goals. The acceptance of employees is important and various methods are used including cross functional teams and employee surveys to determine the objectives and achieve acceptance. As such a bottom-up approach is employed to get the approval of the project then the implementation is driven by designated teams. The objectives are also incorporated into individual incentives. These point to clear signs of existence of information culture in terminal C also supported by high level of IS use within the organisation.

Terminal D sees further implementation of information systems and technology as a business requirement to support growth and quality of the service delivery. The biggest obstacle to delivery is

the scale of resources and the time required to implement the changes. Therefore, terminal D relies on outside resources to implement the changes. Employee acceptance is seen as an important factor in driving the change. At present decisions are driven by short term goals and more focused on IT requirements rather than a more comprehensive use of IS.

Terminal E has currently a low-level information system and technology use. This is influenced by the business model of the terminal where the clients and third-party service providers take the responsibility in handling, storage and transfer of commodities between the quayside and the facilities. There is a recognition and desire towards benefits of further use of information systems and technology within the organisation. The progress is driven primarily by the benefits of a new system, the implementation uses a bottom up approach where the managers cultivate and promote ideas.

3.5.6 Extracting Themes from the Semi-structured interviews

Identifying the main themes

I gathered qualitative data during the semi-structured interviews I carried out during the site visits. I needed to organise and analyse the interview scripts in order to determine the patterns emerging from them to assist me with analysing important areas for the participating terminals. I used thematic coding as a process to encode this data (Gibbs, 2018). Thematic coding is a method for identifying themes within data and provides flexibility in how themes may be extracted from a data set. Data corpus refers to all data collected during the project and a data set is all the data from the corpus used for a specific analysis (Braun & Clarke, 2006). In my analysis, the data set comprised of semi structured interviews. I used inductive analysis in identifying the themes without reference to themes that previous research on this topic might have identified. The process of thematic analysis I followed is illustrated in Table 19 below.

Phase	Description of the Process
Familiarising with data	Transcribing and reading semi-structured interview recordings
Generating initial code	Codes generated with the assistance with NVivo
Searching for themes	Using Treemaps to group the codes and looked at frequency and number of referencing for them
Reviewing theme	Looking for coherent patterns within each data set and also across all datasets
Defining and naming the themes	Consider the relationship of themes to the practical areas of KPIs, naming them
Producing a report	Analysis of themes and comparison with KPIs utilised presented in Annex 3

Table 19 - Process of Thematic Analysis (Based on Braun & Clarke, 2006)

The coding enabled me to categorise the text from the semi-structured interviews to identify emerging themes so that not only I can examine the data in a structured manner, but I can also examine the links between the themes and the areas where KPIs are used in participating terminals. The coding involved gathering the text from my semi structured interviews (the source) into different categories and then assigning a label to them. Therefore, it was an emergent open coding process and I did not use pre-defined codes. In order to help with this process, I utilised a programme called NVivo (version 11). The programme provides a number of tools to assist with the analysis of data. Nodes are folders used to gather material related to each other in order to help with emerging patterns and ideas. Nodes are divided into thematic nodes and case nodes. I gathered the content for the nodes by coding the content from the interview scripts into nodes. Thematic nodes are used for the material whereas the

case nodes are used to collate units of observation from the data. I coded themes into thematic nodes from 39 interview scripts which helped me to organise the nodes into a meaningful order. There is no consensus in literature with respect to an optimum number of interviews to be held before data saturation is reached. Guest et al. (2006) used studies they carried out in two West African countries as an example and concluded that they identified 92% of the themes by the time they carried out twelve interviews. In my project, after the first three interviews with each organisation I found that over 90% of the issues were covered and very few new issues emerged from the subsequent interviews. Figure 5 shows the themes that emerged as a result of coding. Themes have been developed in an inductive way from the data sets within the interviews without using any pre-existing coding frame. These main themes represent areas of importance to the participants from the terminals.

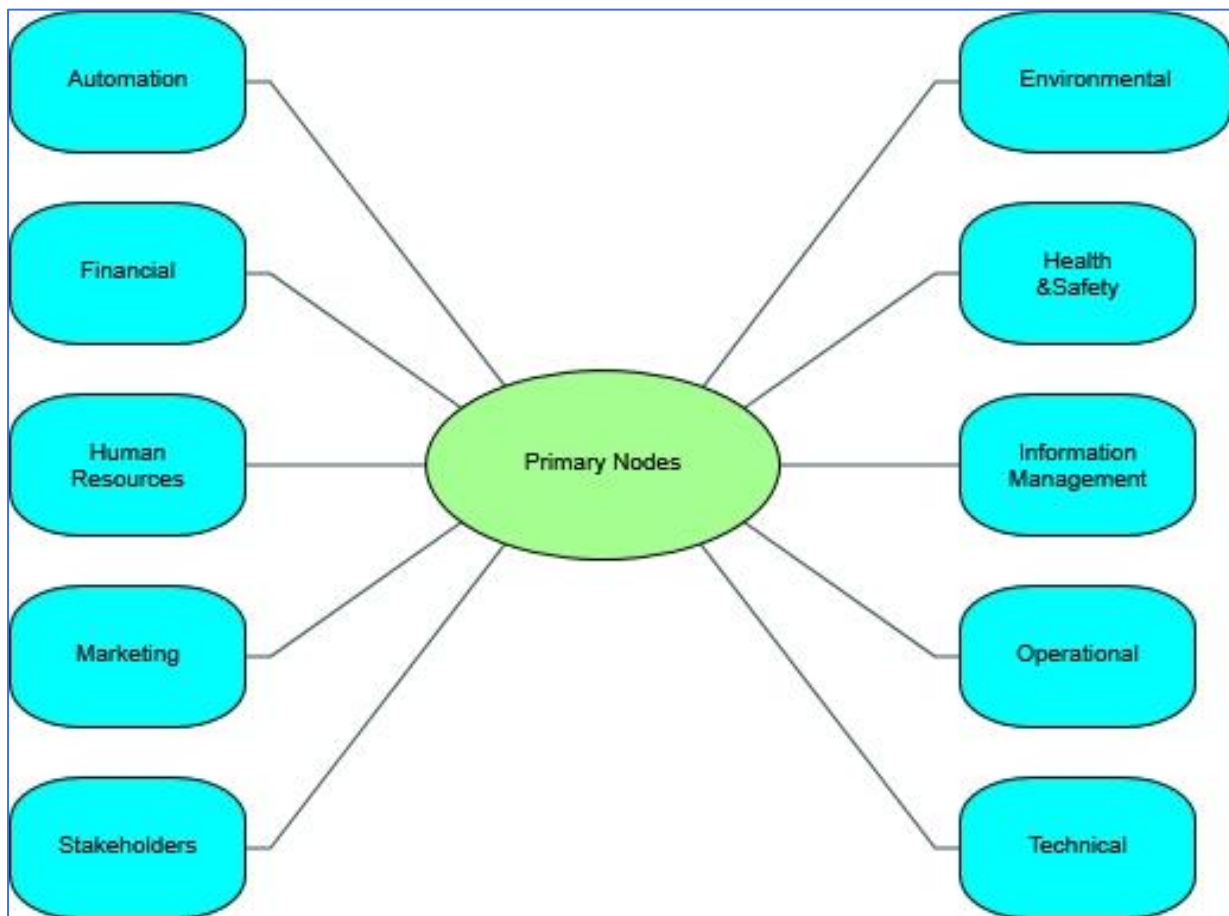


Figure 5 - Main Themes emerging from coding of the semi-structured interviews

I created case nodes to represent two categories that are important in the context of my project.

- Location, which is based on the location of each participating terminal in the project
- Participants, individuals who have participated in the interviews identified by their roles in terminals

Locations of the participating terminals are shown in Table 4 and designations of the participants from each terminal are shown in Table 5.

Identifying themes by means of thematic coding has contributed to the planning and action stages of the project and exploring some of the research objectives. The identification of themes enabled the project to look at the link between the themes and the areas where KPIs are implemented by the

participating terminals. The frequency of referencing of the areas coded in each theme provided an opportunity to compare those areas with most frequent referencing with the specific KPIs implemented by the terminals in the same areas. The analysis assisted in developing options for change KPIs during the discussions took place at the planning stage with the participants, it also helped in selection of questions and areas to be included in the stakeholder surveys. The analysis also provided a reference point to refer back to as a basis for areas and actual KPIs which have been amended or introduced during the action cycle by the terminals. In relation to the research objectives identification of themes from the semi structured interviews assisted in determining the level of importance and consideration given to the effectiveness dimension of the KPIs and the views of the stakeholders prior to the implementation of the project. The themes emerging also helped in discussions regarding the role of organisational culture and management style in implementing KPIs. The analysis also helped to understand the coherence of the message across the organisations from the cultural point of view in relation to role of KPIs in the organisation.

3.6 The relationship between existing KPIs and the themes

The areas where the participating terminals developed specific KPIs largely follow the same areas where the themes emerged as a result of the coding of the semi-structured interviews. I had specific discussions on the KPIs currently utilised by the participating terminals as part of the initial interviews. During the interviews, the participants explained what KPIs were currently utilised in different areas of their terminal. I also had a brief description of the context in which each KPI was utilised. This allowed me to map and match KPIs currently utilised by the participating terminals with the themes.

Current KPIs used by the participating terminals involve the eight areas shown in figure 6.

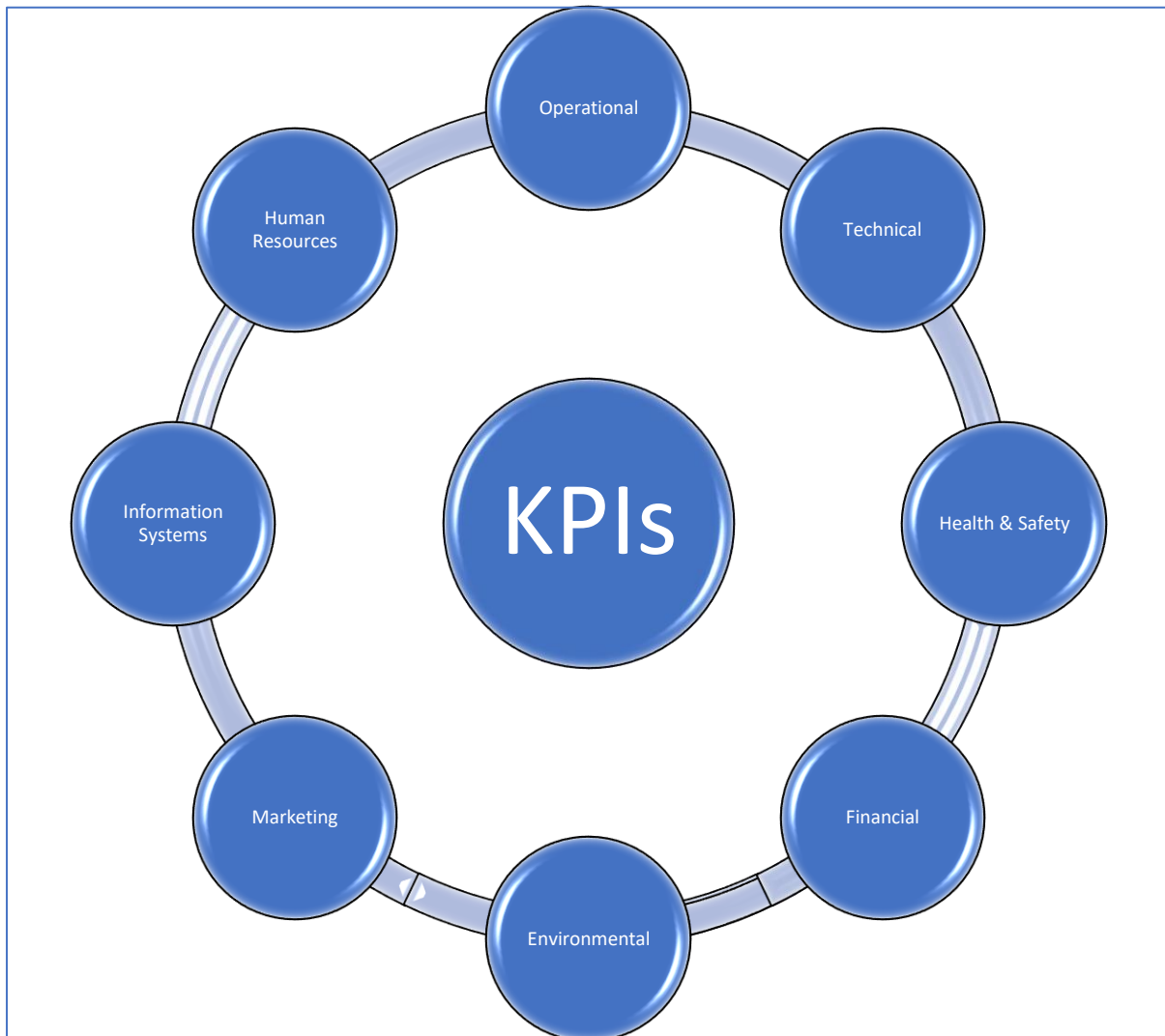


Figure 6 - Main areas where KPIs are currently utilised

The areas highlighted in Figure 4 closely relate to the business unit structures within terminals participating in the project.

1. The *environmental area* is very important, all terminals place an emphasis in this area. There is continuous tightening of regulatory boundaries in this area primarily driven by regulatory bodies, government agencies and environmental groups. In addition, key stakeholders in participating terminals show an increasing level of interest in performance of their terminal in this area.
2. The *financial area* is influenced by the mission and objectives of the terminals participating in the project as well as the stakeholders who have interest in the shareholding of the terminals. Objectives of the terminals focus on sustainability, growth or a combination of the two and these in turn affect the focus on the financial area.
3. The *health and safety area* is one of the areas of primary importance to all participating terminals. It is driven by constant desire to raise standards in this area and on many occasions, it is also one of the key corporate objectives for organisations. There are regulatory standards that participants need to adhere to, however in my interactions with participants the key driver in this area was a genuine desire to provide a safe working environment to employees

and third parties engaged within the confines of a terminal. The level of importance placed on health and safety is such that on occasions it may be a key driver in formulating important business decisions. A number of participants have taken it a step further by starting to put together initiatives for employee welfare in an effort to establish a relationship beyond the workplace and working hours spent on site. The thinking behind this is that if an employee is content and happy at home, he or she is more likely to be the same at work and contribute further to the enterprise.

4. The *human resources area* of the participating terminals involves the monitoring of various aspects of health and wellbeing of their employees and at the same time there is a great degree of emphasis on personal development and training of employees. There is a preference among the participating terminals to promote employees from within their organisation. There are examples of employees having gone through the ranks starting on the quayside and moving up to managerial posts. Terminals also place an emphasis on developing multi-skilled employees who can perform different tasks within their area of involvement. A good example of such a practice is multi-skilled machine operators, operating different machinery on the quayside, in ships holds and in warehouses. Employee retention is an important area for all of the participating terminals. This is reflected in low employee turnover figures, indicating that employees have been with organisations for a period of time and possess a considerable range of skills and experience in their work.
5. The *information systems area* covers a wide range of applications within participating terminals. All participants recognise the importance of collection, analysis and dissemination of data within their organisations in a way where it assists decision making process or monitor and evaluate various aspects of their performance. There is a shift towards making more intelligent use of technology and software for analysis and reporting of information in different areas of business. Participants are also experimenting with real time collection and use of data within their organisation. In a wider context, use of information systems also related to the degree of automation used in participating terminals to provide key services to clients. At least two of the participating terminals see automation as a central part of their service delivery. The reasons for implementing technology vary. Capacity utilisation, throughput delivery, consistency of service performance, environmental compliance and safer working environment for employees are some of the incentives for participating terminals to apply automation.
6. The *marketing area* is important each participating terminal. The framework each terminal apply in this area is driven by different circumstances and constraints they experience. Key stakeholders with a say in business have an influence on how business development should take place. The most important factor driving terminals' decisions in this area is the long-term sustainability of their business. All participating terminals are aware of changing market conditions within business environment they operate therefore they seek opportunities to support their business in the long term. This area is also about making sure that the key clients continue to support their business and their business can support changes in key clients' business and their expectations.
7. The *operational area* covers services provided by the terminals, specific KPIs in this area are driven by a combination of factors. Performance in this area is linked to corporate objectives, business targets, competitive nature of the market as well as client relationships and contracts.
8. The *technical area* is in the heart of assets owned, operated or managed by the terminals. All participating terminals employ engineering driven concepts in order to ensure that technical function deliver what is expected of it. There is a great degree of interdependence between

the areas; the age, condition and maintenance history of assets affect decisions to be taken on operational performance, business objectives as well as budget decisions on life expectancy of assets.

In Table 1, I provided a list of port performance parameters used in a number of previous studies. Those parameters mainly related to operational performance and capability areas. Themes identified as a result of thematic coding I carried out above show that the KPIs are utilised in many other areas in participating terminals.

The analysis of themes and specific KPIs

In this section of the report, I analysed the main themes that emerged from the thematic coding in more detail and looked at the frequency of engagement of specific KPIs within the themes by the participating terminals. Details of the analysis is included in Annex 3. The analysis looked at the frequency of referencing in each area within each theme in order to provide a pattern for its importance in participating terminals. It also provided examples of how specific KPIs in each area are related to the specific activities undertaken by each terminal. There is further explanation as to how KPIs in each area are being used by participating terminals. This analysis provided an opportunity to understand how commonly each KPI was used among the participating terminals and how similar the measurement and reporting mechanisms were.

3.7 Conclusions

Development of themes following interviews I held with the participants from each terminal identified areas of importance within the context of performance KPIs utilised by the participating terminals as well as providing information in other areas of research questions. It also allowed me to compare the themes emerging from the analysis with the areas where the existing KPIs were used by the terminals. A summary of number of KPIs implemented in each category by each terminal is provided below.

Environmental

Number of environmental KPIs utilised by each participating terminal are shown in Table 20.

Environmental KPI Categories	A	B	C	D	E
<i>Official complaints</i>	1	1	2	1	1
<i>Emission control</i>	1	1	2	1	1
<i>Green energy use</i>	1		3	1	
<i>Community engagement</i>	1	1	1	1	1
<i>Spillage and industrial discharge</i>	1	1	3	2	1

Table 20: No of environmental KPIs used by the participating terminals

Table 18 shows that except for the *green energy use* category, all terminals utilise one or more KPIs in each category. The categories with more than one KPI indicate that a terminal may use two variations of a KPI within the same category for example in *official complaints* category terminal C monitor regulatory breaches that lead to complaints as well as community group complaints. Environmental performance KPIs are not widely reported in previous studies. However, participating terminals had a significant emphasis in this area driven by increasing regulatory requirements and community pressure. All participating terminals actively involved in community projects related to environmental

initiatives. The environmental agenda also affected handling and storage methods as well as the choice of handling equipment in the terminals to minimise environmental impact.

Financial

The selection of specific KPIs terminals utilise within the financial area are driven by internal controls such as corporate objectives and budgets. Range of KPIs used by the participating terminals include a number of financial ratios. Table 21 shows a selection of ratios used by the participating terminals; these are not exhaustive.

Main financial KPIs	A	B	C	D	E
<i>Predicted and actual revenue streams</i>	√		√	√	
<i>Return on capital employed</i>					√
<i>Debt/equity ratio</i>				√	
<i>Annual profit/margin</i>	√	√			
<i>Operational cost</i>	√	√	√	√	√

Table 21: A selection of financial KPIs utilised by the participating terminals

Key financial ratios utilised by each terminal differ from each other, however all terminals monitor KPIs in *operational cost* area. The selection of financial ratios utilised by each terminal is affected by type of ownership, and stakeholder influence within the organisations and corporate objectives. Terminals with significant stakeholder influence or ownership (A, C and D) prioritise revenue streams and concentrate on cost control with an aim to deliver a consistent service. Service delivery is at the forefront for public ownership organisations (E) with cost control taking a centre stage.

Health & Safety

Number of KPIs utilised by terminals in health and safety KPI categories is shown in Table 22.

Main Health and Safety KPIs	A	B	C	D	E
<i>Accidents, incidents and near misses</i>	1	1	3	1	1
<i>Risk assessment and monitor</i>	1	1	1	1	1
<i>Employee wellbeing</i>	1		1		1
<i>Safety Training and interactions</i>	1	1	1	1	1
<i>Workplace inspections</i>	1	1	1	1	1

Table 22: Number of Health and safety KPIs utilised by the participating terminals

All terminals utilise a KPI in each category except employee wellbeing category where terminals A, C and E have more structured KPIs.

Human Resources

Table 23 shows number of KPIs used by participating terminals within human resources category.

Main Human Resource KPIs	A	B	C	D	E
<i>Employee absence/leave</i>	1	1	1	1	1
<i>Employee development</i>	1	1	1	1	1
<i>Performance Management</i>	1		1		1
<i>Employee retention</i>	1	1	1	1	1

Table 23: Number of human resources KPIs used by the participating terminals

All terminals utilise a KPI in each category, the difference in *performance management* category among the participating terminals arise from the level of established systems in place for implementing *performance management* which is more strongly established in terminals A, C and E.

Information Systems

Use of IS in participating terminals vary depending on type of operations they run, level of automation within the terminal, level of IT structure they have in place and the level of strategic importance placed on IS in participating terminals. A detailed discussion on how each terminal approach their development towards an effective IS framework is provided in sections 3.5.5 and 4.5.6.

Marketing

Customer satisfaction is a common area that all terminals monitor. Otherwise, the approach to how marketing activities take place in terms of promotion of services depend on a number of factors such as the organisational objectives, type of ownership and organisational structure at each terminal.

Operational

Number of operational KPIs utilised by each participating terminal shown in Table 24.

Operational KPI Categories	A	B	C	D	E
<i>Productivity</i>	4	3	4	1	1
<i>Turnaround</i>	1	2	2	2	1
<i>Throughput</i>	1	1	1	1	1
<i>Cargo integrity</i>	3	2	2	2	2
<i>Stock control</i>	1	2	2	2	

Table 24: Number of Operational KPIs used by the participating terminals

All terminals utilise KPIs within all the categories identified except Terminal E that does not utilise *stock control* as the stockyards are operated and controlled by the clients. Number of KPIs in each category is explained by variation of services delivered by different terminals or the area of focus of each terminal. For example, in productivity category, terminals with silo and warehouse facilities tend to measure KPIs in these facilities in addition to quayside operations. The KPIs utilised in operational area in participating terminals are most similar to KPIs used in previous studies as discussed in section 2.2.1.

Technical

Number of KPIs utilised in technical KPI categories is shown in Table 25.

Technical KPI categories	A	B	C	D	E
<i>Equipment availability</i>	1		1	1	1
<i>Equipment reliability</i>	3	1	2	1	1
<i>Equipment effectiveness</i>		1		1	1
<i>Maintenance planning</i>	1	1	1	1	1
<i>Maintenance effectiveness</i>	1	1	1		

Table 25: No of Technical KPIs used by the participating terminals

Terminals use KPIs in the equipment availability and reliability categories interchangeably, some with more emphasis on one than the other. *Equipment effectiveness*, which compares theoretical capacity against the actual performance, is measured by terminals B, D and E. *Maintenance planning* and *maintenance effectiveness* are also used interchangeably by the terminals.

The analysis of KPIs utilised by terminals provided a picture of specific KPIs in place at each terminal. KPIs in different categories are put together by terminals for specific purposes such as measuring productivity, improving standards and enabling regulatory and contractual compliance. They all serve a purpose, and the main focus is efficiency. The analysis also provided a focus for discussions at the planning stage where participants discussed the options for any changes to the existing KPIs or introduction of new KPIs for the project. The analysis from the stakeholder surveys was essential during these discussions as it highlighted areas where the importance and performance in specific areas fell short of stakeholder expectations. Therefore, stakeholder survey analysis provided the effectiveness dimension to the discussions and assisted in making decisions on changes to be implemented to existing or introduction of new KPIs.

3.8 Preparation of stakeholder Surveys

The discussions I had during the semi-structured interviews helped to identify the key stakeholders for each participating terminal, as outlined in the diagnosis section. I then identified the attributes to include in a survey to be completed by the stakeholders in order to determine the level of importance they placed on such attributes, and then their view of level performance of the participating terminals for each qualifying attribute. I used a number of approaches to determine what attributes to include in the surveys. Several attributes emerged during the initial discussions with the participating terminals. All the participating terminals have marketing or business development functions and they maintain a dialog with key stakeholders. Some terminals carry out customer satisfaction surveys at regular intervals. Others have specific projects in relation to environmental aspects of their operational or community development projects which help them to interact with their communities. As a result of activities which create regular interaction with the key stakeholders, the participants have a good idea of expectations and factors that are of importance to the key stakeholders. These include, for example: consistency of service delivery, alignment of terminal development and objectives to the client needs, environmental compliance and cost of services and logistics services provided by the terminals.

I also examined other examples within the industry such as Germanischer Lloyd who developed a container terminal quality indicator (CTQI) in 2008 with an aim to establish a partnership among the

stakeholders along the supply chain to improve efficiency within the container industry. Another aim of this scheme was to try and develop a global standard to measure port/terminal performance. There has been relatively slow uptake of the framework proposed in this study over the years. The European Sea Ports Organisation (ESPO) is another organisation which created a port performance dashboard with the participation of some of the member ports to improve port performance and transparency Chlomoudis & Pallis, (2002). They collected information mainly in areas of port governance and environmental compliance, which has been published two years in succession back in 2012. Thereafter, it seemed to have limited application and currently they publish mainly throughput and environmental data on a quarterly basis. I have also considered effectiveness criteria that have been developed by previous research. For example, Brooks and Schellinck (2015) used three different types of users shipping lines, supply chain partners and cargo owners and agents in their research in order to identify effectiveness criteria to include in their surveys. I grouped together the evaluation criteria they used in their study of cargo owners and agents under a number of categories in Table 26.

Category	Evaluation Criteria
Service Quality	Overall reliability of the port Provision of adequate on time information Capability of employees Ability to develop tailored services to different cargo interests Terminal operator/port authority responsiveness to special interests
Economic Criteria	Overall cost of using the port Cost of rail-truck-warehousing
Logistics	Availability of direct service to cargo destinations Connectivity to rail-truck warehousing Choice of rail-truck-warehousing companies
Operational	Incidence of cargo damage
Health and safety	Port security

Table 26: Evaluation criteria for cargo owners and agents (Brooks & Schellinck, 2015)

The evaluation criteria under each category provide a useful list of areas of importance for one group of stakeholders, the cargo owners and agents. The criteria cover both port and terminal therefore where division of responsibilities in different categories are not clear between the two, it may cause some difficulties in evaluating performance.

Woo et al. (2011) identified eight different aspects related to the evolution of ports, and then developed a port performance measurement framework which grouped these under three main areas: service, operational and logistics. They used the framework to construct surveys to measure effectiveness dimension of KPIs. Figure 7 illustrates their framework.

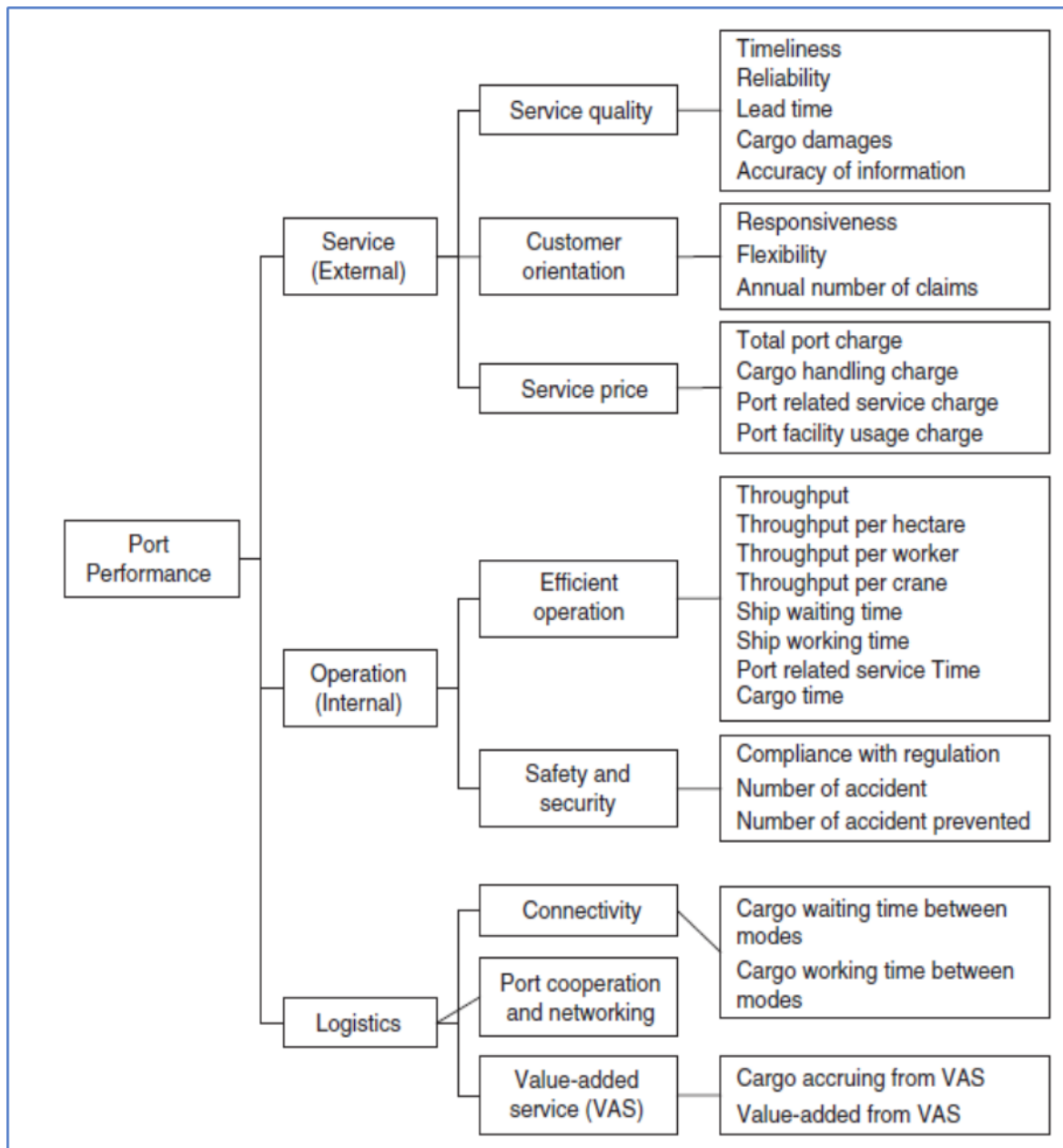


Figure 7 - Port performance measurement framework (Woo et al., 2011)

While the first model takes the lead from a specific stakeholder group, this one uses a port structure as a model where services, operation and logistics are identified as three distinctive areas. This model does not concentrate on a specific stakeholder category but looks at the criteria from a structural and service delivery point of view. This model concentrates on a port rather than a terminal. Most of the criteria identified in this model are very similar to the first model and they can be grouped under the same categories I used for the first model.

Brooks et al. (2011) considered two additional groups of stakeholders (supply chain partners and shipping lines) in their study and used the evaluation criteria shown in Table 27 in their surveys.

Evaluation criteria supply chain partners	Evaluation criteria shipping lines
<ul style="list-style-type: none"> • Efficiency of documentary process • Incidence of delays • Accessibility to port for pick up and delivery • Adequacy of integrated communications infrastructure • Availability of capacity • Availability of labour • Invoice accuracy • Speed of stevedore's cargo loading/unloading • Ocean carrier schedule reliability/integrity • Punctuality of arrival times • Reasonableness of port charges • Punctuality of departure times • Timely vessel turnaround 	<ul style="list-style-type: none"> • Capability of dockworkers • Speed of stevedore cargo loading/unloading • Timely vessel turnaround • Availability of capacity • Availability of labour • Incidence of delays • Timeliness of maritime services • Overall cost of using the port • Invoice accuracy • Quality of rail/truck/warehousing companies • Availability of rail/truck/warehousing companies • Reasonableness of port charges • Quality of maritime services • Sufficiency of size of hinterland • Adequacy of integrated communications infrastructure • Availability of logistics providers serving the port

Table 27: Evaluative criteria for supply chain and shipping line (Brooks et al., 2011)

This model introduces supply chain partners and shipping lines as additional stakeholders and the criteria identified for these stakeholders greatly overlap with those in the first two models. Criteria in this model can also be grouped under the same categories I used for the first model. There are slight differences among the criteria outlined for each stakeholder in models. For example, logistical connectivity is an important consideration for cargo owners and agents, efficiency and communication are important for supply chain partners and capacity and turnaround are in the forefront for shipping lines.

I used certain criteria that are applicable to my project from these three models while constructing the stakeholder surveys. For example: cost of using services, the ability to develop tailored services, preserving cargo quality and timely information provision from (Brooks & Schellinck, 2015), throughput, responsiveness to changing stakeholder requirements from (Woo et al., 2011), vessel turnaround, performance of operations, efficiency of marine services and accuracy of billing from (Brooks et al., 2011). Discussions I had with the participating terminals in relation to current KPIs and importance of stakeholders also contributed to criteria I used to construct the stakeholder surveys.

The stakeholder surveys played an important role in planning for the action stage of the project. As I previously mentioned the input for the stakeholder surveys came from the interviews I had with the participants from the terminals and the selected criteria that are applicable in the context of my project from the literature of the previous research. The analysis of the results of the survey directly contributed to the discussions I had with the participants in identifying options for change KPIs they would implement in their organisation. The *importance* part of the survey provided the participants with an opportunity to compare the importance placed by the stakeholders on certain areas where

they may or may not already have performance KPIs in use. This provided an opportunity for them to evaluate current KPIs to decide whether it is necessary to amend them. The *performance* part of the survey highlighted the relative weaknesses in terminals' performance in areas where the stakeholders rated as important. This has contributed strongly to the discussions with the participants in deciding which change KPIs to implement in terms of firstly deciding to what extent the current KPIs used by the terminals address the relative weakness highlighted by the stakeholders and secondly if there is a gap in the portfolio of KPIs used by the terminals whether a new KPI should be introduced to address such a gap as well as satisfying the requirement of the stakeholders and improving the performance rating of the terminals.

The survey I prepared for the key stakeholders consisted of two parts. The first part was designed to measure the importance of a number of key areas in five different criteria. The second part measured the performance of the participating terminals for the same criteria. These criteria are shown in Figure 8.

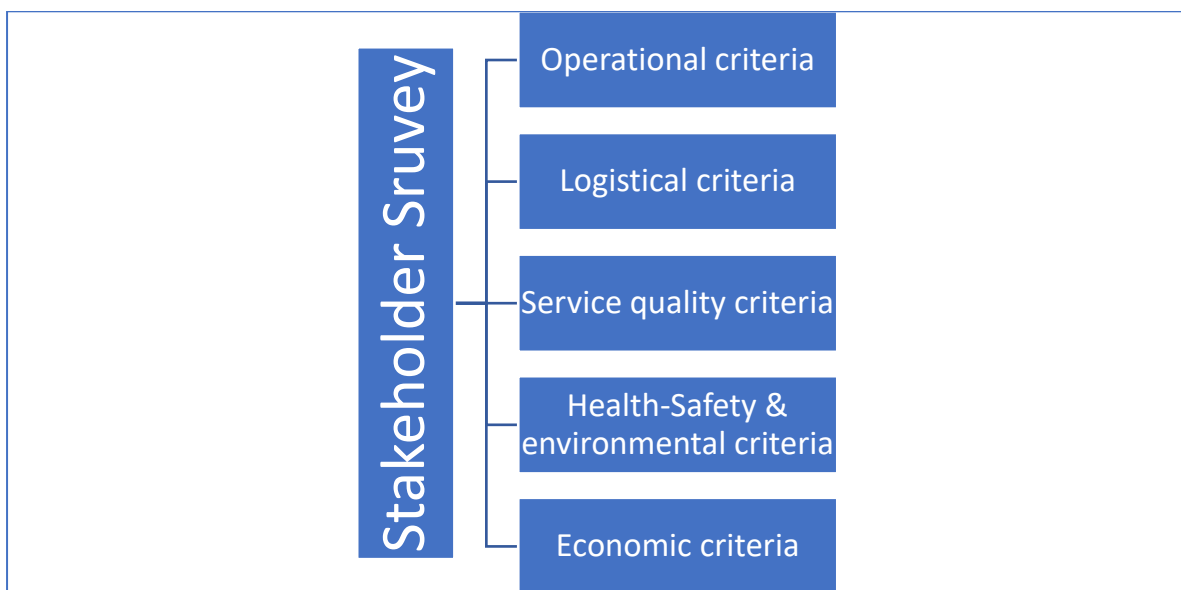


Figure 8 - Stakeholder survey criteria

Operational Criteria

The questions in this part of the survey cover three main areas: productivity, cargo integrity and safe access as shown in Table 28.

Loading/discharge performance ship to shore and vice versa	Productivity
Total ship turnaround time	
Minimising delays encountered during the discharge and loading of the cargo	
Timeliness of despatch or acceptance of cargo to/from transport/stockpile/warehouse	
Reliability of the equipment utilised by the terminal to provide services	
Preserving cargo quality and preventing contamination	Cargo integrity
Stockpile-storage capacity offered by the terminal	
Minimising cargo damage during the operations	
Minimising cargo losses during the operations	
Preventing wrong cargo delivery to the client	Safe access
Safe access to and from the berths	

Table 28: Main areas for operational criteria

The productivity includes loading and discharge speeds, turnaround of ships and control of delays. Cargo integrity includes damage, loss control, preserving quality and preventing wrong cargo delivery. Safe access to berths considers ability to safely berth and sail vessels.

Logistical criteria

This part of the survey considers capacity of the terminal to cater for stakeholder requirements, ability to develop tailored services to cater for additional requirements, physical connectivity of terminal to distribution networks and the balance between capacity offered and resources available to the terminal. These criteria cover four main areas of Resources, connectivity, capacity and added value as shown in Table 29.

Timely availability of terminal resources, equipment, labour	Resources
Physical connectivity of the terminal to rail and road network	Connectivity
Capacity of the terminal to handle throughput required by the client	Capacity
Level of added value services offered by the terminal (warehousing, logistics, processing, analysis)	Added value
Terminal's ability to develop and provide tailored services to suit client needs	

Table 29: Main areas for logistical criteria

Service Quality Criteria

This is the most comprehensive criterion tested in the survey. It covers four main areas: service reliability, reporting, documentation and flexibility as shown in Table 30. The ability of the terminal to accommodate vessels is tested through waiting time at anchorage, quality of marine services, availability and allocation of berths. The standard of service provided is tested through service quality, working hours of the terminal, flexibility to accommodate changing client needs and level of automation offered by the terminal. Communication and reporting are tested through frequency and accuracy of reports, efficiency of documentation and clearance process, timely notification of disruptions and access to just-in-time information.

Maintaining Quality of the cargo (and hygiene standards) handled by the terminal	Service reliability
Availability and allocation of berths by the terminal	
Waiting time for ships to berth at anchorage	
Working hours of the terminal	
Overall service quality delivered by the terminal personnel	
Terminal adherence to agreed load/discharge window for the cargo	
Timeliness of marine services offered (pilotage and towage)	
Reliability and consistency of service delivery by the terminal	
Level of automation in service delivery of the terminal	
Communication and coordination of planned maintenance/shut down periods of the terminal	Flexibility
Flexibility of terminal to respond to changing client requirements	
Willingness to offer solutions to specific problems encountered during the service delivery of the terminal	
Response from terminal to unexpected client requirement changes	
Alignment of Terminal development & objectives to the client needs	Reporting
Provision of timely reports by the terminal for the services delivered	
Provision of correct format and adequate reports by the terminal	
Frequency of information update on key areas of service delivery	Documentation
Access to just in time information on key service areas by the client	
Efficiency of documentary, clearance process in the terminal	

Table 30: Main areas for the service quality criteria

Health, Safety and environmental criteria

This part of the survey covers security of terminal premises and facilities, track record of the terminal in health and safety, the green energy use and energy saving practices, emission control and environmental compliance. The three main areas covered are: compliance, track record and emission control are shown in Table 31.

Environmental compliance of terminal operations	Compliance
Security of terminal premises and facilities	
Control of dust and noise emissions during discharge/loading operations	Emission control
The level of green energy use and energy saving practices within the terminal	
Health and Safety track record of the terminal	Track record

Table 31: Main areas for the health, safety and environmental criteria

Economic criteria

This covers cost of main and added value services provided and timeliness and accuracy of invoicing. Therefore, the two areas covered are, cost competitiveness and invoicing as shown in Table 32.

Cost of services charged by the terminal	Cost
Cost of logistics services offered by the terminal	competitiveness
Accuracy and timeliness of invoicing for service charges	Invoicing

Table 32: Main areas for the economic criteria

The same criteria in five categories are used in both importance and performance parts of the survey. The importance part seeks to determine the level of importance placed on each specific criterion by the stakeholder. Stakeholders are asked to indicate their preference on a scale from 1 to 5 ranging between very important and not applicable. The performance part indicates the perceived performance of the terminal in question in each area by the stakeholders. This is also measured on a scale from 1 to 5, ranging between very good and not applicable.

3.9 Administration of stakeholder surveys

Taking into consideration my position in relation to the participating terminals, it was important to make sure that the thought process and objectives of the stakeholder surveys were aligned between myself and the participants. I held meetings with participants who were going to administer the surveys and went through the surveys with them to ensure that the participants would be able to explain the objectives and also benefits to the stakeholders. In support of administration of the surveys I put together explanatory notes that the participants agreed to use to engage the stakeholders.

The criteria included in the survey do not apply to each stakeholder category in full; the respondents can choose a 'not applicable' option on their response to indicate this. The respondents are also asked to add any other area of importance to them which may not have been included in the survey at the end of the survey and rate each specific terminal accordingly.

The second page of the survey form asks respondents to identify themselves with a stakeholder category of given choices and to describe what activity they are involved in and what services they receive from or provide to a terminal. (A copy of stakeholder survey form is included in Annex 4). I requested participants from each terminal to engage as many stakeholders as possible in responding

to the surveys. I prepared a proposed wording which explains the purpose of the survey, what is included in the survey form and how it is required to be filled as a guidance to the participants in case they wanted to use it for correspondence with stakeholders. Surveys were sent to different categories of stakeholders by the participants in each terminal. Table 33 shows the categories of stakeholders contacted by each terminal.

Stakeholders contacted for surveys	A	B	C	D	E
Client (Receiver-shipper)	√	√	√	√	√
Port Authority	√	√	√	√	
Shareholder		√	√		
Ship agent		√			
Logistics Provider/partner			√	√	

Table 33: Categories of stakeholders contacted for surveys

The surveys were conducted between my first and second site visit to the participating terminals. A total of 29 surveys were sent to the stakeholders by the participants in each terminal and responded by the stakeholders. A breakdown of the number of surveys returned to each participating terminal and number of surveys completed by different stakeholder categories is shown in Table 34.

Stakeholders contacted for surveys	A	B	C	D	E
Client (Receiver-shipper)	3	6	6	1	1
Port Authority	1	1	1	1	
Shareholder		2			
Ship agent	1	1			
Logistics Provider/partner			3	1	
Total	5	10	10	3	1

Table 34: Completed surveys returned to the participating terminals

A total of 29 surveys were completed and returned by the stakeholders. The terminals have contacted and briefed each stakeholder regarding the purpose of the surveys prior to sending them out and followed up for responses afterwards, therefore all the surveys sent out by the terminals were completed by the relevant stakeholders. The biggest percentage of the surveys were completed by the clients.

3.10 The analysis of the completed stakeholder surveys

I carried out three different analyses of the stakeholder survey in order to assist the terminals in the planning process of the project. The first is a *performance gap* which shows the positive or negative mismatch between the importance and performance measure for each criterion on the survey for each stakeholder. In the case of a positive mismatch, it provides the terminal an indication as to where resources may be overused therefore can be re allocated, if it is a negative mismatch, it highlights areas for the terminal to consider for change in order to improve the performance in relation to a specific stakeholder. The second is *pattern analysis* which brings all the stakeholders for each terminal

together and plots the positive or negative mismatch across the stakeholders in order to indicate any patterns emerging for any of the criteria. The consistency of a negative or positive pattern will highlight the existence of a weakness or overuse of resources to the terminal therefore assist in making decisions on strategies to implement. The third is *stakeholder mapping analysis* which plots the importance and performance scores across all the stakeholders for each terminal, therefore highlighting areas where there are positive or negative patterns across a number of stakeholders. This analysis provides the terminals with an indication of the importance of the gap across a number of stakeholders and assist in decision making process for the action stage.

There are several differences in relationships between the participating terminals and different categories of stakeholders. Some terminals deal with the shippers or the receivers and others deal with both. The type or services the participating terminals provide to shippers or receivers differ from each other in terms of the level of integration each terminal has with the related logistics chain. In addition, some terminals provide logistics activities and others subcontract or allow the shipper or the receiver to carry out such activities within their premises. As far as the port authorities are concerned, some of the terminals have the authority to carry out some of the port authority functions, whereas the others operate as a separate entity from the port authority. The participating terminals have different types of shareholders, including private investors, government authorities and clients. Ships agents have different levels of influence with different terminals. For some of the terminals they play an important role as they influence the cargo throughput and in others have an important role in logistics arrangements between the terminals and the clients. Logistics providers have different levels of integration within the logistics chain in different terminals and some are independent while others related to the clients. This means that the importance placed by the same category of stakeholders for the same criteria on the survey for different terminals is likely to be different. In the same manner, the expectations of each category of stakeholders for the performance of different terminals are also going to differ. Therefore, I have primarily analysed the survey results for each terminal for each stakeholder and across stakeholders as explained above. As the importance and expectations of the stakeholders are closely aligned to their relationship with a specific terminal, I analysed the results of the surveys for each stakeholder with their respective terminals.

The methodology and an example of each type of analysis carried out for the stakeholder surveys are as follows:

Performance gap Analysis

Performance gap analysis is used in different settings and is described as the difference between an existing level of performance and a desired one (Chevalier, 2010). In most cases, work to close a performance gap is planned and undertaken by using manageable milestones. In the context of my project, performance gap analysis I carried out had two elements. Schellink and Brooks (2014), used a similar model in their study related to ports. The analysis introduces an importance element into the mixture to combine with the performance in areas under consideration. In my project, the areas of consideration were determined by the stakeholder surveys and the importance element was introduced by the responses from the respondents. Perceived performance represents the existing level and the level of importance represents the desired level. The gap is calculated as importance minus performance and a positive number indicates a poorer performance. I plotted the results for each stakeholder and participating organisation as per the example shown in Table 35.

1 2 3 4 5

OPERATIONAL CRITERIA					
Loading/discharge performance ship to shore and vice versa		X0			
Total ship turnaround time			X	0	
Minimising delays encountered during the discharge or loading of the cargo		X	0		
Stockpile-storage capacity offered by the terminal		X0			
Minimising cargo damage during the operations	X		0		
Minimising cargo losses during the operations					X
Preventing wrong cargo delivery to the client	X			0	
Timeliness of despatch or acceptance of cargo to/from transport to/from stockpile/warehouse		0	X		

Table 35: An example of Performance gap

The score for the importance criteria is indicated by 'X' and for the performance criteria by '0'. Where X and 0 are in the same box, it indicates that the stakeholder rated the importance of that criteria and the performance at the same level, therefore the importance placed on that criterion and the expected performance of the terminal match each other. Where X and 0 are in different boxes, it indicates that there is a mismatch between the importance and performance rating for that criteria. In this case, the gap can be negative as indicated by red, where the performance lags the importance or positive as indicated by green, where the performance is ahead of the importance placed to that criterion.

This analysis in the first instance highlights the criteria where the expected terminal performance matches the importance. This means that the terminal has the right balance for service delivery, resource allocation, performance and reporting. The second important aspect of this analysis is that it highlights the level of importance placed by a stakeholder on each criterion. The more important a criterion is, it becomes more important for the terminal to match or exceed the performance expectations. The third aspect of this analysis is the gap between the importance and performance for each criterion. If a criterion is very important to a stakeholder but the performance is good, it is less of a concern for the terminal than if the performance is rated only satisfactory.

Pattern Analysis

The aim of the pattern analysis is to take the performance gap analysis a step further and look at the performance gap in each area across the different types of stakeholders. I developed a pattern analysis following the inductive theme of the thematic analysis. The analysis is conducted from the replies to the stakeholder surveys. The pattern was derived by looking at the performance gap at each area in the survey and across the stakeholders. The results are shown on a matrix table in Table 36.

		CLIENTS			Agents	Port
		☺	☹	☹	☹	☹
OPERATIONAL CRITERIA						
Productivity						
1	Loading/discharge performance ship to shore and vice versa					
2	Total ship turnaround time					
3	Minimising delays encountered during the discharge or loading of the cargo					
4	Timeliness of despatch or acceptance of cargo					
5	Reliability of the equipment utilised by the terminal to provide services					



Table 36: An example of pattern analysis

In Table 31 the results of the survey from clients, agent and the port for each of the criteria are plotted together. Where there is more than one stakeholder in a category they are grouped together. In cells where there is no colour there is no mismatch between the stakeholders' importance and performance rating for that criterion. Negative mismatches are highlighted in red, positive matches are highlighted in green. A consistent negative pattern across a criterion may indicate that the terminal may need to place more attention in that specific area. A consistent positive pattern may mean that the terminal places unnecessary emphasis in that specific area. This analysis also provides an indication of a negative or positive trend within a stakeholder category.

Stakeholder Mapping Analysis

I developed a further analysis which I called 'stakeholder mapping analysis', at this stage. Although the performance gap and pattern analyses identified gaps and pattern across the stakeholders, it was felt that a visual analysis that shows areas where 'very important' classification and 'not satisfactory' performance can be depicted would be beneficial to participating terminals, helping them to identify areas where they needed to look at for resource planning and allocation.

I carried out a further analysis of all the stakeholders for each participating terminal in each of the main areas of each criteria. One axis of the diagram showed the performance indication for each stakeholder between not satisfactory and very good. The second axis showed the importance indication between low priority and very important. I plotted the stakeholders on the diagram in accordance with the stakeholder survey results for each criterion. The stakeholder mapping analysis allowed the terminals to see areas where they needed to concentrate as a priority as well as areas where they might have an over concentration of resources in relation to the importance rating of the stakeholders. The key to the symbols used for the analysis is shown in table 37.

	Symbol
Client	
Port authority	

Shareholder	SH11
Agent	A11
Logistic Partner	LP32

Table 37: Symbols used stakeholder mapping analysis

The first number in each symbol shows the identification number of a stakeholder where there is more than one stakeholder plotted. The second number is the reference number of the specific criterion as indicated on the example in Table 35.

Figure 9 shows an example of the stakeholder mapping analysis.

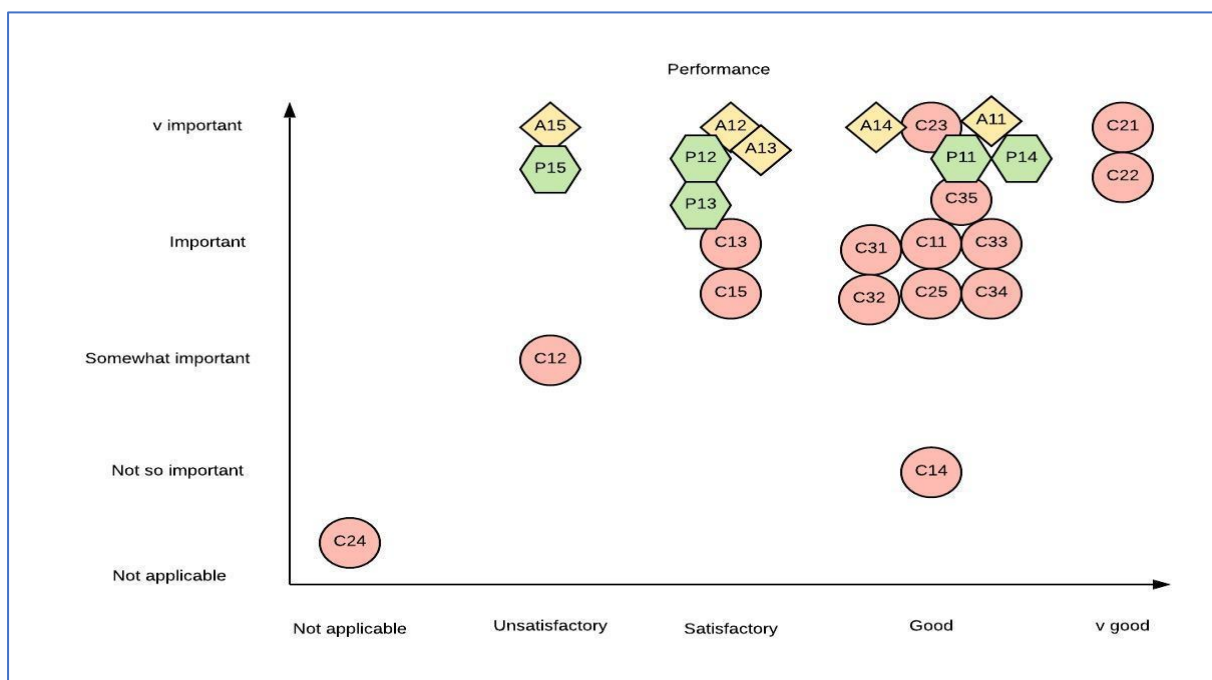


Figure 9 – An example of stakeholder mapping analysis

3.10.1 Types of analysis of survey results carried out for each terminal

I carried out a pattern analysis and a stakeholder analysis for each participating terminal in analysing survey results. Pattern analysis for each terminal is included in Annex 5. I used a detailed stakeholder mapping analysis to assist planning for the action stage of the project as outlined in section 4.1. Stakeholder mapping analysis for each terminal is included in Annex 6. I followed up the initial performance gap by carrying out for each client a pattern analysis in which I pulled the stakeholders together and highlighted areas where there is divergence between importance and performance

scores for each criterion. I then used the pattern analysis for each terminal to discuss the outcome of the performance gap where there are differences between importance and performance. I followed this with a stakeholder mapping analysis to provide a clearer indication of areas of focus for the terminals in planning change KPIs. The pattern analysis and stakeholder mapping analysis follow the same format for each of the terminals in five criteria and sub sections as used in the stakeholder surveys.

3.11 Conclusions

The diagnosis stage involved a number of activities and analyses which enabled me to discover and evaluate the current status of the participating terminals in relation to the KPIs and prepare for the planning stage. Site visits, discussions and interviews were important for gaining knowledge as well as building an important relationship with the participants from each terminal. Semi-structured onsite interviews were important to understand each organisation's corporate objectives, organisational culture and management style. They also helped to identify key stakeholders and use of information systems within each organisation. It was interesting to see that the themes emerging from the analysis of interviews closely matched the areas where existing KPIs were utilised in the terminals. This demonstrated a good connection between areas that participants felt were important and the organisation's efforts to monitor performance in these areas. Stakeholder surveys provided valuable feedback on areas of importance and stakeholder's perception of terminals' performance in these areas. This information provided an essential input into the conversations during the planning stage to identify changes in terms of new or amended KPIs. Administration of stakeholder surveys required participants from terminals and to engage closely with the key stakeholders in explaining the purpose and content of the surveys. This in turn helped stakeholders to engage more with the participants during the implementation stage of the project.

Chapter 4. Planning

The planning stage of the project involved participating terminals identifying what changes they wished to make to existing KPIs as well as new KPIs they wanted to introduce within their organisations and how they would implement those changes. Alignment of my role and level of intervention at this stage with the participants was important. The key areas were the interpretation of stakeholder survey results and the generation of options for KPIs to be implemented. I used the group meetings with the stakeholders to understand whether they were happy with my direct involvement in discussions as well as generation of scenarios. All the terminals were much more accommodating and open than what I would have expected at this stage. Although they welcomed my suggestions during this stage of the project, I was careful to make sure that the final selection of KPIs was undertaken by them.

4.1 Areas of information and analysis used to assist at planning stage

There were three main areas of input during this process as outlined in figure 10.

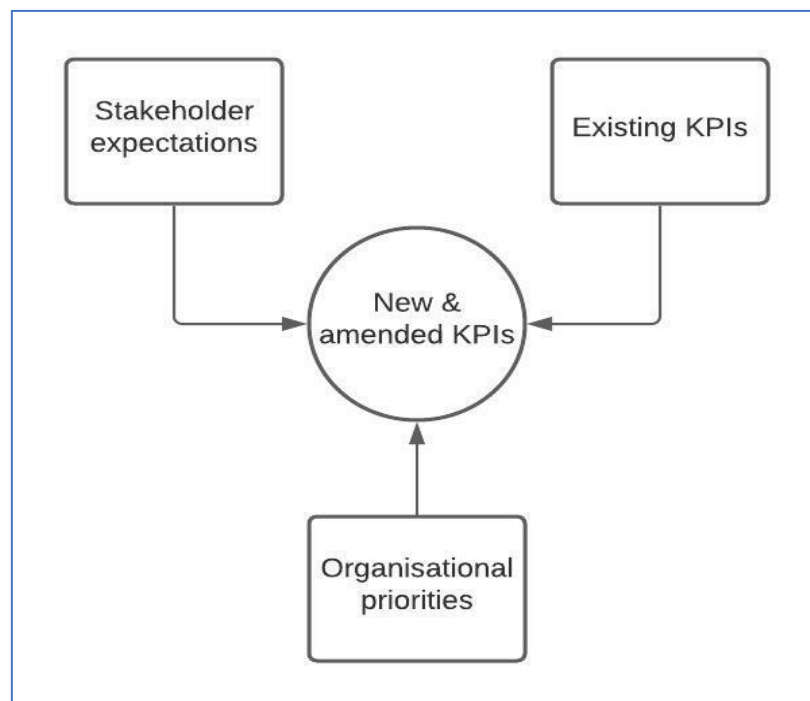


Figure 10 - Areas of input during the planning stage

Firstly, the participants were asked to consider current KPIs in areas identified during the diagnosis stage of the project as summarised in section 3.7 and identify any areas of improvement going forward. Secondly, a number of participants had initial ideas as to areas where they considered amendments or improvements to the existing KPIs during the initial interviews I had with them. Finally, I introduced a new dimension by considering the expectations of stakeholders we identified during the diagnosis stage of the project. By bringing stakeholder expectations into the process any changes would seek to achieve improvement in effectiveness as well as efficiency of current KPIs in participating terminals. To achieve this, I used an approach introduced by Brooks et al. (2011) who looked at incorporating effectiveness to improve performance management systems in a port environment. In addressing this issue, the authors initially attempted to understand what criteria users in a port environment used to evaluate their experiences, and then tried to identify a system by which decision makers in a port environment could make informed decisions considering users' expectations.

An analysis used in this exercise was introduced by Martilla and James (1977) who called it *importance performance analysis*. They initially used this analysis in relation to measuring customer satisfaction in response to a marketing campaign by car dealers. It has since then been used in a number of different industries. They pointed out the importance of two aspects in running importance performance analysis. First, determining what attributes are to be measured as important, and second, questions about importance measures and performance measures should be grouped in different sections so that the respondents are not influenced by the second category when they consider replies to the first. Another important aspect of carrying out such an analysis is to determine which attributes are more important than the others to the respondents. Myers and Alpert (1968) looked at the specific factors that influence buying behaviour of customers and classified these as determinant factors among others. Schellink and Brooks (2014) utilise importance performance gap in order to identify discrepancies between the effectiveness of a port and the users' expectations and come up with a mapping process to assist decision makers in allocating their resources and making investment decisions. Feng and Lalwani (2012) carried out an importance performance analysis between two selected ports: one in Europe and the other in China, and they concluded that there were significant differences across most of the factors they included in the analysis between the two.

In the context of my project, it was important to identify differing degrees of importance and relevance of effectiveness parameters for various stakeholders. This helped participants in the terminals to make the right choices when deciding amended KPIs because they knew which attributes were more important for specific stakeholders.

4.1.1 A summary of significant importance-performance gaps

This section provides a summary of significant importance-performance gaps across the participating terminals following the analysis of stakeholder surveys. I used two types of criteria to populate table 39: areas where a stakeholder rated the performance of a terminal unsatisfactory and areas where there are more than two categories of negative variance between importance and performance criteria. For example: a stakeholder rated a criterion as very important and the terminal performance as satisfactory rather than very good or good.

Table 38 shows the summary of significant importance performance gaps.

	A	B	C	D	E
OPERATIONAL CRITERIA					
Productivity					
Loading/discharge performance ship to shore and vice versa		√			
Minimising delays encountered during the discharge or loading of the cargo			√		
Reliability of the equipment utilised by the terminal to provide services	√		√	√	
Cargo Integrity					
Stockpile-storage capacity offered by the terminal		√	√		
Minimising cargo damage during the operations		√			
Minimising cargo losses during the operations			√		
Preventing wrong cargo delivery to the client	√				
Safe Access					
Safe access to and from the berths			√		
LOGISTICAL CRITERIA					
Resources					
Timely availability of terminal resources, equipment, labour				√	
Connectivity					
Physical connectivity of the terminal to rail and road network		√		√	
Capacity					
Capacity of the terminal to handle throughput required by the client		√	√	√	
SERVICE QUALITY CRITERIA					
Service reliability					
Maintaining Quality of the cargo (and hygiene standards) handled by the terminal	√				
Availability and allocation of berths by the terminal			√		
Terminal adherence to agreed load/discharge window for the cargo	√				
Timeliness of marine services offered (pilotage and towage)	√		√	√	
Flexibility					
Willingness to offer solutions to specific problems during the service delivery of the terminal		√	√	√	
Response from terminal to unexpected client requirement changes	√		√	√	
Alignment of Terminal development & objectives to the client needs		√		√	
Reporting					
Frequency of information update on key areas of service delivery			√	√	
Access to just in time information on key service areas by the client			√	√	
Documentation					
Efficiency of documentary, clearance process in the terminal	√				
HEALTH – SAFETY & ENVIRONMENTAL CRITERIA					
Compliance					
Environmental compliance of terminal operations				√	
Security of terminal premises and facilities					
Emission control					
Control of dust and noise emissions during discharge/loading operations			√		
Track Record					
The level of green energy use and energy saving practices within the terminal	√	√		√	
Health and Safety track record of the terminal				√	
ECONOMIC CRITERIA					
Cost competitiveness					
Cost of services charged by the terminal	√	√	√		
Cost of logistics services offered by the terminal	√				
Invoicing					
Accuracy and timeliness of invoicing for service charges	√				

Table 38: Summary of significant importance of performance gaps

The table shows a number of areas where there is consistent perception of underperformance by the stakeholders supported by the hard data returned by the stakeholder surveys. Reliability of equipment utilised by the terminals is one of these areas. The interesting point is that almost all terminals place a significant emphasis in this area and use KPIs to monitor *equipment reliability*. Capacity to handle the cargo volumes is another underperformer. Once again terminals focus on this area very closely by

means of *productivity* KPIs but there are significant communication problems between the terminals and the stakeholders to highlight problems in this area. Some of the amended KPIs implemented in the project by the terminals seek to rectify these shortcomings. The area of flexibility for terminals to respond to client requests or to align their objectives with those of their clients is another area with a significant negative pattern. Terminals need to examine the reasons behind the perception more closely. At times this may be due to genuine problems with availability of resources, it may be due to lack of clear communication between the stakeholders and terminals or conflict between objectives of the terminals and interests of certain stakeholders. Level of green energy is another area with a significant gap. Stakeholders are becoming more sensitive in use of *green energy use* in terminals and terminals need to respond to changing stakeholder expectations and by doing so they need to communicate initiatives they are taking to the stakeholders. Cost of services charged by the terminals is an area where the perception of performance falls significantly below the expectations. This is a difficult area for the terminals to address. However, during the project some of the terminals have taken measure through the KPIs they introduced to improve the situation by either making sure that major stakeholders are involved in outcome of the KPIs or KPIs provided clear evidence of changing costs and service levels to demonstrate their efforts to balance the two.

4.2 Planning Process for determining what action to take

I followed the same planning process with all participating terminals. The discussions for preparation took place during the site visits I carried out to each terminal. The activities involved during the site visits are shown in Figure 11.

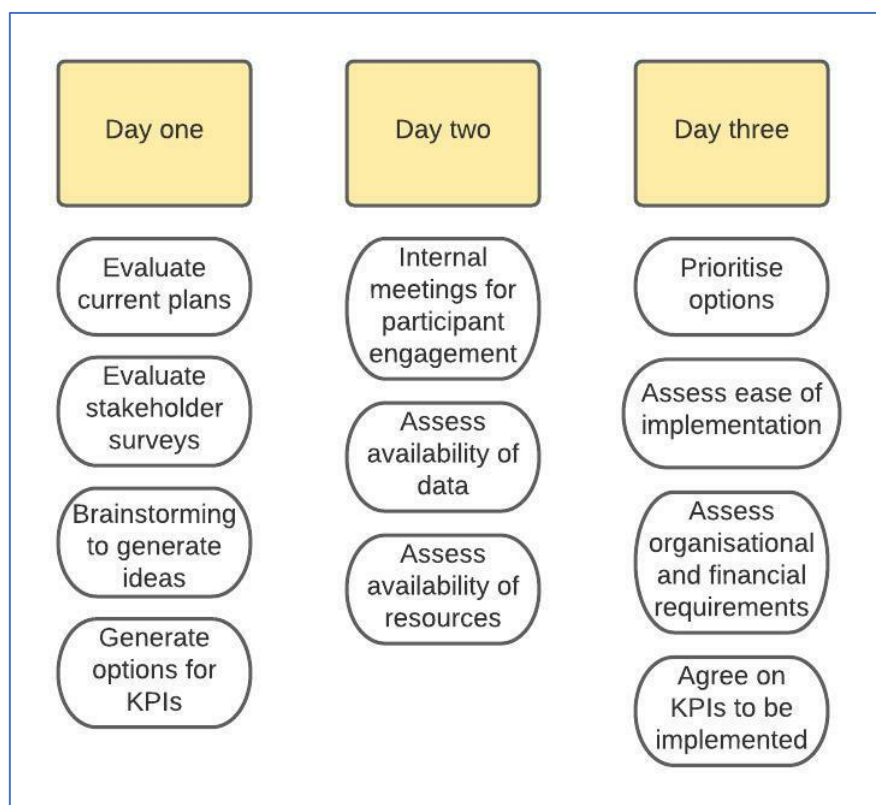


Figure 11- Activities undertaken during site visits

I provided a lead in these discussions taking into consideration the interactions I had with the participants during the diagnosis stage of the project. The interviews and stakeholder surveys provided me with information to assist in preparing scenarios for new and/or amended KPIs for planning stage discussions. The process involved following steps:

- I agreed a time frame for a three days site visit with each terminal
- I asked participants from each terminal to think about what amended or new KPI options they would like to consider ahead of the site visit.
- I prepared a list of options myself on the basis of my interaction with each terminal.
- On the first day of the visit meeting with all the participants to discuss outcome of stakeholder survey analysis followed by a brainstorming session to generate options for amended or new KPIs.
- On the second day, terminal representatives and other relevant personnel had internal meetings to discuss KPI options generated during the meeting on the first day.
- On the last day, I had another meeting with the participants where the discussions led to selection of one or more of the options generated to be selected for implementation.

I shared the results of the analysis of stakeholder surveys with the participants a few weeks ahead of the site visit in order for them to become familiar with the information and share it within the organisation. During the first meeting I discussed the areas where there were significant gaps between the importance rating of a stakeholder and the performance rating of the terminal with the participants. Then we looked at the negative or positive patterns within the survey results across the same class of stakeholders and across all the stakeholders. The discussion provided a platform for the participants to comment and discuss background to any significant gaps or trends emerged from the survey results and relate those areas to where they had existing KPIs within the organisation. The second part of the first meeting focused on a discussion to generate options for new KPIs to be implemented. This part of the discussion involved a number of areas:

- An overview of the existing KPIs that each participating terminal currently used, and on this basis, I made some suggestions as to areas where each terminal could consider but they may not have looked at before.
- The participants considered which areas they could implement new KPIs or amend existing ones in order to assist them to address the gaps from the stakeholder surveys.
- The participants considered other initiatives they had in planning within their organisations as a result of previous interactions with the stakeholders or as a part of their corporate objectives that could be included.

At the end of the first day's discussion each terminal ended up with a list of options that can be considered as amended or new KPIs in the project. These options are described in section 4.3. The options generated by each terminal included at least three different areas such as operations, technical and health and safety. During the second day, participants at each terminal spent the day talking to their colleagues who work in specific areas in order to discuss merits of each option and try to come up with an order of preference.

I met the participants from each terminal for a second meeting on the third day of my visit to terminals. The aim of this discussion was to determine which amended or new KPIs would be taken forward to be implemented. The discussion at each terminal involved around following areas:

- Feedback from their internal discussions on day two regarding preference among the options generated.

- Current plans they had to introduce new KPIs in similar areas within the organisation.
- Availability of resources within the organisation to implement any of the short-listed options.
- Relative degree of importance and benefits of each option in relation to the organisational objectives and initiatives as well as stakeholder relationships.
- Availability and/or ease of collecting the data required to implement an option.
- Level of acceptance and ease of implementation of a new option by the rest of the workforce.
- Need to make any organisational changes and level of additional training that may be required for each option.
- Additional financial burden an option may impose on the organisation.

Above areas provided some guidance during the discussions for the participants to decide in which area(s) and what amended or new KPIs to implement. At the end of the second meeting each terminal had a number of KPIs agreed to be implemented.

4.2.1 A comparison of approaches in terminals during decision making process

During the discussions I had with terminals although I followed the same planning process with each one, they had different approaches in making decisions. I observed following areas of focus which influenced decision making process of each terminal during the planning process.

Terminal A

- Areas where they felt they needed improvement such as optimisation of use of new equipment they invested in.
- Development plans and objectives of a major stakeholder and a client within the next five to ten-year period. The changes in strategic position of a major stakeholder meant that the terminal needed to consider changes to handling methods and to the mix of commodities they handled.
- The results and analysis of the stakeholder surveys. It was unusual but positive that the major client took a close interest in the stakeholder survey and follow up to the results.
- Terminal ran a successful lean management practice across the organisation, therefore any amended KPIs needed to fit in with the existing system.
- Terminal placed a lot of emphasis to positive or negative experiences they had in different areas where they utilise KPIs in making decisions.
- The ability to secure support of employees for the amended or new KPIs was an important consideration during the discussions.

Terminal B

- Competitive environment that this terminal operates in provided a focus in determining what KPIs to select in order to maintain their market advantage.
- Terminal had a focus on effectiveness dimension of the KPIs during the discussions, however participants paid less attention to some of the stakeholder survey results and more to their experience of stakeholder requirements. Because of the political and competitive environment there was a degree of scepticism with some of the stakeholder survey results.
- Better use of information within the organisation and further development of IS was one of the major considerations.
- Performance was a key consideration that drove discussions in operational and technical areas as the equipment at the terminal was relatively new.
- Logistics and storage were key add on services for this terminal and performance improvement in these areas were considered essential.

Terminal C

- Long term organisational objectives and meeting service delivery objectives were the overriding considerations during the discussions.
- Supply chain integration and stakeholder targets for throughput targets provided a focus for discussions as this terminal works with multiple stakeholders and handles significant volumes regularly.
- Stakeholder survey analysis was taken as a central theme during the discussions with significant consideration given to the gaps indicated between importance and performance results. This was also an indication of a very close relationship this terminal had with all the stakeholders.
- Automation was considered as one of the central themes for reliability of service delivery, health and safety and environmental credentials.
- The discussions on area of required improvements focused on improving service quality in technical and operational areas.

Terminal D

- This terminal was relatively new with a major client, therefore the focus during the discussions was on meeting client requirement within the next two to three-year period.
- Meeting contractual performance targets was an important area of focus.
- Terminal had some environmental challenges because of the proximity to the nearby communities which featured heavily in discussions.
- Stakeholder survey results provided some guidance during the discussions, but participants preferred to concentrate on their experiences in deciding which options to develop.

Terminal E

- Ownership structure and corporate objectives of this terminal provided an overriding focus during the discussions. The focus was continuity of service provision.
- Project coincided with a period that terminal was looking to invest in new quayside handling equipment, internal discussions related to making decisions on this topic also affected the choice of options for KPIs.
- This terminal has strong environmental credentials therefore a number of options were considered related to environmental development projects as the leading participant in the organisation was the Compliance Director as the final KPI to be implemented was and operational one there was a certain level of loss of direction as to who would lead the preparation and implementation.
- There was limited success in completing stakeholder surveys for this terminal probably because the stakeholders run their own operations with limited reliance on the terminal. As a result, the input in terms of effectiveness dimension during the discussions was limited to participants' own experience with the stakeholders.

4.3 KPI options developed by each terminal

4.3.1 Terminal A

Table 39 shows the list of options developed during the discussions with terminal A.

Area	Suggested Options
Operational	Changes to process improvement, lean management parameters
	Potential KPIs to assist with the resource optimisation
	Operational KPI dashboard to communicate with the stakeholders
	Enabling better understanding of KPIs within the workforce
	Introduction of GPS based bulk yard management system
	Truck <i>turnaround</i> monitoring at stockpile areas
	Monitoring system for formal complaints from the clients
	New KPIs to measure operational <i>productivity</i> targets
Technical	Development of Apps for <i>maintenance planning</i> and condition monitoring
	Improving cross functional support between the departments to improve condition monitoring activities.
	Monitoring of unplanned maintenance incidents
Marketing	The impact of investment in new equipment on business opportunities
	Conversion of marketing leads, business offers to new clients
	Extending and monitoring client satisfaction KPIs within the organisation
	Impact of the new value-added services on the business
Financial	Establish and monitor cost per man hour targets for handling
	Monitor demurrage costs incurred
Health & safety	Introduce new KPIs and targets for monitoring <i>accidents incidents and near misses</i>
	Monitor site inspections for health and safety
Information Technology	Implementation of a new business system to help bring information and analysis together

Table 39: List of KPI options Terminal A

Operational

Terminal A has worked with lean management techniques for a long time. Some of the suggested options in the operational area such as process improvement, resource optimisation and enabling better understanding of the KPIs within the workforce are part of the continuous improvement initiatives in the organisation. The introduction of a new stockyard management system, operational productivity targets and monitoring client complaints are in response to the results of the importance performance analysis of the stakeholder surveys.

Technical

The options in the technical area lend themselves to addressing some of the weaknesses from the importance performance analysis of the stakeholder surveys. Use of technology and cross functional support are considered important to facilitate improvement while utilising existing resources.

Marketing

The terminal has invested in new equipment as a part of the marketing strategy, the options in this area are aimed at measuring the impact of the investment and potential new opportunities it brings to the business.

Financial

The options in this area aim to monitor costs in different areas of terminal operation.

Health & safety

The options in this area partly aim to improve the compliance and competence and partly address some of the shortcomings from the stakeholder survey results.

Information Technology

The options considered by the terminal here introduce wider use of information technology in areas of operation and financial control.

4.3.2 Terminal B

Table 40 shows the list of options developed during the meetings with Terminal B.

Area	Suggested Options
Operational	Better planning and coordination of discharge performance and storage capacity
	Quality sampling and analysis process (<i>cargo integrity</i>)
	Improving control, performance aspect of warehouse operations (productivity)
	Better recording and analysis of stoppages (<i>throughput</i>)
Marketing	Better analysis of competitors' business
	Potential link between KPIs and operational and strategic decisions
	Development of a KPI dashboard for management purposes
Human Resources	Linking KPIs to remuneration
Information Technology	Developing mobile technology platform to utilise KPIs
	Use of real time information platform to disseminate KPIs within the organisation
Health & Safety	Safety audits as part of a <i>risk assessment and monitor</i> regime
	Targeted and planned safety interactions
Technical	Introduction of vibration and thermographic analysis
	Meantime between failures and meantime to repair (<i>equipment reliability</i>)
	Breakdown and preventative maintenance work

	<i>Maintenance effectiveness</i>
Environmental	<i>Green energy use</i>

Table 40: List of KPI options Terminal B

Operational

Better planning and coordination between the discharge performance and storage capacity was an option to assist in improving ship *turnaround* and minimising delays during the operations. A closer analysis of stoppages also supported this. Warehouse operations were a significant part of operational activities for the Terminal B, therefore performance improvements in this area were also considered.

Marketing

The awareness and monitoring of changes in the market including competitors were important for Terminal B. Another option in this area was to look at linking KPIs more closely to operational and strategic decision making. In the same manner, development of a KPI dashboard for management purposes was also considered as an option.

Human Resources

Linking KPIs and performance to remuneration was considered as an option.

Information Technology

Terminal B has a good use of automation at the terminal. Developing a mobile technology platform that can be used by the employees to improve utilisation of KPIs was considered as an option. This would potentially assist in better utilisation of resources and improve the performance rating in that area.

Health and Safety

Improving safety audits was considered as an option.

Technical

The options in this area were considered as some of the techniques and KPIs utilised in other similar facilities and the merits of whether they would be beneficial for Terminal B.

Environmental

The level of *green energy use* and potential alternatives were considered as an option.

4.3.3 Terminal C

Table 41 shows the list of options developed with Terminal C during the meetings.

Area	Suggested Options
Operational	Improvement of cargo losses and damages (<i>cargo integrity</i>)
	Optimisation of stockyard utilisation and availability (<i>stock control</i>)
	Monitoring and improving vessel <i>turnaround</i>
	Preserving <i>cargo integrity</i>
Marketing	Improving certainty of service delivery
Technical	Improving <i>equipment reliability</i>
Financial	Control of <i>operational costs</i>

Table 41: List of KPI options Terminal C

Operational

The cargo losses were an area of concern that was picked up from the stakeholder surveys. One of the options discussed aimed to investigate this area by collecting information via various control points at the terminal where the incoming or outgoing cargoes are weighed. The optimum use of stockyard capacity was another option discussed. This option would consider finding a way to measure and monitor the capacity and utilisation across the stockyards. Vessel *turnaround* was an important KPI, this would concentrate on looking more closely at areas where there may be further improvements. The *cargo integrity* was in response to the stakeholder surveys where the clients indicated that there was room for improvement in this area.

Marketing

Improving certainty of service quality was picked up from the results of the stakeholder surveys where clients expressed dissatisfaction in areas such as communication of shut down periods. This is an important area where the liaison and coordination with the clients and logistics supply partners play an important role for the terminal.

Technical

Improvement on *equipment reliability* was an option discussed.

Financial

This option would look at areas of cost with a view to exploring ways to improve them and maintain pricing to customers at competitive levels. This was also a consideration as a result of the stakeholder survey results.

4.3.4 Terminal D

Table 42 shows the list of options developed with Terminal C during the meetings.

Area	Suggested Options
Operational	<i>Productivity</i> improvement
	Assessment of truck turnaround times
Technical	Monitoring and improvement of breakdown maintenance (equipment reliability)
	Measuring <i>maintenance effectiveness</i>
Health & safety	Improving <i>safety training and interactions</i>

Table 42: List of KPI options Terminal D

Operational

The discussions in this area focused on improving ton per man hour productivity within the terminal as one of the options. The terminal handles a large number of direct deliveries during the operations, therefore monitoring and improving truck turnaround was another option considered in this area.

Technical

The terminal was keen to reduce number of breakdown maintenance incidents and the time lost during such incidents. This was one of the options discussed as a new KPI to put into action. The second option discussed was the improvement in effectiveness of maintenance by monitoring live and completed maintenance actions.

Health & safety

Increasing safety interactions within the terminal was an option discussed in this area.

4.3.5 Terminal E

Table 43 shows the list of options discussed with Terminal E during the meetings.

Area	Suggested options
Technical	Monitoring of <i>equipment reliability</i>
Marketing	Business development and return on investment
Environmental	New air and water quality improvement projects (<i>emission control</i>)

Table 43: List of KPI options Terminal E

Technical

Load and discharge *equipment reliability* is one of the most important areas for the terminal, therefore monitoring of *equipment reliability* was discussed as one option in this area.

Marketing

The terminal had a contingent of reliable customers over the years but looking to bring on board new business. A closer analysis of business development initiatives and returns from prospective new business was discussed as an option.

Environmental

The terminal had a number of projects in the pipeline to improve monitoring of air quality and the related targets as well as better management and filtering of the storm water in and around the terminal. These were considered as options in this area.

4.4 Planning process for how to implement the KPIs

Following the site visits to terminals, amended or new KPIs to be implemented for each terminal were agreed during the final meeting on site. I also agreed with each terminal that they would then have a period of 3-4 weeks in order to prepare for implementation of KPIs. Terminals would address following areas during the preparation period:

- Establishing parameters that each KPI will be operated in
- Establishing boundaries for each KPI in line with the objectives to be achieved
- Deciding what existing or new information to be collected and in what format for each KPI
- Establishing responsibilities and intervals for collection and analysis of information
- Deciding external and internal distribution limits for the information on new KPIs
- Deciding how the results will be interpreted and used
- Establishing training requirements for the participants

I stayed in touch with the participants from each terminal during the interim period. They periodically shared information with me related to the preparation process and I contributed with suggestions to the process. Each terminal took a slightly different approach to the preparation period as described below.

Terminal A

KPIs were discussed at the management level to start with and department heads were given responsibility to determine the parameters and targets such as the minimum *equipment efficiency* levels during the preparation period. Operations manager took charge of pulling final parameters and reporting format for each KPI. Terminal used historical figures for the last three to five years for establishing new targets for the KPIs. The details of amended KPIs were included in the daily team meetings across the terminal to ensure that the employees were informed about the changes. Supervisors and machine operators were briefed as to what information to collect during each shift and how the information would be reported to support each KPI. Bulk yard management system that was included in the new KPIs, required operators to be trained in the use of technology and that was arranged with a third-party provider. In terms of reporting, an internal dashboard was created for distribution among the management on a monthly basis for discussion and same information would be discussed at the daily team meetings across the terminal. Operations manager and the management team liaised very closely with the major stakeholder during the preparation period and it was agreed that all the KPIs were also going to be reported to the stakeholder on a regular basis.

Terminal B

The board members supported the discussions during the site visit at this terminal, but they preferred to leave the preparation for implementation to the management team. Operations director took over the role of overseeing the preparation period. Discussions held between the operations director and the departmental managers who took charge of establishing parameters for each KPI. Operation supervisors were tasked with coming up with new delay categories to be recorded for each vessel operation on the quayside in order to provide a more detailed analysis of reasons for stoppages during the operations. Warehouse manager and stakeholders involved in the logistics side of the operations were tasked with establishing targets and boundaries for the truck turnaround and unloading processes. Warehouse manager also undertook discussions with the transport providers to brief them of the new time limits and boundaries for operating in the terminal, he also briefed mobile equipment operators in terms of how they needed to collect and submit the data each shift. Departmental managers' recommendations were discussed by the management team and approved in terms of category of delays, limits on truck turnaround and loading KPIs as well as financial return target KPIs. Operations director agreed the format for reporting with the departmental managers and it was agreed that the reporting of KPIs will take place monthly and discussed at the management meeting. The information would also be shared with the supervisors and operators on a regular basis.

Terminal C

General manager took charge of overseeing the progress during the preparation period. All the KPIs selected to be implemented by this terminal had one purpose which was improvement of service delivery and stakeholder satisfaction. Specialist teams which consisted of area and terminal manager responsible for service assurance, contract compliance and performance review led the preparation of parameters to be included in the KPIs as well as the format they will be reported. This terminal chose to include new short, medium- and long-term planning horizons which were part of new corporate objectives as part of the new KPIs. The reports were prepared in a format that can be shared with the stakeholders. Proposed parameters and report format for each KPI were discussed between the specialist teams and the general manager to ensure that they were aligned with the corporate objectives related to service delivery before a final format was agreed. Participants agreed to share all the reports with the management on a daily basis, specific reports on vessel *turnaround* and optimising stockyard capacity were shared with all relevant clients on a daily basis and medium and

long term planning horizons were decided to be shared with the major stakeholders at quarterly review meetings. All the amended reports had previous established formats, therefore there was very little need for additional training of supervisors and planners. Most of the KPIs related to the corporate objectives were also aligned with personal targets of key individuals within the organisation during the preparation period to ensure that the process was followed up once the implementation period started.

Terminal D

Terminal manager took charge of preparations at this terminal. The process for deciding parameters for each KPI involved checking historical performance over the last two years and bringing in contractual requirements for the key client. For truck waiting and loading times the process involved moving from manual to electronic record keeping by using a newly acquired terminal management system. Control room operators were trained during the preparation period. The format for the reports were put together by the terminal manager and it was agreed that monthly report would be submitted to the management. Transport services are normally provided by the clients at this terminal therefore there was a discussion with the clients on the format of reporting in order to explore possibility of improving bottlenecks in the logistics provision once the implementation got underway.

Terminal E

This terminal linked the KPI they wanted to put in place to the planned investment for new quayside cargo handling equipment. As the general manager was in charge of the project, he also took the lead during the preparation period for implementation of the KPI. He held discussions with the stakeholders during the implementation period to ensure that the performance measurement would be in line with the requirements of the stakeholders for delivery of the commodities from the vessels. Technical team were primarily involved in deciding which parameters to be involved in recording downtime on the cranes for the KPI. General manager had a number of discussions with the technical team who were originally not in favour of replacing the existing cargo handling equipment on the quay in order to get participation during the preparation period. It was decided that the reports would be produced for each vessel handled and distributed on a monthly basis.

[4.5 Reflections on the planning stage](#)

This section discusses the process of planning for the participating terminals and reflects upon the planning stage taking into consideration the research questions posed in section 1.3.1 and literature review topics explored in section 2.2.

[4.5.1 The planning process](#)

The face-to-face discussions I had at the participating terminals at the start of the planning process provided guidance on the process implemented by the terminals. All the terminals followed a similar process for planning. Once the KPIs for implementation were agreed each terminal appointed a representative to take charge of the process. In order to achieve a successful implementation each terminal involved a number of representatives from each department related to the KPIs to be implemented in the process.

The starting point for changes to the existing KPIs for all the terminals were the results of discussions and outcome of the gap and pattern analysis following the stakeholder surveys. Depending on the organisational set up of each terminal department, managers and specialist teams such as quality control, health and safety held meetings in order to discuss details of changes to the existing KPIs taking into consideration practicality, health and safety implications, availability of resources,

potential environmental impact, costs involved and stakeholder impact. The teams then discussed specific boundaries and parameters that each KPI was going to be measured against. Each terminal had a representative at supervisor/operator level who was going to be directly involved in implementing the changes in the teams. At the next step, teams looked at requirements for internal and external reporting for amended KPIs and the methods used, such as weekly meetings, toolbox talks to monitor implementation of the amended KPIs.

Terminals that introduced new KPIs followed a similar process to existing KPIs provided there were no changes required to existing resources or equipment. However, they engaged with the stakeholders as and when required, in order to incorporate their feedback during the planning process by way of discussions. In the case of terminals, A and E, where a new equipment and technology was introduced to the terminal as part of introducing a new KPI, a further alignment between business development teams and teams working on new KPIs was required to make sure that the expectations between equipment efficiency and project objectives were compatible with the boundaries of new KPIs to be introduced. There were also additional testing and training requirements between the projects and the KPIs to be planned. On the one hand the introduction of new technology or equipment had the potential to disrupt and delay the introduction of new KPIs but on the other hand both terminals introduced amended KPIs in similar areas based on existing operations in order to eliminate the impact of such delays.

In the context of standardisation of KPIs, I expect that there may be differences in planning and implementation of KPIs among the participating terminals. However, as discussed in Chapter 7 the important factor is how similar the specific KPIs such as *productivity* or *equipment efficiency* to each other in terms of criteria for measurement among the terminals.

4.5.2 Efficiency and effectiveness of KPIs

Terminal A had a number of efficiency KPIs in different areas such as operations (*productivity* KPI), technical (*equipment availability* and *equipment reliability*) prior to the planning stage. The participants took into consideration the outcome of the stakeholder surveys (importance-performance gaps) during the discussions at the planning stage of the project in order to bring in effectiveness dimension into the modified KPIs. Terminal historically carried out regular customer satisfaction surveys however the stakeholder survey of the project provided a different type of approach which enabled the participants to incorporate expectations of the stakeholders into the picture. The areas of significant difference between the stakeholder importance and performance ratings were discussed in relation to developing the options for the implementation stage. The operations manager commented as to the positive engagement of a major stakeholder following the stakeholder survey conducted: “ We shared our intentions for improvements in performance areas, they were very interested to be directly involved”.

Terminal B had a mix of efficiency KPIs at the start of the project in operational, maintenance, finance and health and safety areas. The participants had a mixed approach to incorporating the outcome of the stakeholder surveys to the discussions. Participants knew that they had a number of areas they wanted or needed to improve in relation to performance at the start of the discussions. Some of these areas played an important role in discussions irrespective of the indications from the stakeholder surveys. Participants were sceptical about the objectivity of responses provided to the surveys by some of the stakeholders. The president summed up their frustration: “Some of the stakeholders do not seem to be able to evaluate the reduction in spillages, losses or wrong deliveries through the transport chain by utilising the modern handling methods we offer”. As a result, the options developed were mainly a further development of efficiency KPI's although in time they can incorporate effectiveness dimension.

Terminal C had a number of KPIs such as the *productivity*, *vessel turnaround*, *vessel queue monitoring* which were developed with the stakeholder expectations in mind at the start of the project. Therefore, these KPIs included both efficiency and effectiveness dimensions. The participants placed a great degree of emphasis in getting replies from the key stakeholders and they also took into consideration any shortcomings outlined by the results of the surveys in their discussions to generate options during the planning stage. As a result, the options generated included improvements to address those shortcomings in the future and bring more emphasis to the effectiveness dimensions of the KPIs.

Terminal D had a number of efficiency KPIs at the start of the project aimed to control main parameters such as *productivity* and *equipment availability*. The participants considered the result of the stakeholder surveys however also considered areas of improvement required within the organisation in relation to performance KPIs in their discussions. The options generated mainly reflected those requirements in the terminal therefore focusing on the efficiency dimension with some reference to effectiveness in environmental and health and safety areas.

Terminal E only managed to get one stakeholder to reply to the survey, therefore there was limited information for analysis and bringing effectiveness dimension into discussions. As a result, the discussion focused on areas of improvement that the participants felt necessary for the existing efficiency KPIs going forward. The business development manager commented: "You cannot promote what you don't have. Performance improvements and new equipment acquisition will bring us more in line with other terminals".

4.5.3 Organisational culture and KPIs

Examples of four different types of organisational culture; role, power, achievement and support cultures as described by Harrison (1987) were present in the participating terminals during the planning stage. The characteristics of different types of organisational culture were reflected in two ways: through the level of management control in the organisation and encouragement of individual or team approach during the project.

Terminal A had a team approach in developing options during the planning stage of the project. The participants from the key departments were present during the discussion meetings. These were either supervisor or manager level representatives. Communication of the ideas developed to the rest of the workforce was also taken into consideration. Ideas were discussed during the daily cross departmental meetings and by use of information panels in the facility. This helped to provide an advance notification of any changes that may be introduced with the new or amended KPIs.

Terminal B recognised the expertise of the individuals in their areas of responsibility. As a result, there was a great degree of reliance on views and ideas of individuals who would be very familiar with the specific problems in their areas within the organisation during the planning process. The board provided guidance however the decisions and the implementation were carried out by the departmental specialists. The organisation made use of area specialists who had a very good understanding of the priorities in terms of what they needed to achieve and what areas they needed improvements as well as technical expertise in other group companies to assist in formulating ideas.

Terminal C placed the individual responsibility and expertise in the forefront during the discussions at the planning stage, but it also recognised the importance of teamwork. I noted that during the meetings whilst area specialists represented teams working with them, the views they expressed very much reflected their own knowledge and expertise in these areas. There is another fundamental cultural trait in terminal C which came across very clearly during the discussions which was the environmental compliance and credentials of the terminal. This area was a full or partial consideration behind many of the options developed during the discussions. The safety and environmental manager

emphasized the importance for the organisation: “Our licence to operate framework sets our KPIs and includes environmental and community relations. It also incorporates our stakeholders’ views”. This terminal also had a very strong corporate social responsibility agenda which was closely linked to a variety of community engagement programmes. These programmes had environmental objectives to reduce the impact of the terminal for the environment and the community around it. Overall terminal C showed elements of achievement culture in practice.

Terminal D showed characteristics of a role culture during the planning stage. I noticed that during the discussions in generating options, the participants looked to the managers to provide guidance in terms of options to be considered. The technical foreman commented: “The management decide on which KPIs to implement and then we monitor the factors”. The development of options was primarily driven by the management. At the same time teamwork was highly regarded and encouraged in the organisation. This terminal had strong sense of cultural responsibility towards the communities around it and engaged in a number of community educational and health programmes.

Terminal E favoured teamwork where the teams were encouraged to deliver on projects and targets while the strength and skills of individuals were also recognised. The participants were keen to get their team members involved in the discussions in generating options. Terminal supported an achievement culture. This terminal had strong environmental objectives and engaged in a number of environmental projects such as storm water management for the benefit of outside stakeholders.

4.5.4 Management style and KPIs

Harrison (1987), suggested that certain management styles out of Laissez-faire, autocratic, consultative and participative tend to relate to a specific organisational culture (role, power, achievement, support). I also commented on the planning horizon for the terminals in this section as the management style is affected by the influence of stakeholders in the management of terminals which also governs the planning horizon for the business.

In terminal A, operations manager took overall control of the process on this occasion in order to ensure that timely progress was made. He was very much in charge of the planning and made sure that the department heads carried out detailed assessment of requirements such as training in relation to different options considered. Although terminal A showed characteristics of a support culture with a teamwork emphasis, an autocratic management style was taken up by the operations manager. This was a departure from the norm, the operations manager commented: “Reliance on individual team leaders’ initiatives is not working therefore I decided to take control of the project”. Terminal A operates on a 3-5 years planning horizon on the one hand taking into consideration changes in the business of a major stakeholder, on the other hand chasing new opportunities to grow the business in other areas. The terminal is open to experimenting with new opportunities even if there is no guarantee of long-term commitment at the start.

Terminal B promotes an achievement culture and a consultative management style where there is a support structure in place. The board level management were involved in discussions, but they refrained from influencing generation of options for the modified or new KPIs to be introduced. Terminal B operates in a very competitive and flexible market, therefore adopts a relatively short planning horizon of 1-3 years. The focus is on growth and development of new opportunities as well as maintaining existing business.

Terminal C has the longest planning horizon in terms of business planning and the plans look ahead to a 5 to 10-year continuity and development of the business. This process is very well established within the organisation and it drives shorter term plans, objectives down to annual plans and specific actions in the short term for the team and individuals within the organisation. There are key principles which

then lead the business processes within the organisation such as the sustainability, capacity availability and quality of service delivery. In the discussions I had with the participants, there was a definite focus on these principles in terms of each area of business in the organisation. The options developed by the terminal C in specific areas reflected the need for improvement in specific processes to support these key principles. The apparent management style was consultative with a clear direction provided in all areas.

Terminal D had an authoritative management style where guidance and direction were provided by the management. Terminal operates in a competitive environment and is relatively new, therefore it concentrates on a short planning horizon of 1-3 years ahead with a focus on growth of business.

Terminal E had a consultative management style. There was a degree of support by the management and control in terms of scope of areas during the discussions to generate options for the KPIs. The terminal had a 3-5 years planning horizon, the main factor behind it was the existence of a long-term established client base with logistical links to the terminal. The business development manager commented: "We serve long term tenants, it is a captive market for us, their requirements change with the market each year".

4.5.5 Key stakeholders and KPIs

The terminals in the project had four different ownership characteristics: terminals with stakeholders having partial ownership stake, private ownership, public company and unlisted public company.

Terminal A was influenced by the priorities of the key stakeholders within the organisation during the development of options. It was interesting to note that the participants took into consideration several wider developments around the terminal in formulating the options. The terminal has a major key stakeholder who is instrumental in terms of current and future business of the organisation. The impact of any changes and developments in the business model of this stakeholder had to be taken into consideration. Any KPIs that will help prepare the terminal to meet the changing expectations of this stakeholder were going to be beneficial for both parties. The organisation invested in new equipment in anticipation of growth and new business in the coming years. One of the objectives was to ensure that the new equipment used and performed in accordance with the planned targets.

Terminal B considered corporate objectives which were influenced by two key stakeholders who also had a stake in the ownership of the organisation in generating options during the planning stage. The organisation is keen to maintain the current business but equally wants to position itself to take advantage of growth in a competitive environment. One of the challenges of the terminal in considering the options was the fact that the terminal operations in terms of scope of responsibility and costs were deliberately limited. The main driver behind this was to maintain tight control on the costs which in turn is linked to the corporate structure and ownership of the terminal which combines private enterprise and financial institutions. The organisational structure involved several group companies (who are also stakeholders for the terminal) providing key support services such as warehousing and logistics to ensure the core quayside operations are effectively linked to these services. The terminal function in terms of organisational structure is kept at minimum level. The group companies are regarded as internal customers by the terminal. Generation of options involved participants pulling in ideas from the experts in these organisations.

Terminal C operates as an integral part of a vast logistics chain involving various stakeholders. Some of these stakeholders, particularly customers have a great deal of say in the organisation, therefore the terminal objectives are very much geared towards maintaining service levels and continuity for these stakeholders. The general manager commented: "Supply chain extends 400 km from the terminal with multiple stakeholders. We are the single entry and exit point and critical in the supply

chain, if we falter the supply chain stops". Service delivery to attain the best client satisfaction is a key priority for the terminal. The options discussed and generated reflect the KPI improvements to achieve this objective.

Terminal D is a relatively new terminal with an anchor stakeholder/client. The service quality and growth were the two main objectives for the organisation. Improving productivity featured heavily in discussions as this was a precursor to creating additional capacity to allow growth of throughput. The general manager commented: "It is important for us to tailor our services to our major client while trying to maximise throughput". The participants were focused on finding solutions locally to improve productivity and prevent any bottlenecks during the operations. The main logistics arrangements to and from the terminal were by road although the terminal also had access to barge transport. The terminal had no control over the logistics arrangements as these were controlled by the anchor client. The options suggested during the discussions therefore concentrated on better control of logistics arrangements under the control of terminal/inside the terminal. The terminal was undergoing a phase two expansion during the project, however the focus remained on phase one activities for the purpose of generating options except for health and safety where the participants considered the role of safety interactions among all stakeholders on site. The participants were encouraged to take time to develop areas of interest and department heads were instrumental in leading internal discussions.

The organisational objectives of terminal E influenced the options developed by the participants which in turn was affected by the operating model of the terminal. This terminal had long-standing clients who had acted as key stakeholders for several years. The control of the terminal in fulfilling its obligations is confined to the direct loading and unloading operations at the quays. The clients who were major terminal stakeholders controlled logistical activities such as transport and stockpile management therefore the options developed had to consider the implications for major clients. The discussions around the marketing area presented a dilemma for the participants between prioritising service delivery to existing clients and seeking new clients to grow the business. The influence of key stakeholders together with the ownership structure of the terminal also meant that the community interests were at the top of the priority list, therefore environmental compliance and initiatives around it were considered as options.

4.5.6 Information systems/Information technology and KPIs

The discussions in generating options at terminal A took into consideration the operation of supporting services around the new equipment. The initial discussions during the project highlighted a weakness in capturing and use of information within the organisation. This was already an action point within the wider context where the terminal was looking at using a better IT infrastructure as well as introducing a level of automation at quayside and stockyard operations. These initiatives served two purposes, one was to make sure that the key personnel within the organisation were better informed in a timelier manner, second was to address some of the concerns of the major stakeholder in the operational context. As a result, this was also brought into the conversation in terms of options to be considered for the project. The discussions around the IT and IS structure in this terminal seem to be driven by the need to satisfy certain key stakeholder demands, as a result the terminal was demonstrating an informatic culture with an emphasis on development of IT structure. The participants at the management level showed a better understanding and use of IT systems in comparison with the employees lower down the chain.

The cargo handling facilities in terminal B are relatively new, therefore there is a high level of automation incorporated in the systems which also provides the terminal with great environmental credentials. The use of IS features heavily in strategic objectives of the company. The participants are familiar with the use of IT across the organisation. This terminal has a dedicated IT function which supports the maintenance of existing platforms as well as development of new ones. In this sense the

organisation shows elements of information culture. The use of mobile platforms to use and distribute information is one of the next objectives in developing terminal's IS platform. The participants at every level at terminal B showed a good understanding and use of the IT.

The cost control is one of the key drivers in terminal C and it is linked to the automation and optimisation of the systems used in the terminal. Some of the options generated during the discussions reflect the desire for continuous development and improvement of systems in this respect. The terminal has a great degree of automation which involves significant IT structure in place. The IS structure is developing and is the area of focus for the future. The terminal shows strong signs of information culture where the IS structure is strongly linked to the long-term objectives of the terminal. The use of IT at terminal C was very well established among the employees although the employees at the lower levels of the organisation had less inclination to use the technology.

Terminal D had a focus on getting the right IT structure in place and getting the participants to make use of the IT tools. This terminal had a terminal management system, but it struggled to use the system to its full capacity mainly due to lack of understanding as to how the system could contribute to the performance of the terminal and lack of process to link the IT to development of IS at the terminal. Very few employees had a good understanding of the IT and IS systems in place. This terminal showed characteristics of an informatic culture focusing on short term IT implementation.

Terminal E used an established IT structure but the aspiration towards establishing a greater degree of IS was not forthcoming. This terminal showed signs of an informatic culture with the focus on short-term IT infrastructure development.

4.5.7 Effectiveness of different communication methods

I arranged a site visit to each of the participating terminals during the planning stage. I allowed three days during each visit on site. The first day was allocated to discussions around the results of the stakeholder survey analysis and specifically performance gaps. Discussions also allowed for a brainstorming session to generate options for implementation. There was time allowed between the first day and the third day for the participants to discuss further among themselves. The third day was planned to generate a short list of KPIs for implementation.

In terminal A participants were present during the face-to-face discussions. There was good interaction and a list of KPIs for implementation were generated at the end of the last day. Participants wanted to have further discussions on the KPIs after the visit, further communication took place by e mail via a designated participant. Once the final choices were made, it was necessary to have several exchanges by e mail to make sure that the scope of each KPI to be implemented is understood by everyone.

Terminal B participants showed a great interest in discussions. A number of options were developed at the end of the second day on site. They wanted to have further internal discussions before deciding on the final KPIs to be implemented following the visit. There was some difficulty during the face-to-face interactions on site due to language. During the e mail and phone exchanges following the site visit a person was nominated to assist in clarifications and control the communications. E mail and phone conversations were considerably more difficult and required effort on both sides to ensure that the points raised were understood correctly.

Terminal C had a very organised approach to the site visit with a fully organised programme for the time on site. There had been preparations made by the participants in advance. The discussions led to a shortlist of options to be implemented by the end of day two. There was minimal need for further clarification afterwards and a final list of KPIs to be implemented was agreed.

The discussions with Terminal D were mainly concentrated on the principles of the KPIs and I made suggestions as to areas they may consider for modified KPIs. There was an initial list of options developed at the end of day two. There were some difficulties in technical areas in communication among the parties because of language. Further communication by e mail after the site visit proved to be difficult as the management needed to lead and guide the participants in deciding which KPIs to implement.

In terminal E, face-to-face discussions were constructive, and a list of options were generated by the end of the day two on site. Participants wanted to discuss the options further before deciding which KPIs to implement. The follow-up email and telephone communication were difficult mainly due to time constraints on the part of the participants and the lack of ownership of the project within the organisation.

Chapter 5. Action

5.1 The process of implementation

I followed the implementation of the KPIs with each participating terminal for a period of eight months. A number of key activities took place in each participating terminal during the implementation stage, as outlined in Figure 12.

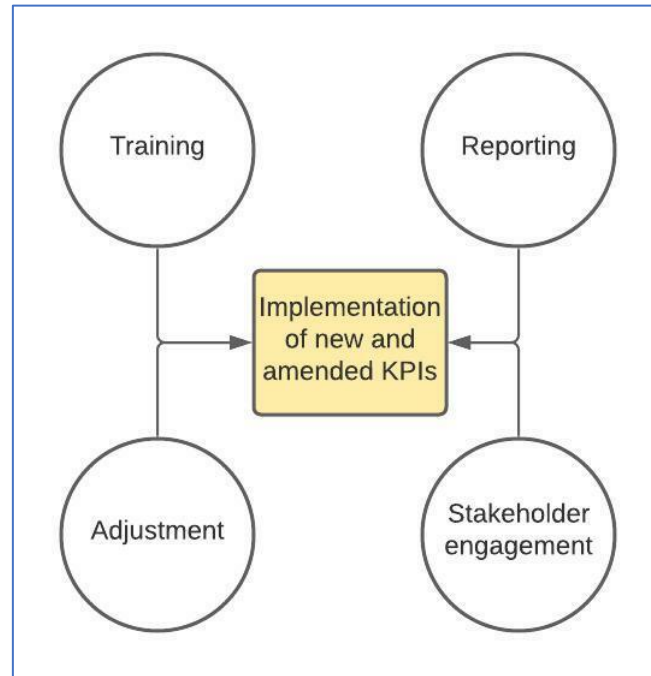


Figure 12- Activities during implementation stage

Terminal participants during this period not only rolled out the new and amended KPIs but were also engaged in reporting significant outcomes regularly as described in Chapter 6. In some terminals this period also involved continuous training activities to improve awareness among the employees as well as introduction of new technology such as the automation of stockyard facilities and introduction of stockyard management systems. In terms of my positionality and role, I was keen to be involved in various aspects of the implementation and assist with any issues arising where I could. My expectation was to have access to the information gathered on a regular basis once the KPIs were in action. Following discussions with the participants, they proposed to share the draft ideas with me so that I could comment on aspects of implementation and measurement. This was a positive step beyond my expectation. The interaction this created enabled me to contribute to the discussions with terminals and understand influences behind why certain KPIs were chosen, such as the logistics chain partners relationship with terminal C, and the influence of organisational culture at the level of supervisors in terminal E.

I maintained regular contact with the participating terminals during the KPI implementation period. During the first couple of months of each terminal commencing implementation I communicated with a key participant from each terminal either by email or telephone. During this initial period the participants from each terminal shared regular reports and, where appropriate, targets they set in order to analyse and report the KPIs with me. This provided me with an opportunity to ask questions where the analysis was not clear. I also received dashboard reports at the end of each month of the KPIs implemented and/or modified by each of the participating terminals. In addition, two to three months into the implementation period I had calls with each of the participating terminals in order to gauge their views of the progress they had been making and explore following areas:

- Any issues they experienced during the implementation of the new KPIs.
- Whether they used existing systems and information, or they needed to create a new platform for implementation.
- Their experience of the outcome from the implementation so far.
- The duration they intended to continue to implement the new KPIs.
- The ways that they used the results.
- Any changes that took place in terms of organisational structure or resources during the implementation.
- Any requirements that surfaced for training or change of responsibilities among the staff.
- Whether they needed to deviate from the original list of KPIs they had agreed to implement once the implementation was underway.

Terminal A

In the operational area, bulk yard management system was implemented in consultation with an outside company and IT specialists in the organisation which involved installation of GPS-based stockyard measurement system and loadcell based sensors on the mobile equipment. The supervisors were involved in testing the system for accuracy and application, the equipment operators were trained in to how to record relevant job information and start stop times for each job. The productivity per ton figures were collected by the equipment operators involved on the quayside and stockyard, then processed by the supervisors. The formal complaints were monitored by the operations manager and he also made sure that any follow up with the stakeholders took place. Technical supervisors collected the data for the operational equipment effectiveness each shift and reported to the maintenance manager. The maintenance manager was responsible for recording instances of breakdown maintenance and the target was set taking into consideration the track record over the last couple of years. In addition to tracking KPIs, each breakdown incident was analysed by the maintenance manager with a view to taking corrective action to prevent reoccurrence. Health and safety targets were communicated to the workforce by the departmental managers, the managers also took part in walk observe and communicate inspections. Incidents were reported by the employees and discussed in daily meetings where appropriate. On the financial front, yard handling costs were set a target and analysis was done and monitored by the financial manager against the operational data in working hours and resources utilised reported by the operations manager. The financial KPIs for the commodities A and B were monitored directly by the operations manager. The operations manager also compared financial KPI instances against the productivity KPIs on a monthly basis.

Terminal B

Terminal B has an organisational structure where the terminal has a very small footprint in terms of resources and activities, and all the services including stevedoring and logistics are contracted in from a number of group companies. The operations director coordinated the monthly reports on all KPIs being implemented and I received a copy each month. The reports were discussed at management meetings each month and I contributed by asking questions or making suggestions on specific aspects of the KPIs implemented such as the measurement limits for new categories of delays implemented at the quayside operations. Operation supervisors on the quayside and mobile equipment operators at various storage facilities collected and sent data electronically to the IT department for processing. The KPIs were processed on a ship by ship basis. Financial manager analysed the financial returns KPIs at the end of each month.

Terminal C

Terminal C had many participants covering all disciplines within the organisation participated at the discussions held during my visit to the site at the planning stage. A smaller team took charge of the implementation process. The team members had responsibility in areas of service assurance, contract compliance and performance review. This focus reflected the emphasis the terminal placed on service delivery. The data on vessel *turnaround* was historically collected by the terminal, however the new approach placed a focus on a number of internal and external processes such as the ship to shore communication and protocols during the berthing of the ships and the productivity of third-party contractors in fulfilling specific responsibilities during the same period. The internal and external processes behind these types of responsibilities were adjusted to provide tangible improvements to the vessel turnaround times. The client facing aspect of the communication was also adjusted and the results were communicated to the clients during the three-monthly customer discussion process. On the area of control of losses and quality, a new shipment contract control tool was developed which highlighted variances in key areas such as the product delivery to the terminal, stockyard operations and ship loading. The operations personnel were given responsibility in monitoring and reporting incidents that may lead to cargo losses. An operation training package was developed to raise awareness of the operations staff of what cargo contamination is and how to carry out observations of cargo contamination. The training also delivered clearly defined instructions as to who to report such instance and how the investigations will be carried out in this area. On the stockpile capacity and utilisation area, a new daily report prepared which shows the level of utilisation of the capacity particularly in relation to the remnant products at the stockpiles. These reports were shared with the customers daily to enable them to review and make informed decisions on remnant product management. In the area of certainty of service delivery, a new concept of short, medium- and long-term planning horizons were developed. Several workshops were held to discuss and agree the planning process. These included accountability, purpose and tools and systems for each planning horizon. Milestones and specific objectives were established for medium- and short-term horizons. The terminal also included key aspects of the planning in the quarterly customer discussions. I received monthly dashboard reports of KPIs implemented and made suggestions and asked questions where appropriate.

Terminal D

The project implementation in terminal D coincided with a period that the terminal was looking to handle multiple commodities rather than the single commodity set up that it was originally planned for. As a result, terminal productivity became more important as the terminal relied on a single berth to handle potential new business. The operations manager together with the logistics and planning administrator took the lead in training supervisors on how to record the delays to assist with analysis of the terminal and *productivity* figures for each vessel and commodity handled. The delays were analysed in multi discipline team meetings after each operation and action taken to ensure improvements in reducing the delays. The terminal used outside contractors to carry out a number of operational activities, the delays caused by the outside contractors became one of the major stumbling blocks in successful implementation of the *productivity* KPIs across the terminal. Operations and finance and technical department heads were involved in monitoring truck waiting and loading time KPIs. The *operational cost* control in utilising the mobile equipment used in handling trucks was one of the major reasons in monitoring the delays. A number of practices were introduced such as grouping a number of trucks at the waiting yard prior to handling operations to save costs. The terminal engaged the client in discussions as the trucks were controlled by the client and provided training and guidance to yard supervisors on any new methods of handling trucks. The truck registration and induction activities were delivered during the waiting time and terminal management system was engaged to register and control trucks for more accurate information flow and reporting. Health and safety manager took the initiative to control the stop audit and waste walk audit initiatives. The actual activities were participated by managers as well as the employees and they were followed

up in monthly terminal safety meetings. The department heads also generated a dashboard for the KPIs they implemented and distributed them to the terminal manager and board of directors including myself.

Terminal E

The general manager took charge of the implementation of KPIs in terminal E. The KPIs implemented were selected to support planned changes in two areas: an overhaul of the existing preventative maintenance system and the process of replacing existing quayside cargo handling equipment with the new ones. The additional information on *equipment reliability* assisted the participants within operations and technical departments to discuss changes to the existing maintenance practices in terms of shifts worked and responsibilities. The new practices favoured a shift towards a bigger use of technology in analysis and planning also in preparation for the introduction of new equipment at the site. I received a monthly report of KPIs implemented and made suggestions as to further refinement to the analysis and reporting in terms of categories of delays reported.

5.2 KPIs implemented by each terminal

5.2.1 Terminal A

Terminal A put into action the KPIs shown in Table 44 during the implementation period. The KPIs were implemented over a period of several months, I followed the implementation process for the first eight months with the progress being reported on a monthly basis by the terminal.

Area	KPI
Operational	Bulk Yard management system
	Formal client complaints
	<i>Productivity – (ton/per man hour)</i>
Technical	<i>Equipment effectiveness</i>
	<i>Breakdown maintenance (maintenance effectiveness)</i>
Health and Safety	<i>Accidents incidents and near misses</i>
	Walk, observe, communicate inspections <i>(Safety training and interactions)</i>
Financial	Stockyard handling costs (<i>Operational cost</i>)
	Control of demurrage cost

Table 44: KPIs implemented by Terminal A

Operational

The bulk yard management system (BYMS) KPI is a GPS - based system which monitors the commodity movements in and out of the stockyard area. The system uses GPS technology on monitoring the stockyard and the equipment utilised at the stockyard as well as a control system which assists with generation of work orders. The data is collected and reported on a monthly basis. The purpose of this KPI is to closely monitor cargo losses and prevent short deliveries or cargo contamination. There have been a number of start-up problems in implementing the system, so the terminal could not collect data for a number of months. There were also technical issues with the operation of the system

leading to unacceptable number of alarms. The training of the operators on how to integrate and use the system as well as the control room as to how to pull it together and report took a considerable amount of time. The operators did not have any weight indicators on the mobile equipment they operated prior to the implementation of the system, therefore they needed to learn how the load cells installed on the equipment worked and how they collect and record the weights they handled during their shift. The system has enabled the operators to record and pass the information electronically.

The formal client complaints KPI, aims to follow, record and keep track of nature of client complaints, actions taken and report on a monthly basis. The terminal used to monitor formal client complaints prior to the implementation of the new KPI. The new KPI focussed on following up and acting on any complaints in a more effective manner. The introduction of new KPI generated a dialog with the key stakeholder which in turn resulted in them showing an interest in the improvements brought about by the new KPIs. This meant that the client is less likely to raise complaints in a process they understood better. The operations manager also took on board the key responsibility for maintaining the continuous contact with the client in order to anticipate and tackle any issues before they become an official complaint.

The *productivity* (ton per man hour) KPI, monitors productivity of equipment/drivers utilised at the quayside and the stockyard against a target. The target set for this purpose is 35 mt per hour and it applies to a pool of commodities handled. The terminal uses a colour coding around the target with some flexibility to highlight the under or over performance quickly. The ton per man hour KPI is only monitored for the two main commodities handled by the terminal. The new KPI looks at the entire system from the ship to delivery to the client. After some consideration the terminal decided to measure and monitor the KPI to cover two processes: from ship to the stockyard and stockyard to client. The ship to stockyard process involved use of either shore cranes or ship's gear to discharge cargoes from the ship and transfer to the stockyard either via conveyor systems or mobile equipment. The stockyard to client process involved reclaiming the material on the stockyard by means of mobile equipment and transfer to the client by trucks or conveyor systems. It was important to ensure that the two processes worked in tandem to prevent any bottlenecks in discharge and handling of the cargoes.

Technical

The operational *Equipment effectiveness* (OEE) KPI looks at the actual performance of the equipment used in handling two different commodities (A, B) in relation to the design capacity of the equipment. The KPI is measured against a target set of 85% and reported on a monthly basis. The purpose of this KPI is to demonstrate the reliability of the equipment and the fact that the performance required by the clients is achieved as well as minimising delays therefore improving ship turnaround times. The performance around the target is colour coded in order to highlight any anomalies quickly. The *equipment effectiveness* KPI which monitored the specific equipment that the terminal use to handle different commodities was a new exercise. The percentage limit was agreed after a number of consultations that involved looking at the productivity of the cranes over the last couple of years. The crane drivers were trained to understand how the new target was going to work in relation to different commodities and these targets were included in the operational briefings prior to the start of the operations. The KPI allowed a 5% margin around the target performance. The terminal previously used to monitor and record the performance in terms of metric tons of cargo handled over a set period. The conversion to % of the equipment capacity is a new approach. It involved looking at the design capability of unloading cranes and assigning a capacity target equivalent to 85% of the design

capability of each crane. This was introduced in addition to the observation of the performance in metric tons.

The breakdown maintenance KPI serves to minimise the occurrence of unplanned maintenance activities and to illustrate the effectiveness of the preventative maintenance system used by the terminal. This is measured as number of incidents and reported on a monthly basis. The target set by the terminal was to achieve less than 23 incidents each month. The breakdown maintenance activities are monitored more closely with the new KPI. The terminal noticed that there were seasonal fluctuations in the number of cases handled. The fluctuations in throughput also had a direct effect on the number of cases handled.

Health and Safety

The *accidents incidents and near misses* KPI aim to reduce the occurrence of accidents and near misses by a 25% target in comparison with the previous 12 months. The KPI is monitored on a monthly basis as the target is also expressed as a number of occurrences per month. The terminal put a lot of effort into reinventing the way they approached the accidents and near misses. Historically the terminal had sound risk assessment and training as well as policies and procedures in place to protect the health and safety of the users. The terminal experienced a fatal health and safety incident which started a process of examining all the processes in this area. The existing practices such as risk assessments were tightened up. It was important to ensure that the workforce was better informed and actively involved in this area. This KPI was used to make changes to the existing culture by trying to get the workers more involved in conversations around incidents and near misses. The departmental heads were given strict responsibility in health and safety which cascaded down to the supervisors.

The walk, observe, communicate (WOC) Inspections KPI aims to strengthen health and safety interactions around the site and enforce the existing practices over a larger percentage of the workforce. The KPI is set as at annual target of 80 inspections and monitored on a monthly basis as number of occurrences.

Financial

The yard handling costs KPI monitors costs on handling the commodity at the yard includes activities such as movement and compacting. The purpose is to keep the costs below a threshold and at the same time demonstrate to the client the extra costs involved in yard operations. The KPI is measured and reported on a monthly basis. On the stockyard handling costs, the terminal received instructions for additional handling of the commodities which involved compaction and moving from the client which led to increased costs. It was important to keep the additional costs to a minimum and to have a record of these costs so that the client was aware of the impact on the terminal.

The demurrage incurred KPI monitors demurrage incurred for the commodities A and B in monetary terms (additional cost incurred by a ship is the loading or discharge operations not performed within an agreed performance limit). It is measured and reported on a monthly basis. The purpose is to quantify and minimise demurrage exposure. This KPI has a direct link to a client as the actual exposure lies with the client who is one of the main stakeholders therefore, this is not a direct cost to the terminal. The main purpose of introducing this KPI for the terminal is to ensure that the terminal performance for each commodity remains above the target levels set by the technical KPIs.

5.2.2 Terminal B

Terminal B put into action the KPIs shown in Table 45. I followed the implementation of the KPIs for the first eight months.

Area	KPI
Operational	Analysis of delays (<i>productivity</i>)
	Analysis of truck turnaround
	Productivity improvements ton/per man hour
	Operational <i>equipment efficiency</i>
Financial	Average returns per client and commodity (<i>profit margin</i>)

Table 45: KPIs implemented by Terminal B

Operational

The analysis of delays KPIs aimed to capture delays in specific areas in detail to enable the terminal to monitor and then target certain delays to reduce them in the future. The categories of delays recorded by the terminal included:

- Breakdown of auxiliary equipment (mainly mobile equipment such as bulldozers etc)
- Breakdown of terminal installation (ship unloaders, conveyor systems etc)
- Weather delays
- Time lost due to labour/union related agreements, such as later start at the beginning or following shift breaks.
- Operational delays such as changing holds

The delays are recorded in hours and then expressed as a percentage of total man hours worked over a month, and the results are analysed on a monthly basis. The results are compared against a 15 % maximum threshold for delays each month. In addition, the accumulative totals for percentages are calculated from the beginning and assessed at the end of each month. The purpose of this KPI is to understand the pattern of delays and work out how to reduce them going forward. The analysis of the delays KPI enabled the terminal to put some of the data that was being collected into a more organised format and focus on causes of different types of breakdowns experienced. When the terminal introduced the KPI it also introduced a maximum target of delays as a percentage of man hours worked. The KPI highlighted some of the areas which affect the productivity. These areas are linked internal and external factors such as working hours and labour provision. Upon reflection during the implementation, the terminal decided that they needed to run the KPI for at least 12 months in order to generate sufficient history to help them to discuss any changes required to the current practices to improve the productivity.

Analysis of truck turnaround KPI aimed to analyse two parameters, the first is the time taken for trucks from incoming scale to when they leave the terminal and the second is the time taken for trucks from registering to enter the terminal to reach incoming scale. The time taken for trucks for each category is grouped under four different time slots in 30 minutes intervals:

- 0-30 mins
- 30-60 mins
- 60-90 mins
- + 90 mins

Each time slot is assigned a weighting, the highest weighting is allocated to the shortest time frame. The terminal uses a formula which also considers the number trucks that fall into each time slot in order to come up with a KPI number. The higher number indicates a better KPI. This KPI covered a number of warehouses and silos inside the terminal. For each category the KPI is measured against a target on a monthly and accumulative basis. The purpose of this KPI is to understand the truck turnaround delays and work out solutions to minimise them in the future. The terminal manages a lot of onsite and offsite truck loading operations from various types of storage and covering different types of commodities. The variety and spread of activities historically made it difficult to monitor and have a sense of where the problems were in the system. The truck turnaround KPI for access and loading times provides firm yardstick to monitor and assess effectiveness of these activities. The KPI is assigned initial minimum targets that the terminal intends to monitor overtime.

Productivity (ton per man hour) KPI is intended to measure the productivity of labour utilised in the terminal in four main areas of quayside discharge operations, truck loading from the warehouses, truck loading from the silos and train loading activities. The allocated working hours consisted of planned hours, overtime, temporary worker hours and working hours without any operation. The information is processed daily and reported on a monthly basis against a target figure as well as monitoring accumulative figures since the start of the KPI. The purpose of the KPI is to understand the reasons behind the productivity blockers in order to manage them more efficiently in the future.

Operational *equipment efficiency* KPI aimed to compare the standard discharge window allocated to each operation against the actual performance achieved. The terminal chose a benchmark from 2017 as the standard capacity against which estimate time window for each operation was calculated. The performance is measured on each operation basis, against a target of 110%. The results are reported monthly on an accumulated basis starting from November 2018. This KPI is reported separately for the two different types of commodities handled by the terminal. The purpose is to improve efficiency and keep the ship turnaround times to a minimum. The operational efficiency of equipment is important for the terminal as most of the equipment and facilities are fairly new. The terminal wanted to make sure that the equipment efficiency for different categories of cargoes handled achieved a minimum standard. This KPI also helped the terminal to ensure that the preventative maintenance practices were at a standard where the performance can be maintained at a regular and satisfactory level.

Financial

The average returns per client and commodity pulls together all the revenues from different clients and two categories of commodities handled by the terminal as well as the detailed costs of each operation including all resources and equipment. The returns are calculated for each operation against a target set for each category of commodities handled and reported monthly on an accumulative basis starting in November 2018. A return target of 10% set against each category of commodities handled. The KPI aims to ensure that the costs are controlled in order to maintain budgeted returns.

The terminal introduced the financial returns KPI for different categories of cargoes handled in order to create a focus on monitoring and achieving minimum returns. As with the other KPIs introduced these also had minimum target levels to measure against the results.

In general terms, the new KPIs enabled the terminal to study the data that was collected in various parts of the terminal in such a way that it would improve results and also make it easier to detect and remedy any shortcomings. The new KPIs ran for eight months during the observation period of the project but the terminal intends to continue with them for at least another 12 months before discussing whether it is necessary to make any changes to them. One of the main reasons for this is

the variety of clients and commodities handled and changes that occur in demand and trade conditions. The longer the new KPIs run there will be more opportunities to capture the results in different trade conditions. The terminal has also put certain practical steps in place where the results from the new KPIs are regularly discussed and analysed at departmental meetings and actions taken where necessary.

5.2.3 Terminal C

Terminal C implemented KPIs outlined in Table 46. I observed the implementation of the KPIs over a period of nine months.

Area	KPI
Operational	Monitoring and improving vessel turnaround (<i>throughput</i>)
	Preserving cargo quality (<i>cargo integrity</i>)
Marketing	Optimising stockyard capacity (<i>stock control</i>)
	Improving certainty of service delivery

Table 46: KPIs implemented by Terminal C

Operational

Monitoring and improving vessel turnaround is an important KPI for the terminal. There is an ongoing effort in this area but the new KPI aims to review a number of internal and external processes to produce tangible benefits for the vessel turnaround. The terminal also uses those improvements as an opportunity to demonstrate improvements achieved to the clients. The ship turnaround times are recorded on a vessel by vessel and the KPI captures average turnaround times on a monthly basis. The KPI is measured against a target of 3 days turnaround. The terminal also captures a long-term moving average in order to monitor any trends. The KPI captures the time between the actual arrival and the completion of the cargo operations. The purpose of this KPI is to improve and maintain the ship turnaround times below the target levels to enable the terminal to deliver throughput commitments to the clients.

Ship *turnaround* is one of the primary KPIs for the terminal as it has a direct effect on the terminal's ability to service the planned *throughput* for the clients. The remaining KPIs that the terminal put into action directly or indirectly affect this KPI. The main improvement to this KPI was to place more focus on proactively managing internal and external factors affecting ship turnaround. As a result, the employees are paying more attention to factors such as seasonal changes in demand, the terminal experienced couple of very busy months since the new emphasis was put in place on this KPI which traditionally affected the KPI significantly. There have also been internal challenges with the performance of the handling equipment during the same period, but the plans kicked in in terms of looking at existing position and reschedule things in order to minimise queues at anchorage as a result of changes. The terminal is looking to report this KPI based on the performance of individual clients in order to inform them better but also to provide them with an opportunity to compare their performance with others. Since the ship *turnaround* is one of the key performance criteria for the terminal, the additional reporting will provide the clients with more confidence in terminal's performance.

Preserving the *cargo integrity* has always been on the radar of the management in terminal C. The major issue for the terminal which leads to cargo losses and client complaints is the internal and

external contamination to the cargo handled by the terminal. The internal contamination may occur while the cargo is in possession of the terminal and external contamination may occur during the transit to or from the terminal. The terminal put in place a training programme for the employees to explain sources of contamination, ways to detect and how to react when such an event happens. The training programme also concentrated on the consequences of contaminated cargo on the terminal in terms of loss of revenue. The training has already started to have a positive effect in raising awareness among the employees. There have been recent examples where operators in charge of loading interrupted the process to remove foreign objects from ships' holds. The terminal found it more challenging to engage the clients in reducing the contamination from sources outside the control of the terminal. From the clients' point of view there seemed to be an inclination to put the responsibility on the terminal to remove any contamination during the handling of the commodity in the terminal. The second purpose of this KPI was to come up with a tool to monitor customer losses and gains through the process of handling commodities at the terminal. The terminal developed a shipment contract control chart. This was a new tool to measure and monitor losses and gains for each ship operation for the clients. The terminal set an initial boundary of +/- 2% to monitor the fluctuations for this KPI.

Optimising stockyard capacity mainly focused on making better use of the capacity particularly in relation to remnant commodities in the stockyard which could take up to 10-15 % of the total stockyard capacity. The terminal implemented a new daily report which outlined stockpile pad utilisation for each day and then detailed the location of volumes of remnant commodities across the stockyard for each client. The new report is shared with the clients in order to help them make more informed decisions on managing their remnant commodities at the stockyards.

Marketing

The terminal implemented a short, medium and long-term planning process in order to improve the certainty of service delivery to the clients. The process is tied to the strategic aims of the terminal to ensure continuity of service to the clients as well as the delivery of contractual obligations in the years ahead. The terminal defined short-term covering the activities of the current year, medium term related to the planned activities of the next year and the long-term covering the period ahead of the next year. The plan identifies resources and capabilities required to deliver the commitments as well as the responsibilities assigned to those resources. The short-term planning horizon outlines specific activities in relation to the service assurance, operational delivery, maintenance services as well as control of assets and infrastructure. The medium-term planning includes interactions with the key stakeholders within the logistics chain to ensure that there is coordination in planning of different activities such as the shutdown periods to minimise interruptions to the service delivery. The newly implemented planning process is also shared with the key stakeholders by the terminal during the quarterly update meetings.

Certainty of service delivery is a powerful marketing tool for the terminal, however this KPI also ties in very strongly to the operational practices in the terminal. The terminal implemented a plan for three different future scenarios as a part of this KPI. These looked at short, medium- and long-term horizons considering the existing infrastructure and processes within the terminal and the requirements for their maintenance and operation for each planning horizon. The terminal involved all the internal stakeholders in this process and the KPI aimed to drive more rigour into the planning process and maintain a good operational discipline. The detailed planning process aimed to ensure that the unplanned events are minimised, and activities are conducted in accordance with the plans.

5.2.4 Terminal D

Terminal D implemented the KPIs in Table 47. The new KPIs were introduced in January 2019 and I observed the implementation for the first eight months

Area	KPI
Operational	Measuring and improving terminal <i>productivity</i>
	Improving truck turnaround in the terminal (<i>productivity</i>)
Health and safety	Monitoring and improving <i>safety training and interactions</i> in the terminal

Table 47: KPIs implemented by Terminal D

Operational

The terminal chose to monitor two specific KPIs for measuring the productivity. Net productivity which measures the ton per metric ton performance of the terminal after taking into account all delays for each operation. The figures are then compiled and reported on a monthly basis. Terminal productivity reports the performance excluding the terminal delays but after deducting any external, ship, cargo and client delays. The terminal also monitored average truck waiting and loading times on a monthly basis.

Berth utilisation is important for terminal D as it relies on a single berth to service the clients. This was the main reason for the terminal to introduce terminal and net productivity KPIs. At the moment the KPIs measure the average productivity across the commodities handled by the terminal. The terminal realised during the implementation of these KPIs that the productivity figures varied significantly between the different commodities handled because of the different type and capacity of handling equipment used for them. The intention is to analyse the KPIs breaking them down per commodity going forward. This will also assist with and link to the equipment reliability KPIs pursued by the terminal. The terminal does not control the trucks therefore is very keen to collect and analyse information on truck turnaround. The space for the trucks waiting to be processed is limited, therefore this is an area identified for improvement. The implementation of truck turnaround KPIs helped the terminal to pinpoint the bottlenecks in the system. The truck volumes handled by the terminal daily depend on the fluctuations of daily demand by the customers. The trucks arrive sporadically, and it is costly for the terminal to start and stop resources every time an individual truck arrives. Terminal started experimenting with grouping a minimum number of trucks arriving before processing them to solve the problem but this in turn has implications on average waiting and processing time for the trucks.

Health and Safety

The terminal chose to introduce two KPIs in this area. Stop Audits and Waste walk audits.

The purpose of the stop audits is to engage both the managers and supervisors as well as the employees in various interactions around the terminal to ensure that activities taking place are done in accordance with health and safety rules within the organisation. The practice also aims to increase the level of awareness and interest in safe working practices among the workforce.

The terminal has strict regulatory requirements for environmental compliance which includes quarterly reports for water and air quality levels to the authorities. Waste walk audits is a new KPI introduced by the terminal to monitor visible dust pollution and waste management practices around the terminal.

The KPIs introduced in this area aim to improve the awareness and contribution of the employees. The stop audit KPI focused on safety on a day-to-day environment including safety of co-workers. The terminal aimed to observe conditions and actions, encourage peer to peer communication among the workers and create a learning opportunity for everyone. The terminal uses a significant percentage of contracted employees therefore the stop audits are used to reinforce the message for safe working practices in the terminal. The terminal identified a number of objectives that they wanted to achieve through the stop audit interactions around the terminal.

- Recognising and reinforcing safe working practices.
- Building a common understanding and commitment to safety.
- Through communication prevent unsafe acts and injuries.
- Change employee behaviour leading to a better safety attitude.
- Develop better safety leaders in the workplace.

The waste walk audits KPI is a part of an initiative by the terminal for an effective waste disposal and management programme. It is aimed to identify new opportunities for reducing waste in the terminal. Part of the programme involved re-organising recycling activities in the terminal. In this respect, the participants assist in sorting and weighing waste recycling in the terminal. There is a regular report produced every month. The objectives of the KPI is to improve the environmental footprint of the terminal, better management of the resources and improve the standing of the terminal in the community.

5.2.5 Terminal E

Terminal E implemented the KPI in table 48. The KPI was introduced in January 2019 and I observed the implementation for the first nine months.

Area	KPI
Technical	<i>Equipment Reliability</i>

Table 48: KPIs implemented by Terminal E

Technical

The *equipment reliability* KPI in terms of ship loading and unloading equipment is a key factor for the terminal E. Managing the delays leading to stoppages provides a number of advantages to the terminal. The better berth utilisation enables the terminal to handle higher throughput. Minimising delays also reduces the number of client complaints. The KPI put into place by the terminal looks at the manhours for each vessel operation and records the down time for terminal loading/unloading equipment as well as the downtime for other reasons. The total and equipment downtime are then monitored as a percentage of the total man hours on a monthly basis. The KPI also captures the different types of commodities handled by the terminal.

Equipment reliability is a key issue for the terminal as it has a direct link to the performance requirements of the clients as well as the berth utilisation. The loading and discharge cranes utilised by the terminal have been in place for a long time. The terminal is in the process of replacing the cranes with the new ones. Part of the decision to concentrate on this KPI was to monitor the reliability parameters during the transition period between the old and the new cranes coming into operation in order to assess the improvements. This still remains the case, however during the implementation period the start-up of the new cranes have been pushed back. The new cranes were expected to be in place at the start of the implementation period, but they are now planned to be in operation towards the end of 2020. The terminal is going to continue to monitor the KPI for at least another 12

months which will then enable them to capture the changes happening during the transition period. The purpose in the initial stages of collecting and analysing the information has been to have a better understanding of the factors affecting the reliability. In the future, the terminal will consider setting additional targets in different areas which link the ship to quayside operations to stockyards. The systematic collection and analysis of the data in relation to downtime highlighted the amount of downtime incurred due to reasons outside use of terminal equipment. It also helped to highlight the effect of different cargo characteristics on performance. For example, in handling pet coke a small part failure seemed to have led to prolonged downtime in the operations which was not experienced with other commodities. The figures also confirmed the shortcoming of the existing loading/discharge cranes in handling big vessels in terms of outreach and efficient performance.

5.3 Reflection on implementation experiences of the terminals

In section 1.3.1 of the project I introduced several research questions. In section 2.2 I explored the previous research behind some of the research questions posed. During the diagnosis stage of the project, I provided a review of these areas in section 3.5. I considered the same areas in reflection of the planning stage in section 4.7. The current section provides my reflection on the implementation stage of the project. The areas covered are efficiency and effectiveness KPIs, organisational culture and KPIs, management style and KPIs, key stakeholders and KPIs and IS/IT and KPIs.

5.3.1 Efficiency and effectiveness KPIs

Terminal A introduced a number of amended KPIs such as the BYMS, OEE for different commodities, yard handling costs and demurrage monitoring, which were based directly on the feedback from the stakeholder surveys. The intention of the terminal was to create a more efficient communication and reporting environment with the client in order to demonstrate positive outcomes from the KPIs or highlight areas where change in practices may lead to cost increases. The terminal had a great level of interest from one of the major stakeholders which had not been expected at the start of the process. The terminal responded to it positively by setting up OEE KPIs for each commodity and yard handling cost KPI in coordination with the stakeholder and the stakeholder was involved in regular updates and meetings during the implementation period. The operations manager commented: "We formed a steering committee with the participation of the client, which is now meeting quarterly, assessing and providing feedback on results of new KPIs".

Terminal B implemented KPIs aimed at improving specific areas in loading and discharge as well as storage and distribution elements of the work done at the terminal. The *equipment efficiency* and *delays* KPIs were specifically related to the core terminal activities, whereas the *truck turnaround* and *productivity* KPIs aimed to improve the performance in relation to the stakeholders involved in providing such services to the terminal. The operations Director was pleased with the initial progress: "We modified the way we structured data in areas such as stoppages to be more precise, the quality of data was not good enough previously, but it has improved". The assessment and progress of the KPIs became a topic of discussion at the regular management meetings in the organisation. This terminal sees the progress of KPIs as an ongoing iterative process and intends to take time to observe the trends over a period before making any further decisions.

Terminal C focused on stakeholder concerns and requirements in making changes to all the KPIs it implemented. Vessel turnaround KPIs improved the communication with the stakeholders enabling them to participate in the planning process ahead of vessels' arrivals. The operations manager described the progress made in this area: "Turnaround is a primary measure for us linked to reliability, planning and execution of service. When an interruption occurs, it is critical how we adjust planning to reduce the queues". Preserving cargo quality KPIs aimed to engage the employees in taking proactive action but also in making sure that there were no contamination issues that affected the clients. Optimising stockyard capacity aimed to bring the stakeholders right into the process to ensure

that they took actions to eliminate bottlenecks in the system. The new planning horizons ensured that the service delivery obligations of the terminal were met towards the clients. During the implementation of all the KPIs engagement of stakeholders in terms of reports and meetings have been a great success.

The focus of the terminal D in implementing new KPIs was the efficiency rather than the effectiveness of its operations. The KPIs aimed to improve the *productivity* therefore improving the capacity of the terminal overall. The terminal manager explained their focus: “We have performance measurement systems for productivity on quayside, truck delivery and dwell times which provide us with good guidance now”.

Terminal E focused on downtime KPI which was linked to their quayside equipment. The *equipment efficiency* KPI is aimed at improving ship to shore productivity to ensure that the clients are provided with a better service. Productivity was identified as one of the key requirements for the clients during the stakeholder discussions. The general manager commented: “Changes we made to come up with a more robust preventative maintenance system on our cranes will help improve our productivity”.

5.3.2 Organisational culture and KPIs

The level of individual and teamwork involved during the implementation of KPIs in participating terminals was an interesting area to observe. In section 3.5.2 I looked at the comparison between Hofstede’s IDV index against my observations at each terminal and discovered that individual and teamwork approach in participating terminals did not follow what was suggested by the national norms suggested by his model. During the implementation stage of the project, I observed that each terminal used a combination of individual and teamwork approaches as described below rather than having a clear distinction between them. This suggests that the use of these approaches is more complex than what is suggested by Hofstede. Table 49 shows the degree of individual and teamwork approach taken during the implementation of KPIs in the participating terminals.

Terminal	Individual	Teamwork
A	High	Medium
B	Medium	Medium
C	High	Medium
D	Medium	High
E	Medium	High

Table 49: Degree of individual and collective approach at participating terminals

Terminal A showed a high degree of trust in individual work and expertise and the level of teamwork during the implementation process was moderate. Terminal B respected the individual specialism of participants but brought in team spirit in discussions and implementation at the same time. Terminal C placed a high degree of importance on individual work and this was also supported by the reward and recognition system that was in place at the terminal but at the same time there was a degree of recognition of the team effort to ensure success. Terminal D relied heavily on teamwork and effort to produce results, whilst individual expertise was recognised the teamwork featured heavily in actions. Terminal E valued individual knowledge and skill but heavily promoted teamwork and rewarded team success. Individual volunteers were extensively used to inspire and promote teamwork in the organisation and during the implementation of the project.

The level of autonomy in decision making during the implementation showed differences among the terminals. Following on from the discussion in section 2.2.2 related Schein’s (2010) layers of organisational culture the level of autonomy given to individuals reflected the organisational beliefs and values in terminals. There was consistency between the artefacts displayed within an organisation, the documentation of goals and aspirations and the response of employees to those organisational beliefs. I observed that there was no optimum combination of autonomy between management and other participants which made one terminal more successful than others in implementing KPIs. However, each terminal had a style in line with their organisational culture. Table 50 shows the level of autonomy in decision making among the participants in the participating terminals.

Terminal	Level of Autonomy
A	High
B	Medium
C	High
D	Low
E	Medium

Table 50: Level of autonomy in participating terminals

In terminal A the participants had a high level of autonomy in decision making whilst implementing KPIs. There was a concerted effort in involving each business unit in the implementation process. In terminal B, the management provided guidance in decision making and the participants were provided with medium level of authority in implementing the KPIs. The operations director commented how the companies within the group contributed to implementation: “We have different departments involved in implementation but the terminal is leading the implementation”. The management kept a degree of control on data processing and reporting during the implementation. In terminal C, the participants had a high level of autonomy in making decisions during the implementation of KPIs, there was a great degree of trust placed on the participants to make decisions as required. In terminal D, the participants were essentially implementing the decisions taken by the management and reporting on the KPIs implemented. In terminal E, participants had a medium level of autonomy in implementing the KPIs where the senior management still had the final say in any major changes.

5.3.3 Management style and KPIs

The relationship observed between the organisational culture and the management style during the implementation period was different from the one I observed during the diagnosis period in couple of terminals. Terminals A and B changed their management style in response to how the implementation of the KPIs progressed in their organisations. I was present at the discussions during the planning stage in both terminals where the decisions as to how the new or amended KPI to be implemented were taken. In terminal A, implementation very much relied on the fact that once everyone understood the process, objectives and what needed to be done, individuals would use their own initiative to implement things. I was in regular contact with the terminal representative following the start-up of the implementation stage, and I subsequently followed the process. The project sponsor decided to personally follow up on actions to be taken by other individuals on this occasion, and it became clear that the personal initiatives were not taken as expected therefore the project suffered. This has opened another discussion within the organisation as to whether a similar weakness existed in implementation of day-to-day responsibilities. The project sponsor subsequently implemented a

change that involved line managers in areas where the new or amended KPIs were implemented taking direct responsibility for implementation. In terminal B, departmental managers were in charge of delivering changes in their own area. However, this approach lacked coordination and drive at the management level therefore a senior manager took charge of the entire implementation process. The objective on both occasions was to ensure that the project was a success. Having an understanding and support of the employees at lower levels within the organisations to implement required changes, were proving to be challenging. Therefore, on both occasions changes in management style involved managers taking more control of the decision-making process. Table 51 provides a description of organisational culture and management style features I observed during the implementation of the project in the participating terminals. The management style followed by the terminals do not match the suggested corresponding styles suggested by Harrison (1987), however the changes in management style by the terminals helped progress the project.

Terminal	Organisational culture	Management style
A	Support	Consultative
B	Achievement	Autocratic
C	Achievement	Consultative
D	Role	Autocratic
E	Achievement	Consultative

Table 51: Operational culture and management style of participating terminals – Based on Harrison(1987)

Terminal A showed classic signs of support culture during the diagnosis stage of the project where the management provided support to the employees but totally trusted employees' ability and dedication in carrying out tasks. During the implementation, the organisation moved along the spectrum by introducing more guidelines and structure together with the introduction of the new KPIs and the management were given more responsibility in monitoring performance of the employees. The participative management style has proven to be not very effective in implementing amended KPIs, therefore the management changed to a consultative management style where they maintained consultation with the participants, but they made the final decisions on implementation. The operations manager commented on this change during a phone call: " We had to change the way we work in order to progress the project, therefore we decided to make department heads specifically responsible for the implementation".

In terminal B the management provided guidance and direction at the start of the implementation and there was consultation with the participants in selection and implementation of the KPIs. However, during the implementation process the management discovered that the consultative style management was not providing the impetus required for the new KPIs implemented, therefore one of the managers needed to take charge of the implementation and take a more autocratic style in order to ensure progress. Therefore, departmental managers were given responsibility in making sure that the implementation of new KPIs progressed as planned.

In terminal C the management provided clear direction and guidance in line with the corporate objectives and values and relied on the participants to develop and implement the KPIs based on their knowledge and experience. There was complete trust in participants to develop the methods and procedures to ensure success of the KPIs. There was no change in management style between diagnosis and implementation stages.

In terminal D the management provided direction and guidance at the start of the process, the participants were encouraged to come up with the options which they did but the final selection of the KPIs to be implemented were influenced by the management. The management kept control of the implementation process and maintained the same management style as before.

In terminal E, the achievement culture was evident throughout the project where individuals with extensive experience in their areas of expertise were also responsible for developing and managing the KPIs in their specific areas of expertise. While the management provided support and approval, the initiatives came from the specialist managers. Layers of organisational culture existed in terminal E was demonstrated during the implementation period as the long-time employees at supervisor level were convinced that the existing equipment was capable of delivering the improvements required whereas the senior management was of the opinion that a new generation equipment was required for the future. The potential conflict paused an issue with the implementation of the KPI however a series of consultations helped to align the objectives between the managers and the supervisors.

5.3.4 Key stakeholders and KPIs

In majority of the terminals, key stakeholders were actively involved during the implementation of the KPIs. This was a major achievement as a result of the approach the participants had taken during the preparation and implementation of stakeholder surveys and the interaction with the stakeholders during the same period. In previous research, as suggested by Brooks et al. (2011) the perceptions of stakeholders were overlooked, and most of the time stakeholders who were involved had relatively passive roles in the research. In the case of terminal A major stakeholder became almost an integral part of the process and was actively involved in following reports and progress meetings. As a result of the significant influence it had within the organisation, it took a leading role providing direction. In terminal B the major participants during the implementation were the group companies that provided several logistics services to the terminal as stakeholders. They were closely involved in reporting and fine tuning of parameters. Terminal C sought to involve all the major stakeholders relevant to each new KPI during the implementation period. It had the most complicated structure because the terminal operated as a part of the complex logistics chain with several participants. The operations manager commented: "Previously we had multiple people in different parts of the organisation talking to stakeholders.

With the new project we simplified the structure with dedicated service representatives under a service assurance team". Terminal D had minimal stakeholder engagement during the implementation period. Terminal E had consultation with the key stakeholders during the implementation with limited stakeholder involvement.

I compared Hostede's LTO index against the participating terminals in section 3.5.2 and pointed out to some differences with the participating terminals. Active participation of stakeholders during the implementation period in most of the participating terminals demonstrated the major influence they had in the level of long-term orientation for the terminals. For example, the key stakeholders in Terminal C's logistics chain determined the degree of long-term planning horizon required for the terminal. In this case the decisions were not taken along the national norms suggested by Hofstede but specifically at the organisational and industrial level where objectives of the organisation and the priorities of the logistics chain partners determined the decisions taken. Table 52 shows the planning horizon for the participating terminals.

Terminal	Orientation
A	3-5 Years
B	3-5 years
C	5-10 years
D	1-3 years
E	3-5 years

Table 52: Planning horizon of the participating terminals

The planning horizon of the participating terminals are affected by several factors. The degree of influence of stakeholders within the organisation is one of the factors, the stronger the influence the longer the planning horizon. The degree of integration of a terminal within the logistics chain involving other stakeholders also have a positive effect on longer planning horizon. The competitive position of the terminal together with the security and existence of long-term clients is another factor. If a terminal operates in a more competitive environment with shorter term contracts, the planning horizon is likely to be shorter. Terminal A has worked with an anchor client for a long period of time but operates in a changing market environment which poses competitive challenges to the terminal, a key stakeholder has a significant influence in the terminal. The planning horizon adopted by the terminal is 3-5 years with annual plans to support short term developments. Terminal B also has established clients but operates in a competitive market therefore chooses to plan for a medium-term horizon. Terminal C works within an integrated supply chain with a number of clients with long term commitments who also have a significant influence on the organisation. Therefore, terminal C has the longest planning horizon of 5-10 years ahead followed by medium- and short-term planning horizons down to 1 year ahead. Terminal D operates in a competitive environment as a relatively new terminal with low security of long-term contracts, therefore concentrates on a shorter planning horizon. Terminal E has a stable and long-term client base and works on a long to medium term planning horizon.

5.3.5 Information systems/Information technology and KPIs

The degree of informatic or information culture that existed within each terminal (Claver, 2001) affected the pace of implementation and level of technology/IS use in each participating terminal. Terminal A has gone through an IT and IS development process especially during the implementation of BYMS KPI. There were several technical issues during the first few months of the implementation. The system also required for the equipment operators to be trained in use of and recording of the information for the system. It took eight months for the system to start operating reliably. The technical manager summed up the troubles: " We are having issues with the implementation of the technology, sizing of different stockpiles and we are getting too many alarms". Terminal B used the existing IT infrastructure during the implementation of the KPIs. The main addition was the information processing and reporting formats for the results to be distributed within the organisation. Terminal C made changes to the IS part of the system by generating new forms to illustrate the information collected and analysed. In terminal D implementation of KPIs mainly required better utilisation of the existing IT infrastructure. Terminal E used the existing IT structure and added new forms to analyse the data. The planned acquisition of new equipment in the future will require the terminal to consider changes to the IS in the organisation.

Terminal B had a well-established IT structure and collected extensive data from the activities within the organisation. The president commented on the importance of IT/IS: "We have made a strategic

decision to move into technology in the business. We trust team leaders to check progress and invest time to ensure the new systems are used". Therefore, introduction of modified KPIs required the participants to identify the correct data and apply the analysis required in order to come up with the information to support the implementation of the KPIs. The bigger challenge was developing and adapting the IS within the organisation to make sure that the information reached the right individuals, and those individuals were informed as to how to use the information in order to benefit from it but also act where required.

Terminal C used the existing IT structure within the organisation to develop new forms to analyse areas such as 14 days forecast for ship *turnaround*, detailed daily stockpile reports for stockpile utilisation and planning horizon schedules to consider detailed planning going forward. The use of IS was important to ensure that the reports and action points generated were communicated with the right people at the right time within the organisation and also across the supply chain that the terminal operated with the logistics partners to enable everyone take actions where necessary. Although the KPIs implemented did not have a specific focus on automation, further automation of cargo handling equipment at the terminal remains an objective for the terminal. The operations manager commented on another area where they used existing IT/IS platform: "An operations training has been developed to raise awareness and communicate areas such as cargo contamination issues in an effort to improve customer service commitment".

Terminal D concentrated on improving the use of the existing terminal management system (TMS) in the context of the new KPIs implemented. During the implementation TMS was used to collect data and assist with the analysis to enable use of new KPIs. The focus remained on the more efficient use of the IT structure during the implementation period. The terminal manager was pleased with the level of understanding in utilising TMS among the employees: "Management has a good understanding of KPIs and contract terms. Even at foreman level there is sufficient understanding".

Terminal E used the existing IT infrastructure to analyse the information on breakdowns. Terminal had a depository of data going back couple of years and this was brought into the analysis during the implementation process. The distribution of information was focused on informing business unit level participants to monitor the implementation of KPIs. Terminal intends to make better use of IS together with the introduction of new quayside cargo handling equipment next year. The general manager pointed to some of the issues: "Current IT structure is inadequate. Using technology more extensively requires change in thinking among the employees, the push ideally should come from the bottom".

5.3.6 Effectiveness of different communication methods

I mainly communicated by e mails and telephone calls with the participating terminals during the implementation period. In addition, I received a report from each terminal on a monthly basis outlining the results of the implementation of KPIs. Email communication helped in understanding progress made every month, especially as terminals A and B made changes to some of the parameters for data collection and terminal A had difficulties in implementation of the BYMS system. Telephone calls were also important to discuss and gather reflections of the participants from each terminal on the implementation as it progressed. However, the person on the call did not always have the full understanding of all KPIs implemented therefore at times further information needed to be chased afterwards. In that sense calls were less effective in comparison with face-to-face discussions.

5.3.7 General observations on implementation

I made site visits to participating terminals at the start of the diagnosis and planning stages of the action cycle. At some of the terminals, discussions during the semi-structured interviews evolved into talking about the areas where the participants had ideas for modified or new KPIs. In that sense they

were already thinking ahead while we were discussing issues at the diagnosis stage. The thought process was driven by different reasons in different terminals. Terminal A was driven by the close relationship it had with one of the stakeholders and the influence that this had on the current and future development plans of the terminal. Terminal B was influenced by the competitive environment that it was operating in. It was therefore pursuing new ways to tackle the challenges it faced. Terminal C had been influenced by the supply chain and stakeholders surrounding its operations and the constant change that it generated for the terminal. As a result, terminal operated in an environment where there was constant supply of new ideas for change and moving forward. In terminals D and E conversations were more confined to the stage under discussion.

There were a number of differences in approach among the participating terminals during the implementation. In terminal A it was not possible to reflect on the results for some of the KPIs due to difficulties with the technology during implementation. Terminal B decided that they needed at least 12 months of implementation before they could draw firm conclusions and decide whether any changes were required to the KPIs. Terminal C had the implementation and reflection going hand in hand through regular internal meetings and quarterly meetings with the stakeholders where information was shared and discussed among everyone. Terminal D lagged behind in terms of getting the most out of the implementation as there were still issues with understanding of the newly implemented KPIs among the employees. Therefore, there was not a great deal of reflection on the results. In terminal E the implementation of the new KPIs was extended to blend in with the capital expenditure and equipment replacement decisions which means that the reflections on outcome will take place when the new equipment is in place at some point in 2020. Overall, most of the terminals were cautious in interpreting outcomes in the short term and chose to take a much longer period of reflection. As a result of this there was little attention paid to evaluation of results on a comprehensive manner within a set period of time which would have provided an opportunity to run another cycle for some of the terminals. Instead, some of the terminals chose to make small adjustments to the parameters and continue with the implementation for a long period.

Chapter 6. Evaluation

This section evaluates the outcomes from the actions taken by the participating terminals. The first part of the evaluation reports on the results of the KPIs implemented by each terminal during the project. The outcomes on the second part of the evaluation are presented in seven areas which include: contribution to knowledge and skills, information and reporting, organisational resources, organisational culture, processes and efficiency, stakeholder engagement and impact of the project. Finally, a comparative summary of KPIs before and after implementation stage is presented. The evaluation stage process is outlined in figure 13.

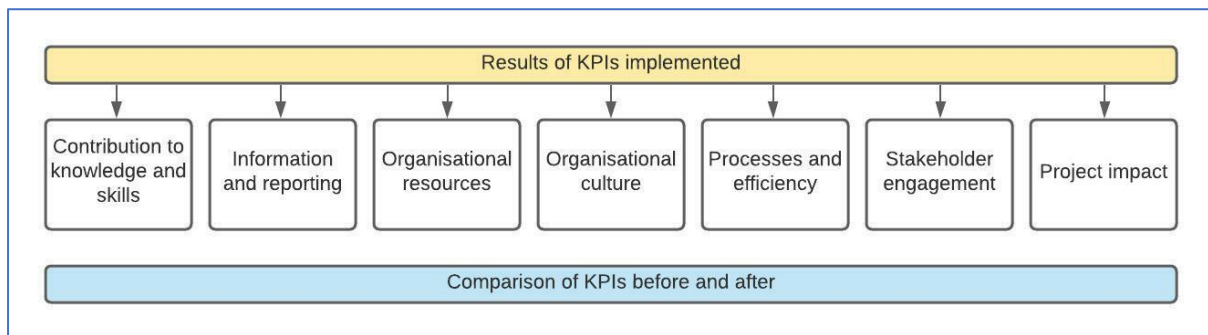


Figure 13- Evaluation stage process

I used two data-gathering methods to assist with the evaluation. The first was a comparison of modified or new KPIs introduced by the participating terminals before and after the KPIs were introduced. It explores specific outcomes, such as: changes in data analysis, reporting practices, training requirements, benefits such as better performance monitoring, and improved employee awareness following the implementation of KPIs. Comparative analysis indicates a position at the time of analysis therefore does not necessarily take into consideration further changes that may have taken place following the observation period of the project.

The second data-gathering method I used was telephone conversations and/or face-to-face meetings with the key participants from each terminal at the end of the first eight months of the implementation period for the modified KPIs. The following questions were asked during these discussions, and respondents were asked to focus their responses on the period from the start of the implementation to the date of my conversation with them:

1. Has the change process improved the knowledge and skills of the employees?
2. What changes happened in terms of collection of data and how the information derived from the analysis has been used?
3. What organisational changes took place in terms of resources, how they were utilised, responsibilities and authority?
4. Did the organisation experience a change in the organisational culture?
5. What specific changes occurred from an efficiency and process point of view?
6. In what ways have the process made a difference to the engagement and relationships with the key stakeholders?
7. What overall impacts have the project made, both positive and negative?

Telephone conversations enabled me to engage with the participants in more detail in areas identified by the comparative analysis of the KPIs. They were particularly useful in identifying some of the specific changes especially in organisational and cultural characteristics. However, the participants were sometimes not specific in their responses to the questions despite my probing for specific details and preferred to make general comments on improvements. Comparative analysis highlighted the specific changes such as new targets, reports and telephone discussions identified organisational impact in the evaluation process.

6.1 Terminal A

6.1.1 Results of the KPIs implemented

Operational

The results of the operational KPIs for the first eight months of implementation are in Table 53.

		Performance							
The KPI	Target	Jan	Feb	Mar	Apr	May	June	July	Aug
BYMS	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Formal complaints	0	0	0	0	0	0	0	0	1
Productivity	35	33	41	33	40	28	38	40	

Table 53: Operational KPI results Terminal A (Source – Terminal A)

The BYMS has been going through a trial process throughout the observation period for the project with an aim to improve *cargo integrity* at the terminal. This has presented a number of challenges as there were issues with the accuracy and sensitivity of alarms generated by the system. As a result, the system has not been put into the full use during this period. The system started operating in November 2019.

The client complaints KPI was put into place in order to focus on monitoring the complaints in relation to any productivity related complaints from the client. There were no complaints recorded during the first seven months of implementation. There was a complaint registered in August.

The *productivity* KPI results exceeded the target set as shown in table 54 in February, April, June and July.

Technical

Table 54 shows the results of the technical KPIs for the Terminal A.

		Performance							
The KPI	Target	Jan	Feb	Mar	Apr	May	June	July	Aug
OEE Commodity A	85%	83	84	92	83	92	95	88	90
OEE Commodity B	85%	63	93	75	66	n/a	77	82	65
Breakdown maintenance	less than 23	42	46	30	38	28	47	29	42

Table 54: Technical KPI results Terminal A (Source – Terminal A)

The results of OEE (*equipment efficiency*) for the commodity A were very close to the target (85%) set by the terminal during the first four months of the year, and consistently outperformed the target for the following four months indicating that the process put in place was successful. The OEE results for the commodity B were less successful with the monthly averages achieved being significantly below

the target set (85%) throughout the eight months period except for February. The breakdown maintenance (maintenance effectiveness) target set was not achieved during the first eight months of the implementation, indicating the need to re-think the process put in place in this area. The intention of the terminal is to extend this criterion to the conveyors in the system once the maintenance criteria for other equipment is settled.

Health & Safety

Table 55 shows the results of health and safety KPIs for the Terminal A.

		Performance							
The KPI	Target	Jan	Feb	Mar	Apr	May	June	July	Aug
Accidents & near misses	-25%	1	1	4	0	0	2	2	2
WOC inspections	80	5	4	5	5	2	3	2	2

Table 55: Health and safety KPI results Terminal A (Source – Terminal A)

The terminal has established a 25% reduction target in *accidents incidents and near misses* which is 1.5 incidents each month. The first five months apart from March the target has been achieved, thereafter the rate of incident continued slightly above the target for the remaining three months of observation.

The newly established WOC inspection (*safety training and interactions*) targets were met for the first four months but there were fewer WOC inspections thereafter missing the target for the last four months. This indicated a need to focus more on management engagement in this area.

Financial

Table 56 shows the results of the Financial KPIs for the Terminal A.

		Performance							
The KPI	Target	Jan	Feb	Mar	Apr	May	June	July	Aug
Yard handling costs	less than 650	653	666	688	666	645	664	648	653
Demurrage - A		0	0	0	31370	6666	24109	166380	0
Demurrage -B		0	0	0	0	0	0	115825	0

Table 56: Financial KPI results Terminal A (Source – Terminal A)

The terminal set a target for yard handling costs, but target has been missed for the first eight months of implementation except for the month of May. The unexpected issues encountered with the implementation of BYMS has contributed to the poor performance in this area.

The monitoring of the demurrage exposure for the commodities A and B showed that the client incurred demurrage for the commodity A for 50% of the period of observation whereas the terminal OEE for the commodity A was around or above the target set by the terminal for the same period. There was only one month with demurrage exposure for the commodity B whereas the terminal OEE for this commodity has been below the target set by the terminal for most of the months observed.

6.1.2 Specific areas of impact and outcomes

The specific areas of impact and outcomes for the terminal A are shown in table 57.

Area	Impact - Outcome
Contribution to knowledge and skills	Increased employee awareness of hazards Better monitoring of productivity and use of technology Proactive approach to cost control
Information and reporting	Better analysis of data Provision of more accurate and employee specific information Introduction of automated data collection and analysis
Organisational resources	KPIs focused on specific departments Specific responsibilities for decision making by line managers
Organisational culture	Less reliance on consultative culture Bigger emphasis on teamwork and achievement
Processes and efficiency	Implementation of better cargo handling processes Reduced claims for damages and improved returns
Stakeholder engagement	Direct stakeholder engagement in improvements Closer stakeholder relationship and participation in decision making Better alignment of terminal and stakeholder objectives
Project impact	Inspiration to examine current KPIs Positive engagement with stakeholders Encouraged new ideas for continuous improvement Implement modified KPIs in other facilities

Table 57: Impact-outcome of modified KPIs Terminal A

1. Contribution to knowledge and skills: Modified KPIs in the health and safety area introduced a new regime of inspections which increased the awareness of employees of hazards in their work areas and in turn engaged them in reporting hazards. The technical manager was optimistic about the prospects: "Through the new KPIs we are able to train employees to gain better knowledge on how to perform their duties with less accidents within our continuous improvement process". Changes in this area are in the wake of serious lapses and highlights the fact that even if there are existing KPIs in place without review and improvements they may over time become less effective. The BYMS system introduced a level of information technology and automated reporting into the operations and therefore helped operational staff to use the technology to measure productivity at the stockyard and minimise wrong product deliveries. The modified *productivity* KPIs improved self-awareness of operators in relation to their productivity and new targets pushed them to seek ways to improve it. The focus on yard handling costs and departmental discussions led the employees to think about methods of handling commodities at the yard and the selection of equipment for operations. Once the company wide reporting system is in place, the managers will access just in time information which will enable them to make more informed decisions.

2. Information and reporting: At the start of the change process the terminal had already collected data in many areas involved in the implementation of the new KPIs. However, the process has provided a focus in the selection of key areas on which to concentrate, and a better analysis of the data was achieved to provide more meaningful results for the participants. The new approach has also helped the analysis of the data to be transferred on to a company-wide information platform. This will be an ongoing process for the next year or so when a new IT system and dashboards will be gradually introduced. Accurate and employee specific information across the organisation will improve the efficiency of the terminal as it will enable employees to act promptly when there are issues in areas such as the delays or productivity. The focus that the new KPIs brought in enabled selected information to be analysed and reported against the targets provided a clear guidance to the

management in terms of improvements required or achievements made in these key areas. It removed the ambiguity that existed in the system previously and provided a platform where individuals can be challenged or rewarded against the clear information presented by the system. The new KPIs also enabled the terminal to introduce a more automated information gathering and analysis process in the operational area. This specific development involved mobile handling equipment and stockyard operations. However due to the technology involved there have been teething problems during the first eight months of the implementation. The introduction of a more automated system required a change in processes, which enabled operators to be trained in specific aspects of their jobs and in turn helped to improve the efficiency going forward. The process highlighted the difficulties in training and gaining acceptance of quayside-level employees with less understanding and use of technology.

3. Organisational resources: The changes implemented with the new KPIs did not require the terminal to make changes to existing resources, particularly manpower. There were however a few positive changes. First, with the modified KPIs and the focus on results, managers from each department were positively involved in discussions on further improvements. Secondly, the information and the focus on the outcome provided an inspiration for the managers to take pride and more responsibility in the areas involved. This in turn had a positive effect on decision making processes although the responsibilities of individuals were not altered. The changes implemented have had some impact on the organisational culture in the short term. In the past once the decisions were made, the individuals who were responsible for implementation were trusted to get on with the process with little supervision from their line managers. The positive engagement of the departmental managers in the newly implemented KPIs required them to take a better ownership of the areas of responsibility and implement appropriate checks and balances to ensure that they followed up implementation processes. There may be further changes over a longer period of 2-3 years subject to the impact of the KPIs, but it is too early to anticipate what this could involve at present.

4. Organisational Culture: There have been some changes to the organisational culture and management style in the context of implementing the modified KPIs. The dominant management style at terminal A was previously participative. However, during the implementation of the KPIs, senior managers put in place stricter reporting and control mechanisms and moved towards a consultative management style where they had more control on decisions made. This process seemed to be at odds with the existing cultural norms within the organisation where there was a considerable degree of confidence in the adoption of self-discipline in taking action. It will be interesting to see if the changes introduced are going to be resilient over a longer period. The second area of change was a concerted effort to place a bigger emphasis on teamwork and achievement in implementation of the KPIs.

5. Processes and efficiency: The modified KPIs and the way that the information is provided to the key participants in the organisation highlighted the deficiencies which existed in some of the existing cargo handling processes and pushed the managers to re-think their processes and find alternative ways to improve the efficiency and achieve their targets. More clearly defined processes such as measuring operating efficiency of discharge for each type of commodity handled through the modified KPIs also provided the terminal with a solid base to demonstrate their productivity and efficiency in key areas to the key stakeholder therefore minimising the chances of claims for damages and positively contribute to the financial outcomes. In terms of assessing the outcome regarding any adjustments to the newly implemented KPIs, the terminal's view is that it will be a long-term process. However, the operations director was pleased with the initial results: "The measurement of performance at the quay and stockpiles is now more visible and understandable both for employees and the client". They

intend to run with the current KPIs for at least another 12 months or so before considering any adjustments as this will provide them with richer data to make decisions.

6. Stakeholder engagement: The change process has led the major stakeholder to engage positively with the terminal. This was not planned at the start but the positive engagement from the stakeholder was welcomed by the terminal. A new process was introduced in the form of quarterly steering committee meetings involving representatives from both the stakeholder and the terminal and the outcome of the change KPIs became one of the focus areas for discussion in the meetings. The stakeholder has also contributed to the process with their own ideas; therefore, a further positive engagement was achieved. This new process has also benefited the terminal as they now have an opportunity to positively engage with the stakeholder and explain the impact of process control and improvements in key areas such as operations and further implications on costs from the terminal’s perspective. This interaction was important as better understanding of some these elements which interact with each other by the stakeholder will guide the terminal in discussions involving changes to tariffs or strategic investment decisions to be made within the terminal. The operations director was buoyant about the other opportunities that the current stakeholder engagement would bring: “We are likely to expand the current engagement in the terminal to bulk storage and steel cargoes in the future”. Cost control is one of the key areas for the stakeholder in this scenario and through the positive and direct engagement created by the steering committee, the terminal has the opportunity to demonstrate the potential change in costs in relation to changing handling methods or equipment in the terminal in response to the changing requirements of the stakeholder. The engagement has also helped the terminal to plan long term changes in response to changing requirements of the stakeholder as the stakeholder is planning a change in its own processes within the next few years which will impact the mix and volumes of commodities that the terminal needs to handle.

7. The impact of the project: The project has provided an inspiration and the courage for the terminal to look at the existing performance KPIs and has also helped the terminal to engage more closely and positively with a key stakeholder. It has also inspired the terminal to start thinking about implementing the modified KPIs in other port facilities involving breakbulk operations within the group. The project has started a cycle of generating new ideas and working towards a continuous improvement in this area.

6.1.3 A comparison before and after project implementation

Table 58 summarises and highlights changes introduced of KPIs implemented by terminal A before and after the implementation.

KPI	BEFORE	AFTER
<i>Accidents incidents & near misses</i>	Number of incidents monitored at corporate level only	<p>Incidents monitored at business unit level, with departmental manager having more autonomy</p> <p>Specific targets established to reduce occurrences</p> <p>Reports compiled and circulated within the organisation leading to much improved awareness</p>

WOC inspections <i>(Safety training and interaction)</i>	This was not carried out previously	<p>Started as a concept targeting work areas such as operations and technical</p> <p>Purpose is to reduce incidents and assist in continuous improvement process, therefore supporting lean management application</p> <p>Training provided and involved employees from all departments</p> <p>Specific monthly and annual targets established and monitored</p>
BYMS Deviations <i>(Cargo integrity)</i>	This was not carried out previously	<p>Purpose is to prevent wrong cargo deliveries</p> <p>Introduction of new technology pushing responsibility to business unit level</p> <p>Significant training for employees</p> <p>Ability to analyse capture and report incidents both internally and report to the clients</p>
Formal complaints	Formal complaints were monitored	<p>Complaints are logged and analysed officially</p> <p>Corrective actions are recorded and implemented</p> <p>Outcome and improvements are regularly communicated to the clients</p>
Output iron ore-coal coke <i>(Productivity)</i>	A basic ton per hour discharge rate was monitored	<p>A new metric introduced by bringing in design capacity of discharge equipment.</p> <p>A new target established which works on % basis.</p> <p>New target provides easy to understand visual presentation for employees creating awareness</p> <p>Regular reports provided to the clients</p>
<i>Productivity</i>	This was monitored informally previously without a defined process and record keeping	<p>A new target is introduced into the system which provides a visual presentation.</p> <p>Enabled performance to be monitored more closely and analysed easily.</p>
Immediate maintenance <i>(maintenance effectiveness)</i>	Number of breakdown maintenance instances were monitored	<p>A new monitoring system established in consultation with the client</p> <p>A linked target is established which is now monitored continuously.</p>
Costs yard handling <i>(operational costs)</i>	Discharge cost of each commodity was monitored at corporate level	Purpose is to measure costs for a specific client, therefore direct stakeholder involvement.

		Enable cost comparison between delivering different service components A target is introduced to ensure cost control
Demurrage (operational costs)	This was monitored informally previously without a process and coordination with the stakeholder	Purpose is to monitor demurrage exposure of the client and comparison with terminal productivity/performance. Enabled justification of terminal performance.

Table 58: Before and after comparison of KPIs Terminal A

Two of the KPIs introduced, WOC inspections and BYMS deviations, were new. Accidents, incidents and near misses were previously monitored at corporate level, the new implementation enabled these to be monitored and discussed at business level. The productivity KPIs assigned new targets which are easy to understand by the operators and workers on the quayside therefore enabling more effective participation from them. Yard handling and maintenance related KPIs were put together in close coordination with one of the key stakeholders therefore enabled that stakeholder to have a much closer insight to the figures and reasons behind changes over time. A number of internal reporting procedures introduced at management level aimed that changing the culture by providing the managers with more responsibility in control and monitoring of the KPIs.

There were a number of additional KPIs which terminal A decided not to introduce as part of the project. They considered monitoring conveyor performances around the site but BYMS deviations at the stockyard took priority. Further equipment efficiency KPIs were also considered, but they deemed to require a lot more time to develop therefore deferred.

6.2 Terminal B

6.2.1 Results of the KPIs implemented

Operational

Table 59 shows the operational KPI results for Terminal B.

The KPI	Target	Performance										
		Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Cumulative
Analysis of delays	15%	17.36	13.44	21.23	21.43	14.90	14.32	0.00	11.00	0.00	9.91	15.03
Truck turnaround loading	8	7.87	8.44	7.92	8.59	8.21	8.61	7.81	8.3	8.43	8.23	8.24
Truck turnaround access	9	9.34	9.24	9.26	8.87	9.19	8.98	9.15	9.35	9.74	9.62	9.23
Productivity ton/per man hour	50	41.7	50.8	37.8	26.2	25.1	39.3	26.3	43.3	18.1	44.4	36.46
Operational equipment efficiency -A	110%	117.2	117.8	116.4	115.5	115.5	115.5	115.0	115.3	115.3	115.3	n/a
Operational equipment efficiency -B	110%	108.6	108.6	108.6	115.4	115.1	115.1	116.0	116.3	116.3	116.5	n/a

Table 59: Operational KPI results for terminal B (Source – Terminal B)

The analysis of delays KPI fluctuated from one month to the other in the early months but it settled below the target level for the last three months of observation with an accumulative average just over the target level.

The truck *turnaround* KPI for loading has mainly been producing results above the target KPI and the cumulative average for the entire observation period was above the target. The truck turnaround for

access also followed a similar pattern and the cumulative KPI figure was above the target for the observation period.

The *productivity* ton/per man hour KPI remained below the target figure for all the months except one and requires further work to meet the target set by the terminal.

The operational *equipment efficiency* KPI for the commodity A has consistently been above the target each month. The same KPI for the commodity B lacked behind the KPI for the first three months and have been above the KPI for the rest of the observation period.

Financial

Table 60 shows the financial KPI results for the Terminal B.

The KPI	Target	Performance										
		Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Cumulative
Return achieved category A	10%	7.09	16.5	15.7	15.7	15.7	15.7	17	17.7	17.8	18.1	n/a
Return achieved category B	10%	22.1	14.6	14.5	13.9	16.1	16.1	17.2	17.2	17.2	17.3	n/a

Table 60: Financial KPI results Terminal B

The return for the category A commodity has been above the set target except the first month of implementation. The return for category B commodity has also maintained a level above the target for the entire observation period.

6.2.2 Specific areas of impact and outcomes

The specific areas of impact and outcomes for terminal B are shown in table 61.

Area	Impact - Outcome
Contribution to knowledge and skills	Re-organised and classified data collection and analysis Improved knowledge of operations leading to better communication Better knowledge led to cooperation between operations and maintenance
Information and reporting	Centralised data collection and analysis Targeted reporting specific to individual needs Creating an environment conducive to introduction of mobile IT platform
Organisational resources	Challenge in engaging wider employees in the KPIs Lack of team support to quickly progress modified KPIs
Organisational culture	Introduction of consultative management style
Processes and efficiency	Introduction of specific targets in all modified KPI areas Targets enabled quick identification of deficiencies Deliberate decision to slow implementation
Stakeholder engagement	Limited stakeholder engagement Need to build trust between participants and stakeholders
Project impact	Project provided an impetus to put ideas into action Engaged employees at all levels in the process

Table 61: Impact-outcome of modified KPIs Terminal B

1. Contribution to knowledge and skills: The discussions during the implementation of analysis of delays KPI led to supervisors re arranging the way that they classified and collected delays therefore leading to improved knowledge in that area. The detailed analysis of truck *turnaround* assisted in learning by employees controlling different areas of operations such as silos and/or warehouses because they were able to see actual numbers and trends and compare loading and processing

information between themselves. The targets introduced for operational *equipment efficiency* provided a focus for the maintenance in terms of solid numbers to assess the *productivity* of quayside cargo handling equipment so that they could adjust their maintenance practices to ensure that the targets are met.

2. Information and reporting: Terminal B had a very extensive IT and reporting system prior to the implementation of the KPIs. Prior to the implementation of modified KIs the data analysis was carried out by different departments and individuals on existing KPIs that are of interest to them. This created a disjointed approach to the analysis and use of KPIs. The IT department played a central role in data collection and analysis during the implementation of modified KPIs therefore creating a common platform for analysis. The president emphasized the importance of the initiative: "Most people are on board but all directors need to support the IS/IT innovation. If they do not, then it will not succeed". The terminal is looking into use of apps internally to provide actual and real time information as the next step. This is likely to be implemented in a year's time. While the objectives outlined by the President were well thought through, it was interesting to observe that different members of the team had slightly different way of analysing and displaying similar information, at certain times leading to confusion.

3. Organisational resources: The new KPIs implemented did not require any organisational changes in terms of personnel or responsibilities. However, one of the biggest challenges for terminal B was to engage the employees at all levels with the process. The planning and implementation of the KPIs were championed by one of the participants who lead the port operations. He was instrumental at all stages of planning and implementation, however communication and the teamwork required lagged behind during the implementation period of eight months.

4. Organisational Culture: Terminal B specifically made changes to the existing organisational culture during the implementation of the modified KPIs. The senior management moved towards a more autocratic management style allowing the business heads to implement and monitor changes themselves. This also meant that the level of autonomy in decision making for the participants was elevated to higher level. This worked well in terms of individuals taking responsibility for implementation but there were issues in terms of making sure that the wider participants were kept informed about the progress including senior level management.

5. Processes and efficiency: Terminal B have taken an approach in terms of process and assessment of KPIs where they decided to gather and analyse the information for a period of one year in the first instance. The terminal had an extensive collection of data prior to the project. Once they decided what KPIs to implement they just formulated the analysis for each one of them and set the target levels based on the last couple of years of experience. Prior to the project the data were not analysed and used for the same purpose, the process of formulating analysis enabled the terminal to identify deficiencies in the way that they recorded their delay information in ship operations and modify the system to improve accuracy and quality of the analysis. Since the implementation commenced, the key participants in different areas such as operations and maintenance were made aware of the new KPIs and sent reports every month. However, for the first 12 months these reports have been treated as observation and advisory reports and the participants do not discuss the specific variations and reasons behind it each month at present. This is based on the decision taken by the leading participant that at least a 12 months' worth of observation is required before they can establish any trends.

6. Stakeholder engagement: Terminal B had a number of surveys completed and analysed by some of the stakeholders for the purpose of the project. Overall, some of the stakeholders who responded to the surveys were affiliated companies who provided the logistics services to the core terminal

organisation. The participants were sceptical about the results of the analysis from the surveys because they felt that the group companies had different interests which could be different to that of the terminal and some of the third party stakeholders such as the port authority had reasons not to be objective in their response. They also felt that they could not engage some of the other stakeholders outside the immediate circle to participate in the surveys. They felt that the results of the surveys did not tell them much that they did not envisage beforehand. Therefore, the view of the participants was that there was very little input directly from the survey analysis to the KPIs implemented by the organisation. This situation affected the confidence of the participants in the practical value of stakeholder surveys. The discussions around this area led to a new approach which the participants thought would be better for them to try in the future. The approach proposed was direct involvement and observation of the stakeholders' activities related to the logistics or linked to the terminal and determine what value could the terminal add and in which areas. This is linked to mistrust among the participants that the stakeholders may not or could not necessarily point out these areas on a survey exercise. In spite of misgivings the operations director commented: "We need to get our customers more involved as we progress further with the implementation process". I believe that the competitive business environment that terminal B operates has a bearing on views of the participants regarding stakeholders. There is a general distrust that certain stakeholders such as the port authority has not been even handed in following agreed terms of reference. As a result, although the KPIs implemented will also have a positive impact on stakeholder satisfaction, the implementation process did not specifically consider some of the analysis of the surveys conducted in this case.

7. The impact of the project: Prior to the project the terminal was aware of the positive impact that carefully implemented KPIs could have in performance improvement and the senior management had the foresight to set the systems to collect data in various areas of terminal activities for a number of years. The project has provided the impetus to put the process into action in a number of ways. The president commented on the impact of the project: "The project set us in motion to take action rather than talking". Firstly, the engagement with the participants and discussions around efficiency and effectiveness of KPIs informed all the participants of the power of KPIs in assisting to monitor and improve performance. Once the participants had an increased level of interest, then they were more engaged in thinking about the areas in which they could apply such KPIs. The senior management wanted to see how effectively the departmental heads and lower level personnel in the organisation could implement such a project. Therefore, apart from providing initial guidance and encouragement for the project, they allowed the participants to take control of the project. This was partially successful as the head of the operations took the responsibility for the coordination of the project. However, active participation of the rest of the participants from other departments in assessment of the results were hampered because of the decision to delay critical analysis of the results until after 12 months of analysis to establish trends. This has also made it difficult to ensure that the interest of all the stakeholders in the project were maintained over a long period of time.

6.2.3 A comparison before and after project implementation

Table 62 summarises and highlights changes introduced of KPIs implemented by terminal B before and after the implementation.

KPI	BEFORE	AFTER
Analysis of delays (<i>productivity</i>)	General stoppages were recorded previously	A detailed classification of delays is introduced. More accurate information enabled better monitoring of performance A regular reporting regime within the organisation is introduced to inform all stakeholders
Analysis of truck turnaround (<i>productivity</i>)	Truck turnaround information was recorded but not analysed in detail	A modified system introduced to more effectively monitor trucks from arrival to weigh scale and weigh scale to going out Targets assigned to loading and access times and analysis carried out. Online reporting of the analysis within the organisation. Use of mobile application is considered going forward
<i>Productivity</i> improvement ton per man hour	This was monitored at corporate level but not at terminal level	A new KPI introduced to measure ton per man hour basis daily working hours and tons of cargo handled Temporary workers at the terminal were also included in the new practice A target assigned to the new KPI and it is monitored and reported at the terminal level.
Operational <i>equipment efficiency</i>	Vessel discharge speed in terms of ton per hour was recorded	A new method introduced which compares the standard discharge window allocated to each operation to actual performance achieved. Targets assigned to the new method and monitored monthly basis
Average returns per client and commodity	Gross profits were monitored previously	A new target of returns per commodity with a minimum target level introduced

Table 62: Before and after analysis of KPIs Terminal B

The analysis of delays for ship to shore operations led to a new classification of those for the terminal which then provided more accurate assessment of the performance. This has also enabled the responsibilities to be pushed down to the departmental level to achieve the targets. The volume of logistics activities involving trucks required introduction of more precise truck *turnaround* KPIs which enabled the terminal to pinpoint and fix problems. This process introduced use of technology to communicate and plan activities and enabled reporting to main stakeholders therefore engaging them in the process. *Productivity* and *equipment efficiency* KPIs assisted in identifying and controlling costs therefore improving margins in a competitive environment that the terminal operated.

6.3 Terminal C

6.3.1 Results of the KPIs implemented

Operational

Table 63 shows the KPI results for vessel turnaround.

The KPI	Target	Performance							
		Jan	Feb	Mar	Apr	May	June	July	Aug
Vessel turnaround	3	1.7	2.6	2.4	1.8	1.5	3	4.1	3.6

Table 63: Vessel turnaround KPI results Terminal C (Source – Terminal C)

The table illustrates average ship *turnaround* times achieved each month in comparison with the target. The terminal monitors the fluctuations between the months which are due to a number of internal and external factors. The aim is to improve the robustness of the system to cope and respond to these factors quickly and minimise deviations from the target. The terminal kept the ship *turnaround* times below the target of three days for the first six months of implementation. The commencement of the rainy season on the seventh month pushed the KPI above the target. Terminal also introduced 14 days forecast table which linked incoming and outgoing tonnages with incoming and outgoing vessel movements and tonnages for planning purposes.

The preserving *cargo integrity* KPI and minimising losses concentrates on a number of key aspects to achieve improvements in this area. The terminal implemented a control chart to record and review the losses and gains for clients in this area over a period of time. These are recorded on a per vessel basis for each client which compares volumes against the contracted values and measures the difference in percentage terms from the contracted values. The terminal also developed a training package for the employees in order to raised awareness of factors affecting the cargo quality leading to cargo contamination emanating from internal or external sources. The consequences of cargo contamination are also explained to ensure that the employees are there to contribute to the improvements in this area. The KPI on the contamination front captures the incidents and inquiries raised by the clients. The typical incidents include contamination by foreign materials, sampling and moisture levels.

The terminal implemented a new report in order to improve the optimum use of the stockpile capacity (*stock control*). The report is issued daily and shared with the clients in order to enable the clients to make informed decisions particularly in relation to the remnant cargo management. The report sets out assembly and remnant cargo utilisation on various stockpile pads in percentage terms. It also provides details of cargo types and volumes in each case. The report also covers each stage of the service delivery provided by the terminal.

6.3.2 Specific areas of impact and outcomes

The specific areas of impact and outcomes for terminal C are shown in table 64.

Area	Impact - Outcome
Contribution to knowledge and skills	Better information with the new tools helped terminal and stakeholders to make informed decisions New business planning horizons increased knowledge and understanding of employees and stakeholders
Information and reporting	Better use of IT platform across the business Improved communication with regular targeted reports for employees and stakeholders
Organisational resources	Simplified management structure with less layers

	Flat reporting structure Single source client interaction across the organisation
Organisational culture	Introduction of planning horizons across the business units Joined up planning across business units and stakeholders
Processes and efficiency	Modified KPIs provide clear tools to monitor efficiency Long term planning horizons and short-term objectives effectively linked to each other
Stakeholder engagement	Positive engagement of clients and logistics partners in using modified KPIs
Project impact	Initiated active discussions within the organisation in an important area of service delivery Initiated modified KPIs which improved client interaction and simplified communications between stakeholders and terminal

Table 64: Impact-outcome of modified KPIs Terminal C

1. Contribution to knowledge and skills: New reporting tools for vessel *turnaround* enabled both the employees and stakeholders to have improved visibility and advance knowledge of forecasted arrivals. This in turn helped both parties to plan against contingencies. For the operation and maintenance teams understanding the implications of areas that affect cargo quality helped them to make the right decisions and communicate with the internal and external stakeholders. Restructuring of the planning horizon for the organisation enabled the employees to relate to how long, medium- and short-term plans put together, what objectives they sought to achieve and how it translated to their own responsibilities. It became apparent during the discussions that participants struggled to balance conflicting stakeholder demands and did not approach it in a coherent way in the past. The fact that they did not previously try to solve the issues with someone dedicated taking overall responsibility prolonged the problems.

2. Information and reporting: Terminal uses information technology extensively to disseminate information internally and externally. There are a number of information networks some of them are internal within and between the terminals and others involving direct communication with the clients as well as communication with logistics network partners. Amended KPIs included new reports such as the ship turnaround and queueing forecast and daily stockpile status and utilisation which made use of the existing IT platform in the organisation.

3. Organisational resources: Amended KPIs target increased client interaction and aim to improve client satisfaction. Implementation of KPIs were done at the same time where there have been organisational changes in the terminal. Terminal manager historically had responsibility for all operations and maintenance activities and multiple people had communication with the clients on a day to day basis. The organisational structure was simplified at the same time as implementing the amended KPIs where the operational and maintenance teams were given responsibility in running of both terminals therefore achieving a flat reporting structure. The service manager commented on the changes: "Terminal managers planned activities in an ad hoc manner previously. They have now aligned their planning to business planning cycles". All the client communication was channelled through the service assurance team therefore providing a single point of contact with the clients and logistics chain partners.

4. Organisational Culture: The biggest cultural change is related to the improving certainty of service delivery KPI. Prior to the introduction of long- medium- and short-term planning horizons different business units and stakeholders used to do their own planning on an ad hoc basis and the planning process was disjointed. The new planning introduced a structured approach which forced the stakeholders to work together in planning and then transferring plans all the way down to day-to-day

actions. The organisation had a reward and recognition system in place, but it appeared that prior to making changes noted above, the resilience of the system was not clear for individuals in the organisation.

5. Processes and efficiency: All the amended KPIs are aimed at improving efficiency and improving processes. The vessel *turnaround* forecast tool enabled the operations team and stakeholders to plan more efficiently for arrival and handling of the vessels therefore reduced the average number of vessels queuing from 6-7 down to 2-3 and the waiting time also reduced from 5-7 days down to 2-3 days. The training of employees on cargo quality and contamination focused on process they need follow in the case of a contamination risk. The introduction of new business planning horizons required putting into place precise processes as to how the long-term objectives, linked to medium term plans and short-term action points. For example; in order to achieve certain *throughput* commitment to a client 5 years down the line, resource and equipment planning 2-3 years ahead needed to be considered, then it translated into 1-year action plan with monthly targets to hit in order to succeed. The operations manager commented on one of the improvements: "Terminal team is now responsible for operations, maintenance and planning for all parts of the terminal under one umbrella to align with the business objectives".

6. Stakeholder engagement: Terminal achieved a better internal and external stakeholder involvement during the implementation of the modified KPIs. Ship *turnaround* KPI required operations and maintenance teams to coordinate and the clients to plan at the same time to manage the process better. New reports generated to optimise stockyard capacity required each client to engage in the planning process for the stockyard utilisation. The new planning horizons initiated internal meetings at the senior management level, and they were discussed with the clients at quarterly meetings.

7. The impact of the project: The project initiated an active discussion within the organisation in a very important area of service delivery which is fundamental for the terminal. The current processes for client interaction and engagement were reviewed in the light of stakeholder survey results held during the project. The amended KPIs implemented aimed to improve client interaction and engagement while simplifying the communication between stakeholders and the terminal.

6.3.3 A comparison before and after project implementation

Table 65 summarises changes introduced of KPIs implemented by terminal C before and after the implementation.

KPI	Before	After
Vessel <i>turnaround</i>	Vessel turnaround was monitored	Better understanding and control of events and sensitivities leading to better turnaround of vessels Ability to demonstrate improvements to the clients. Monitoring moving average enabled the terminal to track the trends 14 days forecast tool enabled stakeholders to act to prevent bottlenecks
Preserving <i>cargo integrity</i>	Cargo contamination incidents were monitored	Staff awareness and understanding improved.

		<p>Staff taken direct responsibility for action when a contamination is detected</p> <p>Clearer and better communication of incidents to clients to prevent re-occurrence.</p>
Optimising stockyard capacity (<i>stock control</i>)	Stockyard capacity planning and monitoring was carried out	<p>Enable clients to make informed decisions in particular for management of their remnant cargoes.</p> <p>Enable the terminal to free up more stockyard capacity and prevent delays and bottlenecks</p> <p>Mutual understanding of each party's obligations and constraints leading to better operational outcomes</p>
Improving certainty of service delivery	The quality of service delivery was monitored	<p>Improved understanding and contribution of all employees to each planning horizon at the terminal.</p> <p>Better integration with the key stakeholders in decision making ensuring certainty of service delivery for the terminal.</p> <p>Better coordination with the logistics chain partners in planning activities such as shut down periods.</p> <p>More certainty and stability in long term planning leading to a better commercial outlook</p>

Table 65: Before and after analysis of KPIs Terminal C

The new processes introduced for the vessel *turnaround* KPI provided much needed prior warning for potential problems both for the terminal and the stakeholders allowing everyone to respond in a timely manner. The training and processes introduced for the cargo quality KPI generated a positive response from the employees in the case of any incidents. Optimum utilisation of stockpile capacity is crucial for the terminal to deliver on long term commitments to clients. New reporting tools generated a positive interaction with the clients to ensure that they contribute actively to better management of stockpiles.

Terminal considered introduction of dashboards to monitor service quality assurance for the clients in different areas but the amended KPIs were introduced in the first instance. The dashboards will be considered as the next step over the next 12-24 months. Amended KPIs already included a number of measures to improve client relationships but the terminal has ambitions to take it to the next stage sometime in the future.

6.4 Terminal D

6.4.1 Results of the KPIs implemented

Operational

Table 66 shows the KPI results for operational KPIs.

The KPI	Target	Performance							
		Jan	Feb	Mar	Apr	May	June	July	Aug
Terminal Productivity mt/hr		1355	0	1518	966	1385	6221	771	1313
Net productivity mt/hr		1356	0	1433	967	1385	6245	772	1313
Av. Truck waiting time hrs		0.31	1.28	0.28	0.08	0.35	23.7	19	16
Av. Truck loading time hrs		1.58	6.98	6	0.56	0.51	7.76	2.85	4.21

Table 66: Operational KPI results Terminal D (Source – Terminal D)

The *productivity* figures show fluctuations from one month to the next depending on the type of commodity and the mix of discharge and handling equipment used by the terminal. The terminal is primarily equipped to handle certain bulk commodities using terminal equipment. When this is utilised to its full capacity best productivity results are achieved as illustrated by the figures in June. There was no vessel handled in February. However, the competitive environment that the terminal operates required it to utilise different methods to handle various cargoes. The terminal chose not to introduce any targets in relation to the KPIs as these were introduced first time with little historical data to compare. The terminal had a desire to monitor truck *turnaround* time and looked at two specific aspects of average waiting and loading times. The change in the figures recorded in June and July reflect effect of the rainy season on the operations. There are also external factors that affect the truck turnaround times as they are under the control of clients. The terminal *productivity* KPI was measured between commencement and completion of cargo handling operations and included all delays except the terminal delays. Net productivity KPI captured all delays including the terminal delays.

Health and Safety

Table 67 shows the results of the health and safety KPIs.

The KPI	Target	Performance							
		Jan	Feb	Mar	Apr	May	June	July	Aug
Stop Audits		115	67	27	32	57	421	141	20
Waste walk audits		0	9	90	40	40	40	75	14

Table 67: Health and safety KPI results Terminal D (Source – Terminal D)

The changes in monthly stop audit numbers indicate the number of interactions recorded each month. The terminal increased the interactions during the rainy season commencing in June. Waste walk audits started in February then they settled into a pattern during the later months.

6.4.2 Specific areas of impact and outcomes

The specific areas of impact and outcomes for terminal D are shown in table 68.

Area	Impact - Outcome
Contribution to knowledge and skills	Improved knowledge of different cargo handling methods and equipment Better knowledge of waste management practices
Information and reporting	Re-classification and better analysis of operational information Better use of IT structure and terminal management system
Organisational resources	Improved communication among the departmental managers
Organisational culture	Freedom for managers to implement modified KPIs

Processes and efficiency	Better assessment of different handling methods to improve productivity Better mapping and management of truck operations at the terminal
Stakeholder engagement	Limited engagement with the stakeholders
Project impact	Informed participants about the role of performance KPIs Provided a platform for further thinking about wider KPIs

Table 68: Impact-outcome of modified KPIs Terminal D

1. Contribution to knowledge and skills: The introduction of terminal and net *productivity* KPIs enabled the operation supervisors to differentiate between handling methods of different cargoes, learn about the capabilities and shortcomings of different types of handling equipment and plan cargo handling operations more accurately. Because of the ancillary services such as weighing and stockpile loading the terminal representatives had difficulty establishing bottlenecks and delays to the truck *turnaround* at the terminal. With the implementation of the modified KPIs they were able to manage different aspects of the trucking at the terminal more efficiently. Waste walk audits, as part of *safety training and interactions* helped employees to contribute to better waste management efforts at the terminal as well as learning about the regulatory obligations placed at the terminal in this area. One of the challenges going forward for the participants is going to be making sure that individuals understand and take charge of the new KPIs rather than relying solely on collective effort to achieve results.

2. Information and reporting: The *productivity* figures were based on average productivity achieved over each vessel operation prior to the implementation of modified KPIs. The terminal divided delays into categories involving stakeholders involved in a typical discharge operation such as the vessel, terminal, logistics providers and identified common delays within each category to be recorded. This process helped to create formulas for terminal and net *productivity* KPIs. The information was collected by the shift supervisors and passed on to data planners who also incorporated the information into the terminal management system. This enabled the information for each vessel as well as multiple vessels and commodities to be analysed and made available easily to the participants. The information for the truck related KPIs were partially collected by the yard supervisors (arrival information, inductions and checks) and the weighbridge operators (in-out times). The terminal moved towards making a better use of existing IT infrastructure with the modified KPIs by linking them to the terminal management system and weighbridge system. The IT manager commented on the progress made: "We are able to react to problems more promptly as a result of incorporating new KPIs into the terminal management system and making them visible to all managers". In spite of the assurances of the IT manager, the gap between the level of understanding and use of technology between the management team and quayside employees was greatest in this terminal. A long-term training and development programme will assist greatly with this.

3. Organisational resources: The new KPIs did not require the terminal to make changes to the resources. However, the quayside and yard supervisors were trained in relation to the new KPIs to enable them to collect the correct data. The departmental managers took specific responsibilities in relation to operational and health and safety KPIs but the modified KPIs also required the managers to liaise with each other more closely.

4. Organisational Culture: The departmental managers took responsibility in their areas of expertise during the implementation of the modified KPIs. The senior management provided guidance in the process of generating options. However, they chose not to dictate which KPIs to implement in the next stage. This also provided the departmental managers with a higher than normal level of autonomy in decision making during the implementation. The team culture remained dominant and that caused

some issues in terms of individuals taking responsibility in implementation and follow up of KPIs as different team members expected others to take the responsibility. This was evident during the conversations I had with the individuals. Although they were reluctant to offer ideas in the first instance when pushed they actually offered valuable ideas.

5. Processes and efficiency: The modified operational KPIs on *productivity* provided the terminal with an opportunity to evaluate the performance of different handling methods and equipment and compare the efficiency of terminal in handling different commodities. In addition to managers this was important for the supervisor level personnel to understand so that they can explore ways of improving the methods they used in ship to shore or stockyard operations. Control of truck operations was not strict prior to the implementation of the modified KPIs. The truck *productivity* KPIs required the participants to sit down and map out the entire truck handling process from holding area to weighbridge, cleaning, loading and tarping operations. This made sure that a clear process was established which is understood by everyone and it also enabled analysis of weaknesses and bottlenecks.

6. Stakeholder engagement: This terminal is relatively new in operation; therefore, stakeholder relationships are still under development. The terminal engaged with the local authority and freeport authority in relation to the road safety aspects of the truck traffic across the terminal during planning and implementation of truck KPIs. The engagement led to a joint initiative between the terminal and the freeport authority to evaluate the road safety within a certain distance of the terminal and put improvements such as safety signs and barriers in place to improve safety.

7. The impact of the project: The project has played a role in informing the participants at the terminal regarding performance KPI's and has provided an impetus for the terminal management to think about and discuss the benefits of implementing KPIs in the long term. The terminal manager described the progress made: "Making KPIs more visible within the terminal enabled us to perform our contractual obligations better".

6.4.3 A comparison before and after project implementation

Table 69 summarises changes introduced by KPIs implemented by terminal D before and after the implementation.

KPI	BEFORE	AFTER
Terminal <i>productivity</i> & net <i>productivity</i>	Ship unloading rate was monitored	<p>Delay categories introduced for different stakeholders which enabled accurate assessment of delays.</p> <p>Terminal and net productivity figures per vessel calculated providing better information for management and stakeholders.</p> <p>The productivity figures differentiated between different types of cargoes.</p>
Average truck waiting & loading times (<i>productivity</i>)	Overall truck turnaround was monitored	<p>New parameters set to collect information while trucks are processed in the terminal.</p> <p>More accurate identification of issues related to truck turnaround leading to effective action to reduce them.</p>

		Better reporting to the clients
Stop audits (<i>safety training and interactions</i>)	This was not monitored previously	Improved employee awareness of health and safety practices. Enabled the terminal to bring contractors in line with the employees in understanding health and safety procedures
Waste walk audits (<i>safety training and interactions</i>)	This was not monitored previously	The new practice enabled the terminal to improve environmental compliance. Engaged and educated employees on waste reduction, recycling and maintaining water quality initiatives.

Table 69: Before and after analysis of KPIs Terminal D

Two of the KPIs introduced by terminal D (stop audits and waste walk audits) were new. One of the main reasons for introducing these was the need to maintain health and safety and environmental compliance credentials at the terminal at a time when a lot of contracted personnel were involved in a number of major projects underway. These audits provided a useful platform to increase awareness of all the employees and encouraged them to take action where necessary. Introduction of terminal and net productivity KPIs enabled the terminal to evaluate performance in handling different commodities to help with the selection of commodities to target in the future. This contributed to the stakeholder engagement for existing and targeted clients to ensure that performance expectations and what the terminal can deliver matched each other. Amended KPIs for truck turnaround measurement incorporated information technology and terminal management system to be used, enabling accurate and just in time reporting to the clients.

6.5 Terminal E

6.5.1 Results of the KPIs implemented

Technical

Table 70 shows the operational KPI results for the terminal E.

		Performance							
The KPI	Target	Jan	Feb	Mar	Apr	May	June	July	Aug
Total downtime		18.8	21	0	20.5	21.2	17.7	16.3	25.95
Equipment downtime		0.6	4.8	0	2.6	1.1	5	0.7	6.15

Table 70: Technical KPI results Terminal E (Source – Terminal E)

The total downtime as a percentage of manhours worked each month fluctuated during the period information was collected. The total downtime captured all the operational and vessel related delays such as meal breaks and shifting of the vessel. The equipment downtime figures as a percentage of overall manhours worked also showed a fluctuation during the same period. The fluctuation in equipment downtime figures were influenced by the type of cargoes handled and characteristics of the cargoes handled. The KPIs were captured based on the existing quayside cranes during the observation period, the equipment downtime also reflected the effect of different cargo characteristics on productivity of the cranes.

6.5.2 Specific areas of impact and outcomes

The specific areas of impact and outcomes for terminal E are shown in table 71.

Area	Impact - Outcome
Contribution to knowledge and skills	Better understanding of performance and reliability of quayside assets Better understanding of factors affecting productivity
Information and reporting	Better use of existing IT platform and reporting of information
Organisational resources	No significant changes occurred in this area
Organisational culture	Existing methods of determining performance and reliability challenged by better data collection and analysis with the help of new KPIs
Processes and efficiency	Amended preventative maintenance practices New KPIs assisted in new crane procurement process
Stakeholder engagement	New KPIs initiated better communication with quayside stevedores in relation to delays New KPIs initiated a discussion with the clients on cargo characteristics and performance expectations
Project impact	The project highlighted the positive impact performance KPIs can have on performance The project provided an opportunity to reflect on some of the existing practices in operational and technical areas

Table 71: Impact-outcome of modified KPIs Terminal E

1. Contribution to knowledge and skills: Introduction of the amended KPIs enabled the terminal to focus on quayside crane reliability and move towards better asset management in that area. Detailed analysis of equipment breakdown and other delays such as labour breaks, shifting of vessels enabled better analysis of the reliability of existing cranes. It also demonstrated where the links between the delays and the assets existed to the workforce involved in operations and maintenance of the assets. Therefore, it helped to expel some of the traditional views on breakdown and *equipment reliability* which were based on intuition rather than analysed data. However, the process fell short of engaging with the key stakeholders effectively in bringing them into the picture in relation to changes being introduced.

2. Information and reporting: The introduction of new KPIs provided a platform for a more detailed analysis of the downtime and a better use of IT platform to distribute data within the organisation.

3. Organisational resources: The modified KPIs did not require the terminal to make changes to the resources or responsibilities of the personnel involved.

4. Organisational Culture: The introduction of amended KPIs and the new crane procurement programme had mixed reviews among the participants. The terminal had a stable workforce, particularly in areas of operation and maintenance. The area specialists had significant autonomy on how they did things. The new KPIs challenged current methods for maintenance and reliability of a set of cranes that had served the terminal over a long period of time. There was a reluctance to accept that the old cranes were not productive and reliable and the new cranes which would also bring new technology into the terminal would be superior to the old ones. This in turn also required some changes to the existing maintenance practices where more technology would be introduced into the system. More effective communication and alignment of objectives between the management and the quayside workers could have made the change process smoother both in relation to the new KPIs and investment in new assets.

5. Processes and efficiency: New KPIs provided an opportunity to define the delay categories particularly in relation to the equipment downtime. The analysis of different types of breakdowns in turn provided an opportunity to examine the existing preventative maintenance programme. The general manager commented on further areas of focus: " We can now also target non equipment downtime and look at the impact of different type of cargoes on downtime going forward". These discussions led to an evaluation of the life cycle and efficiency of the existing quayside cranes. Furthermore, a new crane procurement project that was under consideration accelerated and it is expected to be in place by the end of 2020.

6. Stakeholder engagement: The amended KPIs provided an opportunity to engage with two sets of stakeholders. Recording of detailed total downtime on the quayside highlighted some of the issues in relation to the labour and stevedore delays. This in turn led to discussions to minimise those in order to help improve the productivity. The analysis of equipment downtime highlighted differences between faults and delays when handling different types of cargoes. This generated a discussion with the relevant clients on cargo characteristics and their performance expectations.

7. The impact of the project: Because of the relatively captive nature of the operations at the terminal, where the terminal had a stable client base and commodities, performance KPIs have not featured heavily in discussions prior to the project. The process initially highlighted the potential benefits of paying more attention to KPIs and provided an opportunity to reflect on current practices and question some of the existing methods. The general manager commented: "If we did not go through this exercise, we would not have paid attention to some of the areas that need improvements. As we do not face a very competitive environment with our clients". The introduction of KPIs provided an opportunity to move on to a more robust preventative maintenance programme (*maintenance planning*) at the terminal.

6.5.3 A comparison before and after project implementation

Table 72 summarises changes introduced by KPIs implemented by terminal E before and after the implementation.

KPI	BEFORE	AFTER
Total downtime (<i>productivity</i>)	Monitored at corporate level	Specific delay components were identified and introduced Enabled more accurate identification of problem areas leading to rectification
Equipment downtime (<i>equipment efficiency</i>)	Monitored at corporate level	Specifically designed to monitor loading and unloading equipment Enabled performance measurement of existing and new equipment and provide comparison Enabled an understanding of how different commodities affected equipment performance

Table 72: Before and after analysis of KPIs Terminal E

The amended KPIs enabled the participants in operational and technical areas to see the detailed delays and act accordingly. Total downtime KPI enabled discussions with the stevedoring and labour

suppliers to address any issues in this area. The focus on equipment downtime helped the discussion within the organisation regarding existing preventative maintenance regime and related costs versus purchase and introduction of new ship loading and unloading equipment into the system. The discussions highlighted the opposing views among the employees in relation to continuing maintenance and operation of existing equipment against investment in new equipment for handling on the quayside.

The terminal had an extensive system of monitoring air quality around the site. This has been developed over the years, and although a discussion took place whether to include this initiative under the project, it was decided that the system was already providing extensive benefits to the terminal with limited potential for extension. The terminal also considered a new storm water collection project as an alternative, but this project was already under way when the current change project started, and it was excluded from the scope of the project.

6.6 A summary of findings in my project against those in relevant literature

The literature review in section 2.2 suggested six areas outlined in previous research which merited further investigation. I re-visited these areas during the diagnosis, planning and implementation stages of the project and reflected on them. This section provides a summary comparison of findings in my project against the findings of relevant literature in those areas.

Previous research has suggested that use of *efficiency and effectiveness dimensions in KPIs* can provide a number of benefits, including improvement of competitiveness and stakeholder loyalty (Brooks et al., 2015; Schellink & Brooks, 2014). My project findings supported this at varying levels for participating terminals. Terminals A and C experienced very strong key stakeholder participation in the planning and implementation stages which helped them to improve their competitive position with the stakeholders. This also helped them to engage the stakeholders in the outcome of new KPIs from the start of the project. Although the remaining terminals had more limited interaction with the stakeholders during the implementation of their KPIs, the increased level of interaction with the stakeholders and reporting already indicated a move towards a positive outcome in stakeholder relationships.

Previous research also suggested that developing effectiveness dimension in KPIs enabled participants to make more informed operational and long-term investment decisions (Brooks & Schellink, 2015; Baltazar & Brooks, 2006). In my project, the corporate mission statements and objectives together with the ownership type (Table 4) of participating terminals played a strong role in the development of new and amended KPIs, and that these in turn contributed to the planning horizon for the organisations. Terminals A and C aligned their strategy with long-term plans and their key stakeholders' objectives allowed them to plan for longer time horizons. Terminals B and E had a medium-term outlook and terminal D concentrated on short-term objectives because of the brief duration of its existence. The areas of importance for individual stakeholder categories used in other research, which tried to bring together efficiency and effectiveness dimensions, were very similar to the areas I used in my stakeholder surveys (Brooks & Schellink, 2015; Woo et al., 2011; Brooks et al., 2011). In relation to areas where performance KPIs were used, in other research there was very little overlap among specific KPIs identified in five studies outlined in Table 1.

In my project, all of the terminals utilised or introduced KPIs in the eight areas identified during the diagnosis stage of the project. The KPIs in each area overlapped with each other to a great extent and showed a similar pattern in areas they were implemented. Therefore, identification of themes and corresponding areas of application for KPIs in my project has helped to establish a consistent pattern in use of KPIs in participating terminals.

The different levels of organisational culture grouped under artefacts, espoused beliefs and values in previous research (Schein, 2010; Taylor, 2014), were also apparent in my project. These were used to convey messages among the employees and assist with the implementation of KPIs in participating terminals. Although the characteristics of national cultures identified in Power distance index (PDI), individualism Index (IDV) and long-short term orientation identified in other research (Hofstede, 2001) were apparent to a degree at the participating terminals, the organisational cultures showed differences from the suggested norms, confirming other findings (Langstedt, 2018; Nathan, 2015) that the organisational culture is complex in nature and is affected by a number of factors at both organisational and individual levels. These differences affected the way that the KPIs were planned and implemented in different terminals. The executive subculture (Schein, 2010) was an example of the complexity of organisational culture in participating terminals, as demonstrated by the different views expressed as to the implementation of KPIs by participants at management and supervisory level. Overall, organisational culture played a significant role both in deciding which KPIs to implement as well as how to implement them in participating terminals.

The interaction between **management style** and organisational culture changed in some of the participating terminals during the project. At the diagnosis stage, terminals displayed characteristics of certain types of organisational culture and suggested management styles that corresponded with them (Harrison, 1987). However, when some of the terminals experienced difficulties in effective implementation of KPIs, because of the incompatibility between their management style and the need to progress the implementation, they had to adjust their management style accordingly. Trying to change the organisational culture was not seen as a viable option but adjusting management style to provide a clearer decision-making process and autonomy within the organisation helped with the process. Overall, the organisations found a way to be flexible and deviated from the management styles suggested to match their organisational culture at the diagnosis stage (Table 12) in times of need.

Previous research has pointed out that, in most cases, the views of **key stakeholders** were not taken into consideration in implementing KPIs (Brooks et al., 2011). In my project, I found that the existing KPIs in participating terminals were mainly efficiency KPIs and they were put together with a view to taking into account stakeholder expectations. However, apart from occasional stakeholder satisfaction surveys, the KPIs were not put in place as a result of direct consultation with the key stakeholders. Focused stakeholders' surveys were very useful in identifying specific areas of importance for stakeholders as well as performance gaps for the terminals. In previous research (Brooks & Schellink, 2015; Slack, 1985; Tongzon, 2002); Brooks & Pallis, 2008) a limited number of specific stakeholder groups were chosen for the purpose of the project. In my project, the identification of the categories of stakeholders to be included was undertaken by the participants. This led to a more representative participation of multiple categories of stakeholders for each terminal, which in turn helped to bring in different areas of importance from different stakeholders and different perspectives for expected performance levels of terminals. Overall, the influence of stakeholders was significant in the implementation of new KPIs where terminals engaged closely with the key stakeholders from the start of the project.

Some of the previous research has suggested that the organisational culture lays foundations for shaping the *IT structure and development of IS* within an organisation (Allard, 1998), while others (Boland et al., 1994) have suggested that IT and IS play a leading role in shaping organisational culture. In my project, the existing status of IT structure and level of IS integration within each participating terminal provided a starting point in terms of IT awareness and IS development within the organisations. However, the biggest driver in pushing further development towards improving or

establishing IS within the organisations came from the organisational objectives of participating terminals. Those terminals with a strategic focus on IS implementation and automation made better use of technology and systems in implementing KPIs. These terminals also actively sought to influence the organisational culture towards more awareness and use of such technologies.

In relation to following the standard PAR stages, the timeline over which results were to become apparent differed between the terminals. Terminal A had initial problems in introducing the BYMS system (one of their operational KPIs) which delayed the KPI implementation for several months. The system has been running over the last few months and providing information regarding cargo segregation and potential wrong product deliveries. Terminal B specifically chose to run with the KPIs for at least 12 months before they started drawing any conclusions on improvements they observed. Terminal C was quick to see the effect of the KPIs in process and efficiency improvements in areas such as vessel turnaround and stockpile utilisation. Terminal D achieved an understanding of its capacity to handle multiple commodities in the future during the project implementation period. Terminal E had the information on the existing equipment and implemented *productivity* and *equipment efficiency* KPIs as a part of the project, but the comparative analysis they sought to achieve with their planned new crane acquisition will only be possible after the newly acquired assets introduced in 2021. As a result of various reasons mentioned above, participating terminals chose to run with a single cycle for a long period of time before they considered any amendments to the KPIs introduced.

Chapter 7. The potential for standardisation and benchmarking of KPIs

One of the objectives of the current project has been to consider the standardisation of the KPIs across the industry as outlined in section 1.1. This will enable the terminals to benchmark against each other in areas such as operations, health and safety, environment, and security, and it will also assist in raising the standards in these areas. The project has highlighted some of the opportunities in standardising KPIs which are explored further in this chapter.

In this chapter, I explore options for standardisation of KPIs in the future and provide an example of a previous benchmarking exercise I was involved in which provides good practice for future benchmarking of the KPIs explored in this project.

7.1 Examples of service quality standards used in shipping and similar industries

In this section, I provide examples of service quality standards that can provide a guidance in developing a standardised set of performance KPIs within the Dry Bulk Terminals industry.

There are standards developed in different sectors of the cargo transport industry and outside which enable industry participants to benchmark their activities. Within the transport industry, airports have been leading the benchmarking where they participate in an Airport Service Quality (ASQ) programme. The programme has been developed by Airports Council International (ACI) so that participating airports can obtain feedback from passengers in relation to the service standards and can then benchmark their services against the competitors as well as identifying areas where improvements are required. The programme looks at changes in passengers' perceptions over time as well as their rating of services of different airports. The inclusion of key stakeholders' expectations and their rating of performance of individual terminals in implementing KPIs within dry bulk terminals will lead to a common platform towards benchmarking within dry bulk terminals.

Another system developed for measuring customer perception of service quality is SERVQUAL. Parasuraman et al. (1985) highlighted three characteristics of services: they are intangible in nature, heterogeneous in the way they are delivered, and delivery and reception of services are inseparable. This method incorporates five distinct dimensions for evaluating service quality: Tangibles, reliability, responsiveness, assurance, and empathy. The use of SERVQUAL in the shipping industry and in particular within the ports sector has been very limited. In one study, Pantouvakis et al. (2010) applied SERVQUAL in their passenger port study, checking SERVQUAL's five main dimensions against service quality in passenger shipping. Their study identified five factors that describe the passenger port service quality expectations: cleanliness, safety and security, parking facilities, guidance and communication and visual information provision. The study showed that there is a good fit between the five-dimensional model and the passenger port data they studied.

The elements of SERVQUAL dimensions can also be related to the dry bulk terminals. The tangibles dimension may include the number of berths available, cargo handling equipment and size and capacity of stockyards. Reliability may include performance in meeting contractual obligations and reliability of the resources utilised by a terminal. Responsiveness may include the ability of the terminal to react to changing client needs and expectations. Assurance may include preserving cargo quality while the cargo is under control of the terminal. Finally, empathy could include a terminal's ability to keep the stakeholders informed in a timely and appropriate manner. There is a potential to develop a service quality indicator along similar lines to SERVQUAL for the Dry Bulk Terminals industry.

Some industry organisations such as the European Sea Ports Organisation (ESPO) have created a port performance dashboard with the participation of some of its member ports in an effort to improve port performance and transparency. They collected information mainly in areas of port governance and environmental compliance, which has been published two years in succession (European Sea Ports Organisation, 2012). Similar initiatives remain limited in their scope and application therefore not likely to provide a workable platform for further standardisation.

Cuadrado et al. (2004) examined the benchmarking of port services as a method of improving competitiveness. They indicated that benchmarking is the measurement of an organisation's performance in comparison with the best in a similar sector, and recommended that incorporating a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis at an earlier stage could help establish a port's competitive environment as an introduction to a benchmarking exercise. The authors pointed to the importance of growing competition among ports beyond their traditional hinterland, and particularly in Europe, with the development of intermodal connections between countries. Their study used the Port of Valencia as the main focus for the research and identified four main issues: geographical location of the port, hinterland connectivity, services offered by the port, and value-added logistics services. They concentrated on the latter two categories as they are areas over which the port has control in being able to vary the services as required. They concluded that the decision by clients to use a specific port very much included not only the location but also the mix of services offered, and the quality of service provided by the port authority. They referred to competitive benchmarking as the appropriate type of benchmarking for their study. My project highlighted that cooperative benchmarking is a more appropriate approach to enabling information sharing and helping to raise standards going forward.

7.2 An example of a benchmarking study in Dry Bulk Terminals Industry

I have been involved in a benchmarking scoping exercise that the international Dry Bulk Terminals Group (DBTG) undertook over two years. Part of the exercise involved extensive discussions among the group members to determine which areas to include in the exercise. The exercise was limited in scope as it primarily looked at certain KPIs used by the participating members and sought to compare differences or similarities in terms of mechanics and measurement of those KPIs. My project involved a much wider scope of looking at overall efficiency and effectiveness dimensions of KPIs in the context of organisations participated in the project.

The members recognised that the KPIs selected for the exercise needed to be comparable among terminals with different characteristics. Some of the important differences recognised by the members included:

- Size of the terminals in relation to the throughput
- Different handling methods among the terminals
- Different types of equipment utilised by the terminals
- The fact that some terminals are purely loading or unloading terminals and others may perform both activities

The members sought to minimise these differences in deciding which KPIs to include in the exercise and how to formulate them. The KPIs agreed for the exercise covered five different areas as illustrated in Table 73.

Area	KPI
Operational	Equipment Availability (EA)
	Equipment utilisation (EU)
	Equipment reliability (ER)
	Operating efficiency (OE)
	Overall equipment efficiency (OEE)
	Tonnes per employee productivity (TPE)
Human Resources	Absenteeism
Environmental	No of official complaints per month
Health & safety	Lost time injury (LTI) frequency
Technical	Maintenance costs

Table 73: DBTG benchmarking KPIs

Operational

The KPIs under the operational area are based on the relationship between a time period and availability or performance of certain category of equipment. In order to make the measurement and allocation of time standard across the participants, the members agreed on various segments of time and defined boundaries around them as illustrated in Table 74.

Calendar Time (CT)				
Available Time (AT)			Down Time (DT)	
Utilised Time (UT)		Operating Standby (OS)	Planned Loss (PL)	Breakdown Loss (BL)
Operating Time (OT)	Operating Delay (OD)			
General Definitions:				
Calendar Time (CT)	= Total hours in time period			
Available Time (AT)	= Total hours plant is available for work			
Down Time (DT)	= Hours the plant is not available for work			
Planned Loss (PL)	= Hours the plant is scheduled for maintenance downtime			
Breakdown Loss (BL)	= Hours the plant is scheduled to work and is unavailable due to breakdown			
Operating Standby (OS)	= Hours the plant is available for work but not being utilised			
Utilised Time (UT)	= Total hours plant has an operator and available to work			
Operating Time (OT)	= Hours plant is in productive operation			
Operating Delay (OD)	= Hours plant is being utilised, but not producing			

Table 74: Allocation and definition of time periods for KPIs

The calendar time is divided into two sections of available and down time. Down time is further split between planned and unplanned down time. Available time is divided between utilised time and operating stand by. Finally, utilised time is split between operating time and operating delay.

Benchmarking exercise sought to define certain boundaries for each operational KPI as illustrated in Table 75.

KPI	Definition	Reporting Criteria
<i>Equipment Availability</i>	Only ship loading and unloading equipment are included	In percentage terms for the period that the equipment was available as part of the calendar time
Equipment Utilisation	Only ship loading and unloading equipment are included	In percentage terms for the time that the equipment performs as part of calendar time
<i>Equipment reliability</i>	Only ship loading and unloading equipment are included	The breakdown loss as a percentage of total utilised time
Operating Efficiency	Only ship loading and unloading equipment are included	Measures the operating time over the time that equipment is utilised excluding operational delays
<i>Overall equipment efficiency</i>	Only ship loading and unloading equipment are included	Actual loading unloading rate over design criteria of the equipment
<i>Productivity tonnes per employee</i>	Only operational and maintenance employees are included	Captured on the throughput handled each month

Table 75: Operational KPI boundaries

The boundaries for *equipment availability*, utilisation and *equipment reliability* were agreed as a result of discussions among the participating members with a view to making outcome of reported KPIs more compatible. *Overall equipment efficiency* was monitored and reported on a monthly basis in metric tonnes and idle periods were excluded from the calculation.

Human Resources

The absenteeism records the percentage of time the employees were absent over total working hours per month. All employees are included in the KPI but planned annual leave are excluded from the KPI.

Environmental

The number of official complaints per month are captured as a KPI. There is no exclusion as to the type or source of the complaints be it from community or official agencies.

Health and safety

The LTI frequency rate is calculated basis No of incidents x1 million hours over total number of hours worked accumulated over time. All employees and contractors are included in the calculation including any overtime work.

Technical

The maintenance cost KPI calculated as actual maintenance expenditure every month, excluding any capital expenditure over the monthly operation budget and expressed as a percentage.

The terminals collated the data on a monthly basis during the benchmarking exercise. The reported figures were compiled and analysed by a third party who stripped the identity of the terminals from the data. The benchmarking data were then shared among the participating members on a monthly basis and once a year annualised figures were distributed.

Participating members enjoyed a number of benefits from engaging in the benchmarking scoping exercise. These can be evaluated in several areas as follows:

1. Contribution to knowledge and skills: The participating terminals already had a number of KPIs in action at the start of the benchmarking exercise. The KPIs included in the benchmarking exercise required some of the terminals to make changes to the scope of the resources they included in calculating a specific KPI. The participants from the terminals held teleconferences or met up during the regular meetings of DBTG discussing practical aspects of the KPIs and learning from each other in the process.

2. Information and reporting: Some of the participating terminals used the opportunity to amend their reporting procedures to make the KPIs available more widely within their organisation and others brought KPIs closer to their decision-making process. The sensitivity of information reported by each terminal was addressed by an independent party appointed by all terminals collating all the information analysing and taking out identity before circulating it to the terminals.

3. Organisational changes: The participating terminals had a vested interest in the process as they were all volunteers. Each terminal appointed a representative as a liaison person to collate and send the data out and represent that terminal during any meetings and discussions.

4. Organisational culture: The participating terminals undertook lengthy discussions inhouse in relation to the scope and spread of the information to be shared outside their organisation. During the discussion stage the number of terminals interested in the exercise were higher than those that actually participated in the exercise. The measures put into place to protect anonymity helped some of the terminals to accept and participate in the exercise.

5. Process and efficiency: One of the biggest benefits for the participating terminals was for them to benchmark their performance against the other terminals over a period. On some occasions this prompted terminals to examine their processes to understand where they fell behind the others and make necessary changes to improve efficiency under areas covered by the KPIs. The strive to improve processes also helped to raise standards among the participating terminals in areas covered by the KPIs.

6. Stakeholder engagement: Benchmarking exercise provided a number of participating terminals with an opportunity to demonstrate their achievements. Some terminals used the opportunity to package and present the information to their internal stakeholders such as shareholders and the board while others engaged with key stakeholders outside their organisation such as the key clients. For many this was also an opportunity to give kudos to their employees in areas where their performance was good.

7. The impact of the exercise: The benchmarking exercise provided an opportunity for the DBTG members to explore a number of selected KPIs in order to see to what extent they can be used in a comparative setting among different terminals.

7.3 Scope for benchmarking and standardisation of KPIs

Benchmarking in its simplest form is the process of measuring the performance of a specific organisation against the best practices and organisations in its industry or others (Stevenson, 1996). Bogan (1994) discussed four types of benchmarking. *Process benchmarking* focuses on improving day to day processes within an organisation. *Performance benchmarking* compares the products and services against others. *Competitive benchmarking* is a type of performance benchmarking that is focused on direct competitors. *Cooperative and collaborative benchmarking* allows organisations that are best in class to get together and share knowledge. In the context of my project, cooperative benchmarking is the most appropriate method that can be implemented in a wider industry setting.

Benchmarking should not just be used as a comparison tool but should also enable participating organisations to set goals and objectives, achieve continuous improvement in their organisations and increase their customer satisfaction.

The benchmarking exercise outlined in this section, and similarities in KPIs used by the participating terminals in this study as outlined below, provides considerable potential for further standardisation of KPIs. There are a number of categories of KPIs that most or all of the participating terminals in the current project utilised in each area. The KPIs used in areas corresponding to those in the DBTG benchmarking study are explored below. This section considers two aspects: the first concerns the specific KPIs taken up by the terminals participated in the project, and the second concerns variations in measurement methods used among the terminals.

Operational:

80% of the terminals participated in the project use a *productivity* KPI either based on tonnes per man hour or tonnes per hour/commodity in their facility. They all use the quayside and stockyard *productivity* as leading KPIs and those that operate silos and warehouses measure *productivity* in silos and warehouses.

All the terminals in the project measure *turnaround* time in their facility. Some place the emphasis on ship *turnaround* time and others turnaround time in their logistics activities such as the truck turnaround. The differences depend on the methods of handling and logistics provision at different terminals.

All the terminals measure the cargo *throughput* through the terminal and individual berths. Some terminals break it down to client level to ensure that their commitment to each client has been fulfilled.

Preserving *cargo integrity* is an important area for 80 % of the terminals. Terminals concentrate on different areas under this KPI, with some paying attention to cargo contamination and cargo losses, and others concentrating on preventing wrong cargo deliveries and cargo damage.

The differences in areas of concentration among the operational KPIs do not necessarily prevent us from thinking about developing standardised categories. For standardisation purposes a number of selected KPIs can be constructed with common parameters that can be used and reported by different terminals similar to the scoping exercise undertaken by the DBTG members.

Human Resources (HR)

Employee absence is monitored by all the participating terminals. Many of the terminals also monitor subcategories such as authorised and unauthorised absences and absenteeism due to sickness. There is a growing effort in proactively managing absenteeism by introducing targets in the organisations.

Personal development plans (*employee development*) are used in 80% of the terminals participated in the project. Some terminals place an emphasis on individuals and others bring in team performance and individual developments plans together.

The variations in approach in HR KPIs are not significant enough to prevent the development of standardised KPIs. It requires alignment of category and specific parameters and limits for measurement to ensure results are comparable among the terminals.

Environmental

All the participating terminals monitor *official complaints* from different stakeholders including regulatory authorities as well as communities they are part of. The terminals also put into place various methods of monitoring activities that may lead to complaints to keep them within acceptable levels.

All terminals also monitor and control their dust and noise emissions (*emission control*). Depending on the regulatory requirements, each terminal sets targets on maximum admissible levels. Some terminals also concentrate on water quality controls. The difference on emphasis between the terminals depends on their geographical setting (river, channel or open sea) and their physical connections to the other infrastructure and communities surrounding the terminal.

80% of the terminals concentrate on different aspects of spillage and industrial discharge, some paying for emphasis to spillages and others to waste management activities and storm water quality. The differences depend on the control and availability of facilities by the terminal.

Health and safety

Accidents and near misses are the most common areas of KPIs used by all the participating terminals. Lost time injuries are recorded and monitored by most of the participating terminals. Some of the terminals set targets for the LTI frequency rate from one year to the next.

Technical

Equipment availability is normally measured across different types of equipment used in the terminal. Some terminals measure it in hours and others as a % of the total operation time each month. 40% of the terminals utilise this measure as there are similarities between equipment availability and equipment reliability which is used by all terminals.

All five of the participating terminals monitor *equipment reliability*. There are different approaches taken by the terminals subject to the type of equipment they utilise. Some monitor and record breakdowns for different categories of equipment, some monitor meantime between failures and meantime to repair.

Four of the five terminals also monitor *maintenance effectiveness*. There are a number of subcategories used in this KPI area. *Maintenance planning* is an important category where the terminals monitor planned and unplanned maintenance practices and set targets. Some terminals

monitor different categories of work orders generated and resolved over a set period. The availability and use of resources against the planned maintenance activities are also monitored by some of the terminals.

In considering the standardisation of KPIs in the wider industry sector, it is helpful to note that in addition to common areas of KPIs utilised among the participating terminals they also sought to achieve similar objectives. Table 76 shows the relationship between the areas of KPIs and common objectives pursued.

KPI Area	Common Objectives
Operational	Improving productivity Better operational efficiency Higher client satisfaction
Technical	Reliability of the equipment
Environmental	Preserving the environment and controlling activities that may cause harm to environment Adhering to regulatory requirements
Health and Safety	Minimise accidents and incidents, prevent any harm to people involved in terminals
Financial	Cost control

Table 76: Common objectives of KPIs utilised by the participating terminals

In the operational area the main aim is to ensure that contractual obligations are met. Although different terminals may measure such obligations in different ways the bottom line is similar for all of them. The terminals pursue extensive community engagement programmes in order to interact with the communities they operate close to. These programmes are overall successful in getting involved in community projects and educating the community on activities of the terminals and the objectives in areas such as environment and health and safety. In all the participating terminals health and safety is at the top of the list and engaged by the leaders in the organisation.

There are two major benefits to benchmarking for the dry bulk terminals: first, the terminals within the industry value the sharing of information and knowledge; and secondly, terminals benefit from the learning that it brings to their organisations. There has always been a desire among the terminals to raise the standards within the industry; benchmarking allows terminals to collectively work towards raising the standards in the industry.

There are a number of difficulties that need to be considered in pursuing standardised KPIs among the dry bulk terminals, which were witnessed during the DBTG benchmarking exercise I was involved. Any benchmarking exercise needs to be selective in what can be included in the process. One of the main areas of concern is the protection of privacy and sensitive commercial information. Therefore, any KPI to be included in a benchmarking exercise should not include any commercially sensitive information such as financial return targets or competitive market information in relation to participating terminals. In areas such as environment there are different regulations that apply in different countries and terminals tend to use their own targets in setting up limits for areas such as dust and noise contamination. It is important to establish a common method of measurement for any KPIs

involved in a benchmarking exercise. The loading and discharge terminals perform different functions but use similar methods and equipment, therefore it is important that any benchmarking activity select common parameters that can be measured across the load and discharge terminals. In the operational area, the selection of parameters and method of calculation for specific KPIs used for benchmarking need to take into consideration differences among the terminals such as single and multiple commodity handling terminals, different type and capacities of equipment, and the level of mechanisation versus automation. The terminals have different organisational structures and working practices tied to their geographical location, culture and management practices, therefore parameters related to working practices need to be clearly defined during a benchmarking exercise to ensure comparability.

7.4 Alternative routes for future standardisation of KPIs

Standardisation of KPIs requires a systematic approach to succeed. Following on from the previous benchmarking exercise carried out within DBTG further benchmarking exercises are needed in stages to develop and align parameters within key area of KPIs to enable comparison among the terminals. There are a number of options that may lead to industry-wide standardisation, These include:

- Develop industry standards through recognised organisations that represent the industry such as DBTG
- Establish a quality mark for the sector through an established organisation such as British Standards Institute.
- Promote these standards within organisations such as International Maritime Organisation (IMO) for wider recognition of standards achieved

The benchmarking exercise within DBTG and common areas of KPIs used by the terminals in the current project suggest that there are areas with common parameters within operations, technical, health and safety, environment and human resources. There are other potential approaches that can be adopted to achieve a wider standardisation of KPIs within the dry bulk terminals industry. One approach is for a benchmark to be developed by a recognised industrial organisation that can assess and award terminals that reach required levels of the standard. An example of this is the Investors In People (IIP) recognition, which assesses the level of achievement by organisations in three distinct areas. The first area is *improving*, which looks at building capability within and organisation, delivering continuous improvement and creating a sustainable success. The second area considers *leading others* in the organisation, living organisation's values and empowering people. This includes assessing the health and wellbeing of people in themes including physical, psychological, and social wellbeing The final area is *supporting* which involves structuring work, recognising and rewarding performance and managing performance. Organisations are assessed based on established criteria which involves the employees as well as the management. The assessment process identifies any shortcomings against the established minimum standards in each area. The organisations are then given an opportunity to make improvements in these areas and subject to achieving the required standards they are awarded a bronze, silver or gold status. The award is valid for three years and the organisation is re-assessed at the end of each three-year period. In the context of the dry bulk terminals industry, industry organisations such as the DBTG can be engaged in developing a similar set of benchmarks which would assesses each terminal with a view to awarding different levels of achievement which can then be reviewed over regular intervals.

A second approach to benchmarking is to establish a quality mark for the industry sector. There are kitemarks for products and services in other industries, such as those developed by the British Standards Institute (BSI), which measure and certify quality, reliability, and safety standards. A similar

kitemark which symbolises the level of standards adhered to by the terminals in key areas such as operations, equipment reliability, health and safety, environmental protection and employee development can be established within the industry. Such a kitemark will go a step further than benchmarking among the terminals, by providing them with a status recognition to confirm the standards they adhere to. This in turn provides terminal partners with a level of confidence as to the standards of quality, safety and reliability that the terminals they deal with adhere to. It helps improve brand recognition of an individual terminal which in turn help the terminal to grow its business as well as attract and maintain skilled manpower as well as young talent for the future.

There is good groundwork being undertaken towards establishing key areas to be included in an industry-wide benchmarking scheme through projects such as the current one and benchmarking exercises undertaken by industry bodies such as DBTG. There is a general desire within the industry sector for the terminals to learn and improve best practices from each other and to set industry-leading standards in their operations. Therefore, it should be possible to develop a benchmarking standard through consultation between a number of representative terminals and an industry body. A representative industry body such as DBTG is well placed to carry out such an exercise perhaps through a working group of representative terminals. The selection and verification of criteria, as well as the establishment of a framework and specific parameters to be included in such a benchmarking scheme could also involve appropriate regulatory bodies in a supporting and endorsing capacity. DBTG could also play a role as a conduit in promoting such a concept in organisations such as the International Maritime Organisation (IMO) through its Non-Governmental Organisation (NGO) status in IMO.

Chapter 8. Project Outcomes and Reflections

This project has highlighted that PAR is complex, and that planned stages are not always followed in the same order in practice as is suggested in standard textbooks. For example, participants tended to change priorities and explore next stages while involved in a previous one. Moreover, while participating terminals have an awareness of the efficiency and effectiveness dimensions of KPIs, they do not bring these together effectively in practice. The project also discovered that the participating terminals followed a similar pattern in KPIs they had used previously in different categories (as discussed in section 7.2), which provided a platform for further standardisation, and an opportunity for benchmarking among the terminals. This will provide a further opportunity for the terminals to raise performance standards and quality of service.

8.1 Summary of outcomes in relation to research project objectives

Role of effectiveness dimension to improve performance of KPIs

The project brought in the effectiveness dimension for the performance KPIs through stakeholder interaction and surveys. The results of the surveys for each participating terminal were incorporated into planning and action stages to generate amended KPIs and implement them. The effectiveness dimension which brought in the expectations of the stakeholders into the picture had a positive effect with all the participating terminals. The degree and scope of improvement for each terminal was different. Terminal A found that the key stakeholder became an integral part of the exercise, terminal B changed the parameters for the performance KPIs in operations areas as a result of the stakeholder survey results, terminal C focused on key service delivery KPIs such as queuing of ships and improved stockpile management, terminal D linked the *equipment reliability* to the stakeholder expectations and terminal E re-affirmed the importance of quayside productivity as a key area for performance KPIs. The project fulfilled one of the key objectives by bringing together participating dry bulk terminals and effectiveness dimension in the context of performance KPIs.

Effect of organisational culture in planning and implementation of performance KPIs

The project confirmed that organisational culture played a central role in how each participating terminal planned and implemented performance KPIs. The artefacts and values that formed symbols of organisational culture in participating terminals as discussed in section 3.5.2 were used as tools to convey the changes within the organisations. In terminal C they were projected in a more planned and concrete manner within mission and objectives whereas in terminal A it was more subtle based on interactions among the participants. Terminal A, D and E had more emphasis on teamwork whereas terminals B and C relied more heavily on individual effort as discussed in sections 4.7.2 and 5.4.2. Both approaches were successful pushing forward and implementing changes that were required. Terminals with individual approach relied more heavily on expertise and knowledge of participants in the decision-making process whereas the terminals with a team approach relied on a consensus within the team to come up with the decisions to implement.

All participating terminals showed the existence of a certain organisational culture and a corresponding management style at the start of the project. During the action stage of the project, some adopted a different management style either to ensure success of the implemented KPIs or upon realisation that the existing management style did not support the actions required appropriately.

I examined the relationship between the organisation culture and KPIs and management style and KPIs during the diagnosis (2.2.2, 2.2.3), planning (3.5.2, 3.5.3) and implementation (4.7.2, 4.7.3) stages

of the project. The level of IT structure and development and use of IS in participating companies also had a direct influence in implementation of performance KPIs. My observations and interactions with the participants at different stages of the project revealed a complex and dynamic relationship between organisational, culture, management style, information systems and other elements as shown in figure 14 which influenced the level of success in the implementation of amended or new KPIs.

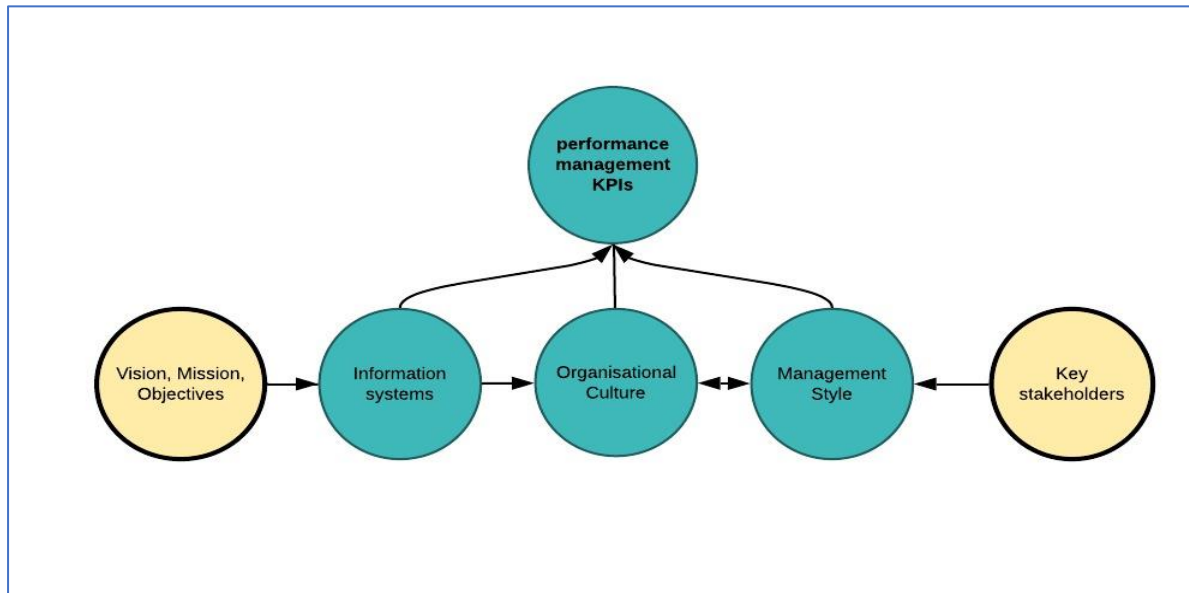


Figure 14 - Elements affecting performance management KPIs

The vision, mission and objectives of some of the participating organisations contained specific reference to the use of IS within the organisation. Participating organisations in my project that incorporated the use of information systems to their vision, mission and objectives and understood how it can be used to the benefit of the stakeholders progressed better than the others who were concentrating on the IT systems and structure to support the KPIs. Information systems in turn directly interacted with the organisational culture, and where the organisational culture and the use of information systems matched each other (informatic vs informational culture), the participants made extensive use of the information systems to drive the performance improvements they sought from the KPIs. Therefore, information systems also affected the success of performance management KPIs directly. In spite of this, the progress of KPIs in the participating organisations with less informational culture were not influenced negatively as long as the objectives set by the management matched the information systems awareness of the organisation.

Key stakeholders are another external factor with significant influence on the management style of the participating organisations. Key stakeholders with an ownership stake in the participating organisations had a direct influence on organisational objectives, which in turn affected the management style of the organisations. These were evident as some of the participating organisations were focused on growth whereas others concentrated on service delivery. Key stakeholders with significant influence as client or logistics chain partners also influenced the participating organisations' management style in a similar fashion. The analysis of themes and specific KPIs showed a strong emphasis on health and safety and environmental KPIs for all the participating terminals. In addition to regulatory conformance, all organisations had community engagement programmes and it is likely that changing regulatory regime and other key stakeholder considerations in the future will continue to affect the management style of the organisations.

Interaction between the organisational culture and management style in planning and implementation of KPIs

Organisational culture and management style have a two-way interaction between them. I observed a distinct organisational culture within each of the participating organisations at the diagnosis stage of the project. As the project progressed, I also noticed that there were layers of organisational culture within each organisation and signs and artefacts such as mottos and notices were evident across the sites. Participating organisations maintained their initial management style during the diagnosis and planning stage of the project, however some of them changed their management style during the implementation stage in order to maintain the momentum of the project. Resistance and lack of understanding among the employees were mentioned on a number of occasions as significant challenges to implementing the amended KPIs. Another important factor for success in this context was the commitment of the senior management in performance management KPIs. Participating organisations where the senior management maintained a level of control and interest throughout the project made better progress. Most of the participating organisations sought to empower the participants throughout the project and those that had to make adjustments to their management style were the ones with less senior management involvement at the earlier stages of the project. Senior management involvement was also important in aligning corporate objectives, and key stakeholders' interests with the project.

Terminals displayed typical relationship between organisational culture and corresponding management style discussed in section 2.2.3. Terminal A had a support culture, terminals B and C had achievement cultures, terminal D had a power culture and terminal E had a role culture. Each terminal displayed characteristics of corresponding management styles during the project. However, terminals A and B made changes to their management style during the action stage of the project in order to ensure that the planned changes to the KPIs were pushed through. The main change in both organisations was one person emerging as the lead for the change and taking charge of the implementation process therefore changing the prevailing management style to consultative and autocratic respectively.

Role and influence of key stakeholders in planning and implementation of KPIs

Participating terminals had varying degrees of success in engaging stakeholders in the process. Terminals A and C were the most successful in directly engaging key stakeholders in the process primarily due to the close engagement of their operations with the key stakeholders and they made a special effort in bringing the key stakeholders into the picture. Positive engagement between the stakeholders and the terminal was the key to success. Terminal B succeeded in engaging internal stakeholders in the project but was less successful in engaging external stakeholders due to competitive environment and lack of trust among the parties. Terminals D and E had less success in engaging key stakeholders which was also reflected in the level of responses they secured for the stakeholder surveys. These two terminals did not seem to be connected with the key stakeholders in a progressive manner. The level of relationship and engagement between the terminals and the key stakeholders was a key factor in the role and influence of key stakeholders in the project.

Role of information systems (IS) in planning and implementation of KPIs

Participating terminals had varying degrees of success in demonstrating the influence of IS in planning and implementation of KPIs. One of the key factors was the cultural orientation within the organisation towards the IS. Terminals A, B and C had established IT structures in place and were well positioned towards using IS as the participants were well informed about the potential benefits.

Terminals B and C also considered IS and automation as an integral part of the company mission and objectives. These three terminals had the best opportunity of getting the most out of the IS both for themselves but also to enhance the benefits for the key stakeholders. They were for example able to establish and enhance reporting structures containing relevant information for the amended KPIs quickly and create feedback from the stakeholders using IS. Terminal D needed to put in place essential IT structure before considering the use of IS to enhance the benefits. Terminal E had the IT structure in place but had not embarked upon using IS to improve the use of information across the organisation. For the first three terminals the added value of effective use of IS was apparent in how quickly the implementation of new KPIs were evaluated and benefits were shared with the participants and the key stakeholders.

Level of standardisation of performance KPIs among the participating terminals

The discussion in section 7.2 showed that the terminals used very similar KPIs in key areas such as operations, technical, health and safety and environment. In most cases 80 to 100% of the participating terminals measured specific KPIs such as *productivity, equipment reliability, vessel turnaround* and *accidents incidents & near misses*. Although there were slight differences in parameters used for measurement or type of measurement, there is a common platform that can be developed further for benchmarking in a wider sector to complement previous exercises within DBTG as discussed in section 7.1.

8.2 Participant Engagement

Engaging potential terminals to participate in the project was one of my first challenges. The terminals I canvassed for the project were all members of the DBTG. The fact that my own organisation was also a member of the DBTG, and I knew the individuals in decisions making positions at some of the terminals, assisted greatly in getting initial responses from the terminals. I believe it would have been much more difficult to engage any other terminal that I have not had a previous engagement with to participate in my project. There was a great degree of scrutiny from the potential terminals at the outset to understand what the project was about and what was expected of them throughout the project. They also raised questions about how the data gathered by the project was going to be treated, and what benefits their participation in such a project would bring to them. Despite a number of interactions during the pre-project period, it was very difficult for me to know how committed each terminal would be to the project once it started. With the benefit of hindsight, it would have been useful, although practically difficult, to visit and meet the participants from potential terminals prior to them committing to the project. The level of commitment from each participating terminal differed depending on who was responsible for the project and how it was dealt within that organisation. The decision makers who chose whether to participate in the project or not were not necessarily the people who became participants on behalf of the terminal. The organisational and cultural differences and the level of commitment of the top management to the project played a considerable part in the level and intensity of participation of each terminal. Overall, I was pleased that all the terminals felt that the project made a positive and concrete impact on the development of their KPIs.

8.3 Effectiveness of communication methods

I used a variety of communication methods throughout the project, as explored in sections 2.2.6, 4.7.6 and 5.4.6. I visited each participating terminal at least twice during the project, however the geographical diversity of the terminals meant that I had to use other means of communication such as teleconferences and Skype calls. The most productive method of interaction was face-to-face meetings during the visits. All the terminals allocated an amount of time to engage with me and discuss the project. Face-to-face discussions were not only useful in understanding individuals' views on different aspects of the project and what they did within their organisation to support it, but it also

allowed me to capture the level of engagement they had in the process by way of their behaviour and participation during the discussions. This was valuable in deciding how much I should push each terminal to engage in further detailed activities. Face-to-face interactions also provided an opportunity to assess the views of different individuals who performed different roles in the organisation, in similar areas of discussion regarding the research project. If the views of different individuals were coherent then it provided me with a degree of understanding as to how informed individuals were throughout the organisation, in areas of common interest such as objectives and targets in their area of involvement. I found that although I provided background and objectives for the project ahead of any telephone or Skype conversation, it was difficult to get the participants from the terminals to commit to engage in the process. This was understandable as they all had other daily commitments. Some were more responsive than others to such requests and this may also reflect in their engagement during conversations. With some of the terminals I felt that there was a push to go through the conversation as quickly as possible and a reluctance to explore some of the areas more deeply while others were more responsive. For some of the terminals this may have been due to language difficulties in understanding and engaging conversations in English. I followed up most of the conversations with an email message which helped to confirm my understanding of the conversations. Written communication was more straightforward and easier to handle, however the frequency and urgency of responses from the terminals differed.

8.4 Observation of planned PAR stages

The PAR stages envisaged during the planning of the project were largely followed by participants. However, I felt that there was not necessarily a clear distinction in practice between the different stages as to how the participating terminals approached them. For example, participants from a number of terminals were already discussing how to formulate certain change KPIs during the analysis of the completed stakeholder surveys, thereby bringing diagnosis and planning stages closer to each other. During the implementation of amended or new KPIs, the terminals were continually analysing the data and evaluating the outcomes on a more ongoing basis rather than taking stock at certain intervals. This has enabled them to act promptly in areas where the outcome was not as expected or where there were issues highlighted by the new KPIs and led me to define a modified version of the AR model. All the participating terminals chose to follow the actions they started over a long period of time before they considered making further amendments to them. For some of the terminals, this was due to the need for new or amended KPIs to settle in and produce meaningful results for them. For others, the processes or projects that potentially could affect the KPIs were progressing more slowly than expected therefore they chose to continue with the KPIs they introduced for a considerable period.

The data played a different role at each stage of the project. At the diagnosis stage it helped to map out current practices of each participating organisation, at the planning stage it helped to formulate options and at the implementation stage it helped to evaluate progress. The participants approached the data in a different manner than what I would expect during the diagnosis and implementation stages. Once the actions were established, the participants were reluctant to evaluate the entire action within an agreed period. This was not because they did not have confidence as to the legitimacy of the actions put in place but they felt that the nature of the changes meant that they needed to run with it for a considerable time before they can make a decision to amend them significantly. The other important element in their thinking was that there were a number of outside factors such as the changes in stakeholders behaviour or fluctuations in trade which occurred over a period of years rather than months which could have affected the evaluation of the changes introduced. Most of the participants decided that it would be better to run the actions over a longer period of time but at the same time they chose to make ongoing small adjustments. This meant that the project ended up with

one big cycle with continuous mini cycles in relation to each action put into practice. Figure 15 Illustrates the cycles-within-a-cycle approach which emerged during the project.

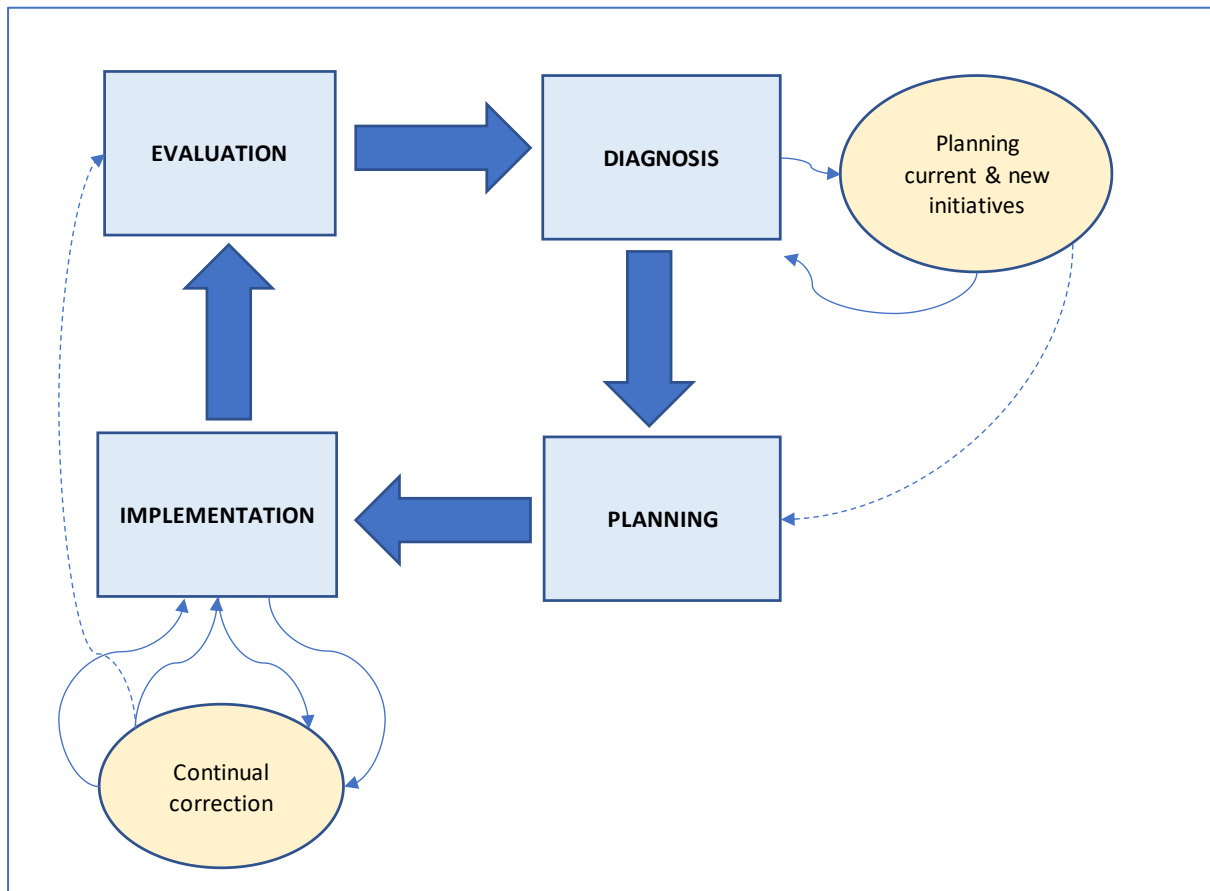


Figure 15 -Cycles within a cycle approach (Based on Lewin 1946)

At the start of the project I envisaged that I would end up with several AR cycles, each completed within a reasonably short period of time following a clear path from one stage to the next. As the project started and progressed it became clear that the diagnosis and implementation stages in particular did not follow the normal process. The participating terminals had a number of current and planned initiatives in areas such as operations, environment and health and safety which could be adopted to be included in the new or amended KPIs, therefore during the diagnosis stage participants wanted to bring these additional dimensions into the discussions while we were discussing the current practices within the organisations. By doing so the clear distinction between diagnosis and planning stages was blurred. This approach of reaching out to the planning stage while dealing with the diagnosis stage appeared logical to me as it helped to generate ideas in a way relevant to the project as well as to the organisations.

I experienced a similar approach which departed from the expected cycle behaviour from the participants during the implementation stage when the participants were reluctant to set a limited time period for the implementation after which they would evaluate the actions. They would rather apply multiple small corrections to the elements within an action such as changing the intervals of measurement or reference points during the implementation and continue with the implementation rather than evaluating outcome of an action after an agreed period of time. The amended AR cycle process which emerged during the project will be useful in organisations where there is a flexible and quick response to change, where there are continuous initiatives in existence within the organisation,

and where the organisation operates in an environment where there are continuous and unpredictable changes not necessarily under the control of the organisation but key stakeholders with influence over the organisation.

I found it difficult to influence the orderly progress of PAR stages with the participants during the project as an outsider. The agenda of discussions at each stage of the PAR was influenced by various factors within each organisation which affected the topics and thought processes of the participants. The business issues and priorities existing within each organisation often took centre stage and influenced the discussions related to KPIs. This meant that at times the discussions took place out of sync with the ongoing stage of the project. To my surprise, the majority of the participating organisations have decided that they would assess the impact and benefits of the amended or newly introduced KPIs over a longer period of time than I had originally planned. I had expected an overview, perhaps after the first 3 months of implementation, which would lead to amendments which would have allowed another PAR action cycle to take place. It is difficult to determine as an outsider whether the decision to take 12 months or longer to assess the outcome of the changes was due to the severity of changes introduced, or because the participants thought it would take much longer to get changes accepted by the internal and external stakeholders. An insider would probably have had access to more details of internal deliberations within the organisations and therefore would have had a stronger influence on the timeframe for implementation and evaluation of changes.

8.5 My role as a change agent in the project

This section considers various aspects of my role as a practice-based researcher in the project as well as some of the challenges this has presented.

Insider versus outsider researcher

Qualitative researchers and sociologists have engaged for a long time in discussions in relation to the benefits of being an insider or outsider as a researcher. A few people, such as Merton (1972) created a strict classification of insider and outsider types. Insiders were characterised by belonging to a certain community with common values, culture, geographical location, ethnicity and race whereas outsiders did not strictly conform to these parameters. This distinction suggests that an outsider cannot appreciate or fully understand the viewpoint of the community as they share very little in common with them. I worked with five different organisations separate from my own during the project. Although one of the organisations was an affiliated company of the group, because of the minority shareholding we had in that organisation, I had limited knowledge of their operations. On the face of it, this suggests that I was an outsider throughout the project. On the other hand, I have worked in the dry bulk industry sector for over 20 years and during the discussions with the participants my views were taken into consideration as I was seen as an insider from an industry participant point of view.

The *Outsider doctrine* values the researcher who does not belong to a community as a neutral and objective observer. It also challenges the ability of the insider researcher to analyse something that they are a part of. The *Insider doctrine* on the other hand holds that insider researchers have a unique understanding of the community they research which outsider researchers lack (Kerstetter, 2012). Banks (1998) suggests that the individuals living in small communities form microcultures with their own beliefs and cultural norms. In the context of my project, each of the participating organisations can be classed as communities and each have their own microculture. As for the researcher's position as an insider or outsider, Banks (1988) suggests that this may change over time and has devised a typology of cross-cultural researchers which reflects this change. These are: the indigenous-insider, the indigenous-outsider, the external-insider and the external-outsider.

The *indigenous-insider* is accepted as a legitimate member of the community, whose understanding and knowledge of its culture enables them to promote the well-being of their community. The *indigenous-outsider*, although socialised within the cultural community has gone through assimilation into an outside culture. As a result, the individual's values and beliefs became indistinguishable from those of an outside community and is therefore considered as an outsider by the community. The *external-insider* was initially embedded in another culture, but rejects the norms of that culture and chooses to adopt those of another community, and therefore becomes an adopted member of the second community. The *external-outsider* is involved in a community other than the one being researched and has little appreciation of the values of that community or understanding of it. He or she is therefore seen as an outsider by the community being researched but may be highly rewarded by an outside community.

It is possible to have a third position in addition to an insider or outsider which is a *hybrid insider-outsider*. This occurs, for example, with individuals who share their work and life between business and academic interests. They are required to observe and adopt the values and beliefs of each community they work with as required. In the context of my project, I find it difficult to place myself in a single category as an external researcher. Although I did not belong to any of the organisations that participated in my project, it was important that I gained their trust, respect and a level of acceptance in order to succeed in the change process I introduced. Therefore, I believe that I moved along a continuum during the project. Having started as an outsider, I quickly established a relationship with the participating individuals which led to a level of acceptance within their groups to enable me to continue with the project. More recently, there has been an acceptance in the literature that a researcher's position in relation to professional participants is not static but continuously shifts along a continuum backwards and forwards subject to changing circumstances of interaction between a researcher and participants (Mercer, 2007). A researcher's identity, cultural background and relationship with the participants help to position the researcher within a space between the two doctrines. It was important for me to use different tools, such as semi-structured interviews, face-to-face meetings and social occasions to understand the cultural norms within each organisation as an outsider, and to position myself accordingly. This also helped me to gain a moral authority to speak and put suggestions on the table at the later stages of the project. Insider researchers in some cases may have a natural advantage in moral authority due to their position or specific knowledge and outsiders most of the time need to earn that authority, otherwise their contribution will either be ignored or lost.

Challenges and advantages as an outsider researcher

I realised at the start of the project that knowledge about the participating terminals was one of the most important factors for me to be accepted as an outsider. I did not have the advantage of an insider to know the business of the participating terminals before I started. I researched each of the participating terminals prior to engaging with them to ensure that I knew all the essential facts about their business, because I felt this was important during the initial conversations with them to prove to them that I had a genuine interest to work with them but also that I was able to make a judgement about the relevance of their business to the project, and vice versa.

Gaining access to the participating organisations presented a challenge for me. I used the contacts I had within each organisation who were acting as gatekeepers, to gain initial access to the organisations. The next step was to ensure that I gained the trust of the participants in the project. This was important for me to be accepted as part of the group and ensure their genuine participation throughout the project. I lived in a different geographical location from each one of the participating terminals, and I did not share their background or cultural norms as they all represented different

nationalities and cultures. However, I had two advantages: firstly, I had spent over 30 years in the ports and shipping industry which prides itself as a community, I was part of that community and therefore I could communicate using a common language with the others (insider) members; and secondly, I had shared experiences that I can relate to with the participants which helped me to start and develop a bond with them. The business community that I had been a part of for many years, with its shared values of integrity, honesty and standards helped me to forge a bridge with the participants from each of the terminals in the project.

Acceptance of me as an outsider was very important for the success of the project. I worked on this during each stage of the project. Semi-structured interviews during the diagnosis stage helped to establish a rapport with the participants. I also used other opportunities offered such as participation in company social meetings and/or lunches to develop a better understanding of the cultural norms in the participating organisations. The progress in this area led to more open meetings during the planning stage of the research where options for change KPIs were developed. The trust I developed with the participants enabled them to openly discuss areas of interest during these meetings and, more importantly, they listened to the suggestions I offered as alternatives to be considered. Gaining the trust of the participants was important to develop a level of credibility and a moral authority as a researcher in making such suggestions. This has also helped during the implementation stage, when it was important for the participants to feel confident to discuss progress as well as difficulties, they experienced with me as the researcher. I think if I had been an insider researcher, I would have been more likely to pass a judgement on the participants, whereas as an outsider my starting point was to trust the participants' knowledge, experience and viewpoint on issues discussed. It is argued that an insider has an advantage in conducting research 'with' rather than 'on' their group (Breen, 2007). Achieving a good interaction with the participants as an outsider was important for them to be an active participant in the project working with me throughout and accepting the project as their own.

One of the advantages of being an outsider was that I did not have a bias in my approach in comparison with an insider who may have been too close to the culture of the organisations participating in the project. I also did not have a narrow perception which could be a negative influence for an insider as a result of their familiarity with social and cultural structures and patterns (Aguiler, 1981). This meant that I could be objective in my approach at each stage of the project. However, I believe there is an equal chance of an outsider being subjective or having a bias on the basis of the interaction and the experience that the researcher has with the organisation. This is especially the case during the initial visits to the sites when the researcher gains an initial impression of the organisation and activities.

One of the most difficult areas on the cultural front as an outsider was for me to have a clear understanding of the unofficial position of the individuals within the organisations in relation to the influence they had in decisions being made in the context of the project. Communication with the organisations, apart from the site visits, was directed through a small number of participants led the project in each organisation. If I were carrying out the project as an insider, I would have known the position and influence of all the other team members which would have provided me with an advantage to engage with participants in specific issues over which they had influence.

Collection of information and sharing of results during several stages of the project was essential to its success. If the participating organisations had not been open in sharing information and plans with me, I would not have been in a position to have the relevant conversations with the participants. I do not believe that I would have had access to the level of information I had if I had not known the individuals at the management or board level of the organisations and had developed a trusting relationship with them over the years prior to the project. I feel that if I carried out the project as a

complete outsider, with no previous contacts within each organisation, I would have had far more difficulties in accessing information and engaging individuals.

The planning and action stages of the project were important in putting the change KPIs into action and seeing what impact they had. An insider would have had more control and influence at these stages of the project in terms of setting objectives, determining a timeframe for actions and collecting feedback at agreed intervals, although it can be argued that this can potentially affect the objectivity of the researcher's approach. As an outsider I had significant input into the generation of options and deciding on the final KPIs to be implemented. However, I felt that I had limited influence on the internal processes of how the decisions were taken and the time it took for the planning and action stages to progress.

Although I worked with a small number of participating sites as an outsider, I had an opportunity to compare practices among the participating terminals. The organisations participating in the project had a number of contrasting characteristics such as their geographical location, volume of cargo handled, handling methods which were representative of the industry sector. This provided me with a better opportunity to consider the subsequent generalisation of the KPIs to other terminals.

8.6 Limitations of the study

The project had a relatively small sample of five terminals, chosen from members of the DBTG, which consisted of about 100 terminals. Although the sample size of the participating terminals was small it had the representative characteristics I needed for the project. Participating terminals represented five different countries and locations which provided geographical spread as well as cultural diversity for the project. Terminals handled commodities with an annual throughput between 1 million and 100 million tonnes and included both import and export activities. The participating terminals represented both private and public ownership and included organisations with a very long and relatively short history of operation. The diversity of these characteristics enabled me to pursue the project objectives. The diversity of ownership and organisational structure enabled me to compare the different approaches to planning and implementing KPIs, cultural diversity helped to identify the effect of different cultural approaches to the selection and implementation of KPIs, geographical and operational diversity helped to understand the similarities between the existing KPIs utilised by the terminals as well as the potential for standardisation.

The project has not considered the potential impact of different type, make and capacity of cargo-handling equipment utilised by the participating terminals on the KPIs they implemented. This may lead to a question as to whether these parameters can have an effect on comparing KPIs across the terminals. On the other hand, a potential solution to diversity of cargo handling equipment used by participating terminals was discussed in Chapter 7 when the project referred to the benchmarking exercise carried out by the DBTG; participants chose to restrict the type and functionality of the equipment to be included in the exercise so they could compare the outcomes.

Terminals participating in the project had different levels of automation. Although the project explored the relationship between IS/IT systems and the KPIs, it has not specifically considered whether the effect of implementing modified KPIs would be different between a terminal with automated handling systems and one with more mechanical means of handling cargoes.

The project assumed that the areas where KPIs implemented by the participating terminals (operational, technical, environmental, etc.) were equally important. It has not considered the relative importance of different areas for different terminals. The environment that the dry bulk terminals operate in is going through some fundamental changes which will force terminals to re-consider their mode of operation in the coming years. These changes are taking place as a result of

regulatory changes in areas such as emission control and environmental compliance which will gradually enforce tighter rules and political decisions by the countries in use of fossil fuels in the future. These changes may mean that some of the KPIs become more important than others in the future.

In examining the effectiveness dimension of KPIs through the stakeholder surveys, the project assumed that the stakeholder responses to the surveys were objective and not biased by their position or relationship to participating terminals. The objectives of stakeholder surveys and benefits to stakeholders were clearly explained in the accompanying guide however it was not possible to verify objectivity of replies in any other way.

The project assumed that the terminals had freedom to set their own strategic objectives and KPIs independently; it did not consider the potential influence of port governance on the operation of terminals where a port may manage multiple terminals.

The key stakeholders were identified for each participating terminal at the diagnosis stage of the project and surveys were sent out to as many stakeholders as possible by the terminals. Some terminals have been more successful than others in getting replies from the stakeholders; the terminals with fewer stakeholder survey replies may have limited benefit from the importance performance analysis of the surveys because they have not had replies from variety of stakeholders in different categories or a number of stakeholders in a single category.

The importance-performance analysis carried out on the stakeholder survey data revealed there was a significant gap between stakeholder expectations and terminal performance in a number of areas for each of the terminals. The areas with a significant gap were also the areas where the terminals placed a significant importance in their organisation. Interestingly, prior to the analysis of the surveys, terminals were not aware of any deficiencies in their performance in these areas. This in turn pointed towards a lack of efficient communication between terminals and stakeholders where such deficiencies might have been identified. Some of the terminals carried out regular customer satisfaction surveys but these have not helped to identify deficiencies previously as they have not necessarily made the connection between the survey results and the performance KPIs.

All terminals link their strategic objectives to the KPIs they implement. However, key stakeholders together with the governance structure in place at the terminals influence the direction and selection of KPIs. This is also reflected on the planning horizon that terminals adopt most choosing to concentrate on short to medium term achievements.

8.7 Areas for further research

- Further research on the effect of different type, method and capacity of handling equipment in dry bulk terminals on standardisation of operational KPIs would be beneficial. This will explore whether the differences between the handling equipment and handling methods could make it more difficult to standardise operational KPIs used in different terminals.
- Further research would also be valuable into the effect of different types of commodities, particularly commodities with difficult handling characteristics, on setting up and performance of KPIs. Some of the participating terminals differentiated KPIs they used for different commodities they handled. It will be useful to explore whether the KPIs can be set up for different categories of commodities such as grains and fertilisers where the characteristics of individual commodities in each category are similar to each other.
- The project followed the change process introduced through both the modified and new KPIs for nearly a year. However, it became apparent that terminals wanted to experiment with the

new KPIs for a significantly longer period before they made a final judgement on their effectiveness or decided to introduce further changes to them. In this sense, the organisational changes that the project sought to achieve have provided us with some results. However, further research which could be undertaken at the terminals in a few years' time would provide an opportunity to explore long-term effects of the changes introduced.

- Further research on the effect of change KPIs on competitiveness of terminals in terms of growth and changes in their market share would also be beneficial. Such a research will explore the level of direct relationship between the change KPIs and competitiveness of the terminals in specific terms measured by the impact on returns or profit over time.
- Within the context of organisational culture, the project highlighted different approaches that participating terminals used in implementing KPIs. For example, some terminals strongly supported and encouraged teamwork while others encouraged specialist individual work. Further research as to whether one type or other of these approaches can be more effective in implementing change KPIs would also be beneficial. My project did not find a significant difference between the level of success terminals pursuing one approach or the other, however it did not examine the reasons behind it in detail.

8.8 Benefits of the project for my own organisation

One of the broader benefits of the project was related to the changes we started to introduce at Nectar as to how we learn from experience as an organisation. This can best be explained as the difference between single and double loop learning. Schön and Argyris (1996) described single-loop learning as behavioural learning that changes governing variables of one's theory in use. In contrast, double-loop learning in the technical or operational context relates to situations where an individual or a team have breakthrough insights. The project led us to think how we devise, introduce and utilise performance KPIs within our own organisation. We realised that we did not make enough use of the feedback and interaction with the teams using these KPIs to enable us to discover improvements in practice or get rid of areas where it did not work. As a result, we introduced processes that involved the teams in the subsidiaries providing feedback on actual or potential improvements that could be introduced to improve the effectiveness of existing systems. This in turn led to the realisation that we could standardise operational, technical and health and safety practices across the subsidiaries. We started a process to achieve this, which will create an opportunity to for us to develop dashboards that can be used across the subsidiaries and generate opportunities for benchmarking within the group.

Participants from the five selected participating organisations worked as teams as well as individuals during the project. There were three specific areas which worked well with the project that led us to re-think our way of doing things at Nectar. As a part of the project, the selected teams had a problem-specific approach, and they understood what they needed to achieve, they had a future orientation whilst at the same time recognising what has happened in the past, and they were selected on the basis of their knowledge and experience to contribute to the project. This was representative of a strengths-based approach which supported doing research 'with' people rather than 'on' people. A strengths-based approach uses a number of strategies to improve the success of project teams: invite members in accordance with their strengths at the start of a project; select qualified colleagues who can enhance the success of the project; provide participants with opportunities to share information; and meet regularly (Coghlan & Brannick, 2014). As our business is built on a number of ongoing projects which require project teams at the head office or field to carry them out, we changed the way

we formed project teams to ensure that qualified members with strength of knowledge and experience to participate in the project were invited, but we also ensured that we created variety within the teams, so that they included different disciplines within the business.

The research project also highlighted the positive difference that key stakeholders can make to an organisation in implementing a change process if stakeholders are engaged in a way that will keep them interested in the project. Although participating organisations interacted with their key stakeholders and regularly engaged them in activities such as client satisfaction surveys, the selection of stakeholders to be approached for the current project was mainly decided by senior management or marketing/business development functions within the organisations. This in turn created a danger that they may have missed out on inputs from some other valuable stakeholders. Upon reflection, we realised that we provided very little opportunity to various employees to participate in discussions regarding which key stakeholders to prioritise and approach for such feedback. We therefore decided that we would take a more inclusive approach to this subject in future by means of more comprehensive and regular team meetings.

8.9 Lessons learnt in terms of research methods used

Greenwood (2015) in his review of theories and concepts used in AR suggested that AR can be both qualitative and quantitative and that it is a useful strategy for using multiple theories and methods opportunistically for the purpose of promoting democratic social change. I used a variety of methods and models at different stages of the project. The activities involved at each stage of the action cycle introduced new information and knowledge into the process. In my view, the analysis required at each stage had a purpose. For example, at the diagnosis stage the data collection enabled us to establish the facts about the organisations and the current state of KPIs they used. Therefore, I used a mix of data collection methods which would logically fit the purpose of the exercise for each scenario developed at each stage of the project. I found this to be a better option than trying to pick a specific method or model and apply it to the information in hand. As a result, I made decisions opportunistically to fit the scenarios arising during the project.

The project highlighted the importance of data collection methods and the quality of the data collected on the success of the project. I used a variety of methods to collect the data including observation, semi-structured interviews, group meetings and questionnaires. However, there were a number of challenges in making sure that the data collected was relevant and accurate. It was apparent that in some of the organisations the same data was collected by different participants leading to repetition. On some other occasions, the data was collected but was not necessarily shared by all the relevant parties, and on yet other occasions it was not clear how the data collection took place. Where possible, using triangulation methods to verify the data collected was helpful but there was not always a clear structure within the organisations which provided guidance as to the best method of data collection to be used at each stage of the project.

I worked closely with the participants in preparing stakeholder questionnaires, including the provision of written guidance as to how to respond to them and a document to explain the purpose of the questionnaire. As I did not have direct contact with the stakeholders, I relied upon the participants to engage the stakeholders and collect responses. Such an indirect approach was not completely effective as it relied upon the participants to fully understand the questionnaires and be able to explain them to others as well as supporting the stakeholders where required to get the questionnaires returned. Ideally direct involvement of the researcher to administer surveys or questionnaire with the stakeholders is much more efficient to minimise delays and prevent misunderstandings.

I used thematic coding to extract the themes from the semi-structured interviews I carried out. This has worked out to be almost a confirmatory analysis to support the existing areas in which the participating terminals used existing KPIs. Eight of the nine themes identified in the thematic coding coincided with the areas where the terminals had existing KPIs. The frequency of coding for specific areas under each theme either pointed to the importance of that area or highlighted a concern in that area by the participants. For example, dust and noise contamination were the two areas coded under the environmental theme by some terminals as important areas focus and as areas of weakness that require more attention by the others. I then brought these indicators into the discussions at the planning stage of the project to assist with generating options for amended or new KPIs.

The performance gap analysis I carried out on the importance and performance criteria in the stakeholder surveys delivered unexpected results for some of the terminals, especially in terms of their perception of how they performed in some of the areas and the perceptions of their key stakeholders. Although some of the terminals carried out regular stakeholder satisfaction surveys, they did not previously pick up the difference in expectations of their stakeholders. This has certainly highlighted the need to identify a purpose in the preparation of stakeholder surveys such as the link to performance KPIs, and to ask specific questions rather than general ones.

While the performance gap analysis was useful in highlighting the differences between the performance of the terminals and the expectations of the stakeholders, there were too many areas for the terminals to decide where to prioritise their efforts. The stakeholder mapping analysis helped to differentiate the areas with the most consistent pattern and highest level of performance gap across the stakeholders participated in the project. For most of the terminals the amended or new KPIs were introduced to reduce the performance gap. In general, the areas where performance gaps existed did not necessarily point to significant failures on the part of the terminals but in many cases highlighted a lack of effective communication between the stakeholders and terminals. It will be important for the terminals to repeat the stakeholder mapping analysis at regular intervals in order to observe the changes in patterns.

The decisions taken during different stages of the project by the participants reflected the complex environment within which the participating organisations operate. There are many internal factors such as organisational structure, organisational culture, corporate objectives and external factors such as the behaviour of the key stakeholders, market conditions, and regulatory environments, some of which cannot be influenced by the participating organisations, making it difficult to predict constantly changing environments to make decisions. As a result, the participants need to consider the effect of the changes they make both internally and externally. I believe the realisation of this lesson was a contributory factor for the participants' reluctance to carry out relatively quick evaluation of their actions which would have required further decisions to be taken. This approach supports the theory that complexity is an essential dimension of AR, and that the world is much more complex than it seems on the surface. Action research which takes into consideration this complexity, pays attention to the history of events that can affect the outcomes to understand dynamics in their richness as a way to enhance the possibilities to liberate changes in the future (Greenwood, 2015).

8.10 Impact of the project on the practitioner-researcher

Ensuring participation and commitment of the participants as well as empowering them to engage with the project has been a valuable learning exercise. Commitment to working with the owners of the problems in order to solve them in a participative manner is a fundamental basis of PAR (Greenwood & Levin, 1998). Participation is the core concept in empowerment of the participants. Making sure that they actively participate at each stage of the project is the key for empowering them.

At the same time the participants need to understand what issues require change and need to be committed to pursue that change. As an outsider, I could not use authority or management techniques to get the participants to respond to the demands of the project but had to use a much more subtle approach of being a catalyst in the process, acting almost like a mentor providing guidance on the potential direction of travel without necessarily making decisions for the participants. I learnt how important and valuable it is to listen and understand the issues and the context in a conversation especially where the context lay outside my area of comfort or expertise. This enabled me to pinpoint important areas and make suggestions to the participants during the planning stage of the project to expand the scope of discussions.

Based on the information I gathered during the diagnosis stage of the project, I prepared a number of suggestions in areas such as operations, technical, and health and safety for each of the participating terminals as an input to the planning stage discussions. Since then, I have been using a similar approach within Nectar where I am involved in developments outside my immediate area of expertise, making sure that I listen and question with intent to understand the core issues. A current example is the development of new prototype bagging equipment within Nectar which incorporates a number of new technological improvements and engineering concepts. I also assisted the participants during the implementation stage by reviewing the data and the results I have been receiving and, where appropriate, making suggestions for changes or questioning a certain approach to help with the thinking process. This involved identifying the parameters to include in truck *turnaround* and warehouse productivity KPIs for terminal B, breaking down downtime categories in operational KPIs and comparing downtime for different types of commodities handled by the terminal in order to understand patterns for terminal E.

Participation was one of the key requirements for the project, and in an ideal world it would have been good to have had a fuller complement of teams engaging in it. In practice, smaller groups of key individuals kept the momentum going in the project in the participating terminals. This highlighted the importance of the selection process of who, in what capacity, and to what extent should participate in the project from the start. In section 8.3 I discussed some of the challenges related to being an outsider practitioner-researcher. I trusted the selection of the participants in each organisation to the key individuals (gatekeepers) and I realised how important it was to brief them properly and get them to understand what the project was aiming to achieve at the start in order to enable them to select the right participants. This also supports the importance of a collaborative approach to PAR where there is a recognition that each participant has experience, knowledge and aspirations that need to be taken into consideration, and that these resources can collectively improve the outcome during the project (Greenwood, 2015).

In Nectar, teams are an essential part of the business and the projects we undertake. Upon reflecting on my experience with the teams during the research project, I have started using a more detailed and structured approach in Nectar when I select and form teams in terms of evaluation of skills, relevant experience, and in providing detailed briefing of team members to maximise the success of the team. For example, we regularly evaluate potential port development projects and these require technical, operational, logistical and sometimes commercial knowledge and skills to be included in the analysis. In the past we used to rely on the individual leading a specific project to gather such information without a firm structure as to the individuals that needed to contribute to it. We now form a project team from the start involving individuals with skills and knowledge and allocate specific tasks and responsibilities to each team member.

Participating terminals in the project represented a geographically diverse group from three continents and five different countries. I expected that there would be cultural differences among the

participants. Different layers of culture within each organisation, as suggested by Shein (2010), were apparent in physical symbols, rituals and artefacts. Although I was an outsider, it was apparent that I was expected to respect and, in some cases, follow the cultural norms within the organisations. This was almost a precursor for me to be accepted as a part of the group. When I reflect in the context of my role within Nectar, I always believed that understanding and respecting cultural norms of the organisations and communities we work with is essential for success. I have applied this approach more vigorously since I started the project, and when I evaluate new opportunities in the different countries in which we operate, I either rely on our existing knowledge and experience of cultural norms such as the etiquette in meetings or I make sure that we have a local partner who can guide us through the process.

The project highlighted different approaches that the participating organisations took in line with their cultural behaviour; some favoured a more individualistic approach while others emphasized the importance of a team approach in tackling the project. It was interesting to observe that one approach was not necessarily better than the other in terms of achieving the outcome each organisation sought, as long as their approach was in line with their cultural norms and understood by everyone within the organisation. An important take away for me was that in times of difficulties in an organisation, the cultural norms are not necessarily the main contributor to the problems. In fact, the main characteristics of a culture within an organisation are normally positive contributors to the progress and development over time. The experience reaffirmed my belief in continuing to uphold the long-established values within Nectar such as an ethical approach to doing business, provision of equal opportunities and promotion from within.

The project highlighted the close link between organisational culture and management style, which I explored at the diagnosis (3.5.3), planning (4.7.3) and action (5.4.3) stages of the project. The alignment between different types of organisational culture and corresponding management style are referred to in literature (Hofstede, 2001; Harrison, 1987). The project highlighted that when there was a conflict between a prevailing culture and the management style during the action stage, it proved to be difficult for me to change the culture. Instead, the organisations chose to adjust their management style. Senior managers and line managers in organisations have certain management styles, and it is important that they are prepared to be flexible when their style clashes with the prevailing culture within the organisation. From a personal point of view, the experience during the project led me to reflect upon the management style of the senior managers within Nectar and how it matches the cultural norms within the organisation. I had individual discussions with some of our senior managers and realised that within our organisation the senior managers find it difficult to be flexible with their management style when it conflicts with the cultural norms of our organisation. I am now engaging with them more often when issues arise, and I have introduced training initiatives to make a positive difference in this area.

The project demonstrated that the organisational culture does not exist on its own; employees in an organisation also exist in a wider society. I explored the layers of organisational culture that exists in the organisations and the importance of symbols and artefacts in guiding organisations relationship with the communities around them in sections 3.5.2 and 4.7.2. The relationship between social interaction and the culture is a dynamic one, with considerable tension emerging which forms a key part of PAR (Greenwood, 2015). I experienced a number of examples of organisations participating in the project actively promoting a link between their organisational culture and the wider society in the form of social engagement and planned community-based projects. These initiatives play a significant role in creating a link between the organisation and the community and strengthen the commitment of the employees to the organisation. Having seen examples of such projects, we have started a more

structured approach towards community engagement projects we adopt at Nectar, and have started specific projects such as building a community school in Freetown, and providing a quarterly health screening for the local community close to our terminal in Mariveles in the Philippines.

At the start of the project I was not sure whether it would be possible to establish common ground among the participating terminals, in order to suggest that standardisation of performance KPIs were possible. This was due to the differences in characteristics of the participating terminals, such as their types of operation, commodities handled, and cargo handling systems, and a wide variety of cultural and geographical approaches among them. I was pleasantly surprised that the participating terminals had very similar KPIs in areas such as operations, technical and environment. The project highlighted that there was a common approach towards standards and priorities among the participating organisations and that they saw themselves as a part of a wider professional community. This reinforced my belief that it is important to nurture the growth and development of industry organisations such as DBTG for the benefit of all, and I have since started engaging with members to expand the benchmarking initiative within DBTG. The initial benchmarking exercise a few years ago was limited in scope and on the basis of common KPIs that the research project suggested, I intend to re-introduce the benchmarking with more KPIs in key areas such as operations, technical, health and safety and environment.

Critical reflection has been an essential part of the process at every stage of the project. It started at the diagnosis stage with the semi-structured interviews, it was useful to reflect on what the discussions brought about in terms of existing performance KPIs in the participating organisations and the level of importance or priority that different participants placed in different areas. During the planning stage it was important to reflect upon the brainstorming sessions that took place with the participants to generate options for change and at the same time to try and bring the salient points from the stakeholder surveys into the mix. At the implementation stage the process of implementation as well as interaction between management style and the cultural norms were important areas to reflect upon. At the evaluation stage it was useful to reflect upon to what extent and why each participating terminal diverged from following the conventional stages of the PAR cycle. It was part of a learning process for me as a practitioner-researcher to understand the importance of critical reflection and become accustomed to using it. I found myself encouraging the other participants to use it during the planning and action stage where we were looking to generate options for the change process and decide on the final selection of KPIs for implementation. This was particularly helpful because participants looked at scenarios or situations that they may not have otherwise looked at or questioned while considering alternatives. The 'Bildung' concept, which is inherited from higher education in the latter part of the 19th century, is used as a learning process. Bildung helps to see the learning process for the learner in terms of the quality of their reception and it makes a difference between what is offered and what is learnt. Bildung is created to support professional knowledge, participation in academic discourses, proper conduct as a friendly outsider while observing ethical and moral standards (Lewin, 2012). In my case this was reflected in how I put into action what I learnt as I described in this section.

The development of an action researcher is a complex process and requires the researcher to engage in the field, critically reflect and analyse experiences from involvement in the change process. However, I found that critical reflection can also be applied to many scenarios I come across in a business environment and could potentially be used to improve the quality of decision-making process. For example, at Nectar we regularly assess new business development opportunities and carry out an external risk analysis that assesses political, economic, social, legal and environmental risks. Although we discuss the pros and cons of various options at the time of making decisions, we

rarely go back and reflect upon how the outcome of our decisions compared with the assumptions we made in relation to various factors at the start of the process. As a result, I have introduced a review process of project decisions within 12 months of each decision being taken which will help us to compare our assumptions with what happened and learn from the experience.

The project has also changed how I communicate, and the type of communication I use with those around me. The participants in the project represented several countries, languages and cultural norms. During the group discussions and semi-structured interviews where issues were discussed face to face, I found that if I did not follow up the discussions by confirming the scope, objectives or actions the understanding of the participants were not always in line with what I had in mind, and on some occasions, they were not clear as to what or whether an action was agreed as a follow up. The other difficulty was that the participants did not always flag up that there was a problem with their understanding. This was sometimes due to language difficulties and at other times due to cultural norms. I can draw parallels between the employees in Nectar and the participants in the project and the experience in the project made me think about similar situations I came across in Nectar, and I am now making sure that any face-to-face interactions which require follow up, I send a written note to all involved and ensure that I get them to respond and confirm their understanding.

As a practitioner-researcher, and also as a professional in the shipping industry, the project has illustrated the importance of using reliable knowledge in making decisions. Eraut (1994) describes six different types of knowledge that can be used in different circumstances. I found that it was important to get to know the participants first-hand to understand how they made decisions, in this sense, Eraut's category of *people knowledge* was an important element. Most of the time decisions were made based on factual knowledge but at times, especially in relation to third party information such as logistics chain partners, the participants had to rely on second- or third-party knowledge. It was good to see that, where required, specialist knowledge such as Eraut's category of *process knowledge* was brought into discussions. During these interactions I learnt about how different types of knowledge can be used together in the same context to achieve better outcomes. I have subsequently started using the same approach in my own professional environment. For example, when we evaluate port development opportunities, we make use of information such as the commodity volumes and tariff rates that exist in the market. We normally receive such information from the prospective partners in a project but then we make sure that we seek to cross reference and verify such information by means of desk research or commissioning an independent market study and sometimes by visiting and collecting information on site.

8.11 Conclusions

The project provided answers to the research questions posed in section 1.3. Table 77 illustrates how and to what extent those questions have been addressed.

Research Question	The extent to which the project addressed the question
Does the effectiveness dimension improve performance of KPIs?	Introduced via stakeholder engagement Actively incorporated into the implementation Outcome on performance and other areas evaluated
How does organisational culture affect implementation of KPIs?	Existing culture established during the diagnosis stage Participants engaged in using elements in planning and implementation stages The effect on success of the project was visible
How do management style and organisational culture interact during planning and implementation stages?	Existing culture and style established during the diagnosis stage Participants made decisions mainly to change management style to ensure success of the change process
What role do stakeholders play in planning and implementation of KPIs?	Stakeholder surveys provided the background All participating organisations utilised outcome of the surveys in the change process Active stakeholder engagement was achieved in some of the terminals
What role do Information systems play in planning and implementation of KPIs?	A clear role and direction were established in organisations with strong informational culture A less clear picture emerged in other organisations
How effective are multiple methods of communication used during the project?	The project proved that this was a complex area and certain types of communication proved to be a lot more effective
To what extent are planned PAR stages followed in practice?	Most of the terminals adopted an approach in time frame and approach different to a traditional one.

Table 77 - The extent to which Research Questions have been addressed

The project illustrated that performance KPIs similar to those used in the ports are also used widely within the dry bulk terminals. They form an integral part of terminals' desire to improve standards, performance and service levels. In pursuing these goals, the project has shown that incorporating effectiveness dimension in using KPIs, by bringing in stakeholders, provide additional benefits to the terminals by improving their performance and providing them with a more competitive edge. The project also highlighted that efficiency KPIs on their own lack the benefits in connecting terminals with important stakeholders. When it comes to organisational culture and management style, organisations used their culture in support of the changes they implemented but opted to change their management style to overcome difficulties along the way. The project also demonstrated that with the right level of engagement, key stakeholders can provide significant support to organisations in their pursuit of better standards and service excellence. Organisations recognise the importance and role of information technology and systems in successful implementation of performance KPIs as well as an important engagement tool with the key stakeholders.

In terms of professional and organisational objectives, I have already reflected on the experience I had during the project and how I applied some of the lessons learnt in my own organisation. DBTG has recently decided to re-start the benchmarking exercise among the member terminals with a view to attracting more participants. The academic objectives also incorporated into the research questions were addressed throughout the project as outlined in Table 77.

In spite of certain differences terminals utilise KPIs in similar areas and measure similar parameters. This provides an opportunity going forward to develop standardised KPIs among the terminals within the industry. Terminals have a desire to continually raise standards and benchmark performance. An industry organisation such as DBTG can take a lead in establishing industry-wide standards for terminals to sign up to. This will also enhance the standing and influence of the industry. Overall, there is scope and a path to dry bulk terminals industry establishing an industrywide standardised performance KPIs to enable benchmarking in the future.

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