Development of a Performance Management Tool for Patterson Grade B1-B3 employees at a minerals processing plant

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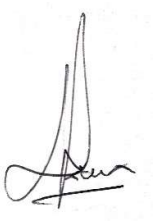
DECLARATION

I declare that this Mini-Dissertation, submitted in partial fulfilment of the degree Master of Engineering in Development and Management Engineering at the North-West University, is my own work. It has not been submitted before towards any degree or examination to any other University,



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ABSTRACT

In this research a *Performance Management Tool* (PMT) has been developed from literature (primarily based on Locke and Latham's *Goal-setting Theory*) to assist supervisors in managing the performance of their lower level subordinates (Patterson Grade B1-B3) at a minerals processing plant. In the paper the PMT is presented as a deliverable in the form of a step-by-step guide to implementation, also allowing for deployment in various other industries. Following development the PMT was tested at the specific plant across four shifts working a rotation cycle and involved a comparison of pre- and post-implementation performance. Although the PMT could not be tested to its full design, implementation did result in significant performance improvements in various positions. According to anonymous surveys conducted it was found that the PMT was easy to use and both the supervisors and employees were in favour of permanent implementation.

KEYWORDS

Performance management, Patterson Grade B1-B3, Motivation, Goal-setting, Performance monitoring, Performance feedback, Consequence management, Minerals processing plant, Ferrochrome smelter

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LIST OF ABBREVIATIONS

Abbreviation	Description
CBS	Casting Bay Supervisor
FPR	Final Performance Rating
KRA	Key Result Area
MBS	Mechanical Breakfloor Supervisor
PC	Production Coordinator
PMT	Performance Management Tool
TTM	Tapping Team Member
VBA	Visual Basic for Applications

1 INTRODUCTION

1.1 Purpose and chapter outline

The purpose of this chapter is to provide the background required to not only understand the problem, but also to comprehend the importance of solving it. The aim of this research will be defined and objectives set, all of which will be subject to certain limitations defined in the scope of the study. As with any research the processes of data verification and validation are of the utmost importance and the manner in which these two aspects will be addressed will also be discussed briefly. The chapter outline for the remainder of this document will be provided. This chapter, similar to all other chapters in this document, will be concluded with a summary.

1.2 Background

At the time of writing, the author was working as a Production Superintendent at a Ferrochrome Smelter situated close to Marikana in the North-West province of South Africa. At this specific operation there are three production departments, each operating two submerged arc furnaces. Ferrochrome ore, reductants and fluxes are loaded into the furnace and electrical energy is used to provide heat for this extremely endothermic reaction. Reductants react via the Boudouard reaction to form carbon monoxide, which in turn reduces the metal oxides to metal (Ramakrishna, et al., 2015). Liquid metal, known as "*charge chrome*" and slag are tapped from the furnace six times per day. A carbon skimmer block is used to separate the slag from the metal once tapped from the furnace. The process of skimming slag from metal is made possible by the significant difference in density of these two product streams (metal is much denser causing the slag to flow on top of the metal). The metal is tapped into a large pit where it is removed with a Front-end Loader once cooled sufficiently and transported to a Mechanical Breakfloor where the sizing of final product takes place, as well as screening for slag contamination. This product is then transported to the Services Department where final preparation takes place prior to export.

Although there has been a drive towards automation in recent years at this plant, the process described above is still heavily reliant on manual labour. Each department employs approximately

100 employees, spread across five shifts (one day shift and four shifts working a rotation cycle). This study will focus on the employees working the rotation cycle (i.e. "*shift personnel*").

The most senior person on shift is called the *Production Coordinator (PC)* and he has three senior employees reporting directly to him, the *Casting Bay Supervisor (CBS), Mechanical Breakfloor Supervisor (MBS)* and finally the Furnace Operator. Please refer to Figure 1-1 for an overview of the reporting structure. The CBS oversees all activities related to tapping the furnace, whereas the MBS oversees the initial sizing step and despatching to the Services Department as described above. The Furnace Operator and his direct reports did not form part of the research.

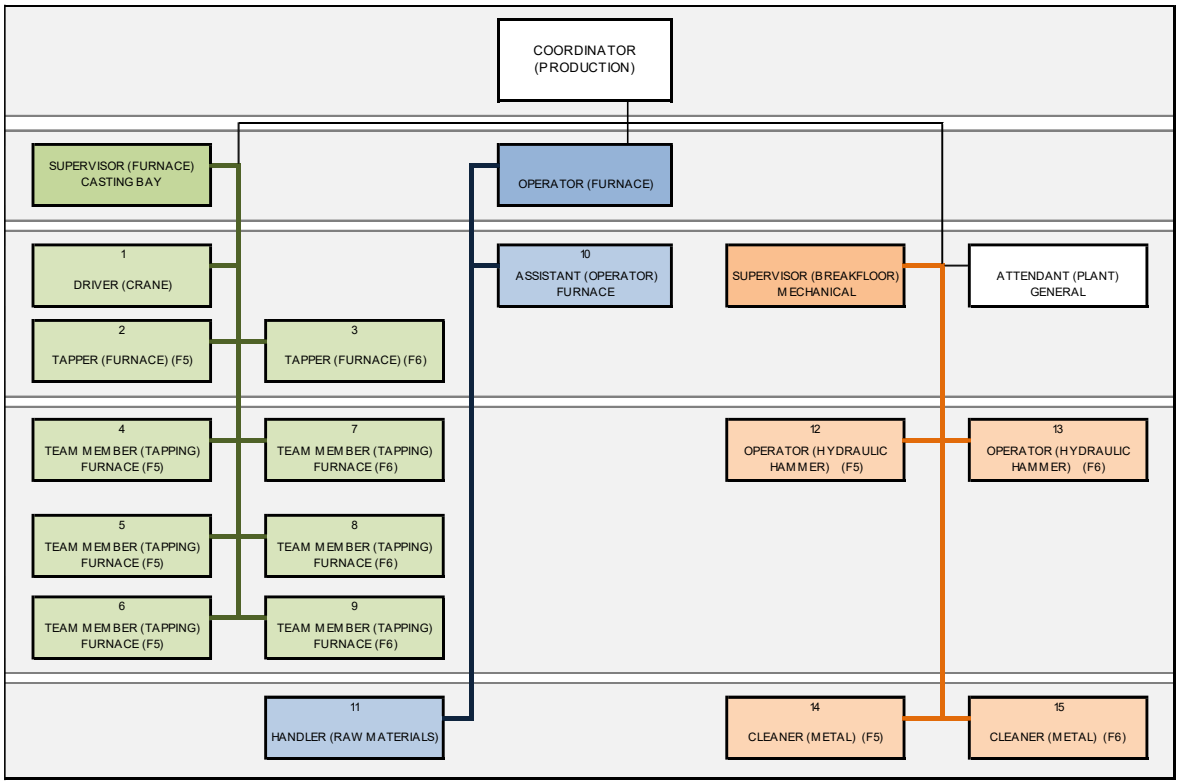

Figure 1-1: Reporting structure of shift personnel

This is the structure for each of the four shifts working the rotation cycle. The other two production departments have similar reporting structures, but for the purpose of this study, only Furnace 5&6 employees were considered. Reporting to the PC, CBS and MBS are all the lower level employees. The focus of this research will be on the four shifts working the rotation cycle and specifically the Patterson Grade B1-B3 employees. "*The Patterson grading system is an analytical method of job evaluation, used predominantly in South Africa. It analyses decision-making in job*

task performance or job descriptions, and sorts jobs into six groups that are graded and grouped into two or three sub grades, such as stress factors, individual tolerance, length of job and number of job responsibilities" (Diamond, 2017). The lowest Patterson Grade is an A1, followed by an A2 etc.

B1 employees are the Metal Cleaners - no.14 and no.15 in Figure 1-1. The B2 employees are all the *Tapping Team Members (TTM's)* and Hydraulic Hammer Operators, more commonly referred to as Pingon Drivers (no.4 to no.9 and no.13 and no.14 respectively). The B3 employees are the Tappers (no.2 and no.3). The MBS is technically also a B3 employee, but fulfils a supervisory role and was, for the purpose of this study, seen as a fully-fledged supervisor. The responsibilities of each position is described in 3.3.2.

The production process can be considered a semi-batch process. A cycle is repeated where critical tasks (i.e. preparations required to make a tap) need to be completed, followed by less critical tasks (such as housekeeping, conducting preventative maintenance etc.).

1.3 Problem observed and justified

The problem that gave rise to this research was the poor performance of these lower level employees. The observation was made that critical tasks are completed, but less critical tasks are being neglected to a large extent. Time spent working at the other production departments and observing their lower level employees has led to the suspicion that the poor performance exhibited was not due to a lack of man power or a shortage of working hours, since the other (read "*better performing*") departments had at their disposal exactly the same resources, but rather an inability of the supervisors to efficiently direct/lead their subordinates.

This lack of performance lead to increased production costs, because contracted employees (assigned to other tasks) had to be re-assigned on a daily basis to complete these less critical tasks (so the company was actually paying twice to complete the same tasks) – especially in the case of housekeeping. The poor work performance of the lower level employees also led to

increased maintenance costs as a result of unnecessary breakdowns, partly due to poor condition monitoring and partly due to negligent behaviour.

The poor performance of these employees also placed additional pressure on their PC's, because they had to neglect their own important work to ensure that at least the critical tasks were being executed to the expected standard. It was clear that the lower level employees were not the only guilty party, but also the CBS, MBS and PC's who allowed this behaviour.

The problem that had to be solved was how to ensure lower level employees complete the less-critical tasks they are being paid to do, safely and without constant senior supervision.

Although this was a continuously occurring problem, rarely have action been taken (in any form) by the supervisors. The sub-standard performance of years gone by had become the new standard. This problem needed to be addressed. The solution had to be simple, easy to implement and maintain and above all effective in improving performance. Please see below excerpt further highlighting the importance of and difficulties encountered with performance management.

Gruman and Saks (2011) wrote that "*Performance management is a critical aspect of organizational effectiveness* (Cardy, 2004)*. Because it is the key process through which work is accomplished, it is considered the 'Achilles Heel' of managing human capital* (Pulakos, 2009) *and should therefore be a top priority of managers* (Lawler, 2008)*. However, less than a third of employees believe that their company's performance management process assists them in improving their performance, and performance management regularly ranks among the lowest topics in employee satisfaction surveys* (Pulakos, 2009)"

1.4 Research aim and objectives

The aim of this research was to develop a *Performance Management Tool (PMT)* that could be used by supervisors to sustainably improve the performance of their subordinates. In order to develop such a tool, the following research objectives had to be completed:

Objective 1: Determine the characterizing attributes of such a tool. Specifically, what requirements need to be met in order to enhance the probability of not only improving subordinate performance, but also to ensure the PMT is "*user-friendly*" and easily implemented in a sustainable manner.

Important to note that, contrary to what might be expected, the supervisors did not form part of the initial compilation of PMT requirements. They were not interviewed to determine their needs. The PMT was developed from a theoretical viewpoint first and then tested in practice. Only then were the supervisors interviewed to gather feedback on the PMT. It was done in this way, because it was considered the route most likely to lead to a positive result. If the supervisors were interviewed first and questioned on their needs, there might have been numerous other motivators affecting their feedback (for instance, when questioned on how subordinate performance can be improved, might have become defensive). Thus, the PMT will be developed and then tested whether it assists the supervisors.

Objective 2: Compile the PMT in such a manner as to comply with the most important requirements identified.

Objective 3: Determine whether the implementation of the developed PMT will lead to an improvement in subordinate performance.

Objective 4: Determine using surveys the opinion of the end-users. Was the PMT well accepted and, having trialled it for a period, would they be in favour of permanently transitioning to the PMT? In other words, this will serve as the validation step for the PMT.

1.5 Overview of research method

A literature study was conducted with the aim of determining, from a theoretical viewpoint, what requirements would need to be met in order to develop a tool that would allow supervisors to improve the performance of their lower level employees. These requirements were then used as a blueprint to develop the PMT and a verification step was conducted to ensure all requirements were adequately addressed.

Following development, the baseline performance was determined for the employees mentioned in 1.2. 48 Employees were then subjected to the PMT to determine whether the tool would lead to improved work performance.

After 25 days of testing the PMT, anonymous surveys were completed by both the employees and the supervisors to determine how the PMT was received and whether they would have a preference to permanently implementing the tool.

1.6 Scope

This research was subjected to certain limitations. Data were collected from the four shifts working a rotation cycle (as explained in 1.2) only and no other Production Departments were included in this research. Only the following positions were involved in testing the PMT (refer to Figure 1-1):

- Patterson B1 grade: Metal Cleaners (14,15)
- Patterson B2 grade: TTM's and Pingon Drivers (4-9,13,14)
- Patterson B3 grade: Tappers (2,3)

Only these positions were considered, because they cover the bulk of the shift and represents the more general positions for which there were clear objectives.

The baseline performance was determined over a period of one month and the PMT was trialled for two cycles. The baseline was determined on a position basis and not for each employee. Hence, performance pre- and post-implementation will be compared for the department as a whole and not per employee.

Whether or not the solution would be sustainable over time could not be measured directly due to time constraints and questionnaires were used in an attempt to establish the fact. Both employees, as well as supervisors were surveyed.

1.7 Chapter outline for remainder of the document

The remainder of this document has been divided into the following chapters.

1.7.1 Chapter 2 – Literature survey

In this chapter the design requirements of the PMT was developed through a literature survey. The aim was to determine, theoretically, what requirements had to be met by the PMT in order to ensure the highest probability of being implemented successfully.

1.7.2 Chapter 3 – PMT as a deliverable

This aim of this chapter was basically to develop a step-by-step guide to implementation, taking into account all the core-requirements identified in the literature survey. Any supervisor should be able to read Chapter 3 in isolation and follow the steps described to establish the PMT in his/her work environment. Although the PMT will be developed specifically for supervisors working at a minerals processing plant, the same principles can be applied in other environments since the subject at hand is human behaviour.

1.7.3 Chapter 4 – Experimental design

In this chapter the experiment was designed to test whether the developed PMT (Chapter 3) fulfils its design requirements. Recall, the PMT must improve subordinate performance in a sustainable manner. The experimental design also addresses the issue of data verification.

1.7.4 Chapter 5 – Results and discussion

In this chapter the results of the experiment were communicated and discussed.

1.7.5 Chapter 6 – Conclusion and recommendations

In this chapter the research is finalized by giving a summary of results attained and confirming whether the research objectives have been met. Recommendations for improvement will be made and areas highlighted for future research.

1.8 Chapter 1 conclusion

In Chapter 1 the background to the problem was discussed and the problem justified. After having identified the problem, the aim of the research was defined and subsequent objectives determined to reach said aim. This was followed by an overview of the research method followed to ultimately achieve the objectives that were defined. The chapter was concluded by discussing the scope and limitations of the research and finally a brief overview of the chapter layout for the rest of the document was provided.

Please note the following, henceforth, when referring to "*supervisors*", it refers to all senior employees working in the three supervisory positions across the different shifts (i.e. the PC, CBS and MBS). Please also note in this mini-dissertation "*he/him*" was used throughout, but does not necessarily refer only to males.

2 LITERATURE SURVEY

2.1 Purpose and chapter outline

The aim of this chapter was to develop the framework of the PMT in the form of a list of requirements – the "*core-requirements*". First however, the detrimental effects of poor employee performance will be elaborated upon, as a means of further justifying the problem. Following this, the concept will be explored of how poor performance can be traced back to a lack of employee motivation. A summary will then be provided of the best-known motivational theories and why "*goal-setting*" as a motivational theory has been selected to form the foundation of the PMT. Goal-setting in the workplace can however not function in isolation and certain auxiliary processes are required to gain the maximum benefit from the process. Throughout this chapter different core-requirements will be identified and after each has been discussed, will be denoted with a letter of the alphabet. The chapter will be concluded with a summary of the core-requirements, forming the PMT Framework, which will be used in Chapter 3 to develop the PMT as a deliverable.

2.2 Detrimental effects of poor employee performance

This research could actually have been justified by the simple fact that it was conducted at a specialized minerals processing plant with a daily turnover far exceeding the million rand mark where poor performance can potentially result in astounding, irrecoverable losses. The aim of this section is to look past this obvious downside and consider less apparent consequences as well.

2.2.1 An unhappy and demotivated workforce

All people are governed to an extent by an internal process of self-evaluation in which they learn about themselves (Festinger, 1954). In this process the individual will compare his performance to some standard. This can either be a company set standard measureable in the physical world, or should that not be possible, the person will compare his performance with that of a peer. In cases where these standards are not clear (have not been communicated properly or the person is working in isolation) there exists an opportunity for misalignment between the

employer/employee and subsequent output might be construed as poor performance by the employer. The poor assessment of performance that might follow such actions may not only have a negative impact on the employee in that moment, but might also severely affect future performance which in turn could result in further losses to the company.

Uncorrected poor performance of certain employees can result in major performance problems throughout the workforce. The Equity Theory (see Table 1: Overview of motivation theories) goes some way to explaining this phenomenon. Suppose two workers with the same job profiles and accordingly rate-of-pay work in close proximity to each other. The one worker observes how his colleague is constantly on his phone and takes very long smoke-breaks, yet receives no form of reprimand. After viewing this injustice (perceived unfairness), a lot of people in his situation would be tempted in following the colleagues example.

The opposite of this is where the employee performs better than expected and attains what could be considered as an abnormal level of success. If the employee himself considered the attainment of a certain goal important and he did finally manage to achieve that goal, it has been found that that success would improve his overall well-being by letting him experience feelings of pleasure, happiness and satisfaction (Latham & Locke, 2006). Just because an employee needs to do repetitive work does not mean he shouldn't experience some form of job satisfaction.

2.2.2 Lack of innovation

It has been noted, in today's highly competitive business environment, that a company's employees are actually one of its greatest assets, because they are the primary source of innovation in a company so desperately required to stay ahead of the competition. According to Waheed and Halim Zaim (2015), "*talent is vital for an organization, a proper talent management and career planning system is essential for both the organization and the employees*". Poor employee performance prevents a company from being innovative and sustainably generating profits for shareholders.

2.2.3 Reputational loss

There have been numerous examples where bad performance of an employee resulted in major losses to a company. The availability of social media platforms and dedicated business review sites such as Hellopeter.com have made the potential losses only so much worse. Although not "*poor performance*" as such, but as an example of the power of social media, consider the case of Penny Sparrow with her "*Monkey*" comments on Facebook at the end of 2015. When something like that happens, people immediately search the name of the person involved and also happens upon the company they work for.

2.3 Employee motivation

On one of the World Economic Forum's web pages titled "*7 Causes of poor employee performance*", they continue to list these seven causes as follow (Marr, 2015):

"The first four causes stem from a lack of ability – resources, obstacles, skills, expectation. The second set of causes for poor performance are more personal and emotional to the employee and are based in a lack of motivation – no carrots, no sticks, burnout"

In the scenario of the ferrochrome smelter the first four causes could be ruled out with certainty. The employees had all the necessary resources at their disposal (time, tools, training etc.) and expectations have been clearly communicated at various stages through different mediums in the past. It seems much more likely that the poor performance could be attributed to a lack of motivation.

The Merriam-Webster dictionary defines motivation as "*a force or influence that causes someone to do something"* (2018).

According to Benson (2013), "*Never before has motivation played such a critical role in the workplace. Employees, in general, have more freedom than ever in getting their jobs done. The idea of self-managed employees and a democratic workplace is no longer the organization of the*

future. Rather, companies are beginning to embrace these concepts in order to have a changing organization that can adapt to an unstable and increasingly changing work environment".

It is quite clear from the above that employee performance are very strongly dependant on motivation. This lack of motivation can either be due to no rewards (monetary, recognition etc.), no penalties in the case of poor performance, a burn-out episode or even a combination of all three. The obvious question that needs to be answered is how an environment can be created where employees are motivated to achieve high levels of performance. As a starting point, it was thought best to first look at existing motivation theories.

Fortunately the problem of undesired employee performance is not something new and a lot of research has been done on the subject and specifically how motivation influences performance. Table 1 gives a summary of the best-known motivation theories.

Table 1: Overview of motivation theories

Year published	**Author**	**Theory**	**Key concepts**
1943	A.H Maslow	Maslow's hierarchy of needs	- Actions motivated by needs - Needs can be divided into different groups - One group of needs to be fulfilled to a large extent before next group of needs will receive attention - Need groups in order of importance: physiological, safety, love, esteem and self-actualization (Maslow, 1943)

1959	F. Herzberg	Motivation-Hygiene Theory	- Motivation through fulfilling of higher order needs, such as achievement, responsibility, advancement etc. (motivation factors) - Hygiene factors don't in themselves motivate (factors include comfortable working hours, environment etc.), but an absence of these factors can decrease motivation (Herzberg, 1959)
1961	D. Mac Clelland	Acquired Needs Theory	- Needs develop over time and is influenced by life-experiences - Thee motivations all people have to varying degrees (some with strong bias towards a certain need): o Achievement motivation: people that seek achievement o Power motivation: people that experience a need to be influential and to lead o Affiliation motivation: people who are motivated towards interaction (Mac Clelland, 1961)
1963	J.S Adams	Equity Theory	- Employees will adjust work input levels in relation to output levels (based on a balance as perceived by them) (Adams, 1963)

1968	V. Vroom	Expectancy Theory	- Behaviour as a result of choices in an aim to maximize pleasure and minimize pain - Based on the following three beliefs (Value Based Management.net, 2016): o Belief in the attractiveness of the goal (Valence) o Belief in availability of the reward (Instrumentality) o Belief in the feasibility of achieving the objective - Employee motivation will increase when they believe high levels of effort will be appropriately rewarded (Vroom, 1964)
1968	E. Locke	Goal-setting Theory	- There exists a direct link between conscious goal-setting and performance - "*One of the most widely tested theories in the field of work motivation and organizational behaviour more generally, with more than 1000 studies supporting its development over the past 40 years*" (Martin, et al., 2016) - Hard goals produce higher levels of output (Locke, 1968)

1975/6	J.R Hackman & G.R Oldham	Job-characteristics model	- The authors argued that the key to employee motivation lies in the task itself (YourCoach, 2018) - Five key features of a motivating job: o Skill variety o Task identity o Task significance o Autonomy o Feedback - These five key features impact three psychological states (experienced meaningfulness, experienced responsibility for outcomes and knowledge of the results), which in turn affects work outcomes.

As can be seen from the above summary, there are numerous theories that attempt to explain employee motivation. Some are more applicable to certain scenarios than others. Some of the theories are more general in nature (like Maslow's Hierarchy of Needs Theory), whereas other theories specifically addresses the work environment. One of these theories are the Job-characteristics model.

Consider the Job-characteristics model, which states that employee motivation lies in the task itself and relies on it having certain features, which will enhance employee motivation (see Table 1). Consider the required features (skill variety, task identity, task significance, autonomy and feedback) and how little a job like being a cashier in a supermarket will fulfil these requirements. The majority of the lower level jobs in this research were very similar to a cashier in a supermarket. The daily work is more or less the same requiring low levels of skill to accomplish. The employees might have the perception that the tasks are of little importance, enjoy very little autonomy and

rarely receives feedback (except when doing something noticeably wrong). So according to the Job-characteristics model these employees should have almost no motivation.

The obvious solution would be to change the jobs to make it more meaningful, interesting, fulfilling etc. But often times, as is the case here, there is simply no way to achieve that. If a spillage below a conveyor needs to be cleaned, it must be done, no matter how unappealing and mind-numbing it may seem. If the job itself cannot provide motivation, external motivation is required, more often than not taking on the form of either threats (*"do it, or else"*) or rewards (*"if you guys finish this job, I will organize cold drinks for you"*). Both these methods are unfortunately very unhealthy in the long term. You can imagine in the example above, what would happen if management cut the Food and Refreshments budget.

The problems the supervisors are faced with should be becoming more clear at this stage. The jobs themselves (i.e. the less critical tasks) do not provide motivation and external motivation only works for a short period of time before the relationship starts breaking down between supervisor and subordinate. As stated earlier, this is not a new problem and one theory in particular has been applied very successfully over the years in various scenarios to address these issues - Locke and Latham's Goal-setting Theory (1968). Although there have been numerous studies done on goal-setting, no relevant literature could be found pertaining to the South African mining sector in particular. It was decided that goal-setting as a motivational tool would form the foundation of the PMT[a].

2.4 The PMT framework

The concept of goal-setting is not difficult to understand, but how can it be applied in practice? How can it be applied at a ferrochrome smelter? Where is the starting point? The aim of this section is to further develop the PMT framework.

Goal-setting is such a powerful tool in the workplace, because it takes the focus away from doing the actual task, to doing the task well (i.e. to reach a target). Motivation becomes independent from the task itself. To return to the example above, employee focus moves away from the

immediate task of cleaning below a conveyor to being recognized as a person who's area of responsibility is always in an immaculate condition.

Unfortunately it is not as easy as simply communicating challenging goals to the workforce, sitting back and waiting for the improvement to happen. Goal-setting will only be the primary theory on which the tool will be based, but in order to be successfully implemented it needs certain other processes/phases as well. These phases follow each other very logically and will form a cyclical process – repeating themselves indefinitely (see Figure 2-1). The first phase will be to establish the performance goals. The second phase involves monitoring the performance of the employees. The third phase takes place after a set amount of time and involves giving feedback to the employees on performance achieved. The fourth phase is the action phase from the supervisor. Exceptionally good or bad performance must have certain consequences. This phase is very important for maintaining goal commitment and enhances the probability of the overall process remaining sustainable. All these phases must be conducted in a manner to enhance goal commitment.

Figure 2-1: Performance management tool process

Each of these phases will be discussed and requirements determined to ensure the particular phase is executed correctly.

2.4.1 Goal-setting

"…more than 1,000 studies conducted by behavioural scientists on more than 88 different tasks, involving more than 40,000 male and female participants in Asia, Australia, Europe and North America, show that specific high goals are effective in significantly increasing a person's performance – regardless of the method by which they are set" (Latham & Locke, 2006).
At its core, goal-setting is a discrepancy creating process, which allows an employee to compare his own performance against a certain standard, which facilitates the process of self-evaluation.

An important phrase here is "*his own*". The psychological phenomenon called "*diffusion of responsibility"* (also known as the *"bystander effect"*) should be avoided as far as practicably possible. Keene (2018) describes the phenomenon as follow, "*It is a type of behaviour change observed among groups of people. It occurs when an individual does not take action or step forward to help another person when a group of people is present. Social psychologists largely attribute this behaviour to an individual's belief that, in a group setting, someone else will do what needs to be done or already has done it*". Obviously, the best way to prevent this from happening is by making one person responsible for one goal[b].

As briefly explained above, the main advantage of employing a goal-setting system, is it takes the attention away from the actual task. This might sound counter-intuitive, but is actually the way in which the process of goal-setting can produce such impressive results. No longer is the employee concerned with the actual task, but rather focuses on the goal that was set and how to achieve it. The issue at hand is self-validation. The person has a certain perception about himself, which can be proven by achieving the set goal. In other words, the process of goal-setting can make a boring task very relevant (Latham & Locke, 2006).

From research conducted by Locke and Latham over the years emerged a few important discoveries. It was found that a "*do-your-best*" goal will almost always result in inferior

performance as opposed to the performance resulting from a specific and difficult goal viewed as achievable[c], because it promotes goal commitment (Lee, et al., 2015). This specific and difficult goal can either be specified by the supervisor or paticipatively set. It has been found that following the last-mentioned route assists the employees with goal acceptance and often also leads to higher set goals[d] (Latham & Locke, 1979).

According to Landers et al. (2017) there is some scientific consensus that goals should be set in a manner described by Peter Drucker in his 1954 book entitled *The Practice of Management* (interestingly preceding the Goal-setting Theory by more than a decade). This method can be summarized using the "*SMART*" acronym, which stands for:

- Specific – The desired end-result must be specific to focus effort.
- Measureable[e] – Success in attaining the goal must be measureable to some degree.
- Attainable – In order to enhance goal commitment, the employee must feel the goal is attainable.
- Relevant[f] – The set goal must be relevant. No point in achieving some abstract goal without any expected advantages.
- Timely – The best goals are time-bound to drive effort and enhance motivation.

Locke & Latham suggested, in order to comply with the "*difficult but attainable*" parameter that goals be set at a level which would be attainable by approximately 10% of the people from the specific population/sample (Locke & Latham, 1990). Goals however, cannot be set too difficult. The employee must be able to believe that he would be able to achieve the goal if he put in the necessary effort and remained committed over a certain period of time. If this is not the case, the employee might simply throw in the towel (Carver & Scheier, 1998).

One of the potential drawbacks of goal-setting as a motivational tool is the possibility that certain aspects of a task/job might be neglected because that specific point was not included in the goal-setting process (Latham & Locke, 2006). One of the ways to negate this possibility is to include a subjective non-specific goal, such as "*engagement*", "*involvement*", "*ownership*", etc.

Following the process of goal-setting is performance monitoring. It is during this phase that the discrepancy is created, either positively or negatively.

2.4.2 Performance monitoring

Performance monitoring and rating will be essential to the working of the PMT, since the PMT involves the setting of certain goals and working to the achievement thereof. A requirement of the goal-setting process is that goals be specified which can be measured and over which the employees have control[h]. Measuring employee performance on a goal over which they have no control, or is irrelevant to them, is pointless and only garners feelings of unfairness (Gruman & Saks, 2011).

Performance monitoring and rating is the process of measuring performance and comparing it against the desired performance level. Besides for the important role performance monitoring will play in the PMT, the following general observations have also been made regarding the advantages of a formalized employee monitoring system:

- Monitoring may enhance employee effort (Brewer, 1995)
- Play a role in effective supervision (Komaki, 1986)
- Increase employee perceptions of fairness (Niehoff & Moorman, 1993)

Performance goals and associated performance monitoring schedules will need to be specified with great care. It has been found that extensive employee monitoring can lead to various negative consequences[i], such as (Martin, et al., 2016):

- Reduction in the effectiveness of the employee (Gnywali & Madhavan, 2001)
- Employees fearing for their jobs (Oz, et al., 1999)
- The appearance of chronic health disorders (Smith, et al., 1992)

Another important aspect to keep in mind is the accuracy of the rating. It has been suggested that, "*raters rate accurately if they are motivated to do so and rate inaccurately if they are motivated to avoid negative consequences*" (Harris, 1994). We find proof for this statement in a

study conducted by Longenecker et al. (1987) where the raters interviewed actually admitted that they are rarely concerned with giving accurate ratings. Raters are motivated differently. In the study conducted by Longenecker et al. the motivation was likely an attempt to avoid confrontation. If the rater is motivated by a desire to fire the employee, one will likely find that the ratings being assigned are unfairly low. Other raters will attempt to "*keep the peace*" and centralize the ratings, scoring everyone more or less the same. In such a case, the time spent rating is actually completed wasted.

There are a few measures that can be put in place to ensure the supervisors (raters) are motivated to rate accurately:

1. Remove as much as possible subjectivity from the equation[j] (specific, measurable goals)
2. Do not hold the supervisor accountable for the poor performances of his subordinates[k].
3. Multiple raters can be used to get a representative score[l] (Appelbaum, et al., 2008)

Another process that can be followed that has not yet been studied extensively is to make use of self-assessments where the employee is allowed to rate his own performance (Appelbaum, et al., 2011). According to Jackson et al. (2003) "*employees who had a chance to rate themselves became more involved and committed to his/her personal goals*".

2.4.3 Feedback

"Most likely, the early 1800s marked the beginning of performance appraisals in industry with Robert Owen's use of 'silent monitors' in the cotton mills of Scotland (Wren, 1994)*. Silent monitors were blocks of wood with different colours painted on each visible side and placed above each employee's work station. At the end of the day, the block was turned so that a particular colour, representing a grade (rating) of the employee's performance, was facing the aisle for everyone to see. Anecdotal evidence indicates that this practice had a facilitating influence on subsequent behaviour"* (Wiese & Buckley, 1998)

By deciding on a certain colour and turning the block the supervisor was in fact providing feedback to the employee on his performance, but also communicating it to the rest of the workforce.

Up to this point goals have been set and performance monitored. The next logical step is to provide the employee with feedback on performance. "*Feedback*" as a PMT phase refers to the method of information transfer between supervisor and employee as well as the way in which the message is transferred – more specifically, how it could possibly be perceived by the employee.

This phase is one of the most difficult to execute and most supervisors and employees find it extremely uncomfortable. According to Spence and Keeping (2011) "*appraisal is often regarded as a daunting and painful experience, not only for those receiving the rating, but also for those providing the rating*".

In this scenario the supervisor is automatically placed in a position of power over the employee and it takes a skilled and experienced supervisor to place the employee at ease and communicate in such a manner as to ensure that the intended message is conveyed and accepted by the employee.

What the employee has control over (provided the monitoring system facilitates fair ratings) is the type of feedback received. If performance was lacking, the feedback received will be negative in nature. Opposite to this, if a set goal was exceeded, the employee could anticipate positive feedback. Both these types of feedback can be conveyed in a constructive or destructive manner.

"*Constructive feedback*" is defined as feedback that not only takes into consideration the feelings of the recipient, but also ensures the feedback is specific (Stoney Alder, 2007). "*Deconstructive feedback*" on the other hand, can then be defined as generalized and inconsiderate feedback. Research have shown that providing feedback in a deconstructive manner will cause feelings of anger and lead to tension between the two parties involved[m] (Baron, 1988).

A "*Feedback Culture*" needs to be established, defined as, "*the organization's support for feedback, including nonthreatening, behaviourally focused feedback, coaching to help interpret*

and use feedback, and a strong link between performance improvement and valued outcomes" (London & Smither, 2002). Once this starts happening the focus shifts from handling the unfamiliar situation to the actual appraising of the performance and enhancing communication between the employee and supervisor

Unfortunately, the only way in which this culture can be established is to do it regularly (London & Smither, 2002) and provide coaching to the supervisors[n]. However, research have shown that individuals often prefer different amounts of feedback at varying frequencies (Fedor, 1991). To accommodate the employee in this it has been proposed that the employee should be able to specify how often he/she would prefer feedback (obviously within certain limitations). When an individual has a certain amount of control over these variables (amount and frequency of feedback), it is said the employee has "*Feedback Control*". Granting the employees feedback control in this research was not really an option, due to the large number of employees involved (will create chaos if each were to specify a different feedback interval), especially during this developmental phase, since the supervisors first need to become accustomed to the various new aspects of the PMT.

It is going to be very important and difficult finding the correct balance when deciding on the feedback interval and there are advantages in both increasing and decreasing the interval length. Increasing the interval length will save time, because the amount of feedback sessions automatically decreases and the supervisor will also spend less time on processing ratings. On the other hand, operating the PMT with a short feedback interval should theoretically allow for increased overall performance.

If the employee is unknowingly doing something wrong, the opportunity to correct the behaviour will be granted earlier. A scenario can also develop where a person knows they will be scored low. In this scenario they might decide to reduce effort completely, with the aim of putting in a big effort again with the next cycle of ratings. If the cycle is shorter, the increased effort will occur earlier.

Performance feedback has never formally occurred in the environment in question and this will pose a challenge. Firstly, the employees' performance have never been appraised, so this will be the first time some of them receive formal feedback on their performance. For some of the supervisors on the other hand, it will be the first time they will have to tell someone how they are performing, compared to the expected standard. What will make the process more difficult is also the method of information transfer – face-to-face communication.

Results from a study conducted by Stoney Alder (2007) proved that constructive face-to-face feedback between a supervisor and subordinate often yielded superior results compared to other methods of feedback. Face-to-face feedback can improve the employees' perception of fairness in the process, because it allows the employee the opportunity to present his own views in response to the feedback received[o] (Murphy & Cleveland, 1995).

From the literature survey, it was also found that feedback given by a legitimate figure of authority increases task performance, even in the absence of formal goal-setting[p] (Martin, et al., 2016). During this developmental phase the feedback will be provided by the direct supervisor, but the PC and other senior personnel may be present. If the employees know that a senior person may be present in the feedback session, it should enhance goal commitment.

Lastly, it must be stressed that this communication channel must be kept confidential. There will be no form of social comparison taking place[q], especially in the form of leader boards. The two main reasons for this are:

- It has been found that leader boards can demoralize certain employees should they constantly be playing second fiddle in spite of giving their best effort. Such an environment breeds backstabbing and sabotage (Kwoh, 2012).
- Leader boards do not necessarily tap into the maximum potential on offer, because the employees are actually allowed to choose their own goals (level of performance), primarily influenced by where they want to be on the leader board (Landers, et al., 2017). This is a problem, because not all people are similar. Human behaviour is governed to a very large

extent by the Hedonic Principle (from the Greek word "*sweet*"), which simply states that people will generally strive towards a state of pleasure and away from pain (Spence & Keeping, 2011). Some people experience pleasure from attaining positive outcomes (like being first on a leader board), whereas some people will focus primarily on avoiding some form of negative consequence. In this example it will be the people that are doing just enough to stay out of trouble and no more.

The "*Feedback Phase*" will be one of the most important phases in the PMT cycle.

"Moreover, the Fried and Ferris (1987) *meta-analysis found that of five core job dimensions (i.e., skill variety, task identity, task significance, autonomy, and task feedback), the amount of feedback provided by a job had the strongest and most consistent relationship with performance, absenteeism, and turnover."* (Renn, 2003)

2.4.4 Performance consequence management

In research conducted by Simonds & Orife (1975) they found strong support for the notion that pay increases, even at small differentials, is very important to non-supervisory employees. Given the choice between an enriched job (i.e. where they have more responsibility, allowed to make decisions etc.) and a job with a larger remuneration, the choice was always the latter.

Extra money as a reward is however not always the answer. It can in fact sometimes have the opposite effect. If it is significantly less than anticipated by the employee, the employee might even feel insulted (Gneezy & Rustichini, 2000).

These incentive programmes typically also do not cater for the masses. These programmes often reward only one person, although there might be numerous persons with very similar performances. Rewarding only the one person is a recipe for demotivating the other high performers (Worrel, et al., 2016).

The consequence management system should be able to cater for good performances, as well as poor performances. The performances of the employees will be logged. This information can

be used to support certain administrative functions, like deciding on who to promote when an opportunity arise or when it becomes necessary to address an employee on poor performance (Spence & Keeping, 2011).

It has been found that when a supervisors have both means available to them (i.e. either punish poor performance, or reward good performance), the general action taken is to reward rather than to punish, which is in line with the "*do-no-harm*" principle which most people abide by (Baron, 1988). Supervisors need to take cognisance of this fact, because punishing is sometimes necessary to ensure fairness in the workplace.

It is going to be especially important to coach the supervisors on how to punish when necessary. According to Molenmaker et. al. (2016), "*the fact that non-cooperators are punished is not necessarily what people deem undesirable, it is being personally responsible for administering those punishments what they want to avoid*". Using these performance ratings as reference, clear boundaries can be set representing acceptable performance. These boundaries can then be used to remove the choice from the supervisors when they need to discipline or reward, contributing to the fair and equal treatment of all employees in the department.

From a practical viewpoint, it is very difficult to reward a person every time they reach their goals. The main advantage of utilizing goal-setting as a motivational tool is the self-validation that occurs when a person reaches a set goal, which counts as a reward in its own right. According to Locke and Latham (2006), "*experiencing success does not depend on the absolute level of performance that is attained, but rather on performance in relation to one's goals*".

Interesting though, the same authors in the same article goes as far as to say that, "*without goal directed action, people cannot attain the values that make their survival and happiness possible*". To summarize then, the aim will be to move away from extrinsic motivation (money, or otherwise rewards fulfilling lower order needs, according to Maslow) to intrinsic motivation[r].

2.4.5 Maintaining goal commitment

Goal commitment can be defined as follow: "*the extension of effort, over time, toward the accomplishment of an original goal and emphasizes an unwillingness to abandon or to lower the goal"* (Hollenbeck & Klein, 1987).

Although goal commitment as a concept is quite easily definable, it is very difficult to measure and accordingly hampered early development in this field of study.

It has been argued that goal commitment is moderated by two aspects: perceived importance of the goal and perceived likelihood of attaining the goal (Monzani, et al., 2015). If the employee believes in the importance of attaining the desired goal and believes it to be possible, goal commitment will be enhanced. Goal commitment is key to the proposed PMT. Goals will be set, but if there is no goal commitment from the employee there will be no improvement in performance (Erez & Zidon, 1984).

The question that needs to be answered is what practical steps can be taken to improve the goal commitment of the employees?

One way to enhance goal commitment is to involve the employee in setting the goals. As briefly touched on in 2.4.1 that will assist the employee in accepting the goal and often will also lead to the employee setting higher goals. Having a say in what the goal should be, allows the employee to set a goal which he obviously believes is attainable and that assists in generating long term goal commitment. When goals are enforced upon employees which they feel are unattainable, they will lose the commitment they had (if they had any to begin with) and replace the difficult goal with one which they feel is more realistic.

Locke and Latham (1988) further suggested that goal commitment is moderated by managerial support and trustworthiness, as well as the employees' peers. They argued that simple instruction in a supportive environment void of threats or intimidation promoted goal acceptance in most of

the studies they conducted[s]. The employees' peers or workgroup can have an extensive influence (both productive and counterproductive) as social pressures pile.

The last method posited to enhance goal commitment that will be discussed is reward structures. It has been found that employees become more committed to achieving certain goals if they believe that the attainment of the goals will lead to valued rewards[t] (Locke & Latham, 1988). As with any reward, if a monetary reward is given, the employee should be able to easily make the connection between what actions led to the reward being given. One would go far to find a better example of this phenomenon than a piece-rate job where remuneration is directly affected by effort.

2.5 Chapter 2 conclusion

In Chapter 2 the potential negative effects of poor employee performance on a company were briefly discussed. Motivation was presented as one of the main moderators of employee performance and a summary of motivation theories provided. It was explained why goal-setting would from the basis of the PMT and an overview was given of the main phases the tool would consist of. Thereafter requirements for each phase were identified and denoted by letters of the alphabet (please see Table 2 for a summary). In Chapter 3 the PMT will be developed and presented as a deliverable with the aim of complying with all these core-requirements.

There is one truth which cannot be refuted, "*effort is costly to employees and beneficial to the employer while wages are beneficial to employees and costly to the employer"* (Benndorf & Rau, 2012). There will always be forces being exerted by the two parties to sway this balance in their favour. This PMT can be seen as an attempt to sway the balance to the side of the employer, but because there is so much to gain from the employee side, it should not be seen in that way. Successful implementation will necessarily lead to advantages for the employer (higher performing work-force), as well as advantages for the employees (self-satisfaction likely to occur after a cycle of good performance).

Table 2: Core-requirements for each PMT phase

Goal-setting	Performance Monitoring	Feedback	Performance Consequence Management	Goal Commitment
(a) Goal-setting theory will form the basis/foundation of the PMT	(e) Performance must be measureable	(m) Feedback must be constructive in nature	(r) Move from extrinsic to intrinsic motivation	(s) Create a supportive environment void of threats or intimidation
(b) One person responsible for one goal	(g) Include at least one subjective score as well, to prevent employees focussing only on measured performance areas	(n) Attempt to establish a feedback culture by providing regular feedback		(t) Achieving certain goals must lead to valued results
(c) Goals will be set which are specific, difficult, yet achievable	(i) Employee monitoring must not be extensive	(o) Face-to-face communication to be used to provide feedback		
(d) Goals will be set participatively	(j) Remove subjectivity from ratings as far as possible	(p) Involvement of a legitimate figure of authority		
(f) Goals set must be relevant	(k) Promote accurate ratings by not holding supervisors accountable for poor ratings	(q) No form of social comparison allowed		
(h) Employees must have control over the ability to achieve a set goal	(l) Promote accurate ratings by using a multi-rater system			

3 PMT AS A DELIVERABLE

3.1 Purpose and chapter outline

The aim of this chapter is to provide a step-by-step guide to implementation of the PMT. Due to the nature of the problem and the scope of the proposed tool, it cannot be in the form of an one-size-fits-all solution.

First an overview will be given of the PMT methodology and the concepts explained using a simple example – implementation in a restaurant. This might seem a bit off topic, but will only be used to explain the concepts.

From this explanation it will be clear what information logging will be required and how quickly it can become a tedious task as the complexity of the business environment increases (as in the case of the minerals processing plant researched). To solve this problem paper forms were removed (on which ratings were being logged) and cell-phones used to log information electronically, which allowed for swifter processing. In Chapter 3.3 this process will be discussed using the investigated ferrochrome smelter as an example. In Chapter 4 (Experimental Design), reference will be made to some of the information in this chapter.

This chapter will be concluded with a summary of the core-requirements and what sections of this chapter describes how the specific requirements should be addressed. The degree to which these requirements are met will obviously be determined by the supervisor implementing the PMT. The aim of the steps described in this chapter is to facilitate the process. Please also keep in mind that the PMT is aimed for implementation by supervisors, but it can obviously also occur at a higher level. This research is an example of such a case, since all four shifts working the rotation cycle were subjected to the process and implementation was driven by a senior member of the team.

The ferrochrome smelter represents a very complex system. There are various positions, a shift cycle is followed and the PMT also had to cater for employee movement between positions and

between different shifts. By designing the PMT to cover this complex system, it should be able to be rolled out to almost any business environment.

3.2 The PMT methodology

Please find below a list of the proposed steps in establishing the PMT.

3.2.1 Determine performance areas and how they will be measured

The first step in the process is to identify the behaviour you, as a supervisor (or manager), want to improve in your area of responsibility. For the sake of this explanation each behaviour will be denoted as a *Key Result Area* (*KRA*). Preferably, the compliance check must be in a YES/NO format and if this is not possible, you should be able to assign a rating to the KRA.

As an example, let's say you are the manager at a restaurant. Table 3 illustrates an example of KRA's you might compile and how you would assign a value to the performance exhibited. Important to note, a percentage is eventually calculated for each rating. A "*YES*" rating for instance can be transformed to a value of 100% and a "*NO*" rating to 0% or 20%. The PMT does involve numerous calculations and the aim is to have a singular value, known as the *Final Performance Rating* (*FPR*) for each individual for a specific cycle of work.

Table 3: Example of a KRA table

KRA	Measurement	Comment
1. Has the cook turned off the stoves	YES/NO	Good behaviour must increase the performance rating value, Hence a "*YES*" will be transformed to a value of 100%.
2. Have all the dishes been washed and been packed away neatly	YES/NO	Same as above, a "*YES*" would translate to a 100% value.

3. How would you rate the general housekeeping in the kitchen?	1 - 5	This question is a bit more open ended, but allows for some subjectivity and perhaps penalizing the employee for something that wasn't explicitly checked (as a KRA). Value selected divided by 5 can be used to calculate a percentage.

A table like this should be compiled for each position. As an example, there will be a KRA table for the cook, the waiter and perhaps the barman.

It is very important that no two persons are assigned the same KRA (see 2.4.1). In the example above, if both the barman and waiter is responsible for cleaning behind the bar, each will wait to see if the other completes the task. Imagine now the waiter cleans very thoroughly, but the barman also now receives a good rating. That would not be fair towards the waiter who put in the extra effort.

It is also important to not assign conflicting KRA's to different employees. As an example of such KRA's, imagine the conflict that would arise if the waiter is measured on how quickly he can get the food ordered to the table (from the time the order is placed), yet the cook is measured on customer satisfaction with regards to the quality of the food. By defining the KRA's in this manner a point of conflict is immediately created between the waiter and cook. In line with this requirement – the employee must have full control over all KRA's set for him. As an example, the barman cannot be rated for maintenance of stock levels if he is not allowed to place orders. A correct KRA would perhaps have been the timeous notification to the manager of dwindling stock levels.

See Table 4 for an example how the cook's FPR could potentially have been calculated if he had been monitored for one week.

Table 4: Example of FPR calculation

	Daily Score					Calculated Percentages				
KRA	Monday	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday
Have all the stoves been switched off	YES	YES	NO	YES	NO	100%	100%	20%	100%	20%
All dishes washed and packed away neatly	YES	YES	YES	YES	NO	100%	100%	100%	100%	20%
General housekeeping in the Kitchen	3	4	5	5	2	60%	80%	100%	100%	40%
				Daily Average		87%	93%	73%	100%	27%
							Final Performance Rating			76%

It is important to only list the most critical KRA's related to the behaviour you wish to change. The supervisor/manager compiling the KRA's should already have a good idea of what needs to be included in the separate KRA Tables, but it might also be useful to critically look at the various positions again and determine what needs to happen to ensure the probability of incurring negative impacts on the business/department is minimized and a position is assumed to capitalize on opportunities as they arise. Keep in mind that these KRA's need to be communicated to the employees (see 3.2.4.1), where you will need to be able to substantiate the reasons for identifying certain KRA's. If the KRA does not add value to the organization, it should not be included. Lastly, there must be one non-specific KRA on which the employee will be measured. This KRA can be used by the supervisor to reward an employee for behaviours exhibited not specifically measured.

Please do not confuse "*KRA's*" with "*Goals*". As explained in Chapter 2, goal-setting will form the basis of the PMT. The process of goal-setting however, will only occur with the first feedback session and the feedback sessions thereafter. Goals will be set for each KRA and/or the overall performance rating achieved and it will differ from employee to employee based on individual performance.

3.2.2 Determine current baseline performance

Before delving into this step, let's first look at a real-life scenario which happens all too regularly. Following on the illustration used above, KRA Tables have been compiled for each position in the restaurant and performances are being monitored. The cook comes to work on the Monday, but phones the next day with the message he has been booked off sick for the remainder of the week.

Fortunately the barman is a food aficionado and you move him to the kitchen. What happens now to the performance monitoring system? Since the barman worked one day as a barman and the other four days of the week as the cook, surely his final performance rating can simply be calculated by taking a weighted average of his scores – something like the equation below?

$$FPR = X_{Barman}PR_{Barman} + X_{Cook}PR_{Cook}$$

Where:

FPR	Average performance rating for the cycle (%)
X_{Barman}	Days worked as a Barman (fraction of total days in cycle)
PR_{Barman}	Average performance rating when working as Barman (%)
X_{Cook}	Days worked as a Cook (fraction of total days in cycle)
PR_{Cook}	Average performance rating when working as the Cook (%)

Unfortunately it is not as easy as this. The problem with this method lies in the way the KRA's have been specified for each position. The amount of effort required to attain a performance rating of 80% for example will necessarily be different for each position – this is where determining the baseline performance becomes important.

If the supervisor would like to have the ability to compare employees working in different positions and/or allow for employees to work in different positions without affecting the process the baseline performance needs to be determined. Having the average and standard deviation available for each position allows for computing the z-score and accordingly the percentile value. The z-score can be defined as follow, "*a numerical measurement used in statistics of a value's relationship to the mean (average) of a group of values, measured in terms of standard deviations from the mean*" (Hayes, 2019). After determining the z-score, the value can be translated to a percentile value. As an example, should an employee achieve exactly an average rating (say for instance 40%), that value would translate to a z-score of zero, which in turn will translate to a percentile value of 50%.

The weighted average of the percentile values can now be used to calculate a representative percentile value for employees working in multiple areas during one cycle. Please note, that this value will also simply be referred to as the FPR (Final Performance Rating). Hence, in all cases the FPR refers to the final representative score attained by the employee, but might differ in the way it was calculated (either by averaging daily performance ratings, or first converting to z-scores and calculating the average of the percentile values).

Accurately determining the representative baseline performance and standard deviation is of the utmost importance and the method to obtain these values will be dependent on the KRA's identified. If the KRA's are well-known to the employees the baseline performance can be determined without notifying the employees. Alternatively, if KRA's have been identified which have not previously formed part of the employees job description the average performance and standard deviation will be inaccurate, should the employees not be notified of these specific checks in advance. In such an instance the baseline performance can only be determined following the meeting with the employees (refer to 3.2.4). The 1st cycle of ratings should then be used to calculate the baseline average and standard deviation.

These values can obviously be changed at a later stage and should be changed if results obtained are distorted. This will obviously impact on the FPR achieved and accordingly goals which have been set. One option would be to update the average and standard deviation with each rating cycle.

In situations of shift work it is easier to obtain these values, since multiple people are rated against the same criteria so the average score and standard deviation can easily be determined with enough data. In the restaurant example above, the supervisor might consider rotating employees to get a better indication of the average performance rating for a specific area. It is also important to get a realistic indication of performance – the employees should not be aware that their performance is being monitored when determining the baseline performance (where feasible).

3.2.3 Decide on rating and feedback frequency

Up to now, criteria have been established for each position in the organization in the form of a KRA table and the baseline performance determined (provided all KRA's are known to the employees). The next decision that needs to be taken is how often the ratings should take place and by whom. Ideally, to promote fairness in the ratings assigned, multiple persons should be involved in the process. It is advised that an exact time-frame be specified in which the ratings can occur. To elaborate on this point, it will be unfair to rate the performance halfway through the shift.

The type of checks in the KRA table will obviously influence this decision, but overall, the PMT will function easier handling daily/shift tasks (i.e. monitoring tasks at fixed intervals). It is suggested that weekly or monthly tasks be monitored and controlled separately. Including them will complicate the calculations severely without gaining a significant amount of valuable information.

3.2.4 Meeting with employees to communicate intent to measure

Once the KRA tables, as described above, have been compiled and a method has been established to keep track of daily ratings (either paper-based or electronic) a meeting can be scheduled with the employees with the aim of communicating the intended implementation of the PMT. The ideal situation is where the message can be delivered in such a way as to garner buy-in from the employees, but it is not a pre-requisite. The format as discussed below is only a suggestion and can be altered to fit to the specific needs of the organization.

3.2.4.1 Explain the problems experienced

Explain to the employees the problems being experienced and why there is a drive to change certain behaviours. If they can understand how their behaviour is affecting the organization they can also be made to understand how it can eventually affect them if allowed to continue unchecked.

3.2.4.2 Provide an overview of the process

After the need for change has been explained, an overview can be given of how the process will work (refer to Figure 2-1: Performance management tool process). Focus should be on the fact that accountability will be transferred to the individual. Each person will have a list of tasks he will be responsible for and it will be checked every day/shift by the supervisor and a rating assigned to reflect the performance.

3.2.4.3 Provide detailed explanation of each KRA table

Once an overview of the process has been provided, the KRA table for each position can be discussed in detail. The employees should know exactly what is being checked and what the expected standard is. At this stage there will likely be a lot of questions and it is up to the manager/supervisor whether he will allow discussion of individual tasks and the possibility of changing them. Keep in mind that when changes are made to the KRA tables the pre-determined baselines will no longer be accurate. In such a case the same process will be followed as when unknown KRA's are introduced. Performance will be monitored for the 1st cycle, which will serve as the baseline performance when calculating the FPR.

3.2.4.4 Rating- and feedback interval

Once every employee took cognisance of what tasks need to be completed, the supervisor/manager should inform them how regularly they will be rated and how often they will be provided with feedback on performance achieved. This is entirely up to the supervisor/manager and can obviously be changed at a later stage.

3.2.4.5 What happens with the ratings (put employees at ease)

This is a critical part of the communication and should receive the necessary attention – it is after all human nature to fear the unknown. Some of the points that can be discussed (not all will be valid for all situations):

- Focus on the fact that the employees have been monitored for a certain period already, without their knowledge, and nobody received any formal disciplinary action against them. People like to be reassured that the PMT will not be used as a "*sjambok*" (Afrikaans word for whip).
- Explain the steps that were taken to make the process as fair as possible (multiple raters, specific checks, face-to-face feedback etc.)
- The ratings achieved will be kept confidential between the manager/supervisor and the employee. If someone becomes aware of someone else's performance, it is because that person himself disclosed the information.
- One of the main aims of the PMT is to identify talented hard working individuals, with the aim of actively developing them (as an example). The employees must see it as an opportunity. Also stress the fact that senior managers will occasionally sit in on feedback sessions.

3.2.5 Continue with ratings and feedback

The only task left is to roll out the PMT and ensure the checks are being completed. At the prescribed time the face-to-face feedback sessions must take place. As mentioned earlier, this will be a very uncomfortable situation for both the employee and the supervisor at first, especially if the performance was below the expected standard. The supervisor should focus on making the distinction between the employee and the actions. The aim of the PMT is to address the unwanted actions. In instances where the supervisor needs to report on the performance of his people, it's very important that the management team he is reporting to do not hold him personally responsible for cases of poor performance. Once this starts happening, the supervisor will obviously be motivated to unfairly inflate ratings, compromising the entire process.

What the supervisor should do in cases of poor performance, is to go through the information logged and determine where the employee scored lower than expected. This can be identified as an area for improvement for the next cycle. It is highly advised that a senior member of the organization be present in the first feedback sessions to give training to the supervisors.

It is up to the management of the organization how they would like to proceed with the data gathered, since the last step in the PMT cycle is Consequence management. Certain rules can be put in place to ensure poor/good performances consistently yield the same results. Please see Table 5 for an example what these rules may look like.

Table 5: Example guideline to consequence management

	Description of performance level	Suggested action to be taken
3rd Instance	3-cycle Moving Average FPR more than 80%	Manager present in Feedback session - formally inducted in F5&6 Development Group
2nd Instance	3-cycle Moving Average FPR more than 80%	Random gift from Manager to thank employee
1st Instance	3-cycle Moving Average FPR more than 80%	Letter/Certificate from Manager to thank employee for exemplary performance
	3-cycle Moving Average FPR more than 40% and less than 80%	Continue with feedback sessions aiming for higher performance
1st Offence	3-cycle Moving Average FPR less than 40%	1st Written Counselling
2nd Offence	3-cycle Moving Average FPR less than 40%	Disciplinary Hearing
3rd Offence	3-cycle Moving Average FPR less than 40%	Disciplinary Hearing
Moving average cycle resets whenever action was taken as prescribed above.		

Please also take note, even though the aim of the PMT is not to be used as a method to punish ("*sjambok*"), consistent poor performance cannot be tolerated. In such a case PMT results can and should be used as evidence when formally addressing poor behaviour (typically through a formal disciplinary inquiry). Recall that not adequately addressing poor performance may in actual fact lead to a decrease in employee motivation (see 2.3).

The last step in the process is to allow the employee to set a goal for the next cycle. This might seem like something small, but can yield great dividends in terms of goal commitment. The supervisor should assist the employee in this step. Goal-setting as a motivational theory is based on achieving goals. So it is very important that the employee experience all the feelings associated with reaching a goal, which is only possible if the goals set are difficult, yet achievable. Once a FPR goal has been reached, the goal should be increased ever so slightly.

For non-shift work implementing the PMT is a simple process, but with shift work the PMT can quickly become overladen with information. In the next section an example will be given of the

forms and Excel programme used to generate employee reports with the least amount of effort. They were developed for the ferrochrome smelter in particular (discussed in Chapter 4), but can be adjusted with little effort to suit various other scenarios. Due to the simplicity of the paper-based process it will not be elaborated upon.

3.3 Practical implementation (electronic based rating system)

In order to assist explaining the forms and Excel programme used to process the data, consider the scenario of the experiment conducted in Chapter 4 – PMT implementation at a Ferrochrome Smelter. A more detailed overview of the process will now be given with specific reference to the different employees conducting the various tasks (i.e. task allocation to the various positions). This will be followed by a compilation of KRA tables for each position, before moving on to the forms and Excel programme.

At this plant work is conducted 24 hours a day, in the form of three eight-hour shifts daily. Each shift there will be approximately 12 employees being monitored and there is also a requirement that multiple raters assign performance ratings to enhance the perception of fairness. Let's assume there are 8 ratings being done per shift (refer to Table 8) and one cycle consists of 7 days (21 shifts). That would theoretically mean a dataset with 2,016 entries be generated across the four shifts, which needs to be processed and allocated to the correct individuals (12 x 21 X 8 = 2,016). This is way too much information to process manually and clearly illustrates the requirement to automate the processing function of the PMT. The explanation below elaborates on a method to achieve this automation.

3.3.1 Process description

The two areas that were considered can broadly be defined as the "*Casting Bay*" and the "*Mechanical Breakfloor*". As the name suggests, the Casting Bay (Figure 3-1Figure 3-1) is where the tapping operation takes place. Two taps are made per furnace per shift and involves all the preparations required to tap (cleaning in front of the taphole, removing old runners, preparation of the separation point etc.), drilling of the tap hole, lancing the taphole with oxygen to ensure

ample drainage and finally closing the taphole again by pushing a carbon based paste into the hole (which hardens when exposed to heat) using a "*mudgun*". Please also recall that there are two furnaces per department. That means there are two Casting Bay areas and two Mechanical Breakfloor areas, each with its own team.

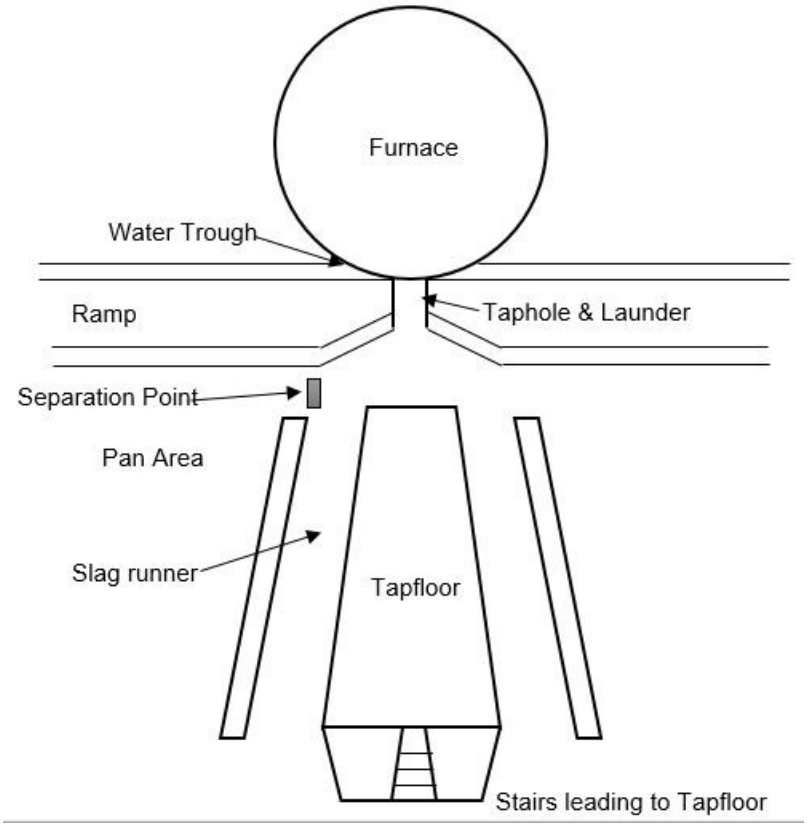

Figure 3-1: Casting bay layout

After allowing sufficient time, the tapped metal is removed from the pan area to the metal cool-down area on the Mechanical Breakfloor (Figure 3-2). Here the metal is cooled (either with water or air) further before being loaded into the intake hoppers, where a hydraulic hammer is used to break the metal through a grizzly with 300mm x 300mm square openings. This is the first sizing step the product undergoes. From here the metal is conveyed to the picking station where slag contaminations are removed.

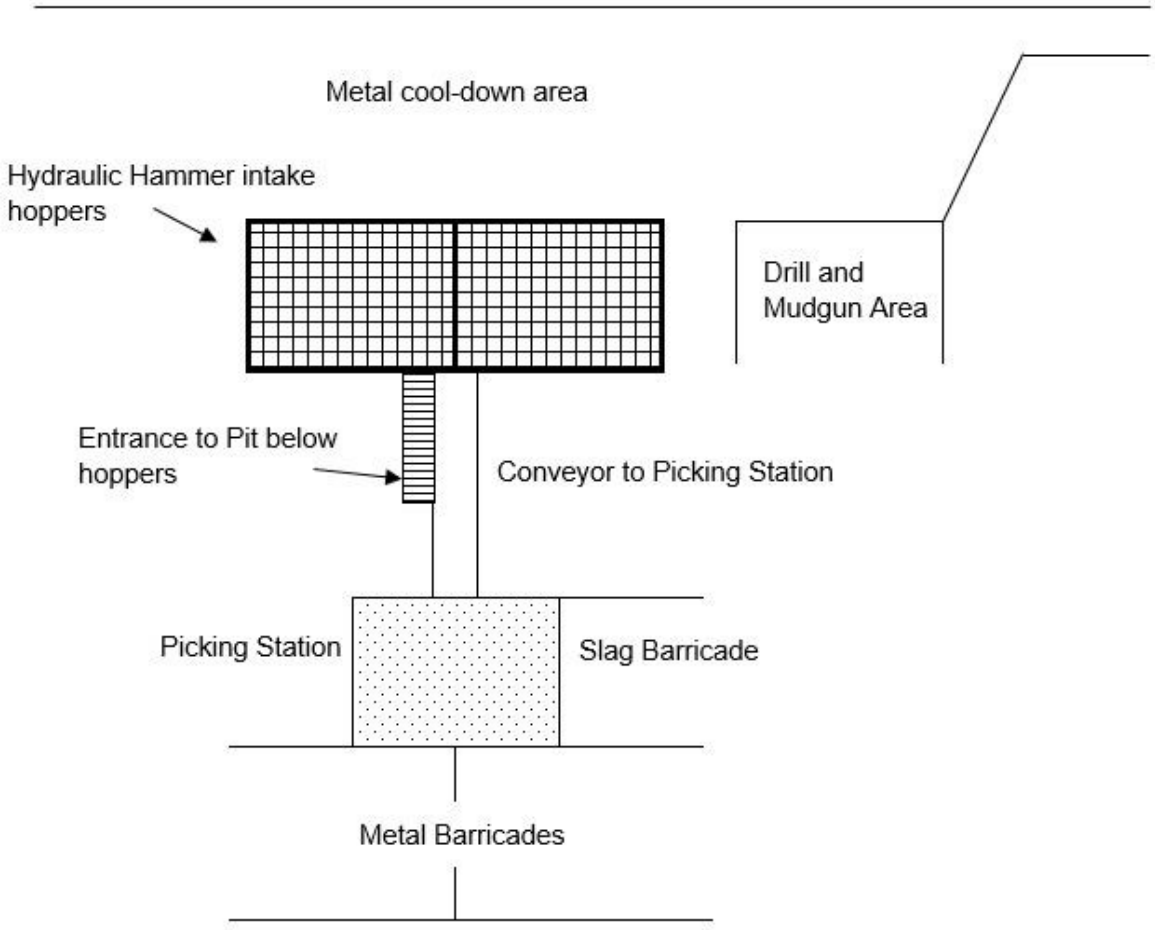

Figure 3-2: Mechanical breakfloor layout

3.3.2 Task allocation per position (compilation of KRA tables)

As described in 3.2.1, the performance areas need to be determined in the form of a KRA table for each employee position. In the Casting Bay the employees work in four different positions to complete all the required work. Please find below a description of the tasks each position is responsible for (this is for one of the furnaces, there is an identical structure for the other furnace). The Tapper Assistant, Chill Operator and Mudgun Operator form the “Tapping Team” as referred to in the organogram of the department (see Figure 1-1).

1. Tapper:
    a. Responsible to cool the area in front of the launder with a water cannon
    b. Supervises internal transport contractor when cleaning in front of the launder
    c. Cleans launder and removes any metal/slag build-ups
    d. Prepares launder for tap by lining out with silica sand
    e. Ensure furnace is drilled correctly
    f. Responsible for lancing the taphole on the correct height if the taphole didn't open with drilling
    g. Ensures maximum effort is put in to drain the furnace properly
    h. Responsible for closing the taphole with the mudgun
    i. Responsible for housekeeping on the tapfloor
    j. Responsible for various safety related aspects on the tapfloor, such as ensuring the oxygen flow control valve is locked out when not in use, availability of electrode paste blocks (for safely igniting oxygen lance), correct working of safety shower, correct working of water cannons, condition of oxygen hoses and couplings etc.
    k. Responsible for replacing used oxygen lance tubes on the Tapfloor
2. Tapper Assistant:
    a. Assists Tapper by controlling oxygen flowrate to lance
    b. Responsible for conducting housekeeping at the stairs leading to the Tapfloor
    c. Responsible for removing all half-burnt lances from in front of the taphole
    d. Responsible for removing all foreign objects (pieces of steel, half-burnt lances, cement etc.) from slag runners

3. Chill Operator:
    a. Responsible for building the separation point using a carbon skimmer block and silica sand
    b. Responsible for building the runner from the launder to the separation point

c. Responsible for the efficient separation of liquid metal and slag during the tapping process
d. Responsible for housekeeping at the ramp area, as well as the cement slabs between the runner walls and the furnace
e. Responsible for cleaning the water trough around the furnace

4. Mudgun Operator:
    a. Responsible for mudgun maintenance (cleaning, unblocking nozzles etc.)
    b. Responsible for cooling the mudgun directly after use and refilling with mudgun paste
    c. Responsible for housekeeping in the mudgun/drill area (emptying dust bins and removing all mudgun paste packaging material)
    d. Ensuring the spare mudguns and drills are in a working condition
    e. Ensuring all mudguns and drills are locked out when not in use to prevent unauthorized usage
    f. Ensuring there is enough mudgun paste at the end of the shift for the next shift

On the Mechanical Breakfloor the employees work in two different positions to complete all the required work. Please find below a description of the tasks each position is responsible for (this is for one of the furnaces, there is an identical structure for the other furnace).

1. Pingon Driver:
    a. Liaises with internal transport contractor to load intake hoppers with large pieces of metal once cooled sufficiently
    b. Must ensure at least one of the hoppers are loaded at the end of the shift
    c. Break large pieces of metal through the grizzly using a hydraulic hammer
    d. Responsible for ensuring that no water damming takes place on the Mechanical Breakfloor by keeping area between intake hopper and mudgun area clear of material spillages

e. Responsible for housekeeping in the *"pit*" – refers to the area below the intake hoppers

2. Metal Cleaner:
    a. Must ensure a clean product is sent to the services department by hand-picking all contaminations
    b. Responsible for housekeeping at the picking station
    c. Housekeeping at the metal barricades – no metal may be outside the barricades at the end of the shift

A KRA Table can now be compiled for each of the six positions above. All the checks have been consolidated into one representative KRA table for the Casting Bay positions (Table 6) and Mechanical Breakfloor positions (Table 7) respectively. Please note that there is not a corresponding check for each responsibility listed. An inherent requirement is that the rater must be able to complete the check (assign the rating) at the end of the shift by simply observing a condition. Hence a responsibility/task such as "*must ensure a clean product is sent to the services department by hand-picking all contaminations*" won't be included in the KRA table, because it cannot be observed at the end of the shift (metal is transported to the services department throughout the shift).

With the KRA tables compiled for the six positions, the electronic forms can now be generated which will be used at the end/start of each shift to log performance data.

Table 6: Consolidated KRA table for casting bay employees

Position	KRA	Rating	Anchors for a rating of (1)/NO. A rating of (5) or YES will be the exact opposite conditions.
Tapper	Housekeeping on the tapfloor	1-5	1 – Litter on tapfloor, slag chips, mudgun paste, pipes not rolled up, lance tubes not in cradles etc.
	Tapfloor safety	1-5	1 – Safety shower not working, oxygen box unlocked, no electrode paste, standing water, cannons not working, foot actuators not working, lance holder assembly poor condition.
	One spare bundle of lance tubes on the tapfloor	Yes/No	NO – low stock level of lance tubes on the tapfloor.
	General impression of tapfloor and furnace drainage	1-5	1 – Overall poor impression of the area. Clear that not enough effort was put in to draining the furnace.
Tapper Assistant	Lance tubes in front of taphole and/or in runners	1-5	1 – Lance tubes and/or drill rods in runners and in front of taphole
	Cleanliness of area below stairs	1-5	1 – Litter and material spillages present
	General impression of runners and pan area	1-5	1 – Overall poor impression. Poor housekeeping and foreign objects in runners.
Chill Operator	Separation quality	1-5	1 – By-pass tap and/or slag to metal pan
	Housekeeping of ramps, cement slabs and trough	1-5	1 – Ramps not cleaned, litter present, cement slab not swept, water pooling, build-ups below launder/arch.
	General impression of the ramps and cement slabs	1-5	1 – Overall poor impression of the ramps, cement slab and trough. Evidence of metal down slag runner or slag into metal pan.
Mudgun Operator	Mudgun area housekeeping	1-5	1 – Mudgun paste, tools, litter, equipment etc. laying around
	Nozzles unblocked and mudguns cleaned	1-5	1 – All nozzles blocked (or burnt), mudguns not cleaned
	Drills/Mudguns locked out	Yes/No	NO – if even one drill or mudgun not locked out. Critical safety check
	General impression of mudgun area	1-5	1 – Overall poor impression of the drill/mudgun area and/or poor condition of equipment.

Table 7: Consolidated KRA table for mechanical breakfloor employees

Position	KRA	Rating	Anchors for a rating of (1)/NO. A rating of (5) or YES will be the exact opposite conditions.
Pingon Driver	Intake hopper loaded	Yes/No	NO – Neither intake hopper loaded before shift change.
	Housekeeping between intake hopper and mudgun area wall	1-5	1 – Spillages present preventing water flow.
	Housekeeping in the pit	1-5	1 –Excessive spillages preventing water flow.
	Visible litter at the Breakfloor	Yes/No	NO – No visible litter at Mechanical Breakfloor area.
	General impression of Mechanical Breakfloor area	1-5	1 – Overall poor impression of Mechanical Breakfloor. Spillages, poor housekeeping, litter present, hoppers not loaded etc.
Metal Cleaner	Are there spillages outside Metal Barricades	1-5	1 – No evidence of cleaning outside barricades.
	Picking station housekeeping	1-5	1 – No housekeeping done, various spillages present.
	Visible litter at Picking station	Yes/No	NO – No visible litter at Picking station.
	General impression of Picking station area	1-5	1 – Overall poor impression of Picking station area. Metal not looked after, housekeeping poor.

3.3.3 Example of electronic forms

Recall Objective 1 of this research, "*Determine the characterizing attributes of such a system. Specifically, what requirements need to be met in order to enhance the probability of not only improving subordinate performance, but also to ensure the PMT is 'user-friendly' and easily implemented in a sustainable manner."* Using electronic forms instead of paper forms assists in complying with the last requirement – making the PMT easy to use and maintain, increasing the probability of long term sustainable usage. Using electronic forms have the following distinct advantages:

1. Because there is no paperwork involved it means there is no printing required, there is no physical handling required and also no filing after the information has been logged.
2. Logging the information electronically ensures the data is readily available, speeding up subsequent processing steps (data-entry step is no longer required).
3. Because the data is readily available for processing, it is not necessary to complete a form for each position (please see Table 4 as an example). One form can now be completed covering all the checks in a specific area. To elaborate on this point, it won't be necessary for the person rating the performance to complete six forms, as one would expect for the six positions listed in 3.3.2. The person will only need to complete two forms per furnace, one for the Casting Bay and one for the Mechanical Breakfloor. This could have been even combined into one form, but because different supervisors are responsible for the areas it was decided to keep it separate. Having the data available electronically allows for automatic allocation to the correct position.

The ideal situation is to run the data acquisition software (i.e. the electronic forms) from a mobile platform – either a tablet or a cell phone. The added advantage of this method is that the capability exists for wireless, real-time data transfer from the field. For the case study, Google Forms were used. Obviously, if the organization has the capabilities of compiling their own software, that will be a preferred option, because it allows for a greater degree of customization. The advantage of using Google Forms is that one rarely encounters compatibility issues – it executes correctly on

most devices and mobile operating platforms. It is also a very simple process to create the forms and download the responses. The supervisors were also assisted in creating the four shortcuts to access the relevant forms from their "*home screen*". Please see Figure 3-3 and Figure 3-4 for an example of the shortcuts and a screenshot of what the forms looked like. For illustration purposes, a dummy form has also been created which can be accessed at the following address: https://goo.gl/forms/fLliZpkV85JzLtE12

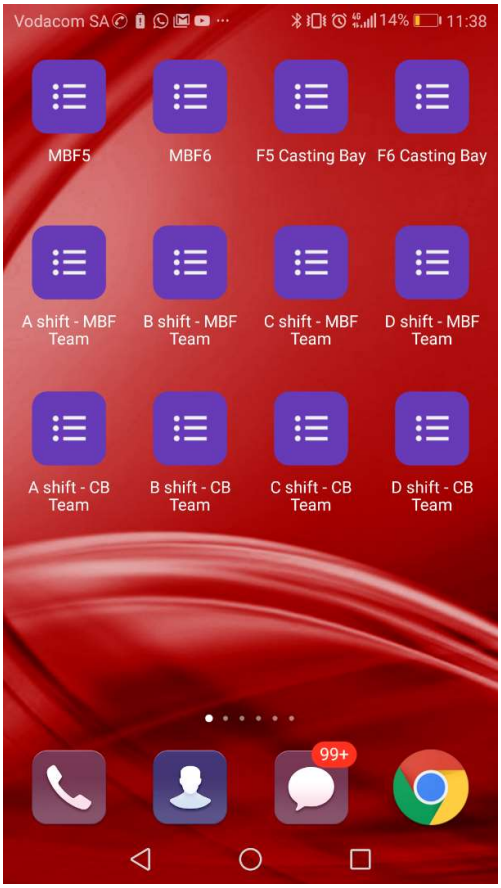

Figure 3-3: Example of home screen with shortcuts

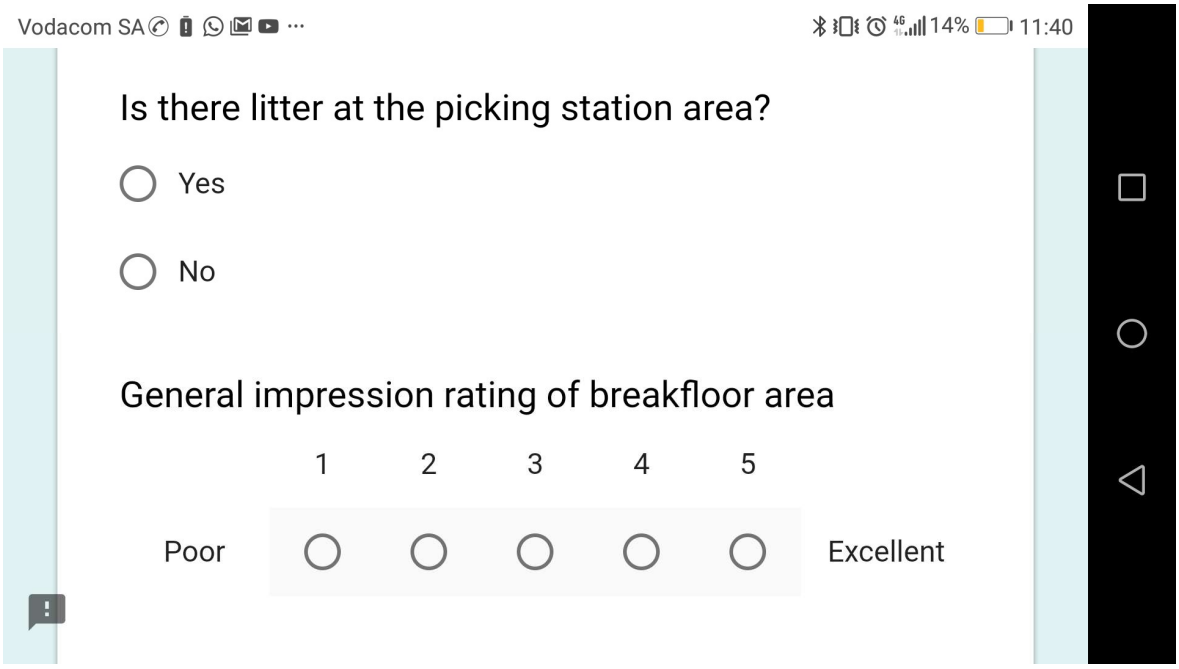

Figure 3-4: Example of the electronic form

Referring to Figure 3-3, the four forms which have been discussed so far are displayed in the top row – two forms (Casting Bay and Mechanical Breakfloor) for each of the two furnaces.

In order to process the ratings, the information regarding which employees worked where also needs to be logged – that is the purpose of the remaining eight forms in Figure 3-3. For each of the four shifts there are two roll-call forms, one for the employees who worked in the Casting Bay and one for the employees who worked at the Mechanical Breakfloor. As an example, when B-shift PC does a pre-shift inspection (i.e. completes the four forms in the top row), the programme should be able to assign the correct ratings to the correct employees by using the information the A-shift supervisors logged. Please see Table 8 for a summary of who will be responsible for completing the various forms. These forms are completed on an ongoing basis as determined by the inspection frequency (see 3.2.3) – in this case at the start and end of each shift. At the end of the rating cycle (in this case 7 days for a particular shift), all the relevant data are downloaded from the Google server and copied into an Excel Workbook that contains the programme to process the data.

Table 8: Summary of electronic forms and responsibility to complete

		MBF5	MBF6	F5 Casting Bay	F6 Casting Bay	A shift – MBF Team	B shift – MBF Team	C shift – MBF Team	D shift – MBF Team	A shift – CB Team	B shift – CB Team	C shift – CB Team	D shift – CB Team
Day-shift Personnel		X	X	X	X								
A-shift	PC	X	X	X	X								
	CBS			X	X					X			
	MBS	X	X			X							
B-shift	PC	X	X	X	X								
	CBS			X	X						X		
	MBS	X	X				X						
C-shift	PC	X	X	X	X								
	CBS			X	X							X	
	MBS	X	X					X					
D-shift	PC	X	X	X	X								
	CBS			X	X								X
	MBS	X	X						X				

The algorithm to process the data will be briefly discussed below. Understanding the algorithm should allow the user to modify the code to suit his own, unique situation.

3.3.4 Excel programme to process data

The aim of the programme is to receive a company number as input (unique number representing each employee in the organization) and generate a report containing all the individual inspections conducted for that employee in the various areas, as well as the final performance rating (FPR) for that specific inspection cycle. The programme is able to achieve this function by executing the following three processes. Each will be discussed separately:

1. Using individual timestamps from the inspections conducted, the entries are amended with the relevant employees that worked in the respective positions by using logged roll-call information.
2. Using the baseline performance (average rating and standard deviation per position), the FPR for each employee can be determined (see 3.2.2).
3. The company number is received as input and *VBA* (*Visual Basic for Applications*) code will be used to extract all inspections conducted in the various areas, as well as compile a breakdown of the FPR achieved.

3.3.4.1 Raw data amended with company numbers

Please see Figure 3-5 as an example of a raw data entry created when one of the supervisors conducted an inspection using the F5 Casting Bay form. The way the Google form has been compiled (based on the relevant KRA table) will have a direct effect on the structure of the entry.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Timestamp	Mudgun area housekeeping	All nozzles unblocked and mudguns cleaned	Is the drill and mudgun locked out?	Are there lance tubes in the runners and/or in front of taphole	Separation quality	Housekeeping of ramps, cement slabs and trough	Housekeeping on the tapfloor	Tapfloor safety	One spare bundle of lance tubes on the tapfloor?	Cleanliness of area below stairs to tapfloor	General impression of the mudgun area (Mudgun Operator)	General impression of the ramps and cement slabs (Chill Operator)	General impression of the runners and pan area (Tapper Assistant)	General impression of tapfloor and furnace drainage (Tapper)	Rater	Comments on Mudgun area (optional)	Comments on Ramps and Cement slabs (optional)	Comments on Runners and Pan area (optional)	Comments on Tapfloor and furnace drainage (optional)
2	2018/09/08 6:57:47 am EET	5	5	Yes	5	5	5	5	5	Yes	5	4	4	4	4	Shadrack Mothlamme				

Figure 3-5: Example of a raw data entry

The timestamp value is now first used to look up which shift was being rated. The relevant shift will then determine which roll-call data to refer to when looking up which employees were working at the time of the rating. The raw data is then amended with both the shift value, as well as the

employees working in the relevant positions. The final data processing that takes place during this first phase of the programme is to transform the individual ratings to percentage values and calculating the average percentage for each employee. Increased performance should lead to an increase in the average percentage value (refer to Table 4: Example of FPR calculation). Figure 3-6 illustrates the corresponding processed entry (some of the first checks have been omitted for display purposes). Coloured cells illustrate how one entry is used to assign FPR's to more than one employee.

18	Timestamp (time format)	Shift	Housekeeping on the tapfloor	Tapfloor safety	One spare bundle of lance tubes on the tapfloor?	Cleanliness of area below stairs to tapfloor	General impression of the mudgun area (Mudgun Operator)	General impression of the ramps and cement slabs (Chill Operator)	General impression of the runners and pan area (Tapper Assistant)	General impression of tapfloor and furnace drainage (Tapper)	Rater	Tapper Score	Tapper Assistant	Chill Operator	Mudgun Operator	Tapper	Tapper Assistant	Chill Operator	Mudgun Operator
96	9/8/2018 6:57	D	1	1	1	1	0.8	0.8	0.8	0.8	Shadrack Mothlamme	0.95	0.93333	0.93333	0.95	40967	40634	33483	35165

Figure 3-6: Example of a processed entry

The same process as explained above was used to transform the data from all four inspection forms (for a specific period).

3.3.4.2 Determining FPR for each employee

Using various lookup functions on the four processed inspection sheets, a table can now be compiled (see Table 9) containing for each employee the average rating when working a specific position.

Table 9: Example of an average rating table

Average	STDEV	Position	13784	40345	39888	39886	32863	13801	40703	40692	34707
78.2%	10.3%	MBF5 Pingon Driver									
82.8%	9.9%	MBF5 Metal Cleaner									
83.0%	8.7%	CB5 Tapper	86.6%								
78.3%	9.1%	CB5 Tapper Ass		85.6%		79.3%	75.0%				
79.9%	7.1%	CB5 Chill Operator		84.7%		73.3%					
86.8%	9.0%	CB5 Mudgun Operator		90.0%	88.8%	95.0%		97.5%		100.0%	
78.2%	10.3%	MBF6 Pingon Driver									
82.8%	9.9%	MBF6 Metal Cleaner									
83.0%	8.7%	CB6 Tapper							91.5%		84.7%
78.3%	9.1%	CB6 Tapper Ass			78.3%	72.6%	74.3%		95.0%	78.3%	80.9%
79.9%	7.1%	CB6 Chill Operator			80.7%				78.1%	84.6%	80.0%
86.8%	9.0%	CB6 Mudgun Operator			91.9%	100.0%		91.7%		100.0%	92.5%

Using the established position average and standard deviation values, the z-score can now be determined and accordingly the percentile value for each employee when working in a certain position. Following this, a count-step is completed where the amount of ratings an employee received working in each position is determined. This information is then used to determine weights to be used when calculating the final performance rating. See Table 10 as an example of the final processed table.

Table 10: Example of weighted percentile values table

	Position	13784	40345	39888	39886	32863	13801	40703	40692	34707
Weighted percentile values	MBF5 Pingon Driver									
	MBF5 Metal Cleaner									
	CB5 Tapper	66.0%								
	CB5 Tapper Ass		39.4%		20.4%	10.3%				
	CB5 Chill Operator		33.3%		2.2%					
	CB5 Mudgun Operator		3.6%	15.6%	10.2%		35.3%		1.7%	
	MBF6 Pingon Driver									
	MBF6 Metal Cleaner									
	CB6 Tapper							60.7%		22.2%
	CB6 Tapper Ass			6.7%	7.8%	23.8%		5.9%	21.9%	30.1%
	CB6 Chill Operator			18.0%				8.4%	39.2%	4.3%
	CB6 Mudgun Operator			19.0%	7.7%		42.4%		1.7%	3.1%
		66.0%	76.2%	59.4%	48.4%	34.1%	77.7%	75.0%	64.5%	59.7%

3.3.4.3 Data extraction

One of the key requirements of the PMT is to provide feedback to the individual employees (refer to 2.4.3). Having the information available in the form as illustrated in Table 10 will not suffice. From the same figure, as an example, employee 32863 will undoubtedly want to know why he received such a low FPR. That would entail navigating in the Excel Workbook to the F5 and F6

Casting Bay Processed worksheets and scrolling through all the entries to locate the inspections where the particular employee was working as a Tapper Assistant. After locating these entries, the individual checks need to be inspected to find the problem areas where he scored lower than expected. Not only will this process be very time consuming, but ideally you would want to provide the employee with a copy of his report.

For this reason a button was added to an empty worksheet (see Figure 3-7) with a company number input cell, allowing for execution of the VBA code as per Appendix A. The macro will simply go through each of the processed inspection sheets and search through all the entries, copying all relevant occurrences to the report. The final step of the macro is to go to the various tables explained in 3.3.4.2 and extracting the relevant columns. Please see Appendix B for an example of the report generated.

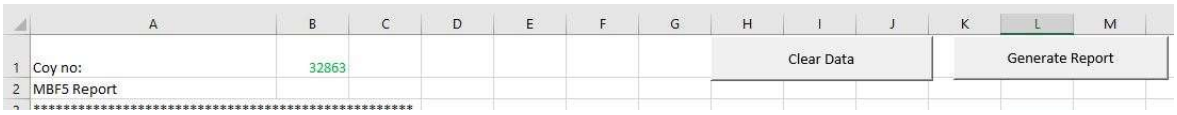

Figure 3-7: Report generating interface

3.4 Verification of PMT methodology

The aim of this section is to revisit the PMT core-requirements identified (Table 2) and confirm how these requirements were met by the methodology as outlined in this chapter. It also provides the supervisor/manager with a useful summary of the core-requirements and which sections in Chapter 3 addresses the requirement. The methodology as explained in this chapter is not set in stone and the supervisor/manager can and should change certain steps to better comply with certain requirements he might deem more important than others.

Table 11: PMT methodology - verification of core-requirements met

Goal-setting	Performance Monitoring	Feedback	Performance Consequence Management	Goal Commitment
(a) Goal-setting theory will form the basis/foundation of the PMT - 3.2.1, 3.2.5	(e) Performance must be measureable - 3.2.1	(m) Feedback must be constructive in nature - 3.2.5	(r) Move from extrinsic to intrinsic motivation - 3.2.5	(s) Create a supportive environment void of threats or intimidation - 3.2.5
(b) One person responsible for one goal - 3.2.1	(g) Include at least one subjective score as well, to prevent employees focussing only on measured performance areas - 3.2.1	(n) Attempt to establish a feedback culture by providing regular feedback - 3.2.5		(t) Achieving certain goals must lead to valued results - 3.2.5
(c) Goals will be set which are specific, difficult, yet achievable - 3.2.5	(i) Employee monitoring must not be extensive - 3.2.1	(o) Face-to-face communication to be used to provide feedback - 3.2.5		
(d) Goals will be set participatively - 3.2.5	(j) Remove subjectivity from ratings as far as possible - 3.2.1	(p) Involvement of a legitimate figure of authority - 3.2.5		
(f) Goals set must be relevant - 3.2.1	(k) Promote accurate ratings by not holding supervisors accountable for poor ratings - 3.2.5	(q) No form of social comparison allowed - 3.2.4.5		
(h) Employees must have control over the ability to achieve a set goal - 3.2.1	(l) Promote accurate ratings by using a multi-rater system - 3.2.3			

3.5 Chapter 3 conclusion

A step-by-step guide explaining the PMT methodology was presented employing a simple restaurant example. It was shown how implementing the PMT in a typical work environment (i.e. no employee movement or rotation cycles) can be achieved with relative ease, relying on printed forms as primary method of data logging. Electronic data logging and processing were also discussed using the ferrochrome smelter as an example. Finally, the PMT requirements were revisited to confirm all of them have been adequately addressed.

In Chapter 4 the experiment that was conducted to complete Objectives 3&4 (see 1.4) will be elaborated upon. In summary, the experiment had to accurately test whether implementation of the PMT lead to increased employee performance at the ferrochrome smelter and whether it was deemed sustainable.

4 EXPERIMENTAL DESIGN

4.1 Purpose and chapter outline

In the preceding chapters a literature survey was conducted to determine, theoretically, what requirements the PMT would have to meet to not only enhance employee performance, but to do so sustainably. These requirements were referred to as the "*core-requirements*" of the PMT and a summary of them can be found in 3.4. Following the theoretical determination of core-requirements, the PMT was developed as a deliverable in Chapter 3 and a verification step was conducted to ensure all design requirements have been addressed.

The question that needs to be answered is whether the design requirements have been identified correctly. In other words, does the PMT do what it is supposed to do? The aim of this chapter then, is to communicate the experimental method which was used to test whether the PMT complies with the objectives which have been set for it (refer to 1.4):

A. Following implementation, there must be an improvement in employee performance.
B. The second requirement was sustainability of the PMT as a whole. Using the PMT shouldn't be seen as a tedious task and to achieve that, it had to be as simple and user-friendly as possible.

The investigation conducted to test these two requirements consisted of two phases. The first phase involved actual PMT implementation at a ferrochrome smelter to test whether it improved employee performance and the second phase consisted of anonymous surveys to determine the opinion of the end-users (both employees and supervisors) to assist in determining whether the PMT would be sustainable in the longer term.

4.2 PMT implementation at a ferrochrome smelter

4.2.1 Experimental phase overview

As mentioned above, the primary aim of this step was to determine whether PMT implementation would lead to improved performance. In order to determine this, the department performance pre-implementation had to be determined and compared to the post-implementation performance.

According to the PMT methodology presented, the supervisor can either determine the baseline performance without notifying the employees in the case where the KRA's are well established, or alternatively the employees need to be informed in advance when new KRA's have been introduced. Since the focus of this experiment was to determine whether PMT implementation lead to improved performance, well established KRA's were used (see Table 6 and Table 7) and the employees subsequently not informed in advance.

The first step involved developing the electronic forms and data processing file as explained in 3.3.3 and 3.3.4. The next step was to meet with all the shift supervisors and PC's. In this meeting the following topics were discussed:

1. The concern regarding the poor performance and the fact that employees at the lowest level are not being held accountable for their lack of effort.
2. They were given an overview of the PMT methodology and the fact stressed that the implementation would only be a test. It was highlighted that one of the main advantages of the PMT (should it be implemented on a permanent basis) would be that management would be able to identify hard-working individuals who would then be selected to enter into a special development programme, so all effort had to go into properly testing the PMT. This was done to garner buy-in from the supervisors and PC's.
3. The electronic forms were shown to them, as well as how and when it should be completed.
4. To ensure the accuracy of the baseline performance rating the importance of keeping the ratings a secret was stressed to prevent the employees from altering current effort levels.

5. As per requirement, it was made very clear to the supervisors and PC's that they would not be held accountable for low scoring subordinates. Neither would disciplinary action be taken against poor performing individuals during the experimental phase.
6. The importance of being impartial when assigning ratings was also stressed. When completing the electronic forms, they had to select their names on the form and they were told that abnormally high or low ratings would easily be detected.
7. Lastly, it was explained that KRA ratings should be assigned based on what is observed at the time of the inspection and not be based on perceived effort levels – the general impression rating can be used to factor this in. This is an important aspect, since it allows the ratings being assigned to be reviewed and tested for any biases. Ultimately, high effort levels should lead to observable results that will translate to higher KRA ratings, so in the case where there were significant process disturbances, the employees who put in the most effort should come off the best (although FPR's for that specific cycle might likely be slightly less).

The fact that it was communicated to the PC's, supervisors and later to the employees that no form of disciplinary action would follow poor performances might seem odd, since consequence management is the 4th phase of the PMT (and accordingly very important for maintaining goal commitment and enhancing motivation) and one would expect that the experiment followed exactly the steps outlined in Chapter 3, there was a simple reason for this omission - to keep the Trade Unions uninvolved. If the employees felt threatened they would have undoubtedly involved the Union, which would have made it extremely difficult to conduct the experiment. So even though the experiment conducted was a watered down version of the PMT, it would still show, in the very least, what difference goal-setting, performance monitoring and feedback would make to the overall performance.

Following these meetings the supervisors and PC's started completing the forms. This allowed them to get familiar with both the PMT and electronic forms, as well as allow them to provide some initial feedback. A suggestion was made to have the functionality to also add comments for

each section in the plant. Reason being, that it would make it easier giving feedback to substantiate below average ratings (be it the case). All the forms were subsequently updated.

Another problem during this initial PMT testing phase were the roll call forms. At the time of testing and establishing the baseline performance there were a number of vacancies within the department with labour brokers being used to fill those positions. Their names were not included as selectable options in the electronic forms. This caused a lot of confusion with the supervisors and they were told to not submit the roll call forms, but only complete the KRA rating forms. Accordingly, a baseline performance could not be established on an employee basis, but only on a position basis (for a summary of positions refer to 3.3.2).

To prevent such an occurrence during the actual monitoring phase, a comments section was added to every roll call form to enter the details of a person who worked in a certain area, but who was not a full-time employee. This ensured the raw data entry could be correctly edited.

After an extended period of establishing the baseline performance (5 June 2018 – 12 July 2018), shift meetings were held following a very similar structure as explained in 3.2.4. Thereafter monitoring continued with the only difference being the employees were now aware of the fact that they were being monitored.

After the 1st cycle the data were downloaded and processed. Individual feedback reports were printed for each individual employee. The author handled the first three feedback sessions of each shift in order to illustrate to the supervisors how to handle the situation. To improve the training one of the three individuals were a high performer, the second average and the last person the worst performing individual on shift. The supervisors were then asked to conduct a feedback session in order for the author to assess whether they were up to the task. This was a necessity, since the amount of employees who had to receive feedback was simply too much to handle alone (in total 48 employees were subjected to the PMT).

The remainder of the feedback sessions the supervisors and PC's conducted themselves (including the feedback sessions following the 2nd cycle of performance ratings). To ensure that

the PC's gave feedback to all the relevant employees, they were instructed to let the employees sign their feedback reports as proof that it has been discussed with them.

As indicated above, two cycles were completed for all four shifts. It was decided to only conduct two cycles, since the consequence management phase was omitted. Whether the employee performed good or bad was irrelevant, because there would be no punishment or reward, which would also severely impact on the goal-setting phase. It's a rare breed of human whom would set a high performance goal and work to attain it knowing beforehand it would not lead to a valued result. Having conducted the experiment for more than two cycles would unlikely have contributed to the results and learnings.

All feedback sessions were however still concluded with a goal-setting step for the next cycle. Together with the signature, this was also noted on the feedback reports and served as a type of commitment from the employee's side, with the aim of increasing goal commitment.

4.2.2 Data verification

All feasible steps were taken to ensure the baseline performance was determined as accurately as possible by removing all motivating factors that would have led to partiality in assigning the ratings.

The raw data were screened and where necessary timestamps were corrected. The programme was compiled in such a manner that a supervisor only had one hour from his shift starting to rate the performance of the previous shift. What would occasionally happen was that the timestamp would not be within this hour. The raw data entry then had to be edited to ensure the data was correctly processed. The entries were also screened for any other irregularities, such as double entries or even entries with no ratings. The quality of the mobile network reception wasn't always stable which might have contributed to these occurrences.

4.2.3 Data analysis

It is going to be difficult to determine with absolute certainty whether PMT implementation lead to improved performance. By how much would the performance need to increase in order to unequivocally attribute it to the PMT? Also keep in mind that the experiment was conducted at an operating ferrochrome smelter where there is always a possibility of severe process disruptions due to the extreme nature of the plant (process streams in excess of 1800C), which could have a telling effect on the performance ratings achieved. Do these lower ratings now mean that employee effort levels decreased? What would the ratings have been if the PMT was not implemented? What should become clear at this stage is that performance ratings give an indication of performance and effort levels, but is by no means an infallible measurement. For this reason it was decided to also include a question in the surveys to establish the opinion of the supervisors and employees – did department performance increase in real terms? This will be discussed further in 4.3.

Returning to the subject at hand, the data were used to conduct three analyses which should collectively provide clarity as to whether PMT implementation lead to improved performance. In the next chapter the results will be conveyed following the same structure as below. The first two of these analyses are aimed at establishing how the performance levels changed following implementation. In the third analysis the electronic form completion rates were investigated. Not only the completion rates were determined, but also when the ratings were done (i.e. did the supervisors predominantly rate only their own shifts, or was there a good balance as intended) in order to assist with interpreting the results from the first two analyses.

4.2.3.1 Analysis 1 – Performance comparison on a per position basis

From the baseline performance ratings the average rating for each position was determined, as well as the standard deviation. By using normal distributions, the average was inherently set to 50%, representing the baseline performance for each position.

The ratings collected during the 2nd cycle will be used with the standard deviation initially determined to calculate the average performance rating per position post implementation. The 2nd cycle was used to represent post-implementation performance, because performance feedback occurred after the first cycle. In this first feedback session the employee's individual performance was discussed, as well as areas identified for improvement. Thus, when comparing 1st cycle performance with 2nd cycle performance, there should be a general improvement during the latter, better representing post-implementation performance.

Part of this analysis was also to look at the individual positions and what actual ratings were assigned to relevant KRA's before and after PMT implementation.

4.2.3.2 Analysis 2 – Percentage of workforce who improved between cycles

Due to the problems experienced with the roll call forms during the baseline performance determination phase, the baseline performance is not known on a per employee basis, but rather only on a per position basis allowing only for performance comparison between the two cycles (on an employee basis). The result of this analysis gave an indication what percentage of the workforce increased their effort levels during the 2nd cycle.

4.2.3.3 Analysis 3 – Electronic form completion rates

In order to put the previous analyses in context, the rating completion rates were determined per shift, as well as the timing of these ratings. Were the majority of the ratings completed at the end of the shift (i.e. supervisors only rated their own subordinates), or was there a balance between rating at the start and end of the shift? The tool has been specifically developed to cater for multiple raters in an attempt to make the overall performance rating attained as fair as possible.

To summarize then, the aim of this analysis was to determine if the rating frequency and timing would explain some of the trends observed during the first two analyses, as well as give an indication of the usability of the PMT. It was communicated when each supervisor would need to start completing the rating forms and they were never reminded afterwards.

4.3 Anonymous surveys to determine acceptability

4.3.1 Experimental phase overview

Anonymous surveys were compiled for both the employees and the supervisors (recall that "*supervisors*" include PC's as well). PC's were entrusted with issuing the surveys to employees and collecting their responses. Following the 2nd feedback session the employees were given the survey to complete. To ensure they completed the survey truthfully, they were told to not write their names on the feedback form. They were also told in advance that they would personally be placing the feedback form back in the pile of responses.

Senior day-shift personnel were entrusted with issuing the surveys to the supervisors. On a per shift basis the PC and two supervisors were called together and issued with the surveys. They were also told to not write down their names. Upon completion the senior day-shift employee took the three feedback forms and placed it with the feedback forms received from the employees (for that particular shift).

Both surveys consisted of Likert-scale type statements. The five response options to each statement were as follow:

1. Strongly disagree with the statement being made
2. Disagree to a certain extent with the statement being made
3. Neutral (neither agree, nor disagree with the statement being made)
4. Agree to a certain extent with the statement being made
5. Strongly agree with the statement being made

Recall that the primary aim of the survey phase was to establish whether the PMT would be sustainable in the long term (or at least get an indication of) by investigating what the employees and supervisors thought about the PMT. The survey was also used to measure the success of some of the other phases of the PMT, like the feedback phase and perceived fairness of the monitoring phase. To prevent response bias, all statements made could be classified as either

being in favour of the PMT, or against it (a rating of five was not always a good thing). Please see Table 12 for a summary of all statements in the employee survey. Table 13 contains a summary of all the statements in the supervisors' survey. Please note the last column, which indicates what the expected response would be for a person in favour of the PMT (this will be important when analysing the data). Each survey also had one or two open ended questions to gather information not specifically catered for by the statements.

Table 12: Employee survey statements

Employee Survey		
no	Statement	Feedback in favour of the PMT
1	When I worked in a certain position, I knew what I was being rated on	5
2	I feel the performance rating I received was fair	5
3	I did not like receiving feedback	1
4	I was disappointed with the feedback I received, because I feel I worked much harder than the rating I got	1
5	I feel the overall performance of the department decreased	1
6	I like the PMT, because management can see that I work hard	5
7	Communication improved between me and my supervisor	5
8	I believe the PMT will help me to develop	5
9	In your own words, what do you like most of the PMT?	NA
10	In your own words, what would you change to make the PMT better?	NA
11	I like to receive feedback and I would like it if the PMT be implemented permanently	5

Table 13: Supervisor survey statements

Supervisor Survey		
no	Statement	Feedback in favour of the PMT
1	I found the PMT easy to understand	5
2	I found the PMT user-friendly and easy to use	5
3	I feel the PMT didn't add value	1
4	I saw an improvement in the way my people worked	5
5	I found that my people more readily accepted instructions	5
6	I feel the ratings my people received were an accurate representation of their performance level	5
7	The PMT forced me to communicate better with my people, especially when their performance were below standard	5
8	My people argued a lot and disagreed with the ratings they received	1
9	In your own words, what do you like most of the PMT?	NA
10	In your own words, what would you change to make the PMT better?	NA
11	I would like it if the PMT be implemented permanently	5

4.3.2 Data verification

The main concern with the surveys was obtaining honest opinions which were not influenced in any way. This was achieved by assuring the employees and supervisors that there was no way of tracing back opinions to individuals. Nobody wrote names on feedback forms and they personally placed back the feedback forms in the collective pile.

Except for the supervisors the employees also completed the forms in isolation, so they couldn't see how they're colleagues were rating, nor could they discuss the various statements. The fact that the supervisors completed a different survey also allowed for confirming trends which emerged from the employee surveys.

Please keep in mind, and as mentioned in the experiment overview, the onus was placed on the PC's and senior day-shift personnel to facilitate the process of completing the surveys. Obviously

there was a risk involved in doing it in this manner, but it was unfortunately unavoidable due to the amount of employees involved and the shift rotations. Both the PC's and senior day-shift personnel were however thoroughly briefed on how to facilitate the surveys to ultimately ensure the integrity of the process remained intact. The uncertainty whether the process was in fact completed correctly aside, the fact that the author was not personally involved no doubt assisted the employees and supervisors to give honest answers.

4.3.3 Data analysis

One should always be weary when interpreting survey results, because people have different motivations for answering in certain ways, not necessarily known to the researcher. For this reason results from the PMT implementation experiment (specifically, resulting performance levels post-implementation) was used in conjunction with survey results to ultimately draw conclusions. Recall that the change in performance levels following PMT implementation was also evaluated on a per shift basis – the same as the survey results. The survey results were processed in the format described below.

4.3.3.1 Analysis 1 – Average rating per statement for employees

In Table 12 the ideal employee responses were provided for each of the survey statements. The aim of this first analysis was to determine the average rating per statement from the survey results, obviously with the aim of comparing it to the ideal responses. The average rating per statement was determined per shift, as well as the department average rating compared to expected responses.

4.3.3.2 Analysis 2 – Average rating per statement for supervisors

In Table 13 the ideal supervisor responses were provided for each of the survey statements. The aim of this analysis, as with the previous analysis, was to compare the feedback received with these ideal responses. Since there are only three supervisors per shift, only the average for the department will be conveyed.

4.3.3.3 Analysis 3 – Determination of recurring themes in open-ended questions

Both the employees and supervisors were asked two open-ended questions to gather information not necessarily related to the other survey statements. Both were presented with the following two questions:

1. In your own words, what do you like most of the PMT?
2. In your own words, what would you like to change to make the PMT better?

4.4 Chapter 4 conclusion

An experiment, consisting of two phases (actual PMT implementation followed by anonymous surveys) were executed to test whether the PMT met its design requirements. For each phase the general process was discussed with specific reference to data verification. The analyses that will be conducted on data collected were also discussed. The aim of the next chapter will be to provide the actual results of these analyses and finally, taking all results into account, determine whether the PMT met its design requirements.

5 RESULTS AND DISCUSSION

5.1 Purpose and chapter outline

The aim of this chapter is to give the detailed results of the experiment conducted. As stated in 4.2.3, the results will be given following a similar structure as discussed in the previous chapter for both the PMT implementation phase, as well as the anonymous surveys. This chapter will be concluded with a summary of key findings.

5.2 Experimental phase 1 – PMT implementation at a ferrochrome smelter

5.2.1 Performance comparison on a per position basis

Table 14 illustrates the baseline performance measurement attained for each position, as well as the standard deviation. By making use of normal distributions, all these scores translate to a FPR of 50%. To clarify further, should a Metal Cleaner be rated for one cycle and attain a score of 82.8%, that would translate to a FPR of 50%. In other words, based on historic performance, his performance for that specific cycle was exactly average.

Table 14: Baseline performance rating for each position

Position	Average	STDEV	FPR
Tapper	83.0%	8.7%	50.0%
Tapper Assistant	78.3%	9.1%	50.0%
Chill Operator	79.9%	7.1%	50.0%
Mudgun Operator	86.8%	9.0%	50.0%
Pingon Driver	78.2%	10.3%	50.0%
Metal Cleaner	82.8%	9.9%	50.0%

As explained in 4.2.3.1, the performance ratings of the 2nd cycle were used to represent post-implementation performance. Table 15 gives an overview of the baseline and 2nd cycle average ratings achieved for each KRA, as well as the change exhibited from the baseline. Using this data, Table 16 was compiled and FPR's determined per position representing post-implementation performance. Please see Figure 5-1 for a graphical representation of results.

Table 15: Average KRA ratings pre- and post-implementation

Position	KRA description	Baseline AVG rating	Baseline STDEV	2nd Cycle AVG rating	2nd Cycle STDEV	%Change from Baseline
Tapper	Housekeeping on the tapfloor	77.3%	12.8%	80.0%	12.7%	3.6%
	Tapfloor Safety	84.0%	12.0%	84.6%	12.4%	0.8%
	One spare bundle of lance tubes on the tapfloor	92.1%	23.9%	86.0%	30.4%	-6.5%
	General impression of the tapfloor and furnace drainage	78.5%	8.8%	78.3%	11.6%	-0.3%
Tapper Assistant	Lance tubes in front of taphole and/or in runners	80.2%	15.3%	82.4%	13.7%	2.8%
	Cleanliness of the area below the stairs	76.5%	13.4%	79.8%	13.8%	4.4%
	General impression of runners and pan area	78.3%	7.1%	77.9%	9.1%	-0.4%
Chill Operator	Separation quality	85.6%	14.9%	86.9%	10.8%	1.5%
	Housekeeping of ramps, cement slabs and trough	76.9%	8.7%	73.7%	12.3%	-4.3%
	General impression of the ramps and cement slabs	77.3%	7.7%	76.5%	11.3%	-1.0%
Mudgun Operator	Mudgun area housekeeping	84.2%	14.4%	81.3%	12.9%	-3.4%
	Nozzles unblocked and mudguns cleaned	82.5%	15.5%	81.0%	16.1%	-1.8%
	Drills/Mudguns locked out	99.4%	7.0%	98.7%	10.1%	-0.7%
	General impression of the area	81.1%	12.2%	77.1%	11.8%	-4.9%
Pingon Driver	Intake hopper loaded	94.0%	21.1%	98.1%	12.3%	4.4%
	Housekeeping between the intake hopper and mudgun area wall	77.5%	16.7%	89.0%	15.3%	14.9%
	Housekeeping in the pit	53.5%	14.9%	79.5%	13.6%	48.5%
	Visible litter at the Mechanical Breakfloor	93.2%	22.3%	95.5%	18.5%	2.5%
	General impression of the Mechanical Breakfloor area	72.9%	10.9%	80.5%	13.6%	10.4%
Metal Cleaner	Are there spillages outside Metal barricades	80.5%	17.4%	88.1%	17.2%	9.4%
	Picking station housekeeping	77.3%	11.6%	86.8%	12.7%	12.2%
	Visible litter at the picking station	97.2%	14.7%	94.8%	19.7%	-2.4%
	General impression of Picking station area	76.2%	11.4%	83.9%	11.4%	10.1%

Table 16: 2nd Cycle performance rating for each position

Position	2nd Cycle Average	FPR
Tapper	82.2%	46.6%
Tapper Assistant	80.0%	57.7%
Chill Operator	79.0%	44.9%
Mudgun Operator	84.5%	40.1%
Pingon Driver	88.5%	84.2%
Metal Cleaner	88.4%	71.6%

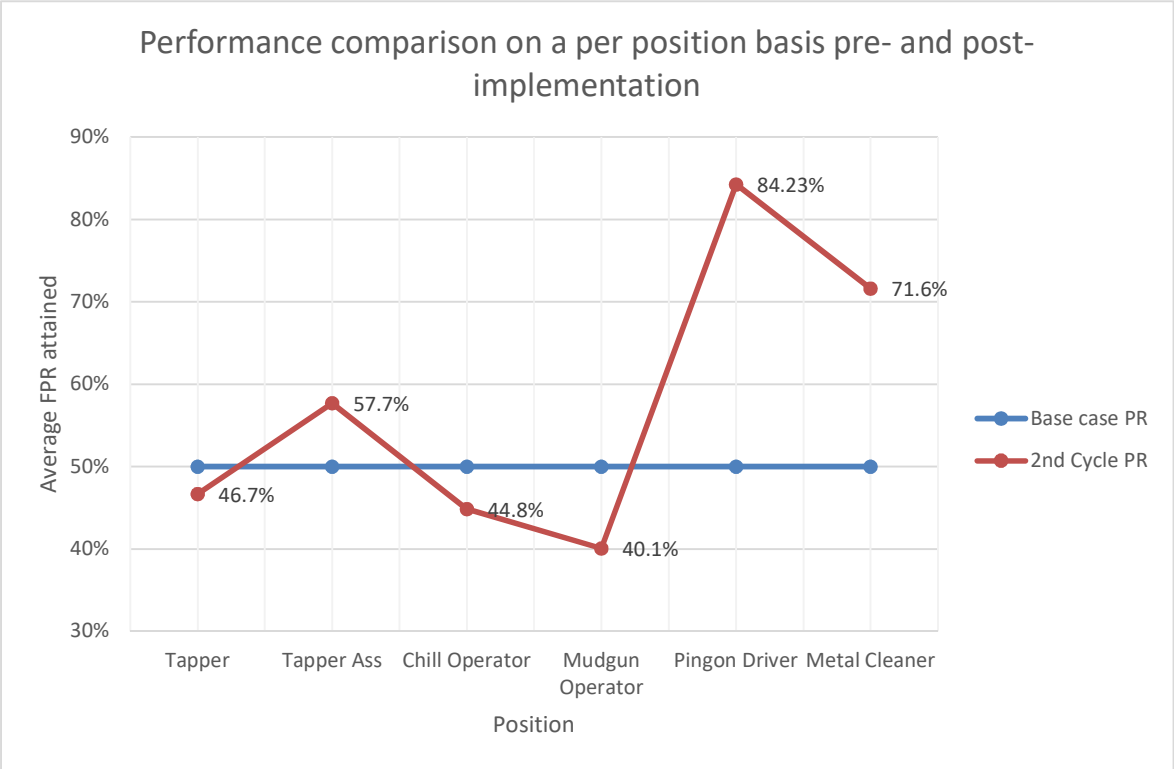

Figure 5-1: Performance comparison on a per position basis pre- and post-implementation

The results did not live up to expectation with improved performance in three of the six positions. Overall, the performance of the employees in the Casting Bay seemed to have deteriorated (besides for the Tapper Assistant), whereas the performance of the Mechanical Breakfloor employees improved significantly. To better understand these results the minimum and maximum FPR's achieved were determined for each position and is summarized in Figure 5-2. For the employees working in the Casting Bay, the baseline averages and standard deviations seem to be well defined. It's clear that the below average scores are not due to an abnormal high baseline

average, with FPR's in excess of 85% being recorded in all four Casting Bay positions. There is no indication that performance increased significantly in the Casting Bay.

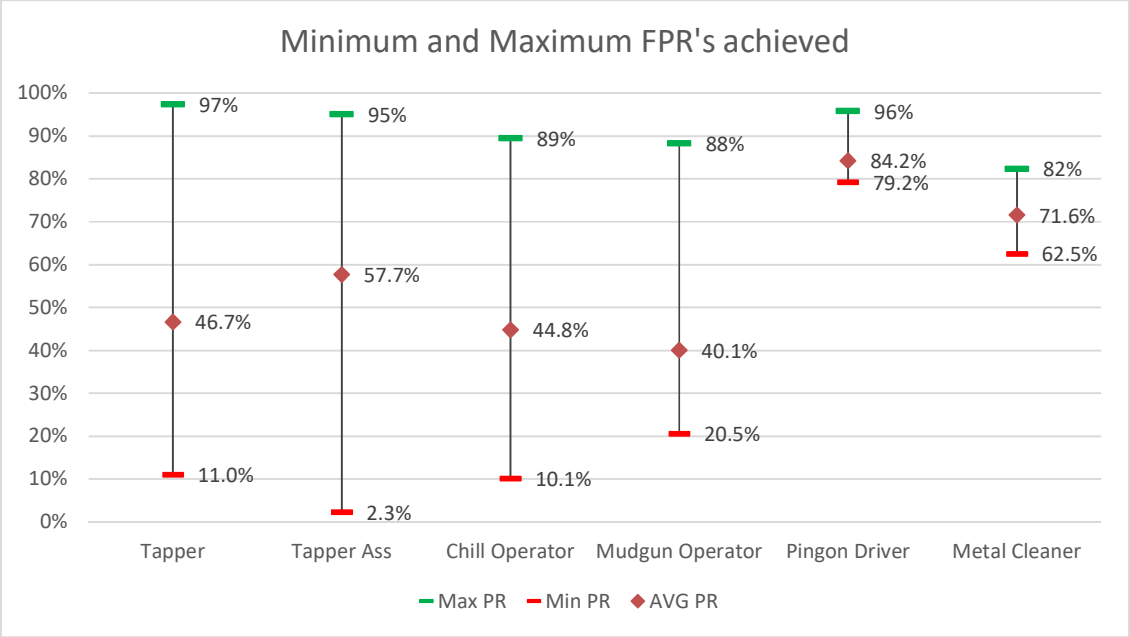

Figure 5-2: Minimum and maximum FPR's achieved during the 2nd cycle

The average FPR's achieved for the two Mechanical Breakfloor positions would suggest a substantial performance improvement. The relatively high minimum FPR's achieved for each position however brings these results into question. The employees were not notified during the baseline determination phase that they were being monitored and they also did not have any other details on how the PMT would work, so it is highly improbable that they would have purposefully lowered effort levels during this phase. What seems more likely lies in the way the KRA's have been defined and the nature of the tasks themselves. To elaborate on this, one of the KRA's for example is related to housekeeping in the pit area. If this area is cleaned thoroughly on one of the shifts and there are no maintenance/engineering issues (i.e. spillages due to worn out liners, intake hoppers etc.) the area will remain very clean and require very little effort on the following shift. Hence, the employee working on the following shift will also attain a very high rating with low effort levels. This is opposite to most of the KRA's defined for the Casting Bay personnel. Consider for example the KRA "*Mudgun area housekeeping*" – every time the mudgun is used (twice per shift), it involves effort to clean the area. There is no engineering solution to

eliminate the work as is the case with the housekeeping in the pit area, so it requires continuous effort.

That is not to say housekeeping in the pit area should not be included as a KRA, but definitely supports the notion of continuously updating the baseline averages and standard deviations (as discussed in 3.2.2).

5.2.2 Percentage of workforce who improved between cycles

In Table 17 is a summary of the 1st and 2nd cycle FPR's for each employee in the department. In some isolated instances some of the employees also assisted on other shifts by working 12 hours. The ratings from these instances were not taken into account. The shift average performance rating was calculated averaging individual performances (for employees normally working on that shift) and did not involve calculating a weighted average. In other words, should the ratings have been used for employees not normally working on the shift, would have had a severe impact on the result.

On B,C and D-shift more than half of the employees increased effort levels and scored better during the 2nd cycle. The shift where the most employees improved their performance was D-shift, with two-thirds of the employees improving with the 2nd cycle.

In terms of absolute performance levels A-shift actually did the best, which might explain the fact that only 40% of the employees scored higher during the 2nd cycle. Figure 5-3 shows the percentage of employees who improved their performance during the 2nd cycle when scoring within the range indicated on the x-axis during the 1st cycle.

The total employees that were measured are 44, which might not be enough to draw accurate conclusions, but the results would make sense to a certain extent, with the poorest performing individuals lifting their performance ever so slightly to not be in trouble (or to not be considered the poorest performing individuals in the department) and high performing individuals on the other

hand, performing at even higher levels with the aim of being the best in the department (recall the Hedonic principle discussed in 2.4.3).

Table 17: Summary of 1st and 2nd cycle FPR's per employee

A shift	Coy no	1st Cycle	2nd Cycle	Improved
	13784	61.9%	ABSENT	
	13186	91.0%	88.1%	NO
	13944	82.7%	79.8%	NO
	15364	82.4%	77.2%	NO
	34707	64.4%	50.3%	NO
	35455	72.8%	ABSENT	
	39886	66.1%	58.9%	NO
	39888	38.1%	49.4%	YES
	40345	39.5%	54.8%	YES
	40692	54.7%	54.0%	NO
	40703	44.5%	ABSENT	
	55629	75.3%	78.8%	YES
	101579	51.9%	66.9%	YES
	AVG*	64.6%	65.8%	
	% Of employees who Improved			40%

B shift	Coy no	1st Cycle	2nd Cycle	Improved
	12309	39.1%	11.0%	NO
	12310	63.6%	52.8%	NO
	13022	71.4%	73.4%	YES
	15773	65.4%	62.5%	NO
	35165	58.7%	33.8%	NO
	36176	32.3%	ABSENT	
	39884	39.9%	61.4%	YES
	39943	44.6%	52.9%	YES
	40536	41.1%	48.7%	YES
	40967	41.1%	46.4%	YES
	60358	78.8%	79.2%	YES
	101073	61.2%	46.7%	NO
	AVG*	55.0%	51.7%	
	% Of employees who Improved			55%

C shift	Coy no	1st Cycle	2nd Cycle	Improved
	12568	24.1%	63.9%	YES
	13232	65.0%	54.5%	NO
	14748	75.1%	83.6%	YES
	15054	50.5%	48.3%	NO
	32861	55.7%	64.7%	YES
	38673	75.2%	56.7%	NO
	39737	60.3%	46.8%	NO
	39885	27.3%	50.9%	YES
	39942	88.1%	74.6%	NO
	40565	73.4%	75.0%	YES
	60446	29.4%	58.8%	YES
	AVG*	56.7%	61.6%	
	% Of employees who Improved			55%

D shift	Coy no	1st Cycle	2nd Cycle	Improved
	12248	87.6%	90.2%	YES
	13691	31.6%	43.3%	YES
	15738	21.6%	36.7%	YES
	33483	30.3%	52.4%	YES
	34024	87.8%	92.6%	YES
	39739	40.4%	46.7%	YES
	40197	41.8%	28.1%	NO
	40634	52.0%	51.7%	NO
	41751	39.8%	38.3%	NO
	43024	62.7%	54.0%	NO
	60337	76.8%	86.7%	YES
	64205	77.6%	82.4%	YES
	AVG*	52.1%	56.4%	
	% Of employees who Improved			67%

Also interesting is the fact that only two of the eleven employees who scored between 45% and 65% in the 1st cycle improved during the 2nd cycle. It seems that this group, the average performers, were not sufficiently motivated to increase their performance and obviously felt that their 1st cycle performances were sufficient.

This fact is concerning, because the PMT was primarily aimed at increasing employee motivation, which in turn should have led to increased work performance, through the process of goal-setting. The employees were granted the opportunity only once to set their performance goals, in terms of a FPR value, at the end of the 1st cycle. It's clear the goal-setting process did not have the desired effect and that could be due to the following reasons:

1. The absence of consequence management (as explained in 4.2.1) took out the PMT's "*sting*". The employees were notified in advance that no disciplinary action would be taken against poor performing individuals, nor would there be any rewards for high performers. Goal-setting was chosen as the primary motivation method, because it allows for self-validation to occur (which results in intrinsic motivation), but this process only happens over time as goals are reached. It seems, to start off with, there needs to be definite rewards and punishment to sufficiently motivate the employees. In real terms, when implemented over an extended period of time and provided clear performance consequences have been established and communicated, the intrinsic motivation associated with goal-setting should start playing a more apparent role.
2. An unanticipated problem arose during the goal-setting process (conducted at the end of the feedback session). The vast majority of the employees, when asked what their performance goals were for the next cycle, gave a very high and unrealistic value. The supervisor could either log this value, or tell the employee that he doesn't believe that the employee is capable of attaining such a high score. This is a problem, because goal-setting functions via the attainment of goals and not absolute performance (see 2.4.4). By setting such high goals the employees set themselves up for failure. If the PMT is permanently implemented, the supervisors and employees should get a better feel and understanding of the FPR value, which should allow for better goal-setting. Although goals need to be participatively set (see 3.2.5), the final decision should still remain with the supervisor. The opposite scenario might also be encountered where an employee sets too low goals or is hesitant to increase the goal.

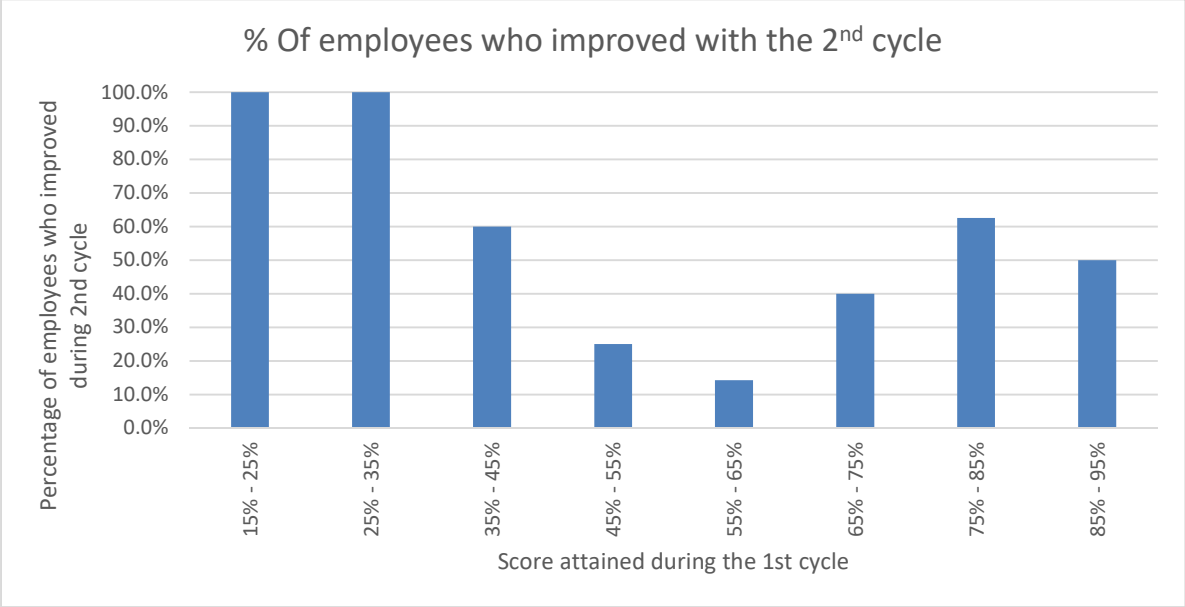

Figure 5-3: Percentage of employees who improved with the 2nd cycle of ratings

5.2.3 Electronic form completion rates

Please note the following difference to prevent confusion – in the preceding two analyses, the data for each shift were isolated for both cycles to determine performances. Keep in mind that at any given time, three of the shifts are working with the fourth off. That means when the first shift that had commenced with assigning ratings completed two cycles there were still other shifts busy with their 2nd cycles.

For the sake of this analysis, all data were used from when the 1st shift had commenced with ratings until the last ratings were assigned (at the end of the 2nd cycle) to the shift that was on afternoon shift at the start. A rating cycle could only start after a shift came back from being off, so the shift that was working afternoon shift when the first ratings were being assigned had to wait the longest before starting a rating cycle. Table 18 summarizes the rating completion rates for each supervisor of every shift. As explained, it's clear that the amount of shift rotations worked differed. From the information in Table 8 the ideal amount of ratings each supervisor had to assign could be determined (see "*Maximum Possible forms*" in Table 18). PC's ideally had to complete four rating forms at the start of the shift and four at the end of the shift for a total of eight per shift.

The CBS and MBS had to complete two forms at the start of the shift and two again at the end of the shift.

Table 18: Rating completion rates for each shift

	Maximum Possible forms				Actual Forms			Completion Rate		
Shift	Shifts worked	PC	CBS	MBS	PC	CBS	MBS	PC	CBS	MBS
A	16	128	64	64	67	56	16	52%	88%	25%
B	16	128	64	64	117	0	0	91%	0%	0%
C	19	152	76	76	69	46	28	45%	61%	37%
D	18	144	72	72	90	24	57	63%	33%	79%

From the actual forms completed the completion rate could be determined for all the supervisors. Table 19 shows what percentage of each supervisors' ratings were assigned (i.e. forms completed) to their own subordinates.

Table 19: Percentage of ratings to own subordinates

	Actual Forms			End-of-shift forms			Percentage of ratings to own subordinates		
Shift	PC	CBS	MBS	PC	CBS	MBS	PC	CBS	MBS
A	67	56	16	31	24	9	46%	43%	56%
B	117	0	0	59	0	0	50%		
C	69	46	28	31	18	11	45%	39%	39%
D	90	24	57	49	6	25	54%	25%	44%

On B-shift, both the CBS and MBS did not complete any forms, with the PC taking it upon himself to complete the forms, attaining the highest completion rate of 91%. He also had the best split between assigning ratings to his own subordinates and to those of the previous shift with a perfect 50% split. This result shows that a very high completion rate is possible (see also A-shift CBS who attained a completion rate of 88%). When questioned why his supervisors did not complete

any forms, it was attributed to their lack of knowledge and old phones. If their results are omitted, an average completion rate of 57% was attained for all whom participated. Overall, this is not a bad result considering the fact that they were not reminded again, nor checked up on, during the course of the experiment. Even with B-shift supervisors' results not taken into account, the MBS's attained the poorest completion rate of only 48%. Compare this to the PC's and CBS's who attained completion rates of 62% and 59% respectively.

Again, omitting B-shift CBS and MBS, on average 44% of ratings were assigned at the end of the shift. There seems to be a slight preference to completing the forms at the start of the shift, which does make sense, since the supervisors are responsible for doing pre-shift inspections at the start of their shift – so might as well then complete the forms. This is a better situation to be in as opposed to the majority of the ratings being assigned at the end of the shift, because it promotes fairness.

5.3 Experimental phase 2 – Anonymous surveys to determine acceptability

5.3.1 Average rating per statement for employees

Figure 5-4 gives a summary of the average rating attained per statement for each shift. For easy reference, please see Figure 5-5 which gives the average rating per statement for the whole department and also shows the expected feedback should the PMT have been successfully implemented (i.e. rating in favour of the PMT).

Overall, there weren't many differences between the responses gathered from the shifts. When studying Figure 5-5, it's clear there were some deviations from the expected feedback. The first of these deviations from the expected responses was for the statement, "*I feel the performance rating I received was fair*". The average rating was 2.9, which is basically neutral, but leaning ever so slightly to the side of disagreement. Looking at statement no.4 however, there is further proof that some people felt they were rated unfairly, although the words "*I was disappointed*" in the wording of the statement might have led to some response bias. This unhappiness with the ratings

however, should not come as a surprise when considering the skewed results from 5.2.1, especially if the employees were discussing their scores with their colleagues.

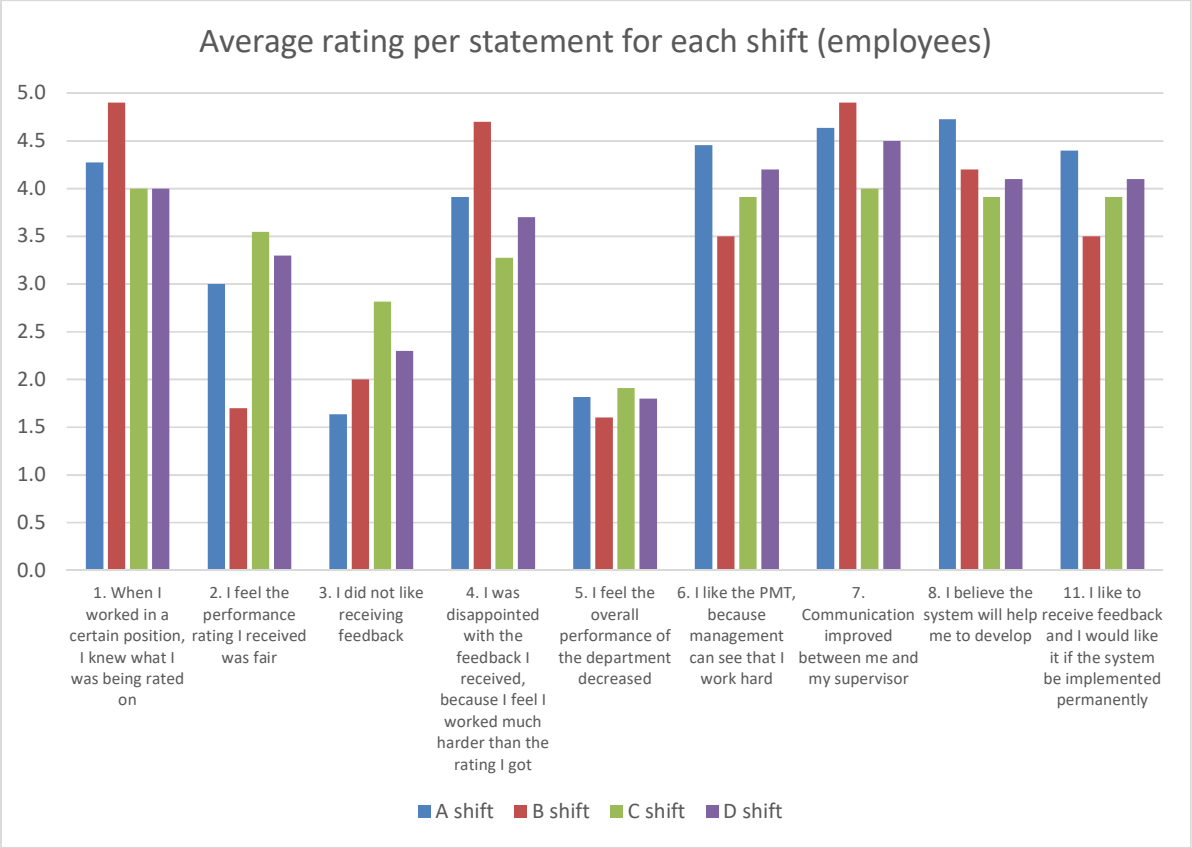

Figure 5-4: Average rating per statement for each shift (employees)

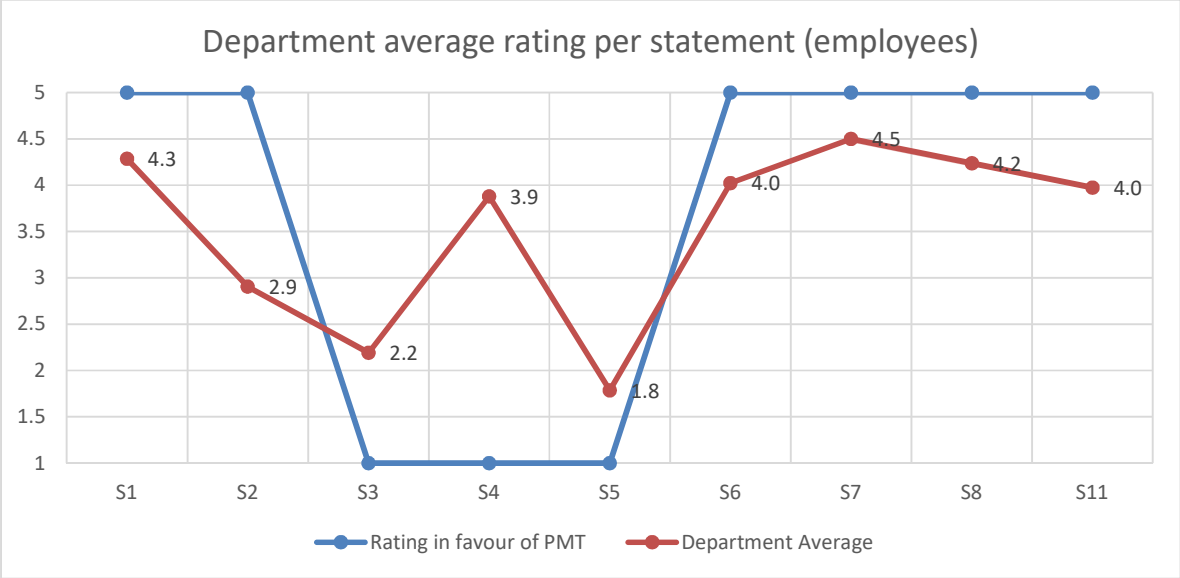

Figure 5-5: Department average rating per statement (employees)

By updating the average score and standard deviation for each KRA at the end of each rating cycle there should be a convergence in the average rating attained per position, which in turn should eliminate some of the discontent from the employees.

Interestingly, even though the employees stated they felt they were scored too low, the majority (4.0/5) also stated that they liked receiving feedback (see S11). This shows this phase of the PMT was executed well, although the absence of consequence management might have contributed to this result.

With regards to overall department performance, the employees disagreed with the statement, "*I feel the overall performance of the department decreased*" (see S5) with an average response of 1.8/5. Whether the performance actually improved is up for debate, especially when taking the results from 5.2.1 into consideration. What is interesting though is one when considers why the majority of the employees would answer in this manner. The first option is perhaps because there was a definite improvement in performance, although not reflected in the performance ratings. The second option might be that they wanted to put the PMT in a good light, because they were told during the briefing session that their feedback would be used to determine whether the PMT would be implemented on a permanent basis. Support for the second option is found in the last three statements, all of which the employees agreed with (average rating indicated in brackets):

7. Communication improved between me and my supervisor (4.5/5)
8. I believe the PMT will help me to develop (4.2/5)
11. I like to receive feedback and I would like it if the PMT be implemented permanently (4.0/5)

5.3.2 Average rating per statement for supervisors

The results obtained from surveying the supervisors are summarized in Figure 5-6. Overall, the ratings attained were very much in favour of the PMT, with the exception the ratings received for S6 and S8. The average response rating for statement no.6 ("*I feel the ratings my people received were an accurate representation of their performance*") was only 3.5, which is a neutral rating,

leaning towards slightly agreeing with the statement. The average response for statement no.8 ("*My people argued a lot and disagreed with the ratings they received*") was 3.1, again a neutral rating. These results were expected when considering the results from the previous analyses where substantial differences were observed between FPR's achieved by employees working in different positions (see Figure 5-1), as well as the feedback received from the employees in the anonymous surveys.

Recall that Objective 1 of this research called for the PMT to be "*user-friendly and easily implemented in a sustainable manner*" (see 1.4). When looking at the average ratings attained for S1 and S2, it seems that the PMT complied with this requirement, with the average rating being very much in favour of the PMT in both instances (4.55/5 for both "*I found the PMT easy to understand*" and "*I found the PMT user-friendly and easy to use*").

Standout result is from statement no.11 ("*I would like it if the PMT be implemented permanently"),* with an average response rating of 4.82 – fervently agreeing with the statement.

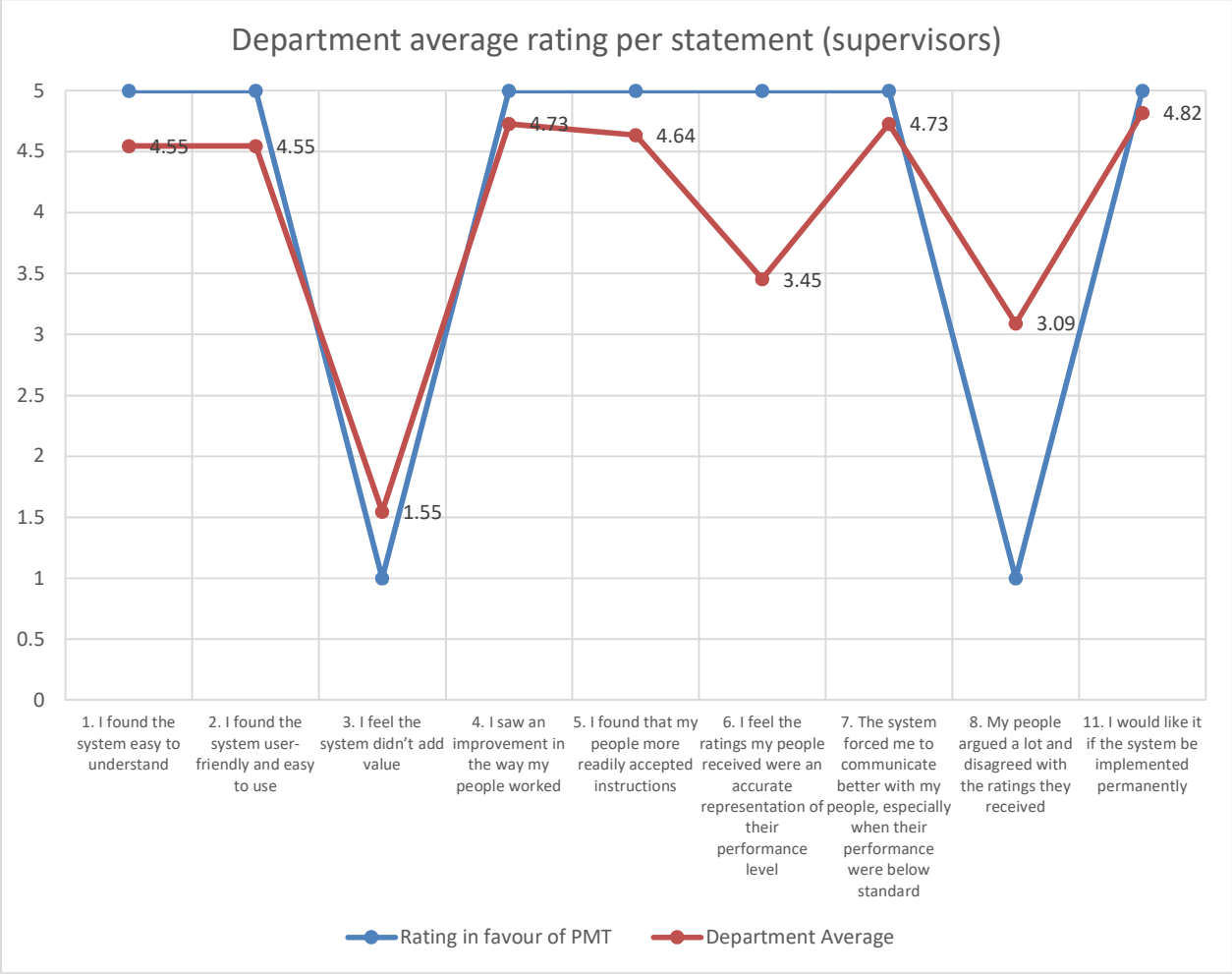

Figure 5-6: Department average rating per statement (supervisors)

5.3.3 Determination of recurring themes in open-ended questions

Please see below four sections summarizing the responses received from the employees and supervisors. Both were asked what they liked most about the PMT and what they would change given the opportunity. Some respondents only answered "*no comment*", whereas others gave elaborate feedback, triggering multiple themes.

5.3.3.1 Employee feedback

In total 86 responses were received from the employees regarding what they liked (which comprised of 46 responses) and what they would change about the PMT (comprising of the remaining 40 responses). Neglecting the "*no comment*" responses, the three themes that featured most (in order of prevalence) when asked what they liked most, were "*Improved housekeeping*", "*Individual accountability*" and "*It will help me to develop*".

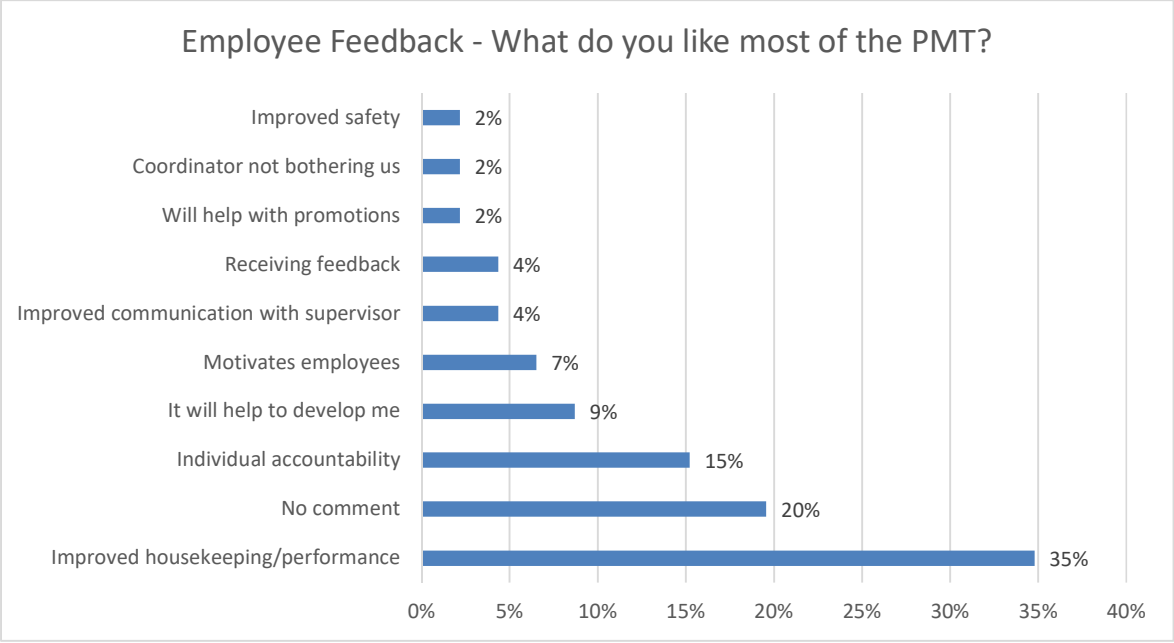

Figure 5-7: Employee feedback - what do you like most about the PMT?

In terms of proposed changes to the PMT (Figure 5-8), 28% of responses received indicated that the PMT is good as is and no changes are required, 18% complained about unfair ratings and a further 8% noted that "*communication*" was a problem. From the relevant responses however it's

unclear what exactly "*communication*" entails. 5% Of responses indicated that low ratings must be accompanied with reasons, which seems similar to "*communication*". The facility was provided to the supervisors to add comments to specific positions (see 4.2.1), but wasn't set as a requirement. At the end of the day the PMT should still be easy to use and hassle free. The final performance rating is an average of all ratings assigned, so if the overall performance rating is very low, it is perhaps not necessary for reasons, since the cause of the poor performance should be quite apparent.

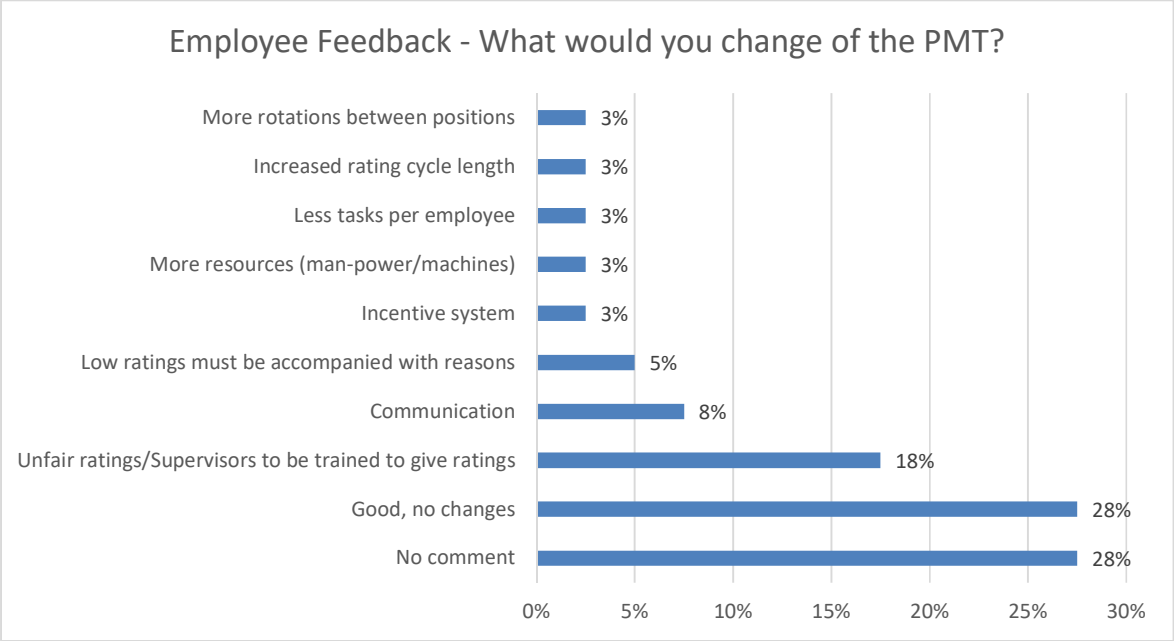

Figure 5-8: Employee feedback - what would you change about the PMT?

The biggest problem/dissatisfaction seems to stem from the skewed (unfair) ratings – a solvable problem which has already been discussed (see 3.2.2 and 5.2.1).

5.3.3.2 Supervisor feedback

Due to the big difference in numbers of the supervisors versus employees, only 27 responses were received from the supervisors, of which 14 responses were for the question what they liked most of the PMT and the remaining 13 were for the suggested changes to improve the PMT. From the first set of responses (i.e. "*What do you like most of the PMT*") five distinct themes emerged and for the second set, six. Please see Figure 5-9 and Figure 5-10 for a summary of the results.

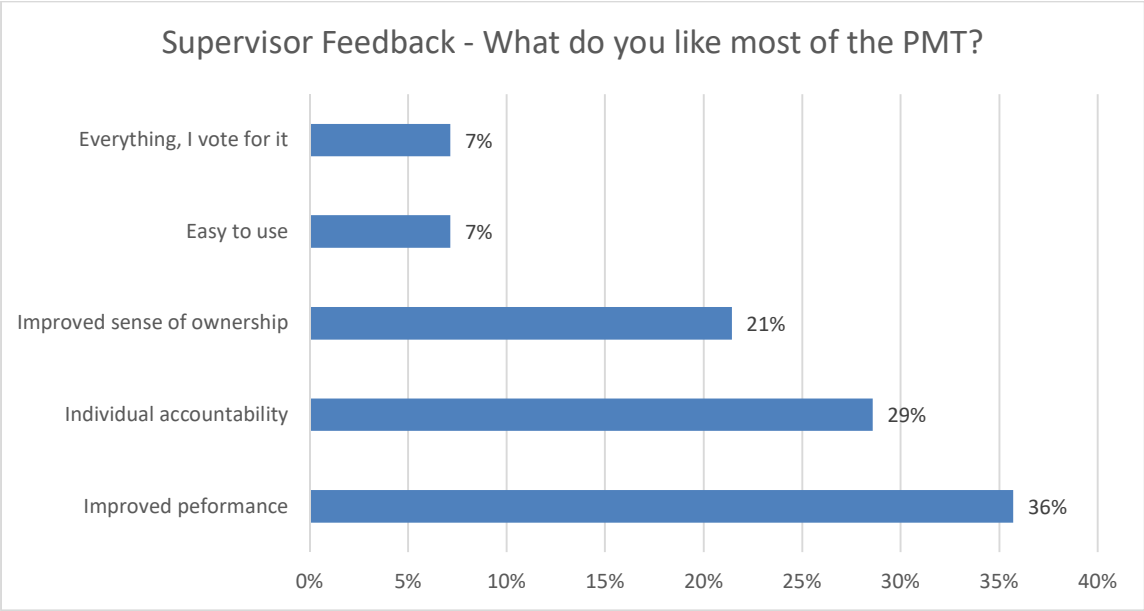

Figure 5-9: Supervisor feedback - what do you like most of the PMT?

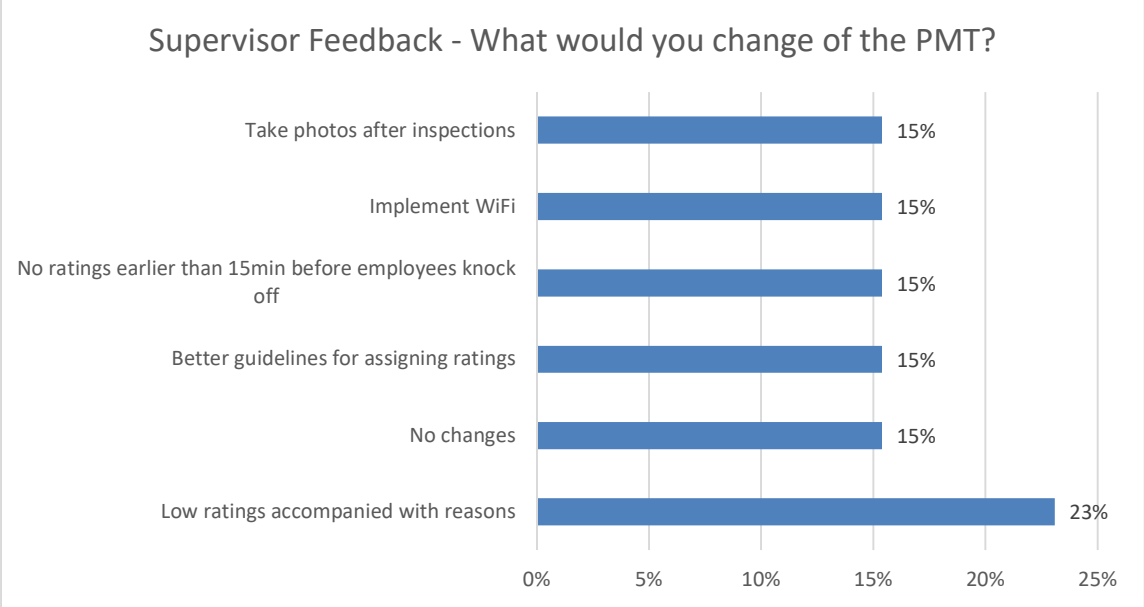

Figure 5-10: Supervisor feedback - what would you change of the PMT?

In terms of what the supervisors liked most of the PMT, it's interesting to find that exactly the same two themes as observed with the employees again surfaced. Similar to the employees, the supervisors enjoyed most the improved overall performance and secondly the individual accountability. Poor performers no longer had a place to hide. This fact in itself will also lead to a more motivated workforce (Adams' Equity Theory in 2.3), because the belief exists that justice

will prevail (which at experimental stage was only an expectation of things to come should the PMT be implemented permanently).

The theme that scored third highest is the increase in ownership behaviour exhibited by the employees – an ideal situation to be in from a supervisors' viewpoint. The PMT took away from the supervisor the need to assign tasks and micro-manage employees on a shift basis, because the performance criteria was clearly defined. Support for this is found, although only from one response which stated, "*coordinator not bothering us*".

With regards to what the supervisors would change to improve the PMT (see Figure 5-10), the responses were quite evenly distributed amongst the six identified themes, with all but one ("*Low ratings accompanied with reasons*") attaining a value of 15%. The aforementioned theme scoring 23%. As already explained, the PMT does have the functionality to assign comments to ratings. So it can be assumed, since no elaboration was provided in any of the survey forms, that supervisors found it better to have reasons for low ratings, which would only be needed during feedback sessions. As stated before, one of the objectives of the PMT from the onset of the research was sustainability of use, an objective that would only be met if the PMT was user-friendly and non-time consuming to use. But since both employees and supervisors complained about this fact, it may be beneficial to put an arrangement in place that all scores equal to or less than two (2) be assigned a reason, thereby still maintaining its ease of use characteristic, but also provide the necessary information to supervisors and employees alike regarding sub-par performance.

Please see below other suggestions that were made, with comments where relevant:

- Take photo's after inspections – this is a good suggestion and might also go some way to solving the above problem. Instead of tediously typing what the problems were, a photo can simply be taken. Definitely needs to be investigated to determine if it can be incorporated.

- Implement WiFi – The PMT in its current format requires very little data transfer. If photo's however are incorporated, it would be unfair to expect from supervisors to do proper inspections (i.e. take numerous photo's) and be liable for data costs. Also a suggestion that needs to be investigated, especially if the facility to take photo's is included in the PMT.
- No ratings earlier than 15min before employees knock off – This is a valid suggestion. The complaint was raised (verbally), that especially housekeeping KRA's are assigned ratings before the employees have had a chance to conduct housekeeping, which normally occurs at the end of the shift. In its current format the PMT allows for ratings to be assigned to a specific shift one hour after the start of the shift (refer to 4.2.2) for the reason of allowing supervisors to also assign ratings to specific KRA's throughout the shift. If the window for assigning ratings are restricted as suggested, the above functionality will be lost and will likely lead to a decrease in ratings completed. The best solution here is simply to train the supervisors to assign ratings to relevant KRA's at appropriate times.
- Lastly, a request was made for better guidelines when assigning ratings. The employees gave similar feedback, with 18% of responses complaining about unfair ratings and the need to improve supervisor training. On the job training should assist with this issue. Another possible solution might be to revise the KRA's and where applicable, divide one KRA into two or three smaller checks.

5.4 Chapter 5 conclusion

Please see below a summary of the key findings from this chapter:

1. An improvement in 2nd cycle ratings (representing post-implementation performance) were observed for three of the six positions.
2. The performance of the employees working in Mechanical Breakfloor positions increased significantly, whereas the average rating assigned to employees working in the Casting Bay decreased slightly. It seems likely that the substantial improvement in

performance of Mechanical Breakfloor personnel can be assigned to the nature of the KRA's defined and measured.

3. The previous finding supports the notion that the baseline averages and standard deviations should be updated with each rating cycle. Recall that one of the advantages of the PMT, as tested, would be to allow for inter-position performance comparisons. Something that's not possible if the baseline is not properly defined.
4. It was found that especially two groups of employees improved on their 1st cycle performance during the 2nd cycle – the lowest scoring individuals (with 1st cycle ratings in the range of 15-35%) and the higher scoring individuals (in the range of 65-95%). Very interesting was the result that only two out of eleven employees who scored in the range of 45-65% during the 1st cycle improved during the 2nd cycle. This results suggests that the goal-setting process did not have the desired effect, but likely more due to the experimental method employed than anything else.
5. Two out of the eight supervisors did not participate in assigning ratings, with the excuse being a lack of knowledge and old phones that's not compatible with Google Forms. The remaining six supervisors and four PC's achieved an average rating completion rate of 57%, which seems adequate, considering they were not reminded once during the experiment to complete the rating forms, which attests to the "*user-friendliness*" of the PMT. Should the PMT be implemented permanently, it will be worth investigating the option of having a permanent cell phone on shift with the necessary capabilities to complete the inspection forms.
6. It was observed that high completion rates are possible. The B-shift PC achieved a rating completion rate of 91% and the A-shift CBS a completion rate of 88%.
7. There seems to be a preference to assigning ratings at the start of the shift, with 56% of ratings being completed during this period. The supervisors do a shift handover in the plant, so this result was expected.

8. From the anonymous surveys it was determined that both the supervisors and employees felt the ratings assigned to the employees were not a true reflection of their performance, being lower than expected.
9. It seems the PMT passed the requirement, at least during the experiment, to be "*user-friendly and easily implemented in a sustainable manner*", with the vast majority of supervisor responses indicating that the PMT is easy to understand and easy to use (average rating of 4.55/5 for both statements).
10. Lastly, during the open-ended questions both employees and supervisors indicated that improved performance and increased individual accountability were the impacts they liked most following PMT implementation. Both groups indicated that they would like to have the PMT permanently implemented (with an average response rating of 4.0 and 4.82 for the employees and supervisors respectively).

6 CONCLUSION AND RECOMMENDATIONS

6.1 Research overview

The problem this research aimed to solve was the poor performance of Patterson Grade B1-B3 employees at the production unit of a ferrochrome smelter. Their performance on less critical tasks (i.e. non-process related) were of special concern.

In order to address the problem a Performance Management Tool (PMT) was developed to assist the supervisors in managing their subordinates. The PMT, in order to be deemed a success, had to improve subordinate performance and the overall process had to be sustainable, i.e. easy to maintain and user-friendly.

The PMT was developed from the ground up by first investigating what could lead to the poor performance observed. Various factors were identified, but it seemed most likely that the lack of performance could be attributed to a lack of motivation. Various motivation theories were reviewed before Locke and Latham's-g*oal Setting Theory* (1979) was identified as having the greatest potential to substantially and sustainably improve employee motivation.

Goal-setting cannot function in isolation and three additional, but equally important, phases were identified to form a cyclical process: Goal-setting – Performance Monitoring – Feedback – Consequence management – Goal-setting etc. For each of these phases relevant literature were reviewed to compile a list of requirements the PMT had to meet in order to be effective in each of these phases.

Following the determination of requirements the PMT was presented as a deliverable in the form of a step-by-step guide to implementation, as well as guidelines presented to ensure process continuation. This was done by first looking at a very simple restaurant example, followed by the very complex scenario which was the production unit at a ferrochrome smelter. In order to keep the PMT simple and easy to use, electronic forms were developed (which could be completed

using cell phones) together with the necessary worksheets to record and process performance ratings during the monitoring phase.

After finalizing the PMT and testing the tool it was rolled out to the supervisors who started rating the performance of their subordinates (without their knowledge) to establish the baseline performance. Following this, the PMT was officially presented to the employees and the actual performance monitoring commenced. Unfortunately the Consequence management phase had to be removed in order to coax the employees into participating. They were told that it was only a testing phase and they would be surveyed anonymously afterwards and the PMT only implemented permanently should the majority be in favour of the PMT. The anonymous surveys were completed at the end of the last rating cycle.

6.2 Key results

6.2.1 PMT implementation at a ferrochrome smelter

The measured performance of the employees working on the Mechanical Breakfloor improved significantly, whereas the performance of the Casting Bay employees remained very similar to the baseline performance and actually decreased slightly in some instances. It is suspected that the reason for the significant increase in performance of the Mechanical Breakfloor personnel could be attributed to the manner in which the performance criteria have been specified. It was of such a nature, that if an employee on one of the shifts put in some effort, the possibility existed that the employee on the upcoming shift would also benefit from it, whereas with the Casting Bay employees continuous effort was required from them. Fact remains the same performance criteria was used during both the baseline determination phase and the experiment, so it can be concluded that the overall performance of the Mechanical Breakfloor employees did improve.

From the 1st rating cycle to the 2nd, two groups of employees increased their effort levels and performance: the employees whom were among the worst and best performers during the 1st rating cycle. Only two out of eleven average scoring employees from the 1st rating cycle improved on their performance during the 2nd cycle. This is indicative of the goal-setting phase not being

executed efficiently, since the average performers were not sufficiently motivated to improve their performance. It is suspected that the goal-setting phase failed for the following three reasons: both the supervisors and employees were still new to the ratings and did not have a feel for what a realistic goal would be, closely related to the first reason is that the goals specified were unrealistically high setting the employees up for failure and lastly the fact that only one iteration of goal-setting was completed. Goal-setting motivates through the achievement of goals.

With regards to performance monitoring, it was found that the electronic forms assisted greatly, with one of the supervisors achieving a 91% completion rate (and not being reminded once during the experiment) for the inspections assigned to him.

6.2.2 Anonymous surveys to determine acceptability

Overall, the feedback from both the employees and supervisors were very much in favour of the PMT. The main problem identified was a dissatisfaction with the ratings received. The employees were of the opinion that they were being rated unfairly.

When comparing the average performance ratings of the Mechanical Breakfloor employees with those of the Casting Bay employees, it is understandable that they would feel this way. The best solution to this problem, since the *Final Performance Rating* (*FPR*) is a percentile value calculated based on the baseline performance, is to update the baseline performance with each iteration of the process.

According to the surveys, it has also been found that the PMT pass muster with regards to user-friendliness and ease of use. Both the supervisors and employees indicated that increased individual accountability and performance were what they liked most following PMT implementation. Both groups also agreed strongly with the statement, "*I would like it if the PMT be implemented permanently*". Which came as a surprise, especially considering the complaints regarding the fairness of the ratings.

6.3 Limitations

The aim of this research was to develop a *Performance Management Tool* that could be used by supervisors to sustainably improve subordinate performance. During the testing phase however, the researcher was forced to test a watered down version that did not include the very important consequence management phase. Due to this fact, it was also decided to only test the PMT for two cycles, since both good and poor performances carried with it no consequences. This in turn affected the efficiency of the goal-setting process which lies at the centre of the PMT. Individuals will only direct effort levels to the attainment of goals if they believe in a valued result. When taking these severe limitations into account, the results attained are very promising.

6.4 Future research

The next step is to implement the PMT as designed – with the consequence management phase included over an extended period of time. The concept has been proven to show promise, but this would be the final test to determine success.

The initial testing phase of the PMT allowed both the supervisors and employees to get familiar with the tool and both parties indicated that they would like to have it permanently implemented, and that was part of the arrangement made – that the PMT would only be permanently implemented if the majority of the employees were in favour of it.

Before implementation however, and to capitalize on the goal-setting phase, I have realized that I will need to further research appropriate consequence management structures – both for good and poor performances. Should the suggested "*Induction into the Development Programme*" be a feasible reward, the programme will first need to be developed before the PMT can be implemented on a permanent basis.

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8 APPENDIX A – VBA CODE TO GENERATE FEEDBACK REPORT

```
Dim dest_counter As Integer 'used to reference destination of paste actions in Report sheet - starts with a value of three

Dim column_counter As Integer 'used to reference columns being copied as a last step in the programme

Dim MBF5_continue_loop As Boolean 'used to loop through MBF5 processed

Dim MBF6_continue_loop As Boolean 'used to loop through MBF6 processed

Dim CB5_continue_loop As Boolean 'used to loop through CB5 processed

Dim CB6_continue_loop As Boolean 'used to loop through CB6 processed

Dim column_continue_loop As Boolean 'used to loop through the columns in Main Employee list (used to switch the while statement)


Dim MBF5_counter As Integer 'used to loop through MBF5_processed, will increase with each iteration of MBF5_continue_loop - starts with a value of 13

Dim MBF6_counter As Integer 'used to loop through MBF6_processed, will increase with each iteration of MBF6_continue_loop - starts with a value of 12

Dim CB5_counter As Integer 'used to loop through CB5_processed, will increase with each iteration of CB5_continue_loop - starts with a value of 18

Dim CB6_counter As Integer 'used to loop through CB6_processed, will increase with each iteration of CB6_continue_loop - starts with a value of 18

Dim column_loop As Integer 'will be used to loop through the columns (used as ref)


Dim pas_maats As Boolean 'will be used as store for function determining whether coy number specified matches one of the coy numbers in the entry

Dim hoof_coy_nommer As Long 'coy number for which report is being generated

Dim pingon_driver As Long 'all below positions type casted as long to be used to temporarily store coy numbers of entry being checked

Dim metal_cleaner As Long

Dim tapper As Long

Dim tapper_ass As Long

Dim chill_operator As Long

Dim mudgun_operator As Long

Dim coy_nommer_to_test As Long 'will be used to transfer column data from Main Employee list


Sub Button1_Click() 'sub routine used to clear the report, in preparation for next extraction

ActiveSheet.Range("A2:CZ500").Clear
```

```
End Sub

Sub Button2_Click() 'sub-routine which will move through the various sheets extracting all applicable data



Application.ScreenUpdating = False

Total_MBF_Checks = Range("D1") 'determines range of data to be copied per entry for MBF sheet

Total_CB_Checks = Range("F1") 'determines range of data to be copied per entry for CB sheet

hoof_coy_nommer = Range("B1")

'write in the first headings of the report

'//////////////////General Copy procedure

Sheets("MBF5 Processed").Activate

ActiveSheet.Range(Cells(12, 3), Cells(12, 3 + Total_MBF_Checks)).Copy

Sheets("Individual Report").Activate

Range("A2").Value = "MBF5 Report"

Range("A3").Value = "**************************************************"

Cells(4, 1).Select

Selection.PasteSpecial xlPasteValues

'//////////////////

'1st Headings are copied, next step is to move through the entries. Only one of the coy numbers need to match for the
entry to be copied

Sheets("MBF5 Processed").Activate

MBF5_counter = 13

MBF5_continue_loop = True 'if all the entries have been checked in MBF5, variable will be set to False

dest_counter = 5

Do While MBF5_continue_loop = True

   pingon_driver = Cells(MBF5_counter, 3 + Total_MBF_Checks - 1).Value

   metal_cleaner = Cells(MBF5_counter, 3 + Total_MBF_Checks).Value

   pas_maats = coy_nommer_match(hoof_coy_nommer, pingon_driver, metal_cleaner, 0, 0)

   'if pasmaats = true, all data to be copied

   If pas_maats = True Then

      Call dra_MBF5_data_oor(MBF5_counter, dest_counter)

   Else
```

```
    End If
    MBF5_counter = MBF5_counter + 1
    'need to test when the loop needs to end
    If WorksheetFunction.IsError(Cells(MBF5_counter, 3 + Total_MBF_Checks - 1).Value) = True Then
        MBF5_continue_loop = False
    End If
Loop 'loop while MBF_continue_loop = true
dest_counter = dest_counter + 3
'MBF5 entries transferred, now for MBF6 headings
Sheets("Individual Report").Activate
Cells(dest_counter, 1).Select
Selection.Value = "MBF6 Report"
dest_counter = dest_counter + 1
Cells(dest_counter, 1).Select
Selection.Value = "**************************************************"
dest_counter = dest_counter + 1
Sheets("MBF6 Processed").Activate
'need to create new reference point in MBF6
MBF6_counter = 12
Call dra_MBF6_data_oor(MBF6_counter, dest_counter)
MBF6_counter = MBF6_counter + 1
'Same logic to be followed as above
MBF6_continue_loop = True
Do While MBF6_continue_loop = True
    pingon_driver = Cells(MBF6_counter, 3 + Total_MBF_Checks - 1).Value
    metal_cleaner = Cells(MBF6_counter, 3 + Total_MBF_Checks).Value
    pas_maats = coy_nommer_match(hoof_coy_nommer, pingon_driver, metal_cleaner, 0, 0)
    If pas_maats = True Then ' data needs to be transferred if true
        Call dra_MBF6_data_oor(MBF6_counter, dest_counter)
    Else
    End If
    MBF6_counter = MBF6_counter + 1
```

```
    'test when to end loop
    If WorksheetFunction.IsError(Cells(MBF6_counter, 3 + Total_MBF_Checks - 1).Value) = True Then
        MBF6_continue_loop = False
    End If
Loop 'loop while MBF6_continue_loop = true
'MBF data transferred, now for the casting bay data, first on the Agenda is to write the headings
dest_counter = dest_counter + 3
Sheets("Individual Report").Activate
Cells(dest_counter, 1).Select
Selection.Value = "CB5 Report"
dest_counter = dest_counter + 1
Cells(dest_counter, 1).Select
Selection.Value = "**************************************************"
dest_counter = dest_counter + 1
CB5_counter = 18
Call dra_CB5_data_oor(CB5_counter, dest_counter)
CB5_counter = CB5_counter + 1
CB5_continue_loop = True
Do While CB5_continue_loop = True
    tapper = Cells(CB5_counter, 3 + Total_CB_Checks - 3).Value
    tapper_ass = Cells(CB5_counter, 3 + Total_CB_Checks - 2).Value
    chill_operator = Cells(CB5_counter, 3 + Total_CB_Checks - 1).Value
    mudgun_operator = Cells(CB5_counter, 3 + Total_CB_Checks).Value
    pas_maats = coy_nommer_match(hoof_coy_nommer, tapper, tapper_ass, chill_operator, mudgun_operator)
    'same process to be followed as above
    If pas_maats = True Then
        Call dra_CB5_data_oor(CB5_counter, dest_counter)
    Else
    End If
    CB5_counter = CB5_counter + 1
    If WorksheetFunction.IsError(Cells(CB5_counter, 3 + Total_CB_Checks - 3).Value) = True Then
        CB5_continue_loop = False
```

```
    End If
Loop
dest_counter = dest_counter + 3
Sheets("Individual Report").Activate
Cells(dest_counter, 1).Select
Selection.Value = "CB6 Report"
dest_counter = dest_counter + 1
Cells(dest_counter, 1).Select
Selection.Value = "**************************************************"
dest_counter = dest_counter + 1
CB6_counter = 18
Call dra_CB6_data_oor(CB6_counter, dest_counter)
CB6_counter = CB6_counter + 1
CB6_continue_loop = True
Do While CB6_continue_loop = True
    tapper = Cells(CB6_counter, 3 + Total_CB_Checks - 3).Value
    tapper_ass = Cells(CB6_counter, 3 + Total_CB_Checks - 2).Value
    chill_operator = Cells(CB6_counter, 3 + Total_CB_Checks - 1).Value
    mudgun_operator = Cells(CB6_counter, 3 + Total_CB_Checks).Value
    pas_maats = coy_nommer_match(hoof_coy_nommer, tapper, tapper_ass, chill_operator, mudgun_operator)
    If pas_maats = True Then
        Call dra_CB6_data_oor(CB6_counter, dest_counter)
    Else
    End If
    CB6_counter = CB6_counter + 1
    If WorksheetFunction.IsError(Cells(CB6_counter, 3 + Total_CB_Checks - 3).Value) = True Then
        CB6_continue_loop = False
    End If
Loop
'Last method to complete, transfer of the correct columns from summary tables
dest_counter = dest_counter + 3
column_counter = 1
```

```
Call dra_kolomdata_oor(4, 3, 12, dest_counter, column_counter)

Sheets("Individual Report").Activate

Cells(dest_counter - 1, 2).Value = "Historical Average"

Cells(dest_counter - 1, 3).Value = "Employee Average"

Cells(dest_counter - 1, 4).Value = "Z-score"

Cells(dest_counter - 1, 5).Value = "Normal Distribution Value"

Cells(dest_counter - 1, 6).Value = "Amount of Ratings"

Cells(dest_counter - 1, 7).Value = "Weights"

Cells(dest_counter - 1, 8).Value = "Contributions"

Call dra_kolomdata_oor(4, 1, 12, dest_counter, column_counter)

column_continue_loop = True

column_loop = 4

Do While column_continue_loop = True

'move through column headings until the correct coy number is reached

   coy_nommer_to_test = Cells(3, column_loop).Value

   If coy_nommer_match(hoof_coy_nommer, coy_nommer_to_test, 0, 0, 0) = True Then

      'correct column reached, now all the applicable data can be moved to the report

      Call dra_kolomdata_oor(4, column_loop, 12, dest_counter, column_counter)

      Call dra_kolomdata_oor(20, column_loop, 12, dest_counter, column_counter)

      Call dra_kolomdata_oor(38, column_loop, 12, dest_counter, column_counter)

      Call dra_kolomdata_oor(52, column_loop, 12, dest_counter, column_counter)

      Call dra_kolomdata_oor(66, column_loop, 12, dest_counter, column_counter)

      Call dra_kolomdata_oor(82, column_loop, 12, dest_counter, column_counter)

   Else

   End If

   column_loop = column_loop + 1

   If column_loop = 100 Then 'database limited to 100 employees, this value can simply be changed, or logical test changed to detect ""

      column_continue_loop = False

   End If

Loop 'column_continue_loop = true

Sheets("Individual Report").Activate
```

```
Call Format_Individual_report

Application.ScreenUpdating = True

End Sub

Function coy_nommer_match(a As Long, b As Long, c As Long, d As Long, e As Long) As Boolean 'this sub-routine
will be used to check specified coy number with a maximum of 4 other entries

coy_nommer_match = False

If a = b Then

   coy_nommer_match = True

End If

If a = c Then

   coy_nommer_match = True

End If

If a = d Then

   coy_nommer_match = True

End If

If a = e Then

   coy_nommer_match = True

End If

End Function

Sub dra_MBF5_data_oor(oorsprong_ry As Integer, dest_ry As Integer)

'sub-routine will be used to transfer entries to report sheet. Just need to know which row to move and where

Sheets("MBF5 Processed").Activate

ActiveSheet.Range(Cells(oorsprong_ry, 3), Cells(oorsprong_ry, 20)).Copy

Sheets("Individual Report").Activate

Cells(dest_ry, 1).Select

Selection.PasteSpecial xlPasteValues

dest_counter = dest_counter + 1

Sheets("MBF5 Processed").Activate

End Sub

Sub dra_MBF6_data_oor(oorsprong_ry As Integer, dest_ry As Integer)

'sub-routine will be used to transfer entries to report sheet. Just need to know which row to move and where

Sheets("MBF6 Processed").Activate

ActiveSheet.Range(Cells(oorsprong_ry, 3), Cells(oorsprong_ry, 20)).Copy
```

```
Sheets("Individual Report").Activate

Cells(dest_ry, 1).Select

Selection.PasteSpecial xlPasteValues

dest_counter = dest_counter + 1

Sheets("MBF6 Processed").Activate

End Sub

Sub dra_CB5_data_oor(oorsprong_ry As Integer, dest_ry As Integer)

'sub-routine will be used to transfer entries to report sheet. Just need to know which row to move and where

Sheets("CB5 Processed").Activate

ActiveSheet.Range(Cells(oorsprong_ry, 3), Cells(oorsprong_ry, 35)).Copy

Sheets("Individual Report").Activate

Cells(dest_ry, 1).Select

Selection.PasteSpecial xlPasteValues

dest_counter = dest_counter + 1

Sheets("CB5 Processed").Activate

End Sub

Sub dra_CB6_data_oor(oorsprong_ry As Integer, dest_ry As Integer)

Sheets("CB6 Processed").Activate

ActiveSheet.Range(Cells(oorsprong_ry, 3), Cells(oorsprong_ry, 35)).Copy

Sheets("Individual Report").Activate

Cells(dest_ry, 1).Select

Selection.PasteSpecial xlPasteValues

dest_counter = dest_counter + 1

Sheets("CB6 Processed").Activate

End Sub

Sub dra_kolomdata_oor(oorsprong_ry As Integer, oorsprong_kolom As Integer, rye As Integer, dest_ry As Integer,
dest_kolom As Integer)

'sub-routine will be used for last actions, moving data from summary table

'input is in the form of x,y reference, amount of rows to remove and x,y reference in desitnation sheet

Sheets("Main Employee List").Activate

ActiveSheet.Range(Cells(oorsprong_ry, oorsprong_kolom), Cells(oorsprong_ry + rye, oorsprong_kolom)).Copy

Sheets("Individual Report").Activate

Cells(dest_ry, dest_kolom).Select
```

```
Selection.PasteSpecial xlPasteValues

column_counter = column_counter + 1

Sheets("Main Employee List").Activate

End Sub
```

9 APPENDIX B – EXAMPLE OF FEEDBACK REPORT

Coy no:	32863	MBF Checks	17	CB Checks	32		Clear Data			Generate Report							
MBF5 Report																	
**********																	
Timestamp (time format)	Shift	Tip has been loaded?	How clean is it between tip and mudgun area wall?	How clean is the pit?	Are there spillages outside the metal barricades?	How would you rate the picking station housekeeping?	Is there litter at the breakfloor area?	Is there litter at the picking station area?	General impression rating of breakfloor area	General impression rating of Picking station area	Pingon Driver Score	Metal Cleaner Score	Rater	Pingon Driver Comments	Metal Cleaner Comments	Pingon Driver	Metal Cleaner
MBF6 Report																	
**********																	
Timestamp (time format)	Shift	Tip has been loaded?	How clean is it between tip and mudgun area wall?	How clean is the pit?	Are there spillages outside the metal barricades?	How would you rate the picking station housekeeping?	Is there litter at the breakfloor area?	Is there litter at the picking station area?	General impression rating of breakfloor area	General impression rating of Picking station area	Pingon Driver Score	Metal Cleaner Score	Rater	Pingon Driver Comments	Metal Cleaner Comments	Pingon Driver	Metal Cleaner

CB5 Report

****

Timestamp (time format)	Shift	Mudgun area housekeeping	All nozzles unblocked and mudguns cleaned	Is the drill and mudgun locked out?	Are there lance tubes in the runners and/or in front of taphole	Separation quality	Housekeeping of ramps, cement slabs and trough	Housekeeping on the tapfloor	Tapfloor safety	One spare bundle of lance tubes on the tapfloor?	Cleanliness of area below stairs to tapfloor	General impression of the mudgun area (Mudgun Operator)	General impression of the ramps and cement slabs (Chill Operator)	General impression of the runners and pan area (Tapper Assistant)	General impression of tapfloor and furnace drainage (Tapper)	Rater	Tapper Score	Tapper Assistant	Chill Operator	Mudgun Operator	Tapper Score	Tapper Assistant	Chill Operator	Mudgun Operator	Tapper Comments	Tapper Assistant Comments	Chill Operator Comments	Mudgun Operator Comments	Tapper	Tapper Assistant	Chill Operator	Mudgun Operator
Sunday, September 30, 2018	C	60.0%	0.6	1	0.6	0.6	60.0%	0.8	0.8	0.2	0.6	0.6	0.6	0.6	0.8	Lazarus Tau	0	0.05	0	0.05	0.65	0.65	0.6	0.75	Bypass tap	Pipes in runners	Cement slabs and trough not cleaned	1 mudgun blocked and area not cleaned properly	39885	32863	40345	32863
Sunday, September 30, 2018	C	60.0%	0.6	1	0.6	1	60.0%	0.8	0.8	0.2	1	0.8	0.6	0.8	0.8	M. Tladi	0	0.05	0	0.05	0.65	0.85	0.733	0.8	0	0	0	0	39885	32863	40345	32863

CB6 Report

****

Timestamp (time format)	Shift	Mudgun area housekeeping	All nozzles unblocked and mudguns cleaned	Is the drill and mudgun locked out?	Are there lance tubes in the runners and/or in front of taphole	Separation quality	Housekeeping of ramps, cement slabs and trough	Housekeeping on the tapfloor	Tapfloor safety	One spare bundle of lance tubes on the tapfloor?	Cleanliness of area below stairs to tapfloor	General impression of the mudgun area (Mudgun Operator)	General impression of the ramps and cement slabs (Chill Operator)	General impression of the runners and pan area (Tapper Assistant)	General impression of tapfloor and furnace drainage (Tapper)	Rater	Tapper Score	Tapper Assistant	Chill Operator	Mudgun Operator	Tapper Score2	Tapper Assistant3	Chill Operator4	Mudgun Operator5	Tapper Comments	Tapper Assistant Comments	Chill Operator Comments	Mudgun Operator Comments	Tapper	Tapper Assistant	Chill Operator	Mudgun Operator
Monday, October 1, 2018	D	20.0%	0.2	1	0.6	0.6	60.0%	0.6	0.6	1	0.6	0.2	0.6	0.6	0.6	Pogiso Mogale	0	0.05	0	0.05	0.7	0.65	0.6	0.45	0	0	0	mudgun left blocked	13691	32863	34707	32863
Monday, October 8, 2018	D	80.0%	0.8	1	0.8	0.8	80.0%	0.8	0.8	1	0.8	0.8	0.8	0.8	0.8	Francois Ellis	0	0	0	0	0.85	0.8	0.8	0.85	Remove empt	0	0	0	13691	32863	39739	39737
Monday, October 8, 2018	D	60.0%	0.6	1	0.6	0.6	60.0%	0.6	0.6	1	0.6	0.6	0.6	0.6	0.6	Pogiso Mogale	0	0	0	0	0.7	0.6	0.6	0.7	0	0	0	0	13691	32863	39739	39737
Monday, October 8, 2018	D	100.0%	1	1	1	1	100.0%	1	1	1	0.8	1	1	1	1	Nathaniel Mogale	0	0	0	0	1	0.93	1	1	Good	Good	Good	Good	13691	32863	39739	39737
Wednesday, October 10, 2018	D	100.0%	1	1	0.6	1	100.0%	1	1	1	0.8	1	1	0.8	1	Phillip Seetane	0	0	0	0	1	0.73	1	1	0	0	0	0	13691	32863	39739	39737

	Historical Average	Employee Average	Z-score	Normal Distribution Value	Amount of Ratings	Weights	Contributions
MBF5 Pingon Driver	0.7816915				0	0	
MBF5 Metal Cleaner	0.827529				0	0	
CB5 Tapper	0.8296438				0	0	
CB5 Tapper Ass	0.7826972	0.75	-0.3586	0.3599	2	0.29	10.3%
CB5 Chill Operator	0.7994911				0	0	
CB5 Mudgun Operator	0.8678117				0	0	
MBF6 Pingon Driver	0.7816915				0	0	
MBF6 Metal Cleaner	0.827529				0	0	
CB6 Tapper	0.8296438				0	0	
CB6 Tapper Ass	0.7826972	0.74333	-0.4317	0.333	5	0.71	23.8%
CB6 Chill Operator	0.7994911				0	0	
CB6 Mudgun Operator	0.8678117				0	0	
					7		34.1%