
The Balanced Scorecard as performance measurement and personal development tool in a steel organisation

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ABSTRACT

The Balanced Scorecard (BSC) is a strategic management tool that provides the manager with a clear and concise picture of the business's health and progress in reaching the goals of the business (Norton & Kaplan, 1992: 71-79). The BSC is a set of financial and non-financial measures relating to a company's critical success factors. Of late the BSC was also used as a personal development tool – measuring the individual's performance towards set personal growth targets.

The BSC process has been part of ArcelorMittal, Vanderbijlpark Works for many years. This process can add great value to a company if managed effectively – the question is thus: is the BSC effectively implemented in ArcelorMittal, Vanderbijlpark Works?

It was decided to conduct a study to determine the status of the BSC with one main objective and two secondary objectives, namely to -

- establish whether ArcelorMittal, Vanderbijlpark Works is effectively using the BSC tool as a performance measurement, and a personal development tool (main objective);
- determine if there is a difference between the effective implementation of the BSC as a performance management and personal development tool within the different business units within ArcelorMittal, Vanderbijlpark Works. These units are Iron Making, Steel Making, Rolling, Engineering and Staff (Secondary objective 1); and
- determine if there is a difference between the effective implementation of the BSC as a performance management and personal development tool between different role gradings (these roles are defined as E, F and G roles) in ArcelorMittal, Vanderbijlpark Works (Secondary objective 2).

An empirical study was conducted in ArcelorMittal, Vanderbijlpark Works. A questionnaire was used as the measuring instrument and was issued via the HR Department to a target group of 724 employees. The questionnaires consisted of 25

questions divided into 2 sections to test both the effectiveness of the BSC as a performance management tool and a personal development tool.

To analyse the data, descriptive statistics and frequency distributions were used and calculated in Microsoft PHStat. From these results the following conclusions were drawn.

- The BSC process is well entrenched in ArcelorMittal, Vanderbijlpark Works, but lacks overall effectiveness;
- The BSC does encourage people to self-develop, but development plans are lacking, not enough time for training is given and managers must show a real intent to develop their people.

From the study and the conclusions drawn, the following recommendations were made.

- Address the issue of mistrust between the employees and their supervisory management.
- Managers should make allowance for individuals to make mistakes.
- Encourage innovation in the organisation.
- More effort should be applied to translate the company strategic objectives into workable (and measurable) KPI's at the lower levels of the organisation.
- ArcelorMittal should make a concerned effort to allow more time for training and self-development during normal working hours.
- Revisit all KPI's for weight allocation. All the departments and all the levels in the organisation see this as a drawback of the BSC system.
- Test the applicability of the KPIs. Ensure that the KPIs on the BSC are clear and that these reflect the effort the company requires from the individual.
- Allow more participation of the individual during the compilation of the BSC (this will improve buy-in).
- The E-role level communicates very well downwards to the lower levels in the organisation. Take key learning aspects from this group, and skill the F-role and G-role levels to the same extent.

ABBREVIATIONS

BSC – Balanced Scorecard

BU – Business Unit

SAP – Systems Applications Products

HR – Human Resources

KPI – Key Performance Indicator

SHERQ – Safety, Health, Environment, Risk, Quality

IT – Information Technology

IM – Information Management

TABLE OF CONTENT

CHAPTER 1: NATURE AND SCOPE OF STUDY	1
1.1 INTRODUCTION	1
1.2 PROBLEM STATEMENT	2
1.3 OBJECTIVES OF THE STUDY	2
1.3.1 Primary objectives	3
1.3.2 Secondary objectives	3
1.4 SCOPE OF THE STUDY	3
1.5 RESEARCH METHOD	4
1.5.1 Phase1: Literature review	4
1.5.2 Phase 2: Empirical study	5
1.5.2.1 Research design	5
1.5.2.2 Participants	6
1.5.2.3 Measuring instrument	6
1.5.2.4 Statistical analysis	6
1.6 LIMITATIONS AND ANTICIPATED PROBLEMS	6
1.7 LAYOUT OF THE STUDY	7
1.8 CHAPTER SUMMARY	7
CHAPTER 2: LITERATURE STUDY	9
2.1 INTRODUCTION	9
2.2 ORIGIN OF THE BALANCED SCORECARD	9
2.3 DEFINITIONS OF THE BALANCED SCORECARD	10
2.4 THE NEED FOR A BALANCED SCORECARD	12
2.5 THE BENEFITS OF A BALANCED SCORECARD	13
2.6 THE COMPONENTS OF A BALANCED SCORECARD	14
2.6.1 Financial perspective	15
2.6.2 Customer perspective	16
2.6.3 Internal-business-process perspective	17
2.6.4 Learning and growth perspective	18
2.7 POSSIBLE REASONS FOR FAILURE OR PROBLEMS WITH	

	THE BALANCED SCORECARD	19
2.8	EFFECTIVENESS OF MEASUREMENT AND THE BALANCED SCORECARD	20
2.9	THE BALANCED SCORECARD AND PERFORMANCE MEASUREMENT	22
2.10	THE BALANCED SCORECARD AND PERSONAL DEVELOPMENT	24
2.11	CHAPTER SUMMARY	26
	CHAPTER 3: EMPIRICAL STUDY	28
3.1	INTRODUCTION	28
3.2	METHODOLOGY REVIEW	28
3.2.1	Data gathering and analysis review	28
3.2.2	Sample selection	29
3.2.3	Instrument selection	30
3.2.4	Pilot study	31
3.3	INSTRUMENT DESIGN	32
3.3.1	The design of the questionnaire	32
3.3.2	Incorporation of pilot study findings in the questionnaire	34
3.4	RESULTS	34
3.4.1	Response rate	34
3.4.2	Basic analysis	35
3.4.3	Detail analysis	38
3.4.3.1	Primary objective	38
3.4.3.1.1	Primary objective - performance management tool	39
3.4.3.1.2	Primary objective - personal development tool	42
3.4.3.2	Secondary objective 1	44
3.4.3.2.1	Secondary objective 1 - performance management tool	44
3.4.3.2.2	Secondary objective 1 - personal development tool	48
3.4.3.3	Secondary objective 2	50
3.4.3.3.1	Secondary objective 2 - performance management tool	50
3.4.3.3.2	Secondary objective 2 - personal development tool	53
3.5	ADDITIONAL COMMENTS FROM THE QUESTIONNAIRE	56

3.6	CHAPTER SUMMARY	59
CHAPTER 4: CONCLUSIONS AND RECOMMENDATIONS		61
4.1	INTRODUCTION	61
4.2	CONCLUSIONS	61
4.2.1	Conclusions on the demographics of the sample group	61
4.2.2	Conclusions on the primary objective	62
4.2.2.1	Performance measurement	62
4.2.2.2	Personal development	63
4.2.3	Conclusions on secondary objective 1	63
4.2.3.1	Performance measurement	64
4.2.3.2	Personal development	65
4.2.4	Conclusions on secondary objective 2	65
4.2.4.1	Performance measurement	66
4.2.4.2	Personal development	67
4.3	RECOMMENDATIONS	67
4.4	ACHIEVEMENT OF THE STUDY'S OBJECTIVES	69
4.5	RECOMMENDATIONS FOR FUTURE RESEARCH	69
4.6	CHAPTER SUMMARY	69
REFERENCES		71
ANNEXURES		
Annexure A: Questionnaire		73
Annexure B: Data – All		76
Annexure C: Engineering		88
Annexure D: Iron Making		93
Annexure E: Steel Making		98
Annexure F: Rolling		102
Annexure G: Staff		107
Annexure H: E – roles		112
Annexure I: F – roles		117
Annexure J: G – roles		123

LIST OF TABLES

Table 3.1: Number of people per department per grading (E, F and G role)	29
Table 3.2: Selection matrix for method to issue questionnaire	31
Table 3.3: Summary of questionnaires received	35
Table 3.4: Frequency distribution – performance management questions	41
Table 3.5: Frequency distribution – personal development questions	43

LIST OF FIGURES

Figure 2.1: The Balanced Scorecard Framework	12
Figure 2.2: The components of a BSC	15
Figure 2.3: The Balanced Scorecard as a link in the management of a company's strategy	22
Figure 2.4: The performance management cycle in effective organisations	23
Figure 3.1: Response per department	35
Figure 3.2: Age distribution of respondents	36
Figure 3.3: Gender distribution of respondents	36
Figure 3.4: E, F and G role response	37
Figure 3.5: Performance Management – average response rate per question	37
Figure 3.6: Personal Development – average response rate per question	38
Figure 3.7: Response to questions testing the effectiveness of the BSC as performance management tool	40
Figure 3.8: Responses to questions testing the effectiveness of the BSC as personal development tool	43
Figure 3.9: Response to questions testing the effectiveness of the BSC as performance management tool	45
Figure 3.10: Responses to questions testing the effectiveness of the BSC as personal development tool	49
Figure 3.11: Response to questions testing the effectiveness of the BSC as performance management tool	51
Figure 3.12: Responses to questions testing the effectiveness of the BSC as personal development tool	55

CHAPTER 1

NATURE AND SCOPE OF THE STUDY

1.1 INTRODUCTION

The Balanced Scorecard (BSC) mechanism of measuring performance has since the initial development by Robert Kaplan and David Norton in the early 1990's grown in popularity. Kaplan and Norton's aim was to develop a more balanced system of measuring performance than simply using short-term financial results. The BSC helps to make strategy operational by translating strategy into performance and measurement targets (Kaplan and Norton, 1999:135).

The effectiveness of a performance measurement system is dependent on the type of mechanism used to measure performance. Old appraisal systems which mainly focused on measuring financial performance (short term focused) are no longer sufficient and relevant to the present (continuously changing) global environment. Emphasis has shifted away from only evaluating and reporting on past results to a focus of future capabilities to serve the company's customers, retain and develop internal resources and maintain growth.

It was, however found that within ArcelorMittal, Vanderbijlpark Works, people are often very negative about the BSC. Comments often made were the following.

- The BSC does not reflect the effort I put in.
- The BSC is not a fair measurement of performance.
- The Key Performance Indicators (KPI's) on the BSC are not relevant to my job.
- My supervisor does not discuss my BSC with me.
- Show me how you will measure me and I will show you how I will perform.
- The BSC is a worthless paper exercise.

The purpose of this study is to research how effectively the BSC process is used to measure performance and to encourage personal development of individuals within ArcelorMittal, Vanderbijlpark Works.

1.2 PROBLEM STATEMENT

The BSC tool has always been a hot point of debate. Traditionally the BSC within ArcelorMittal was used only to measure performance. During the last 2 years, however, the company has developed the BSC to accommodate a portion aimed at encouraging the employee to self-develop in terms of training and career development.

Because the outcome of this tool is linked to remuneration – it is even more important to ensure that the BSC meets the required criteria. It is the target of ArcelorMittal, Vanderbijlpark Works, to (by end 2009) be in a position to input the outcome of the BSC discussion into Systems Applications Product software (SAP), whereafter everything will be electronically calculated up to the point of printing the payslips of the employees. This means no further “manual” intervention by line managers.

The BSC interviews are held bi-annually. These figures are then combined to get to an annual value. This value is normalised throughout the Works and used during reward allocation. The problem is, that managers still manually adjust some of these figures due to the results, not reflecting the perceived performance of the employee. The question is why? The consistent application and effectiveness of the BSC principles across the different business units in the Vanderbijlpark Works are also questionable.

The objective of this research is to establish whether ArcelorMittal, Vanderbijlpark Works has successfully developed and implemented the BSC tool as:

- a performance measurement tool, and
- a personal development tool.

1.3 OBJECTIVES OF THE STUDY

The objectives of the study are divided into primary and secondary objectives.

1.3.1 Primary objective

The primary objective of the research is to establish whether ArcelorMittal, Vanderbijlpark Works is effectively using the BSC tool as:

- A performance measurement, and
- A personal development tool.

1.3.2 Secondary objectives

The secondary objectives of this research are as follows:

- To determine if there is a difference between the effective implementation of the BSC as a performance management and personal development tool within the different business units within ArcelorMittal, Vanderbijlpark Works. These units are Iron Making, Steel Making, Rolling, Engineering and Staff (Secondary objective 1).
- To determine if there is a difference between the effective implementation of the BSC as a performance management and personal development tool between different role gradings (these roles are defined as E, F and G roles) in ArcelorMittal, Vanderbijlpark Works (Secondary objective 2).

1.4 SCOPE OF THE STUDY

ArcelorMittal South Africa Limited is the largest steel producer on the African continent, producing 6.4 million tonnes of liquid steel per annum. ArcelorMittal South Africa is part of the world's largest steel producer, ArcelorMittal. The company is the world's number one steel company, with 310 000 employees worldwide. ArcelorMittal has an industrial presence in 27 countries across Europe, the Americas, Asia and Africa. ArcelorMittal is the leader in all major global markets, including automotive, construction, household appliances and packaging, with leading Research and Development (R&D) and technology, as well as sizeable captive supplies of raw materials and outstanding distribution networks.

Vanderbijlpark Works is one of the 4 steel operations in South Africa (also the largest producer of Flat Steel Products), with the other being in Vereeniging, Newcastle and Saldanha.

This research study was done in the Vanderbijlpark Works which has ± 4300 full-time employees. Of these employees ± 800 (18.6%), are subjected to annual performance reviews based on KPIs identified in BSCs. Included in this number, is a group of 724 people consisting of middle management, supervisors, technical people, and administrative support (staff functions including Safety, Health, Environment and Risk (SHERQ), Information Technology (IT), Information Management (IM), Finance, Human Resources (HR) and Commercial). These employees function in 4 main business units within the Company (Engineering, Iron Making, Rolling, and Steel Making) and was the sample used during the research. For ease of reporting the research findings the balance of the sample has been combined as a Staff function grouping.

The 2008 calendar year was used as the base date to gather data from the empirical study.

1.5 RESEARCH METHOD

The research method will comprise both a literature review and an empirical study.

1.5.1 Phase 1: Literature review

In the literature review an in-depth study was done with regards to the Balanced Scorecard tool as a measurement instrument. Specific research was done to determine the following:

- Why is the BSC used as a tool to measure performance?
- How is the BSC used as a measuring tool?
- What are the possible pitfalls when using the BSC?
- Can the BSC be used to encourage Personal (Self) Development?

- When is a BSC effective?

The sources that were consulted, included the following.

- Literature and published articles by Kaplan and Norton, and other known authors on this topic.
- Other research done in this field of study.
- Related articles on the world-wide web.
- Internal published documents related to ArcelorMittal, Vanderbijlpark Works.

1.5.2 Phase 2: Empirical study

1.5.2.1 Research design

A quantitative research approach was followed but due to the explanatory nature of the research study, no hypothesis was formulated.

Information for the research on this subject was obtained from both secondary and primary sources. Secondary resources included sources such as scientific journals, textbooks, previous studies and the internet.

The primary source of data was gathered by means of an empirical study (self-administered questionnaires). Respondents were requested to complete an anonymous questionnaire and submit it via hard copy to a central point of receipt. Control of this process was centralised within the HR department of the Company. Permission was obtained from both Management and the Unions to issue these questionnaires to the selected target group. The employees were assured that the information would be treated as confidential and that the results would be used only for research purposes.

An initial pilot study was done by selecting a small sample of respondents from the target group to complete a draft questionnaire. This sample indicated any problems respondents could have with the instructions or the items on the questionnaire. The

questionnaire comprised of an opening section requesting demographical data from the respondents, followed by 2 additional sections testing the effectiveness of both the BSC as performance management tool and personal development tool. These sections were comprised of a number of scaled-response questions measured on a five point Likert-type Scale and allowing for additional comments at the end of the questionnaire. The Likert-type Scale used, consisted of the following choices: SA – Strongly Agree, A – Agree, N – Neutral, D – Disagree and SD - Strongly Disagree.

1.5.2.2 Participants

Employees within the E-, F- and G-role band in ArcelorMittal, Vanderbijlpark Works, were chosen to participate. A convenience sampling method purely based on availability was chosen. This group is easily accessible (all located at the same premises in Vanderbijlpark) and sufficiently homogeneous.

1.5.2.3 Measuring instrument

The main measuring instrument that was used, was a questionnaire. This questionnaire was issued to the sample group.

1.5.2.4 Statistical analysis

Descriptive statistics and frequency distributions were used to analyse baseline data.

1.6 LIMITATIONS AND ANTICIPATED PROBLEMS

This study was limited to ArcelorMittal, Vanderbijlpark Works and findings can therefore not be generalised to the rest of the Group in South Africa.

At present ArcelorMittal, Vanderbijlpark Works is facing tough economical pressures. It was, therefore, anticipated that (due to the voluntary nature of the request) a large number of the sample would not complete and return the questionnaire.

People being very negative about the BSC, might not have responded at all and some of the participants might not have been able to understand how this research could add any value to their future growth.

1.7 LAYOUT OF THE STUDY

The chapters in this mini-dissertation are presented as follows.

Chapter 1: Nature and scope of study.

Chapter 1 provided information on the background to the selection of the research topic, the problem statement and summary of the proposed research method.

Chapter 2: Literature study.

Chapter 2 summarised the overview of the literature study that was done on the proposed research topic.

Chapter 3: Empirical study.

Chapter 3 gives the detail on the empirical study that was done, summarised data on the questionnaire returns and results and discussions.

Chapter 4: Conclusions and Recommendations.

Chapter 4 concluded the findings made in Chapter 3 and made recommendations to ArcelorMittal, Vanderbijlpark Works, on the way forward.

1.8 CHAPTER SUMMARY

The Balanced Scorecard is classified as a performance management tool. ArcelorMittal, Vanderbijlpark Works has been using this tool for a number of years and comments often made by employees question the degree of success of this tool.

Of late the company introduced an additional section to encourage employees to self-develop.

The question arising, is thus: has this tool been effectively implemented as a performance measurement tool and a tool that encourages people to self-develop?

In this chapter an overview was given on the approach followed to try to answer the problem statement. In the following chapter an in-depth literature review, discussing the ability to match the results generated during the empirical study, was done.

CHAPTER 2

LITERATURE STUDY

2.1 INTRODUCTION

Global competitiveness forces companies to focus on advantages of sustaining and gaining market share. For this reason developed strategies need to be implemented and tracked. Mistakes in the market place can be very costly and, therefore, managers spend a lot of time and effort to stay ahead of competitors.

The ability of a company to mobilize and exploit its intangible assets has become far more decisive than investing and managing its physical assets (Kaplan and Norton, 1996:3). To be able to improve a company's performance, one needs to control it; to be able to control it, one needs to understand it, and to understand it, one needs to measure it. The BSC is a tool that has been developed to assist managers to measure the performance of individuals and groups towards attaining set goals aligned with the company strategy.

In the past financial measures were the only parameters used to determine a company's success – this, however, has changed significantly as companies realised the importance of measurements of customer needs, internal business process performances and innovation and learning.

This chapter will deal with the origin of the BSC, the definitions of the BSC, the need, benefits and components of a BSC, possible problems with the BSC and the BSC as both performance management and personal development tools.

2.2 ORIGIN OF THE BALANCED SCORECARD

During 1990 the Nolan Norton Institute started a multicompany study defined as: 'Measuring Performance in the Organisation of the Future'. This study was motivated by a believe that existing performance measurement approaches, primarily relying on financial accounting measures, were becoming obsolete (Kaplan and Norton,

1996:i). Norton (at that stage the CEO of the company) was the study leader, assisted by Kaplan as the academic consultant.

During the early stages of the project Kaplan contacted the CEO (Art Schneiderman) of a company, Analog Devices, to ask permission to investigate their corporate scorecard. Kaplan realised that this multidimensional scorecard was far more useful for measurement of strategic initiatives. Many group discussions were held which led to the formulation of the now known Balanced Scorecard. This BSC was organised around four distinct perspectives: financial, customer, internal, and innovation and learning.

The Balanced Score Card name reflects the balance provided between short-term and long-term objectives, between financial and non-financial measures, between lagging and leading indicators, and between external and internal performance perspectives (Kaplan and Norton, 1996:viii). The findings of this study group were documented in an article *The Balanced Scorecard – Measures That Drives Performance* in 1992. After this a number of executives were contacted to implement the BSC in their organisations and this again led to another round of developments with specific focus on strategic measurements. These findings were published in a second article in 1993: *Putting the Balanced Scorecard to Work*.

Following up to 1996, an even larger number of developments were introduced and these findings were summarised in an article *Using the Balanced Scorecard as a Strategic Management System*. Kaplan and Norton summarised the concept and the learning up to this point (1996) in their book *The Balanced Scorecard*.

2.3 DEFINITIONS OF THE BALANCED SCORECARD

The BSC is a strategic management tool that provides the manager with a clear and concise picture of the business's health and progress in reaching the goals of the business (Norton & Kaplan, 1992: 71-79). The BSC is a set of financial and non-financial measures relating to a company's critical success factors.

Kaplan and Norton describe the innovation of the Balanced Scorecard as follows.

“The Balanced Scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. These financial measures are inadequate, however, for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation.”

The BSC provides executives with a comprehensive framework that translates a company's vision and strategy into a coherent set of performance measures (Kaplan and Norton, 1996: 24). The BSC includes not only historical (lagging) performance measures (such as financial targets) but also leading indicators such as customer satisfaction and expectations, and learning and growth opportunities.

Kaplan and Norton (1996: 7) define the BSC as a “collision between the irresistible force to build long-range competitive capabilities and the immovable object of the historical-cost financial accounting model”. This definition implies that the BSC complements financial measurements of past performance with measures of the drivers of future performance (Kaplan and Norton, 1996: 8).

Kreitner and Kinicki (2007: 270) define performance management as “the continuous cycle of improving job performance with goal setting, feedback and coaching, and rewards and positive reinforcement”.

Niven (2002: 12) describes the BSC as a carefully selected set of measures derived from an organisation's strategy. The measures selected for the BSC, represent a tool for leaders to use in communication to employees and external stakeholders, the outcomes and performance drivers by which the organisation will achieve its mission and strategic objectives. Niven sees the BSC simply as a measurement system, a strategic management system, and a communication tool.

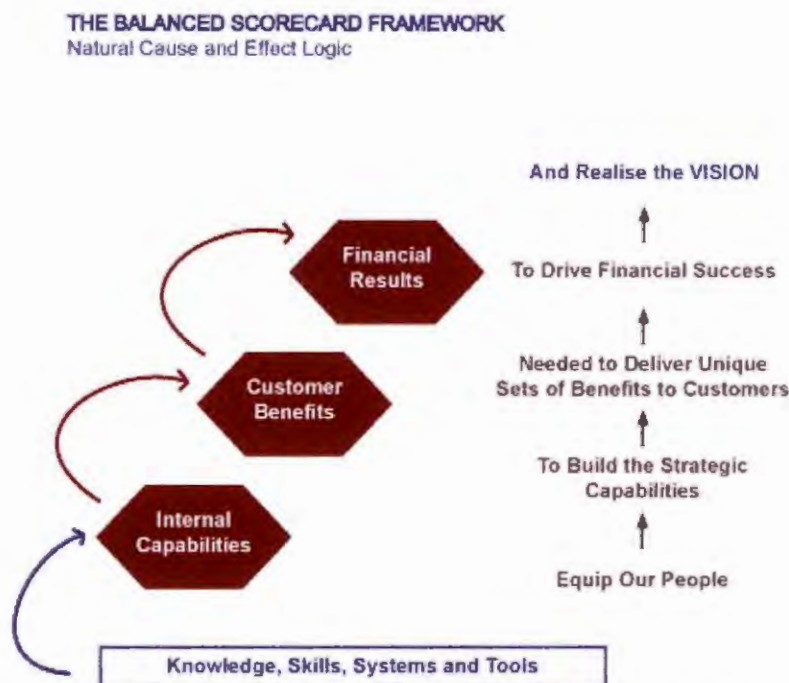
The Balanced Scorecard Institute of South Africa defines the BSC as a management system that enables organisations to clarify their vision and strategy and translate these into action. It provides feedback around both the internal business processes

and external outcomes, in order to continuously improve strategic performance and results. When fully deployed, the Balanced Scorecard transforms strategic planning from an academic exercise into the nerve center of an enterprise. The four perspectives of the BSC (Kaplan and Norton, 1996: 24-29) are defined as the

- learning and growth perspective;
- business process perspective,
- customer perspective, and
- financial perspective.

These perspectives are all linked by cause and effect logic – see figure 2.1 below.

Figure 2.1 The Balanced Scorecard Framework



Source: The Balanced Scorecard Institute of South Africa, 2009

2.4 THE NEED FOR A BALANCED SCORECARD

Organisations today continue to grapple with the complex challenges of our changing environment, brought about by market demands, new technology and – more specific in South Africa – the pressures being placed on organisational performance due to a transforming workforce (Rampersad, 2006: v). The well-known axioms “If you can’t measure it, you can’t manage it, because you won’t know if it

improves” and “What gets measured gets done” summarise the need for a balanced scorecard.

Kaplan and Norton (1993:135) state specifically three reasons why companies need a BSC.

- No single measure or set of measures can adequately guide and motivate the current actions that drive future performance.
- Financial results are lagging indicators (report past performance) and are not adequate predictors or drivers of future performance. Companies need to balance short-term financial performance with long-term growth opportunities. Companies often distort their current financial performance by not reporting the effects of current actions on the future value of the company.
- Strategic objectives need to be linked to a set of financial and operational measures in order to clarify and communicate the objectives. These linked objectives can then be used to evaluate performance.

2.5 THE BENEFITS OF A BALANCED SCORECARD

The purpose of having a BSC system for an organisation should be to add value to the business and stimulate innovation and growth. The BSC translates mission and strategy into objectives and measures, organised into four different perspectives: financial, customer, internal business process, and learning and growth (Kaplan and Norton, 1996: 25). The BSC thus channels the energy, abilities, and knowledge of people towards the long-term goals of the company.

Some of the benefits of a BSC are the following.

- It clarifies and gains consensus about the company strategy.
- It communicates the strategy of the company throughout the organisation.
- It maintains a balance between the short-term financial profits and long-term competitive ability of an organisation.
- It provides managers with a tool to break down corporate level measures to the levels of the workers on the floor. This enables the workforce to recognise their contribution to the survival and growth of the company (line of sight).

- It serves as a focal point for the company's efforts, defining and communicating priorities to managers, employees, investors and customers.
- It helps the organisation to focus on breakthrough performance.
- It encourages the process of innovation, learning and growth.

Research outcomes of studies of the Corporate Leadership Council reveal the following.

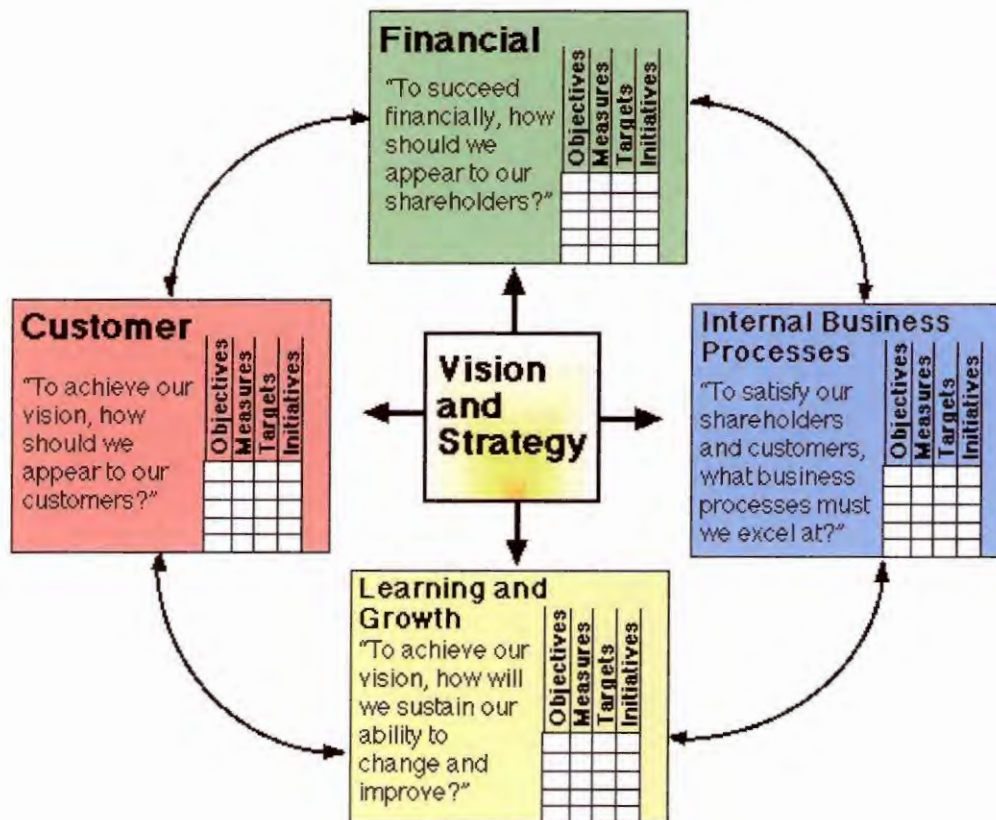
- Companies with performance management programs (BSC) have higher profits, better cash flows, stronger stock market performance, and a greater stock value than companies without performance management.
- Productivity in firms without performance management programs (BSC) is significantly below the industry average, while productivity in firms with performance management programs (BSC) is on par with the industry average.
- Companies with performance management programs (BSC) significantly improved their financial performance and productivity after implementing performance management programs (BSCs).

2.6 THE COMPONENTS OF A BALANCED SCORECARD

Managers recognise the impact that measures have on performance in today's global competitive environment. Companies need to have a measurement system which drives actions that will ultimately lead to creating value for its shareholders, while also encouraging employees to be innovative and to grow through the process of learning and experiencing.

The BSC gives a balanced view of the four main perspectives (as developed by Kaplan and Norton): financial, customer, internal business process, and learning and growth. Every measure selected for the BSC, should be part of a link of cause-and-effect relationship, ending in financial objectives, that represent a strategic theme for the business unit (Kaplan and Norton, 1996: 62). When used this way, the BSC is not a group of isolated (unconnected) or conflicting objectives. These components are illustrated in figure 2.2 below.

Figure 2.2: The components of a BSC



Source: Kaplan and Norton, The Balanced Scorecard: 1996, 11

2.6.1 Financial perspective

Financial measures are important and valuable in summarising the readily measurable economic consequences of actions already taken (Kaplan and Norton, 1996: 25). These measures indicate if the company's strategy, implementation and execution are contributing to the bottom line of the company (are these actions adding value and increasing profits?). All energy spent on improving customer satisfaction, quality and on-time delivery, will be of no use if there is no increase on returns. Typical financial indicators include: operating income, revenue growth, return on equity, return on assets, economic value added, sales growth and cash flow.

The BSC can make financial objectives explicit and customise the financial objective of each business unit within an organisation. This enables managers to improve the

line of sight of their unit responsibility towards to ultimate goal: to provide superior returns (to stakeholders) on invested capital. The BSC enables the manager to specify the metric by which the long-term success of the business unit is measured, and the variables considered most important to create and to drive the long-term outcome objectives (Kaplan and Norton, 1999: 61).

In simplicity, financial goals are to survive, succeed and prosper. Survival is measured by cash flow, success by growth in sales and operating income and prosperity by an increased market share and return on equity and capital employed.

2.6.2 Customer perspective

To be able to formulate this perspective, managers should know their targeted customer and market segment. This market segment will represent the source that will deliver the revenue component of the company's financial objectives. According to Niven (2002: 15) an organisation must answer the following two questions.

- Who are our target customers?
- What is our value proposition in serving them?

Core outcome measurements in this perspective are: share of market, retention, acquisition, partnerships, loyalty, satisfaction and profitability. These, however, again are lagging indicators. To develop leading indicators, Kaplan and Norton (1996: 85) suggest that companies strive to select objectives and measures from the following three classes of attributes.

- Product or service attributes (this include price, quality, speed (time) of service, functionality (fit for purpose)),
- Customer relationship (quality of purchasing experience, personal relationships),
- Image and reputation (brand awareness and strength).

The BSC demands that management must translate their general mission statement on customer service into specific measures that reflect the factors that really matter to the customers. Customers are normally concerned with lead-time, quality of

products and services, the company's performance with regard to service and the cost-effectiveness of the product or service.

2.6.3 Internal-business-process perspective

To determine the internal-business-process perspective measurements companies must decide on what processes and competencies they must excel at and specifically measure each of them. Internal measures for the BSC should be derived from the business processes that have the greatest impact on customer satisfaction (factors that affect cycle time, quality, skill of the employees and productivity). To satisfy customers and shareholders' expectations, a company may need to identify entirely new internal processes rather than to focus efforts on the incremental improvements of existing activities (Niven, 2002: 16).

Recent development incorporates the innovation process as a vital component of this perspective. Innovation highlights the importance of identifying the characteristics of the market segment a company wants to satisfy with new products and then also how to design and develop these products. The BSC must thus allow for considerable weight and measures to encourage research, design and development work.

Kaplan and Norton (1996: 96) suggest that a company's internal-business-process perspective can be developed by following a generic value-chain model which encompasses the following three principal business processes.

- Innovation (research the emerging or latent needs of customers and create products or services that will meet the requirements or needs of the customers).
- Operations (producing and delivery of existing products and services to customers); and
- Post-sale service (service to customer after the original sale or delivery of the product or service).

The internal perspective examines areas such as operations management, customer management, customer relationships, innovation, product development, delivery, manufacturing, after-sale service, regulatory and social processes.

2.6.4 Learning and growth perspective

A company's ability to innovate, improve and learn, correlate directly with the value of the company. A culture of innovation and continuous learning can bring about efficiency in the operating domain of a business. This ensures cost reduction and product differentiation so as to meet the varied requirements of the customers. As a result, it strengthens the financial ability through earning higher profits and retaining a larger share of earnings to finance the forthcoming expansion of future projects of the company under consideration.

According to Kaplan and Norton (1996: 146) the enablers for learning and growth come primarily from three sources: employees, systems and organisational alignment. They state that strategies to ensure superior performance will generally require significant investment in people, systems and processes that build organisational capabilities. Niven (2002: 16) sees this perspective as the foundation of the BSC. This perspective could contain both leading and lagging indicators.

The learning and growth perspective is itemised by -

- human capital (competencies, skill, knowledge, and experience of employees),
- information capital (accuracy, availability, networks, infrastructure); and
- organisation capital (leadership, alignment, culture).

Indicators can be employee turnover, employee retention and attraction, employee skill levels, employee satisfaction, amount of training hours, availability of information, continuous improvement initiatives, career opportunities, promotions within the company, personal alignment, team alignment and organisational alignment.

2.7 POSSIBLE REASONS FOR FAILURE OR PROBLEMS WITH THE BALANCED SCORECARD

Many executives have commented that the BSC is not as simple as it seems. Managers in both manufacturing and service organisations have encountered some problems with the development, implementation and sustaining of the BSC. Kaplan and Norton (1996: 284) suggest that these failures can be categorised in 2 main categories:

- Structural defects (choice of measures), and
- organisational defects (process of developing and implementing the BSC).

Structural defects come about when managers try to supplement already existing financial measures with non-financial measures like market share and customer satisfaction. These non-financial measures however, already contain defects of traditional financial measures – they are generic, lagging and report on how well the company's strategy has worked in the past. Managers need to balance leading indicators with the lagging indicators to achieve excellent long-run financial performance (Kaplan and Norton, 1996: 285).

Organisational defects come about due to inadequate development and implementation of the BSC. The BSC development should be led by senior executives and should not be based on general measures used by other industrial leading companies, but be derived for breakthrough performance. The implementation of the BSC can sometimes be delayed as managers try to perfect the measurements. This can lead to a loss in momentum and enthusiasm. The BSC is a dynamic process and should be reviewed continuously - rather start the process and keep on learning how to manage with a balanced set of performance drivers and outcome measures (Kaplan and Norton, 1996: 286).

Schneiderman (1999: 6) identifies six main reasons for failures of the BSC.

1. The non-financial variables are incorrectly identified as primary drivers of future stakeholder satisfaction.
2. The metrics are poorly defined.

3. Improvement goals are negotiated. These goals should be built on stakeholder requirements, fundamental process limits, and improvement process capabilities.
4. There is no deployment system that breaks down high-level goals to the level where actual improvement activities reside (loss of line of sight).
5. No state-of-the-art improvement system.
6. There is no (and cannot be) quantitative linkage between the non-financial and anticipated (expected) financial results.

From the above it is evident, that the BSC can be successfully developed, implemented and maintained when managers keep to the basics by not confusing the employees with too many measures. Measures should be aligned with the strategic goals of the company, by defining the metrics well and by breaking the measures down to floor level where people can understand what is required of them.

2.8 EFFECTIVENESS OF MEASUREMENT AND THE BALANCED SCORECARD

To determine when a BSC is effective, we have to understand the definition of effectiveness. Coetsee (2003: 42) defines effectiveness as “doing the right things right”. Coetsee (2003: 43) also correlates effectiveness with the 80/20 theory (Pareto Principle). This principle implies that when you are effective it means that 20% of your effort leads to 80% of your results, 20% of time spent should lead to 80% positive outcomes (effectiveness) and the use of 20% of resources should achieve 80% of results.

Coetsee (2003: 43) defines organisational effectiveness as a company’s ability to:

- adapt to present and future internal and external demands, expectations and constraints,
- inspire action and create outcomes which satisfy stakeholders (clients, shareholder, owners, employees),
- realise the vision; and
- survive.

Kaplan and Norton (1996) stress the importance of adhering to the following three principles in order to develop a BSC that is more than a group of isolated and eventually conflicting strategies and measures.

- Build in cause-and-effect relationships.
- Include sufficient performance drivers; and
- Provide a linkage to financial measures.

They also state that if data do not exist to support a measure, the management process for a key strategic objective is likely to be inadequate or nonexistent.

The Corporate Leadership Council research suggests that one should clearly define performance standards, and thereafter, ensuring employee understanding of their objectives, is the single most effective driver of performance. Additional keys to overall performance management success include encouraging a culture of risk-taking, having managers provide employees with good formal and informal feedback, and providing employees with the appropriate job development opportunities.

Covey (1999: 52) states, that his seven habits are being effective because they are based on principles and therefore, they bring the maximum long-term beneficial results possible. These habits become the basis of a person's character, creating an empowering center of correct maps from which an individual can effectively solve problems, maximise opportunities, and continually learn and integrate other principles in an upward spiral of growth.

Boyett and Conn (1996: 75) give the following four guidelines for performance measurement.

- All measures should be accomplishment-based.
- Measures should be group- or team-orientated, not measures of individual employee performance.
- When developing measures, seek a level of precision sufficient for the purpose of the measurement, and use a family of measures rather than try to force one measure to serve as a ultimate indicator; and
- Measures should be reviewed and changed, if necessary, when strategies change.

2.9 THE BALANCED SCORECARD AND PERFORMANCE MEASUREMENT

Traditional financial performance measurements give an excellent view of what happened in the past (lagging indicator) but are inadequate in addressing the real value-creating mechanisms in today's organisations. These value-creating mechanisms include intangible assets such as knowledge and networks of relationships (Niven, 2002: 13). The BSC complements the lagging indicators with leading indicators (drivers of future economic performance). The great advantage of the BSC lies in the translating of a company's mission into action plans and aligning employees with these actions.

The BSC describe the key elements in achieving the company's strategy and is the cornerstone of a company's current and future success. Figure 2.3 below indicates that the BSC is a critical link (performance measures – light green block) in the closed loop (continuous) process of formulating strategy through to final evaluation and assessment. From this it is evident that the BSC should be a dynamic process which should be changed as the need for a change in the strategy arises.

Figure 2.3: The Balanced Scorecard as a link in the management of a company's strategy.



Source: The Balanced Scorecard Institute of South Africa, 2009

Performance management can also be described as a systematic process by which a company involves its employees as individuals and members of a group, in improving organizational effectiveness in the accomplishment of the company's mission and goals. Employee performance management includes:

- planning work and setting goals and expectations,
- continually monitoring performance and giving feedback to the individual,
- developing the capacity to perform (learning and growth),
- periodically rating performance in a summary fashion; and
- rewarding good performance.

In effective organizations, managers and employees practise good performance management naturally all their lives, executing each of the above-mentioned key components in the process well. Goals are set and work is planned routinely while progress toward these goals is measured and employees get regular feedback. To ensure effectiveness, high standards (with clear measurements) are set, but care is also taken to develop the skills needed to reach each of these expectations. Both formal and informal rewards are used to recognize the behavior and results that accomplish the mission. All five component processes working together and supporting each other, achieve natural, effective performance management. Figure 2.4 below illustrates this continuous process.

Figure 2.4: The performance management cycle in effective organisations.



Source: unknown

For the BSC to be a successful performance measurement tool the following needs to be done.

- The strategy need to be clear, agreed upon and well communicated.
- Departmental and personal goals need to be aligned with the strategy.
- Measurement metrics need to be accurate.
- The strategic objectives need to be linked to financial results and long-term targets.
- Periodic strategic reviews need to be conducted; and
- Lessons learnt need to be built into future measurements (continuous improvement).

2.10 THE BALANCED SCORECARD AND PERSONAL DEVELOPMENT

The BSC allows for a mix of factors to be included to measure organisational and individual performance. These include strategic intent, well-defined values, strategy-aligned structure, sound processes, courageous leadership, skilled people and importantly, a high performance and learning culture. The learning and growth perspective of a BSC is the glue that holds it all together and differentiates the organisation from its competitors (Rampersad, 2006: v).

The objective of the learning and growth perspective is to provide the infrastructure to enable ambitious objectives in the other three perspectives to be achieved (Kaplan and Norton, 1996: 126).

The BSC stresses the importance of investing in the future. These investments include people, systems and procedures. According to Kaplan and Norton (1996: 127) the following three principle categories for the learning and growth perspective apply.

- Employee capabilities.
- Information system capabilities; and
- Motivation, empowerment and alignment.

It is thus evident that this perspective is important in the self-development process of an individual. Dr Hubert Rampersad (2006: 15-16) notes that both individuals and managers can greatly benefit from a well-structured personal balanced scorecard.

These benefits include the following.

For the individual.

- Greater understanding of the self and increased self-esteem.
- Self-actualisation.
- Greater enjoyment and inner involvement in the work (happiness is enhanced at the work by reducing the gap between company life and normal life).
- Working smarter instead of harder (we become more creative as we grow, we become good time-managers).
- Greater usage of individuals' mental capacity and productivity; and
- Increased personal responsibility (more competent people become more confident to take on more complex work).

For the manager.

- Higher employee engagement.
- Greater customer satisfaction (employees delivering quality work on time).
- Improved employee performance.
- Intrinsically motivated employees.
- Less absenteeism and grievances for the organisation (stress and burnout are reduced).
- Individual and team empowerment (individuals start to trust fellow workers and share personal ambition and knowledge).
- Increased innovation.
- Effective talent management (taking up challenges and developing of related skills).
- Effective diversity management; and
- Sustainable organisational effectiveness.

It is evident that this portion of the BSC translates personal vision into concrete personal targets and actions for improvement, providing the basis for balancing personal aspirations with personal behaviour (Rampersad, 2006: 17).

2.11 CHAPTER SUMMARY

The BSC is a tool that measures performance of a company in four perspectives: financial, customer, internal-business-process and learning and growth. In this chapter a literature study was done to analyse the background on the BSC, research different definitions of the BSC, understand the four perspectives of the BSC, determine when a BSC is effective, and investigate the BSC as personal development tool.

It was concluded, that for the BSC to be effective the following are prerequisites.

- Employees need to have participated in the compilation of their BSC.
- Employees must get feedback on their performance.
- KPIs need to be clearly link to the business strategy.
- KPIs must be measurable and have direct line of sight (the employee must be clear on what he has to do to contribute to the bottom line).
- KPIs must be linked to financial gains.
- KPIs must inspire action and create outcomes which satisfy stakeholders (fair, achievable); and
- Some KPIs must measure team performance (not only individual).

Personal development forms a very important part of the BSC and this learning and growth perspective form the base to successfully manage the other three perspectives.

From the literature review, the following is clear.

- The BSC should include a personal development KPI as part of the learning and growth perspective.
- This KPI should encourage self-development.
- This KPI should encourage innovation.

- Allow opportunities for growth through learning (and making mistakes); and
- Allow the individual to develop this KPI.

The next chapter reflects the finding of the field study done in order to determine if the BSC is effectively implemented in ArcelorMittal, Vanderbijlpark Works as a performance measurement tool, and a personal development tool.

CHAPTER 3

EMPIRICAL STUDY

3.1 INTRODUCTION

An empirical study was conducted in ArcelorMittal, Vanderbijlpark Works. A questionnaire was used as the measuring instrument and was issued via the HR Department to a target group of 724 employees. The questionnaires consisted of 25 questions divided into 2 sections to test both the effectiveness of the BSC as a performance management tool and as a personal development tool.

This chapter discusses the method of:

- data gathering and data analysis;
- sample selection;
- measuring instrument selection, and
- measurement instrument design.

The chapter closes with the analysis of the results which were calculated in Microsoft PHStat and displayed in graphical and table formats.

3.2 METHODOLOGY REVIEW

3.2.1 Data gathering and analysis review

According to Struwig and Stead (2004:86) there are two basic primary data collection methods:

- Observations; and
- Asking questions.

For the purpose of this study, questions needed to be asked. The methods for collecting data by means of a questionnaire study can broadly be categorised as follows (Struwig and Stead, 2004: 86-88).

- Personal interviews.

- Telephone surveys; and
- Mail surveys (alternatively hard copy surveys).

The selection of the appropriate instrument for the survey is discussed in paragraph 3.2.3 in this chapter.

The data-gathering and analysis review of this study has the following objectives.

- Gather data to be able to analyse the effectiveness of the BSC as performance management tool and personal development tool in ArcelorMittal, Vanderbijlpark Works.
- Gather data to be able to analyse data with regards to the effectiveness of the BSC as performance management tool and personal development tool within the different BU's in ArcelorMittal, Vanderbijlpark Works.
- Gather data to be able to analyse the effectiveness of the BSC as performance management tool and personal development tool between the different role gradings (E, F, G roles) in ArcelorMittal, Vanderbijlpark Works; and
- Use statistical methods to analyse the data and determine relationships.

3.2.2 Sample selection

A sample of 724 workers (all the E, F and G roles within ArcelorMittal, Vanderbijlpark Works) was drawn (see table 3.1). This sample was drawn from the 4 major business units (BUs) within ArcelorMittal, Vanderbijlpark Works (Engineering, Iron Making, Steel Making, and Rolling) and the balance of the sample was combined as a Staff function grouping.

The rationale behind the selection of this sample, is that this is the biggest group of people that fall within the category of the management review process as governed by the BSC process implemented within ArcelorMittal, Vanderbijlpark Works. The sample covers a broad spectrum of race, gender and age participants at different levels within the organisation.

This sample was selected because of its ease of accessibility (within ArcelorMittal, Vanderbijlpark Works), low cost requirement and limited fieldwork time (the HR department within the company assisted with the fieldwork).

Table 3.1: Number of people per department per grading (E, F and G role)

Actuals				
Department	E	F	G	Total
Engineering	19	22	77	118
Iron Making	13	14	90	117
Rolling	28	38	141	207
Steel Making	21	23	98	142
Staff	27	52	61	140
Grand Total	108	149	467	724

Source: Own research.

3.2.3 Instrument selection

The selection of the appropriate instrument for the survey was determined by comparing three different types of questionnaire study methods, as well as considering the issuing and collection method of the completed questionnaires. The issuing and collection method for the questionnaire was a very important decision, for the following reasons.

- The confidentiality of the respondent should be ensured.
- The method should be the easiest, most time- and cost-effective way to reach the targeted sample group.
- The method should encourage respondents to complete the questionnaire.
- The method of returning the completed questionnaires, should be effective.

Three methods of issuing and collecting of the questionnaire data were considered: one-on-one discussions, e-mail and hard copy handouts (telephone surveys were not considered due to the size of the sample and the low response rate associated with this method).

To determine the best possible method, a simple matrix calculation was designed – see table 3.2 below. The 4 questions above were tabled across the three possible methods of issuing the questionnaire. Weights were allocated to the questions by considering the importance of each. The four questions were then ranked on a scale of 1 to 3 (1=low, 2=medium, 3=high) in each of the possible methods on the matrix (one on one discussion, e-mail, and hard copy handouts). The product of this scale

and the weight of each question in each of the methods were summed and averaged to a value out of 100. From these average scores it was evident that the best method of issuing the questionnaire, was by hard copy hand-out.

The issuing method was discussed with the HR Manager of Vanderbijlpark Works and it was decided that the field-work would be done by the HR Consultants and HR Representatives in the different BUs. The initial period allowed for completion of the questionnaire was set at 1 week but was thereafter extended by 3 more weeks to allow for a better rate of return. The results are discussed in paragraph 3.4 of this chapter.

Table 3.2: Selection matrix for method to issue questionnaire

Question	Weight	One-on-one discussion		E-mail		Hard copy hand-out	
		Scale	Score	Scale	Score	Scale	Score
1. How is the confidentiality of the respondent ensured?	35	1	35	2	70	3	105
2. What is the easiest, most time- and cost-effective way to reach the targeted sample group?	20	1	20	3	60	2	40
3. Which method will encourage respondents to complete the	30	3	90	1	30	2	60
4. How are the completed questionnaires returned?	15	2	30	3	45	1	15
Total weight	100						
Total score			175		205		220
Average score out of 100			<u>58.3</u>		<u>68.3</u>		<u>73.3</u>
Scale	1	Low					
	2	Medium					
	3	High					

Source: Own research.

3.2.4 Pilot study

A pilot study was done so as to determine the quality of the questionnaire, and ensure that the questionnaire will be effective once issued to the main sample group.

The main objectives of the pilot study were to ensure the following.

- The covering page was well-constructed and the target group would clearly understand the purpose of the questionnaire.
- All questions are clear, with no ambiguity.
- The geographical data required do not intimidate the respondent not to complete the questionnaire.
- The time needed to complete the questionnaire was not too long.

Proposed improvements to the questionnaire determined from the pilot study would then be implemented before the issuing of the questionnaire to the main sample group.

3.3 INSTRUMENT DESIGN

3.3.1 The design of the questionnaire

The questionnaire was designed with a cover page, followed by pages containing the questions. The cover page included the following.

1. The title of the research topic.
2. Demographic information required for the study (department, gender, age, grading).
3. An information block indicating the purpose and confidentiality of the questionnaire.
4. An instruction paragraph on how to complete the questionnaire and where to deliver the completed document.

The questionnaire was comprised of 2 sections with questions to test responses to the two main areas of research.

- Performance management (questions 1 to 12).
- Personal development (questions 1 to 8).

A five point Likert-type Scale was used to measure response. The Likert-type Scale used, consisted of the following choices: SA – Strongly Agree, A – Agree, N –

Neutral, D – Disagree and SD - Strongly Disagree. The questionnaire also made allowance for additional comments.

This questionnaire tested the effectiveness of the BSC as performance management tool and personal development tool by addressing the following key issues.

- Is the BSC aligned with the Business strategy?
- Does it reflect the employee's contribution towards the Business strategy?
- Are the KPIs relevant to the employee's job?
- Does the employee see this as a fair measure towards his / her performance?
- Does the BSC allow the employee to make mistakes and learn from it?
- Does the BSC encourage innovation?
- Does the BSC encourage teamwork and team performance?
- Does the BSC encourage the employee to self-develop?

The questionnaire was structured in such a way that the questions could be grouped to test different aspects of the BSC. These groupings can be described as follow.

Questions 1 to 12 – Performance Management Tool

- Questions 1, 2 and 3 test effectiveness in terms of the understanding, need for and compilation of the BSC of the employee.
- Questions 4 and 8 test the effectiveness of communication and feedback with regards to the formal BSC performance interview.
- Questions 5, 6 and 7 test the effectiveness with regards to the alignment, weighing and measurability of the KPIs on the BSC of the employee.
- Questions 9 and 12 test to see if the employee sees the BSC as a fair measurement of his or her input.
- Question 10 tests the trust of the employee with regards to the BSC process to such an extent, that annual remuneration can be linked to it.
- Question 11 specifically tests allowance for innovation within the BSC.

Question 1 to 8 – Personal Development Tool

- Questions 1, 4 and 6 test the effectiveness of the BSC to encourage employees to self-develop.
- Question 2 tests the effectiveness of the BSC process with regards to addressing shortcomings in a development plan.
- Question 3 tests the effectiveness of the BSC to allow for mistakes to be made as part of the employee's learning process.
- Questions 5, 7 and 8 test the employee's willingness to take ownership of his / her development.

The questionnaire is attached in Annexure A.

3.3.2 Incorporation of pilot study findings in the questionnaire

An initial questionnaire was designed and tested during a pilot study. From the pilot study the following 3 main changes were made.

1. Three of the questions were eliminated as this was seen as a duplication of existing questions.
2. The format of the front page was changed to emphasise the fact that the questionnaire was based on the performance evaluation which was done during the year ending 2008.
3. The text font was changed to allow the total questionnaire to be printed on 2 pages (one single double-sided page). This not only reduced costs by 33% but also ensured that all feedback would be limited to one single document.

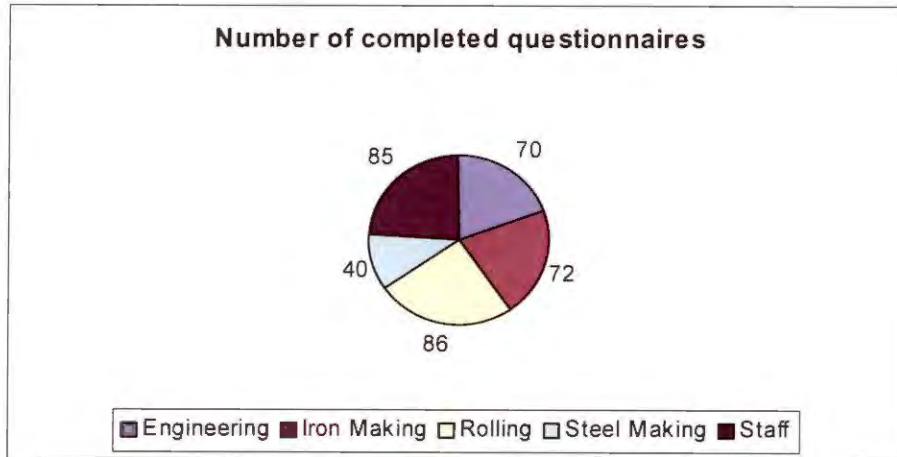
3.4 RESULTS

3.4.1 Response rate

The field-work was done during a period of four weeks. Questionnaires were issued by hand via the HR Department of ArcelorMittal and collected at a central point. A

total number of 724 questionnaires were issued and 353 (49%) were received back. The detail per department is shown in figure 3.1 below.

Figure 3.1: Response per department



Source: Own research

The detail of the responses per department (per grading) is shown in table 3.3 below.

Table 3.3: Summary of questionnaires received.

Received					
Department	E	F	G	Total	Total %
Engineering	18	15	37	70	59%
Iron Making	13	8	51	72	62%
Rolling	11	21	54	86	42%
Steel Making	10	6	24	40	28%
Staff	20	39	26	85	61%
Grand Total	72	89	192	353	49%

Source: Own research

3.4.2 Basic analysis

Descriptive statistics and frequency distributions were used and calculated in Microsoft PHStat. All the data were captured in Microsoft Excel and to enable analysis of the data the responses on the 5-point Likert-Scale were coded according to the following:

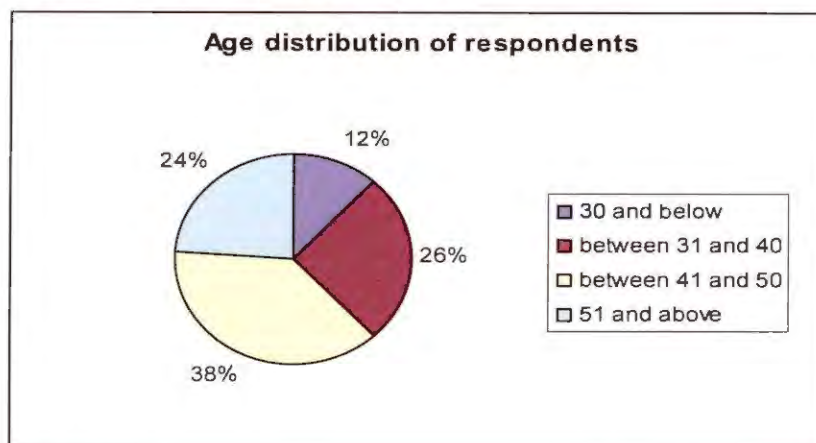
- Strongly agree = 1,

- Agree = 2,
- Neutral = 3,
- Disagree = 4,
- Strongly disagree = 5.

It is important to note that with this coding method, high values will indicate negative responses while low values will indicate positive responses.

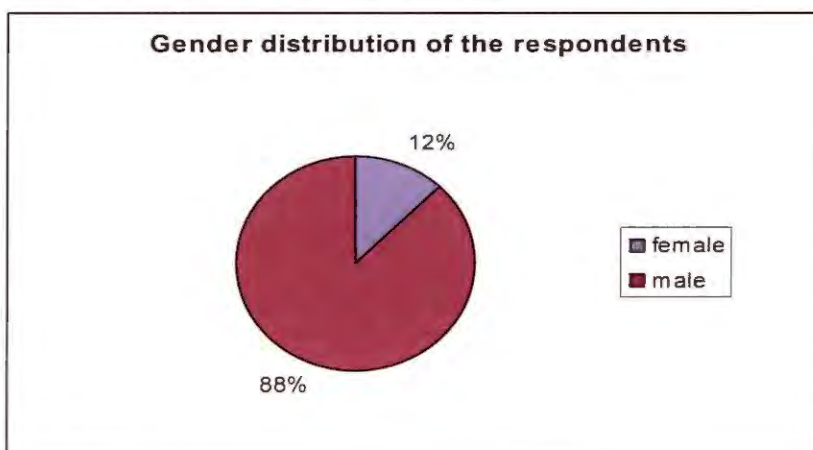
From the data it is clear that 62% of the respondents were above the age of 40 and that 88% of the respondents were males. Figures 3.2 and 3.3 illustrate these findings. It was calculated that the average age of the respondents was 42.9 years.

Figure 3.2: Age distribution of respondents



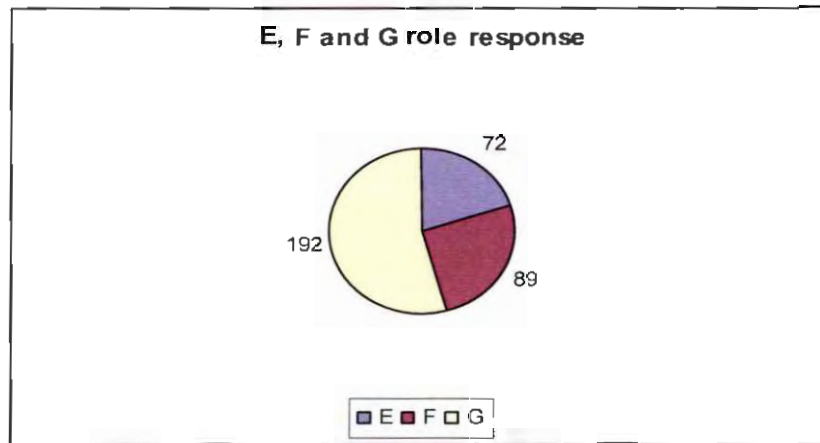
Source: Own research

Figure 3.3: Gender distribution of respondents



Source: Own research

Figure 3.4: E, F and G role response

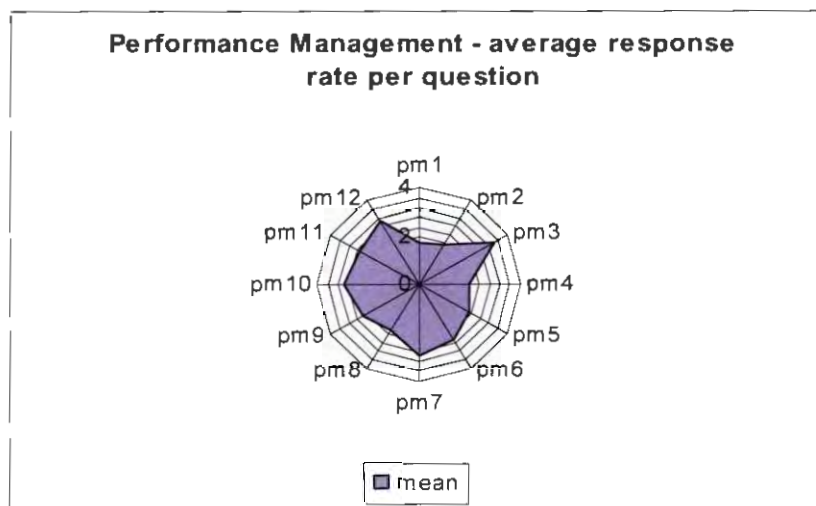


Source: Own research

Figure 3.4 above shows that 20% of the respondents came from the E-role level, 25% from the F-role level and 55% from the G-role level.

From the data gathered the mean values of all the responses on the 20 questions (12 questions in the performance management category and 8 questions in the personal development category) were calculated and illustrated in the two spider graphs (figures 3.5 and 3.6).

Figure 3.5: Performance Management – average response rate per question



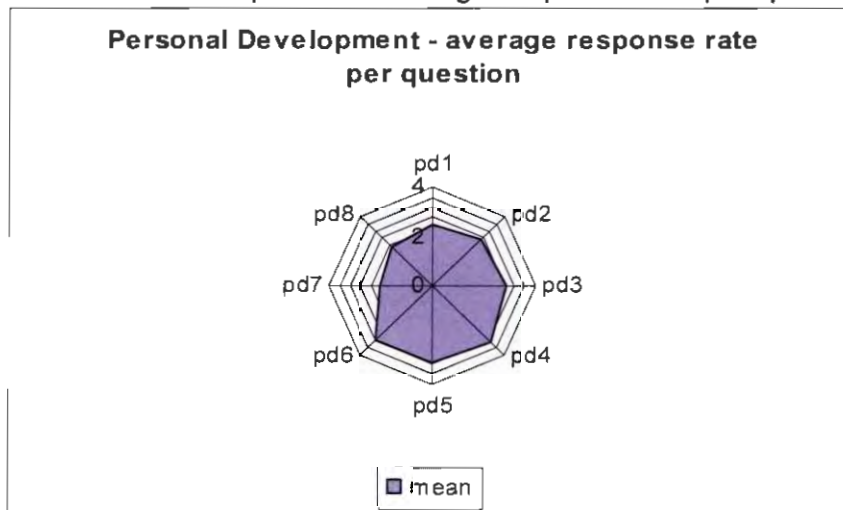
Source: Own research

From the graph above the following is evident.

- The average values (means) varies between just below 2 to just above 3;

- The lowest mean (most positive response) is seen in question pm1 (mean = 1.75) and the highest mean (most negative response) is seen in question pm3 (mean = 3.38).
- None of the averages were below 1 (which would have indicated a strong positive response) and none of the averages were above 4 (which would have indicated a strong negative response).

Figure 3.6: Personal Development – average response rate per question



Source: Own research

From the graph above the following is evident.

- The average values (means) vary between 2 to just above 3.
- The lowest mean (most positive response) is seen in question pd7 (mean = 2.0) and the highest mean (most negative response) is seen in question pd4 (mean = 3.26).
- None of the averages were below 1 (which would have indicated a strong positive response) and none of the averages were above 4 (which would have indicated a strong negative response).

The detailed analysis of the different objectives follows in the paragraphs below.

3.4.3 Detail analysis

3.4.3.1 Primary objective

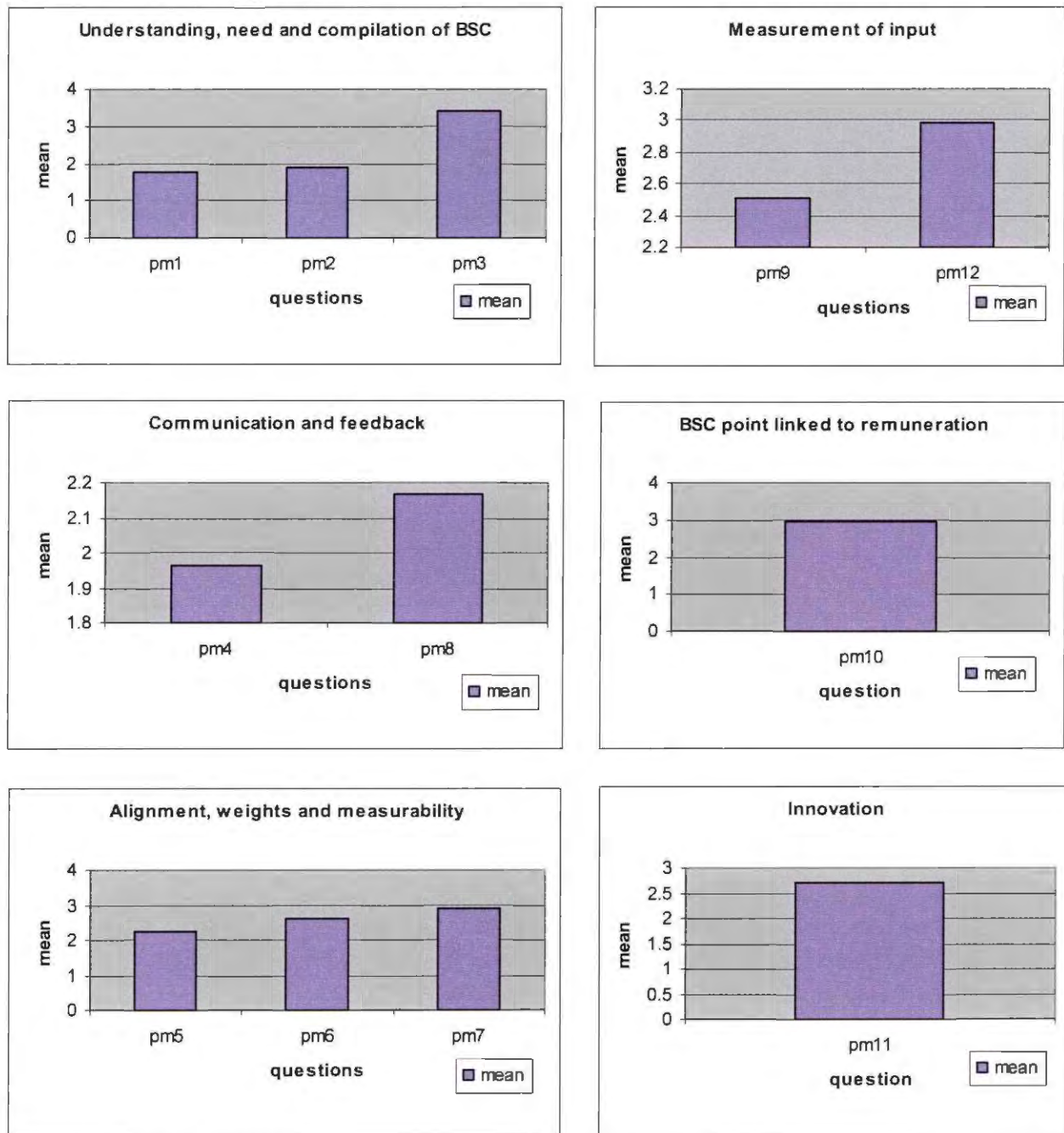
3.4.3.1.1 Primary objective - Performance management tool

The mean values of the responses to the questions are illustrated in figure 3.7 below and the frequency distributions in table 3.4 below.

From these graphs and frequency tables the following is evident.

- Testing of the understanding, need and compilation of the BSC (questions pm1, pm2 and pm3).
 - The positive response to questions pm1 [(mean = 1.75 and frequency = 90.09% (agree and strongly agree)] and pm2 [(mean = 1.90 and frequency = 87.82% (agree and strongly agree)] indicated, that the respondents do have a formal BSC and that they understand the need thereof.
 - Question pm3 (mean = 3.38) indicates that 55.81% of the respondents feel that they had input into their BSC compilation while 17.56% were neutral to this question. The balance (26.63%) of the respondents indicated that they had no input into the compilation of their BSC. The total of 44.19% (respondents answering neutral or not agreeing) is an indicator of concern, with possibilities of improvement.
- Testing communication and feedback during the BSC process (questions pm4 and pm8).
 - The positive responses to questions pm4 (mean = 1.96) and pm8 (mean = 2.17) indicate, that the communication and feedback with regards to the formal BSC interview is effective. This is confirmed by the high positive frequency distribution of above 80% for both the questions.
- Testing alignment, weights and measurability of the KPI's (questions pm5, pm6 and pm7).
 - Question pm5 (mean = 2.23) with frequency = 70.25% (agree and strongly agree) indicates, that the KPI's of the respondents are aligned with the ArcelorMittal Strategic objectives.

Figure 3.7: Response to questions testing the effectiveness of the BSC as performance management tool.



Source: Own research

- Question pm6 (mean = 2.63) tested the measurability of the KPIs on the BSC. A total of 51.56% of the respondents positively agree with the statement. Of concern, however, is that 48.44% of the respondents are neutral or do not agree that the KPI's are clear and measurable.
- The importance and correctness of the weight allocated to each KPI on the BSC was tested by question pm7 (mean = 2.91). A total of 28.05% of the

respondents agree that this is the biggest drawback of the BSC system, 50.14% are neutral on this question and 21.81% see this as no drawback. This indicator is an area of concern, with possibilities of improvement.

Table 3.4: Frequency distribution – performance management questions

bins	pm1		pm2		pm3		pm4	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	143	40.51%	102	28.90%	29	8.22%	97	27.48%
2	175	49.58%	208	58.92%	65	18.41%	203	57.51%
3	23	6.52%	28	7.93%	62	17.56%	29	8.22%
4	5	1.42%	6	1.70%	136	38.53%	17	4.82%
5	7	1.98%	9	2.55%	61	17.28%	7	1.98%

bins	pm5		pm6		pm7		pm8	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	53	15.01%	26	7.37%	21	5.95%	68	19.26%
2	195	55.24%	156	44.19%	78	22.10%	217	61.47%
3	84	23.80%	110	31.16%	177	50.14%	26	7.37%
4	14	3.97%	46	13.03%	67	18.98%	26	7.37%
5	7	1.98%	15	4.25%	10	2.83%	16	4.53%

bins	pm9		pm10		pm11		pm12	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	40	11.33%	24	6.80%	21	5.95%	28	7.93%
2	170	48.16%	137	38.81%	158	44.76%	118	33.43%
3	84	23.80%	75	21.25%	100	28.33%	87	24.65%
4	42	11.90%	68	19.26%	46	13.03%	72	20.40%
5	17	4.82%	49	13.88%	28	7.93%	48	13.60%

Source: Own research

- Testing the input (effort) given by the respondents at the workplace (questions pm9 and pm12).
 - Question pm9 (mean = 2.51) indicates that the majority of the respondents (59.49%) see the BSC point as a reflection of their “perceived performance” rather than their actual performance. This correlates well with question pm12 (mean = 2.98) with only 41.36% of the respondents agreeing that the BSC reflects the effort they put in at the workplace. This indicator is an area of concern, with possibilities of improvement.
- Testing the degree of comfort the respondents have with linking the BSC outcome to their remuneration (question pm10).

- Question pm10 (mean = 2.95) indicates, that only 45.61% of the respondents feel comfortable that their BSC point can be linked to their remuneration. This indicator is an area of concern, with possibilities of improvement.
- Testing encouragement for innovation (question pm11).
 - Question pm11 (mean = 2.72) indicates, that 50.71% of the respondents believe that the KPIs on their BSC encourages them to find better ways to do their jobs. This can definitely improve, as one would like to see people being encouraged to be more innovative.

3.4.3.1.2 Primary objective - Personal development tool

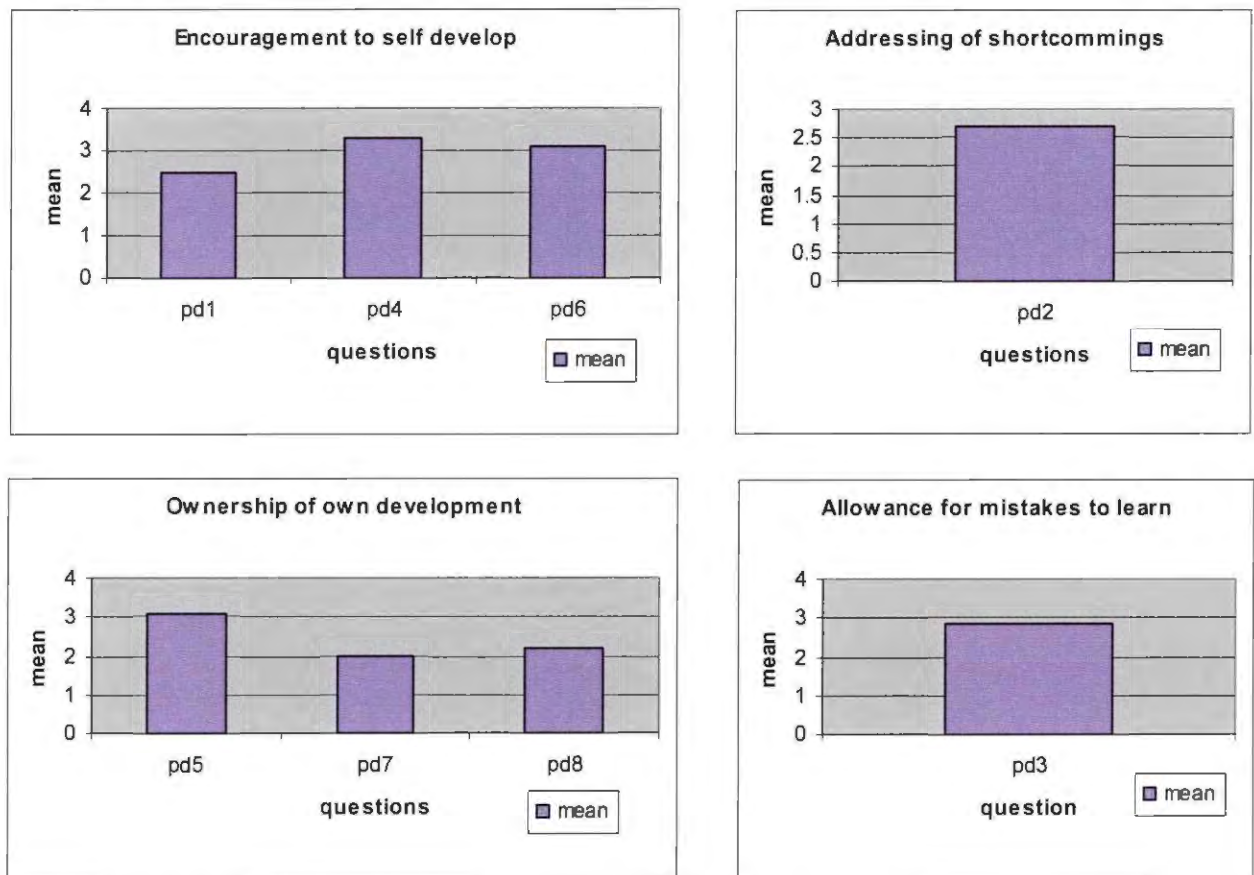
The mean values of the responses to the questions are illustrated in figure 3.7 below and the frequency distributions in table 3.5 below.

From these graphs and frequency tables the following is evident.

- Testing encouragement to self-develop (questions pd1, pd4 and pd6).
 - Question pd1 (mean = 2.49) indicated, that 60.62% of the respondents are encouraged by the BSC to accept responsibility for their own development.
 - Question pd4 (mean = 3.26) indicated that 30.03% of the respondents believe that they have enough time during normal working hours for training and self-development, 43.06% do not have enough time, while 26.91% are neutral. This indicator is an area of concern, with possibilities of improvement.
 - Question pd6 (mean = 3.1) indicated, that only 28.61% of the respondents think the company is serious about their development. This indicator is an area of concern, with possibilities of improvement.
- Testing allowance to address shortcomings (questions pd2).
 - Question pd2 (mean = 2.69) indicates that 50.99% of respondents have an action plan developed after their BSC interview with the purpose of addressing shortcomings in their personal development. This is far below the

expectation that all interviews should lead to an action plan for further development of the individual.

Figure 3.8: Responses to questions testing the effectiveness of the BSC as personal development tool.



Source: Own research

- Testing allowance to be able to make mistake to learn (question pd3).
 - Question pd3 (mean = 2.88) indicates, that 36.83% of the respondents believes that the BSC allows for mistakes to be made as part of their learning curve. A large number of responses (40.51%) were neutral on this question. This is a concern as the BSC should be used not only to punish but also to encourage people to learn from their mistakes.
- Testing ownership of own development (questions pd5, pd7 and pd8).
 - Question pd5 (mean = 3.07) indicates, that 33.14% of the respondents do studies / training outside of their normal working hours.

- Both questions pd7 and pd8 (means = 2 and 2.19 and frequencies = 84.99% and 71.67%) shows positive signs that the employees take every opportunity to develop and take ownership of their own development.

Table 3.5: Frequency distribution – personal development questions

	pd1		pd2		pd3		pd4	
<i>bins</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>
1	35	9.92%	16	4.53%	15	4.25%	5	1.42%
2	179	50.71%	164	46.46%	115	32.58%	101	28.61%
3	83	23.51%	103	29.18%	143	40.51%	95	26.91%
4	43	12.18%	52	14.73%	58	16.43%	100	28.33%
5	13	3.68%	18	5.10%	22	6.23%	52	14.73%

	pd5		pd6		pd7		pd8	
<i>bins</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>
1	27	7.65%	11	3.12%	72	20.40%	54	15.30%
2	90	25.50%	90	25.50%	228	64.59%	199	56.37%
3	95	26.91%	148	41.93%	38	10.76%	84	23.80%
4	113	32.01%	68	19.26%	11	3.12%	12	3.40%
5	28	7.93%	36	10.20%	4	1.13%	4	1.13%

Source: Own research

3.4.3.2 Secondary objective 1.

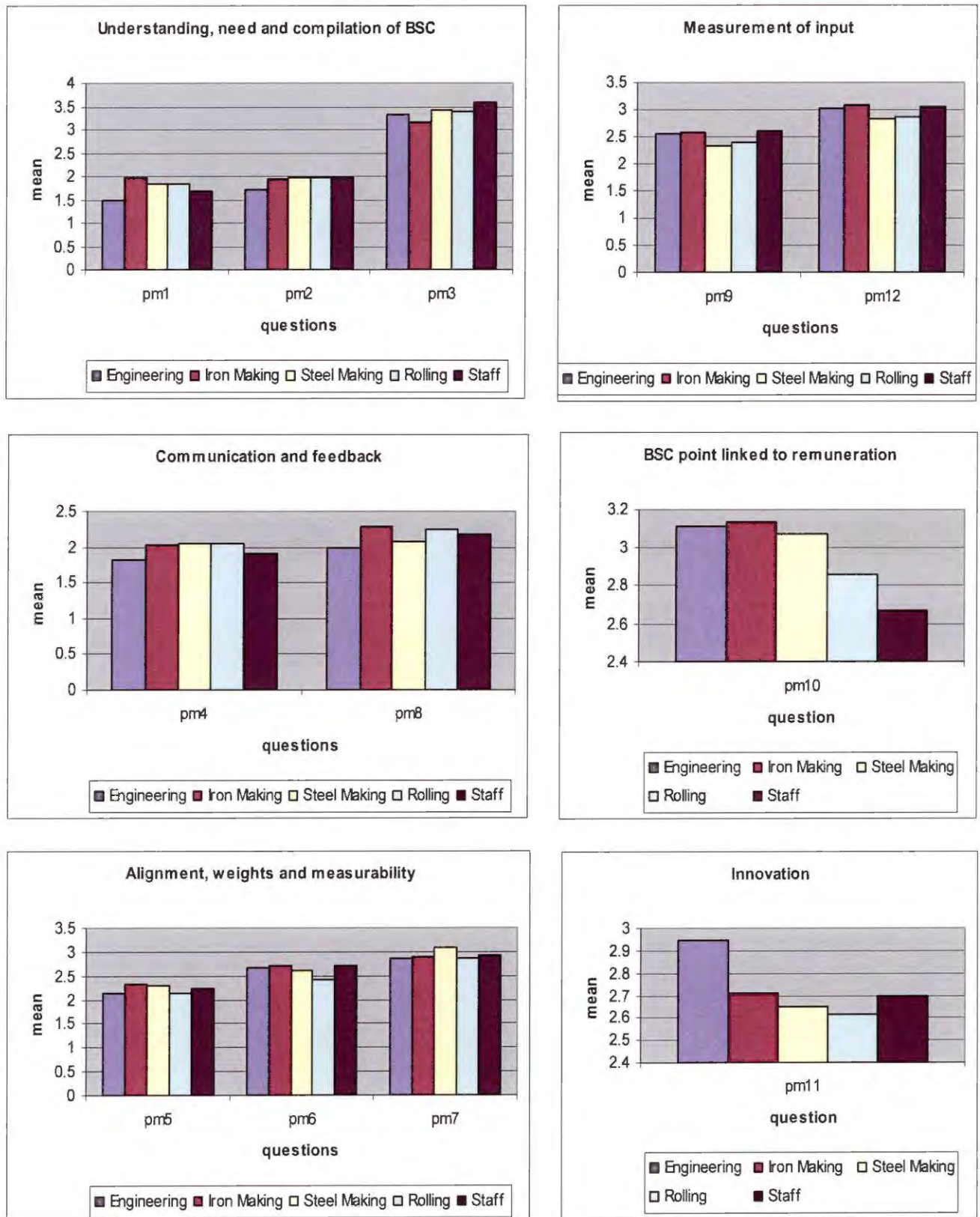
3.4.3.2.1 Secondary objective 1 - performance management tool

The mean values of the responses to the questions are illustrated in figure 3.9 below and the frequency distributions in Annexures C, D, E, F and G.

From these graphs and frequency tables the following is evident:

- Testing of the understanding, need and compilation of the BSC (questions pm1, pm2 and pm3).
 - Question pm1. The frequency distribution of the departments is between 97.14% (Engineering) and 84.88% (Rolling), indicating that only a small percentage of respondents do not have a formal BSC. The target for this is 100%. Contributing to these lower values can be the fact that graduates in training and technicians in training (who forms part of the sample) follow a different evaluation process during their initial training period.

Figure 3.9: Response to questions testing the effectiveness of the BSC as performance management tool.



Source: Own research

- Question pm2. The frequency distribution of the departments is between 95.71% (Engineering) and 83.53% (Staff), indicating a good understanding of the principles and need of the BSC in all the departments.
- Question pm3 (negatively-posed question). The frequency distribution of the departments (disagreement with the statement) are between 61.18% (Staff) and 44.44% (Iron), indicating an area of concern. This question tested the inputs of the respondent into his or her own BSC. A much higher mean (>4) was expected, which would have indicated far more participation in the formulation of the BSC.
- Testing communication and feedback during the BSC process (questions pm4 and pm8).
 - Question pm4. The frequency distribution of the departments is between 90% (Engineering) and 80% (Steel), indicating that the respondents do have formal one-on-one discussions with their supervisors.
 - Question pm8. The frequency distribution of the departments is between 88.57% (Engineering) and 75% (Iron) indicating that the respondents do get formal feedback after the BSC evaluation.
- Testing alignment, weights and measurability of the KPIs (questions pm5, pm6 and pm7).
 - Question pm5. The frequency distribution of the departments is between 74.42% (Rolling) and 62.5% (Iron) indicating reasonable alignment of the KPIs with the company strategy but a possible area for improvement.
 - Question pm6. The frequency distribution of the departments is between 60.46% (Rolling) and 45.71% (Engineering), indicating that all KPIs are not clearly measurable. The possible low value at Engineering may be contributed to the nature of the business of the Engineering Department (KPIs for service departments are normally more difficult to formulate and measure).
 - Question pm7. The frequency distribution of the departments (disagreement with the statement) is between 24.42% (Rolling) and 19.45% (Iron) with the majority of respondents in all the departments giving a neutral answer on this

question. This indicates that all the departments see the weights allocated to the KPIs as a possible drawback of the BSC system.

- Testing the input (effort) given by the respondents at the workplace (questions pm9 and pm12).
 - Question pm9. The frequency distribution of the departments is 70% (Steel), 66.28% (Rolling), 56.94% (Iron) 55.29% (Staff) and 52.86% (Engineering) indicating that more than 50% of all respondents believe that the BSC points is a reflection of what the supervisor “thinks” of their performance. The big gap between the Engineering, Iron and Staff departments compared to the Steel and Rolling departments indicates a serious concern.
 - Question pm12. The frequency distribution of the departments is between 50% (Rolling) and 34.73% (Iron), indicating more than 50% of all respondents do not believe that the BSC reflects the effort they put in at the workplace. This correlates well with the responses in question pm9 and indicates an area of serious concern.
- Testing the degree of comfort, the respondents have with linking the BSC outcome to their remuneration (question pm10).
 - Question pm10. The frequency distribution of the departments is between 57.63% (Staff) and 37.14% (Engineering) indicating less than 60% of all respondents are comfortable that their annual remuneration reward can be linked to their BSC point. The very high mean values calculated in the Engineering, Iron and Steel departments (all > 3) indicate a real concern in this area.
- Testing encouragement for innovation (question pm11).
 - Question pm11. The frequency distribution of the departments is between 56.97% (Rolling) and 42.85% (Engineering) indicating a less than expected opportunity for innovation. This result is of specific concern in the Engineering department that should be focused on innovative solutions to improve the business.

3.4.3.2.2 Secondary objective 1 - personal development tool

The mean values of the responses to the questions are illustrated in figure 3.10 below and the frequency distributions in Annexures C, D, E, F and G.

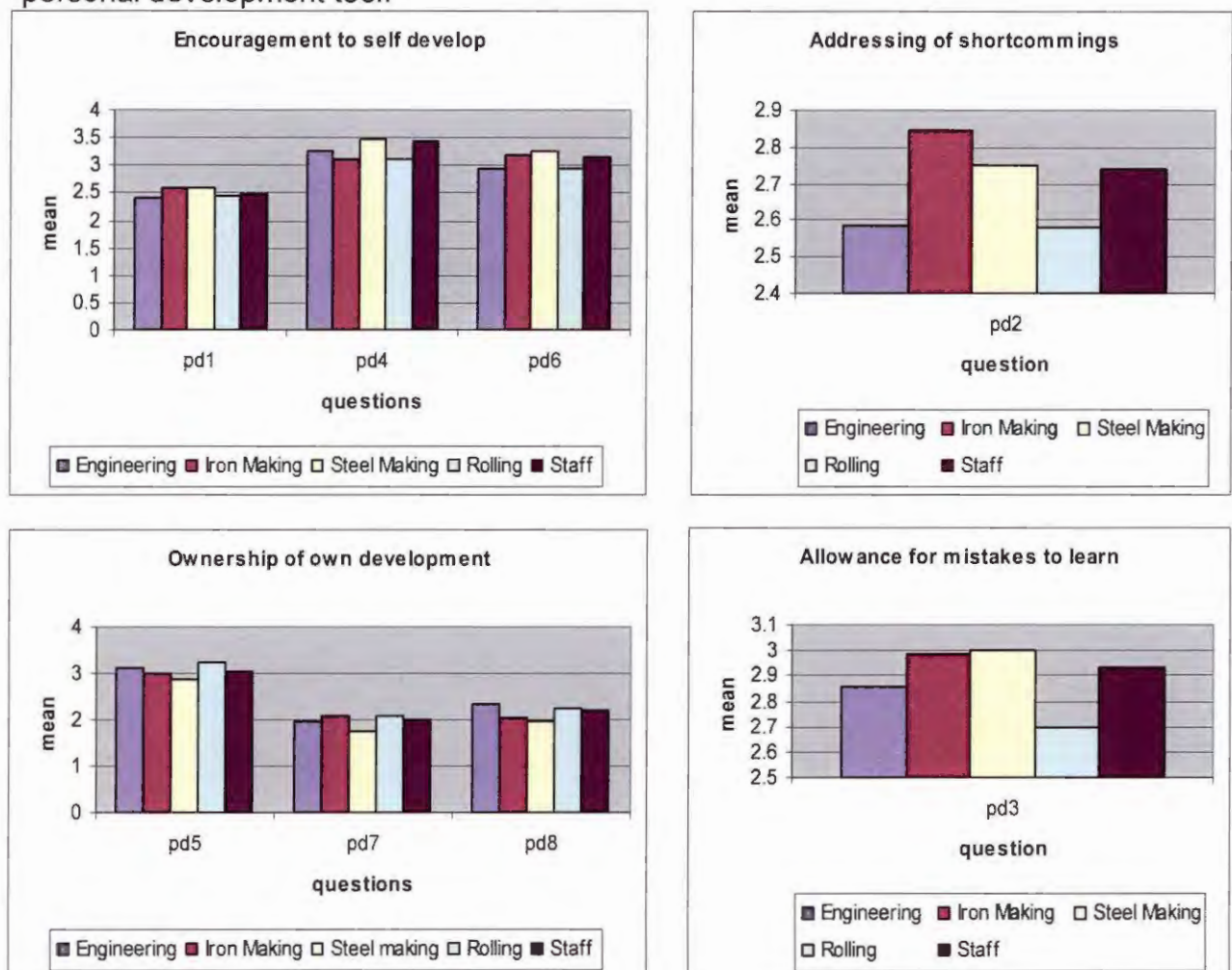
From these graphs and frequency tables the following is evident.

- Testing encouragement to self-develop (questions pd1, pd4 and pd6).
 - Question pd1. The frequency distribution of the departments is between 68.57% (Engineering) and 55% (Steel) indicating that the respondents have some believe that the BSC encourages them to self-develop. The difference between the highest (Engineering) and lowest (Steel) frequency could, however, pose a learning opportunity for the lower-ranked departments.
 - Question pd4. The frequency distribution of the departments is between 36.05% (Rolling) and 22.36% (Staff), indicating that all the respondents do not believe that enough time is allocated during normal working hours for training and self-development. What is of real interest, is that the staff departments are the lowest ranked in this question.
 - Question pd6. The frequency distribution of the departments is between 32.56% (Rolling) and 24.71% (Staff), indicating that all of the departments do not think that the company is serious about their development. This is an area of major concern.
- Testing allowance to address shortcomings (question pd2).
 - Question pd2. The frequency distribution of the departments is between 57.14% (Engineering) and 41.67% (Iron) indicating that a large number on respondents do not have a action plan for future development after the BSC interview. This is an area of concern.
- Testing allowance to be able to makes mistakes to learn (question pd3).
 - Question pd3. The frequency distribution of the departments is between 50% (Rolling) and 27.5% (Steel), indicating that 50% of all respondents do not think that the BSC allows for mistakes as part of the individual's learning

curve. In Engineering, Iron and Steel, this figure is as high as 70%. This is an area of serious concern.

- Testing ownership of own development (questions pd5, pd7 and pd8).
 - Question pd5. The frequency distribution of the departments is between 47.5% (Steel) and 22.09% (Rolling), indicating that between one and two out of every five people are busy with some sort of training or studies outside of their normal working hours.
 - Question pd7. The frequency distribution of the departments is between 95% (Steel) and 79.16% (Iron), indicating that the majority of respondents in the different departments take ownership of their own development.

Figure 3.10: Responses to questions testing the effectiveness of the BSC as personal development tool.



Source: Own research

- Question pd8. The frequency distribution of the departments is between 82.5% (Steel) and 62.86% (Engineering), indicating that many of the respondents in the different departments use every possible opportunity to self-develop. The lower frequency value in the Engineering and Staff departments could indicate an opportunity for improvement.

3.4.3.3 Secondary objective 2.

3.4.3.3.1 Secondary objective 2 - performance management tool

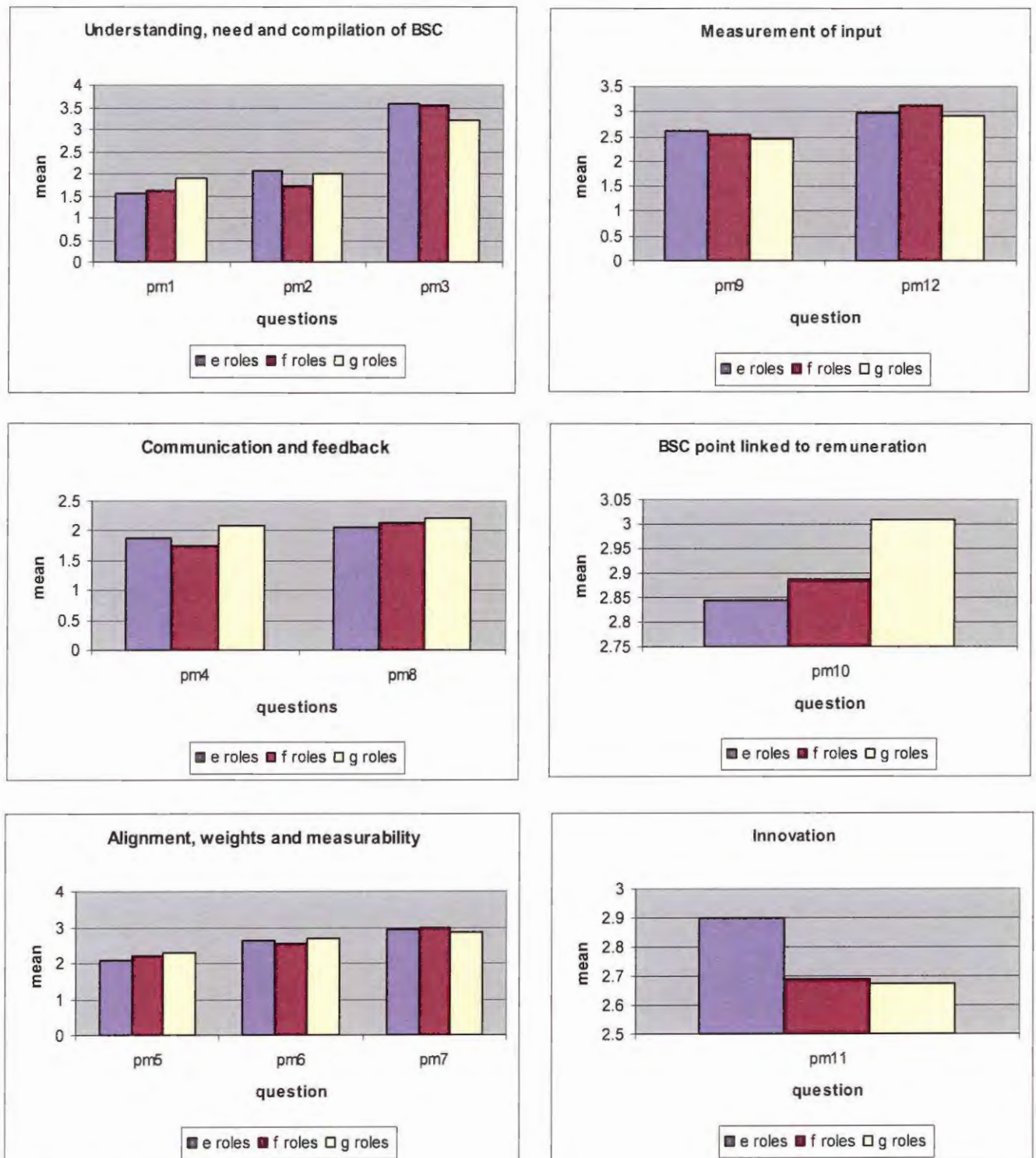
The mean values of the responses to the questions are illustrated in figure 3.11 below and the frequency distributions in Annexures H, I and J.

From these graphs and frequency tables the following is evident.

- Testing of the understanding, need and compilation of the BSC (questions pm1, pm2 and pm3).
 - Question pm1. Mean values of below 2 for E, F, and G roles indicate a very strong positive response to this question. The frequency distribution of the gradings is: 98.59% E roles, 92.22% F roles and 85.94% G roles indicating that the majority of respondents do have formal BSC's. A possible contributor to the lower value on the G-role level, is the fact that the majority of engineers in training and technicians in training are appointed on G-role level and follow a structured training programme with a performance management system different to the standard BSC process.
 - Question pm2. The frequency distribution of the gradings is: 84.51% E-roles, 93.33% F-roles and 85.94% G-roles, indicating a high level of communication effectiveness with regards to the principles and need of a BSC. The higher frequency value on the F-role level (and lower mean value indicating a strong positive response) indicates a very strong level of communication downwards from the E-role level.
 - Question pm3 (negatively-posed question). The frequency distribution of the gradings (disagreement with the statement) is: 63.38% E-roles, 61.11% F-roles and 50.52% G-roles. This indicates that almost 31.77% of all G-role

respondents believe that they had no input into the compilation of their BSC with 17.71%, responding neutral to this question.

Figure 3.11: Response to questions testing the effectiveness of the BSC as performance management tool.



Source: Own research

- Testing communication and feedback during the BSC process (questions pm4 and pm8).
 - Question pm4. The frequency distribution of the gradings is: 90.14% E-roles, 93.33% F-roles and 79.17% G-roles indicating that almost 80% of all levels do have formal one-on-one performance discussions at least twice a year with their supervisors. The lower frequency value on G-roles should be seen as an area for possible improvement.
 - Question pm8. The frequency distribution of the gradings is: 85.92% E-roles, 81.11% F-roles and 78.65% G-roles, indicating a similar response on all the levels. More than 78% of all respondents do get feedback on the final BSC point allocated to them.
- Testing alignment, weights and measurability of the KPIs (questions pm5, pm6 and pm7).
 - Question pm5. The frequency distribution of the gradings is: 76.06% E-roles, 73.33% F-roles and 66.67% G-roles, indicating a decline in alignment with strategic objectives as the level of the roles go lower. This is an indicator that more effort should be applied to translate the company strategic objectives into workable (and measurable) KPIs at the lower levels of the organisation
 - Question pm6. The frequency distribution of the gradings is: 50.70% E-roles, 58.89% F-roles and 48.44% G-roles indicating that more than 49% of both E- and G-role level respondents are unsure that their KPIs are clear and measurable. This is an area of possible improvement.
 - Question pm7. The frequency distribution of the gradings (disagreement with the statement) is: 29.58% E-roles, 25.55% F-roles and 34.33% G-roles. A very large number of respondents gave a neutral answer on this question (E-roles = 42.25%, F-roles = 50% and G-roles = 53.70%). This is a clear indication that all the roles see the weights allocated to the KPIs as the biggest drawback on the BSC system.
- Testing the input (effort) given by the respondents at the workplace (questions pm9 and pm12).

- Question pm9. The frequency distribution of the gradings is: 57.75% E-roles, 60% F-roles and 59.90% G-roles, indicating that all the roles believe that the BSC point is a reflection of how the supervisor perceives the performance of the respondent. This is a major area of concern.
- Question pm12. The frequency distribution of the gradings is: 39.44% E-roles, 32.22% F-roles and 46.35% G-roles, correlating well with the frequency distributions, as seen in question pm9. This is again an area of concern and more worrying is the very low frequency from the F-role level (the technical backbone of the company).
- Testing the degree of comfort the respondents have with linking the BSC outcome to their remuneration (question pm10).
 - Question pm10. The frequency distribution of the gradings is: 45.07% E-roles, 50% F-roles and 43.75% G-roles, indicating that more than 50% of all the roles are not comfortable that the BSC point can be linked to their annual salary adjustment. From the mean values it is evident, that this sense of unease increases as the grading levels go lower down in the organisation.
- Testing encouragement for innovation (question pm11).
 - Question pm11. The frequency distribution of the gradings is: 39.44% E-roles, 48.89% F-roles and 55.73% G-roles. This shows that the lower the level in the organisation goes, the more is the belief that the KPIs on the BSC encourage the respondents to find new and better ways to do their job. This is contrary to the thinking that the E- and F-role levels people (engineers and technicians) are more involved in plant optimisation and improvements than are the G-role level people. Both the frequency distributions and the mean values however indicate a huge opportunity for improvement.

3.4.3.3.2 Secondary objective 2 - personal development tool

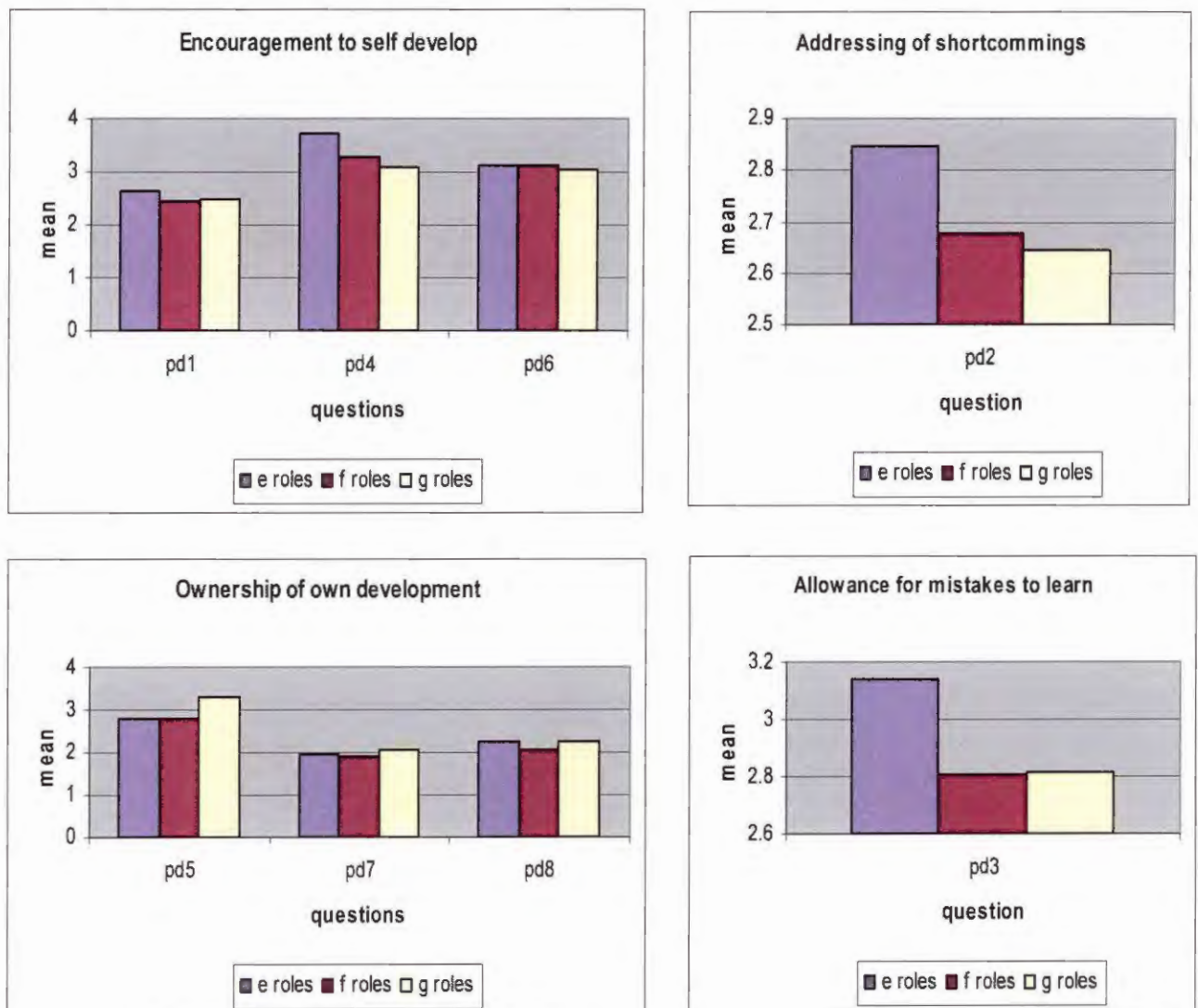
The mean values of the responses to the questions are illustrated in figure 3.12 below and the frequency distributions in Annexures H, I and J.

From these graphs and frequency tables the following is evident:

- Testing encouragement to self-develop (questions pd1, pd4 and pd6).
 - Question pd1. The frequency distribution of the gradings is: 49.30% E-roles, 64.44% F-roles and 63.02% G-roles, indicating that there is a lot less encouragement for the E-role level on the BSC to accept responsibility for their own development. This may be because E-role level people are normally well-qualified and experienced and areas of self-development are less easily identifiable.
 - Question pd4. The frequency distribution of the gradings is: 14.08% E-roles, 27.78% F-roles and 36.98% G-roles, indicating that a small percentage of respondents believe that they do get enough time during normal working hours for training and self-development. It is evident that the higher the level in the organisation, the less time is available for training and development.
 - Question pd6. The frequency distribution of the gradings is: 23.94% E-roles, 24.44% F-roles and 32.29% G-roles, indicating that all roles do not see the company as being serious about their training and development. On all three levels a large number of the answers were neutral. This perception is, however, a lot stronger on E- and F-role levels.
- Testing allowance to address shortcomings (question pd2).
 - Question pd2. The frequency distribution of the gradings is: 35.21% E-roles, 51.11% F-roles and 56.77% G-roles, indicating that far less E-roles see an action plan for development as outcome of the BSC interview.
- Testing allowance to be able to makes mistakes to learn (question pd3).
 - Question pd3. The frequency distribution of the gradings is: 21.13% E-roles, 37.78% F-roles and 42.19% G-roles, indicating that all the roles do not think that the BSC caters for mistakes as part of the respondent's learning curve. This is, however, far more evident on the E-role level.
- Testing ownership of own development (questions pd5, pd7 and pd8).

- Question pd5. The frequency distribution of the gradings is: 45.07% E-roles, 44.44% F-roles and 23.96% G-roles, indicating that a fair amount of the respondents are doing studies / training outside of their normal working hours. The G-role level percentage is a lot lower than the E- and F-role level, but the sample size is a lot bigger (more than double that of the E- and F-role sample sizes). This is verified by the much higher mean value of the G-role level respondents (on this question) compared to the other levels.

Figure 3.12: Responses to questions testing the effectiveness of the BSC as personal development tool.



Source: Own research

- Question pd7. The frequency distribution of the gradings is: 83.10% E-roles, 90% F-roles and 83.33% G-roles, indicating that all the role levels take ownership of their own development.
- Question pd8. The frequency distribution of the gradings is: 71.83% E-roles, 80% F-roles and 67.71% G-roles, indicating that all the role levels do take opportunities to develop. The higher value in the F-role level does correlate with the fact that these respondents are mainly technical people who often are exposed to opportunities on the plant to learn and develop.

3.5 ADDITIONAL COMMENTS FROM THE QUESTIONNAIRE

The questionnaire allowed the respondents to add additional comments. These comments were categorised in positive and negative responses toward the BSC process.

Positive responses.

- If handled in the right way it will motivate the person, otherwise it will stem to negative behaviour.
- Learn from others.
- I think my manager must have a one-on-one discussion with me (on my performance) every month.
- The success of the BSC is strongly related to the involvement of the manager in the process.
- Exposure to managerial work is crucial to the development of individuals.
- The BSC is a useful tool for upcoming young employees, but not for established employees.

Negative responses.

- Many adhoc time-consuming tasks, that have to be done, are not on my BSC.
- My supervisor changes the goalposts and makes things vague and unclear. I have numerous fights to prove that I take my self-development serious. I am completely dissatisfied with how my BSC is managed, and believe that my

development is being prevented. I am rushed and forced to sign my BSC that I am completely dissatisfied with.

- The ratification process appears to be a black box favouring certain people and penalising others. This makes the whole BSC process not fully reliable.
- The BSC is a waste of time if your BSC score can be overruled behind your back.
- The BSC as a personal development tool focuses mainly on the development of line people and not across all functions (including staff).
- Management ratification makes the BSC a very subjective process. The 360-degree tool adds more value to the process and should be re-introduced. Safety KPIs should apply only to people who can contribute towards the target. The "people" part of the BSC should carry more weight.
- Due to the current economic condition the focus on training and development has somewhat diminished.
- The normalisation of scores is regarded as unfair and has a demoralising effect. Sometimes it is felt that the BSC only is a paper exercise and that not much is coming from it.
- The BSC is a joke and don't work.
- The forced ranking of people makes this tool non-effective.
- There are so many people who have the power to change the BSC points, which makes the BSC system a theoretical exercise in which few people believe.
- The BSC is not in line with down-stream and up-stream KPIs.
- I think the way that my year-end rating was determined, is a big circus.
- I had different experiences with regard to the BSC when working for different supervisors.
- What is the point of having a BSC when management decides to "normalise" the scores? Due to this too many people are achieving too high scores.
- I would like to see the manager use a pen to write the final value of the BSC, and not a pencil. He can change the value after you have signed the BSC and left.
- We are wasting our time as top management decides on our increase and rob Peter to pay Paul.
- BSC points keep on getting downgraded by higher management. This happened several times in the past.

- The BSC system is not effectively applied in ArcelorMittal as in the end, the results are manipulated to achieve management's own targets.
- What is the point of doing this questionnaire; all the comments will be ignored anyway.
- There should be strict guidelines as to what scores should be given to subordinates. Scores should never be adjusted by top management after being discussed with people.
- The BSC is useless if you start normalising.
- The BSC is generally a rushed paper exercise. There appears to be no real effort at improving performance, or pushing out non-performers.
- Targets and expectations are unclear.
- My BSC did reflect the effort I put in at my workplace until management changed it.
- Some of the KPIs on my BSC are beyond my control (e.g. machine breakdown for production personnel).
- Clear goals and targets need to be identified before the BSC compilation and interview.
- The superintendent's BSC rating is a disaster – no input from managers. Announced results are changed without notification.
- Due to the severe staff shortage and additional workload of my supervisor, he was not available to discuss matters of importance in detail.
- Salary adjustments are definitely not linked to BSC points – everybody cannot be average.
- According to my manager, the BSC has no effect on my salary adjustment.
- The BSC is an admin exercise – salary adjustments are thumb-sucked.
- It would help if someone does not get penalised for something over which he / she has no control.
- The BSC is a paper exercise to ensure that all documents are in place for auditing purposes.
- No scope or motivation in current post for future development.

3.6 CHAPTER SUMMARY

An empirical study was conducted by issuing 724 questionnaires to departments within ArcelorMittal, Vanderbijlpark Works. Of these issued questionnaires, 49% (353) were received back, and analysed. The study showed that 88% of the respondents were male, 62% of the respondents were above the age of 40 years and that the average age of the respondents was 42.9 years.

The analyses on the primary objective as performance management tool showed positives responses in respect of the -

- understanding, need and compilation of the BSC; and
- communication and feedback during the BSC process.

The analyses on the primary objective as performance measurement tool showed negative responses in respect of -

- alignment, weights and measurability of the KPIs on the BSC,
- the reflection of the effort of the respondent at the workplace on the BSC,
- the linkage of the BSC outcome to the annual remuneration process; and
- the degree of encouragement of innovation in the BSC process.

The analyses on the primary objective as personal development tool, showed positives responses in respect of -

- people taking ownership of their own development,
- the number of people doing training or self-development outside of their normal working hours; and
- people taking every possible opportunity to self-develop.

The analyses on the primary objective as personal development tool showed negative responses in respect of the -

- amount of time available during normal hours for development;
- view of the respondent about the company being serious about their training / development; and

- allowance of mistakes in the BSC process as part of the individual's learning curve.

Similar trends were found during the analyses of the 2 secondary objectives. Smaller variations were found within the different departments and different role gradings within ArcelorMittal, Vanderbijlpark Works. These findings were discussed in chapter 3 and summarised in chapter 4.

In the next chapter final conclusions were drawn from the findings in chapter 3, and recommendations were made as to the possible improvement of the effective use of the BSC process.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 INTRODUCTION

In this chapter the insight gained from the literature study in Chapter 2, the research done, and results obtained from the empirical study (documented in chapter 3) will be combined to conclude whether the BSC is effectively implemented (in ArcelorMittal, Vanderbijlpark Works) as a:

- performance measurement tool, and a
- personal development tool.

Conclusions will be categorised to cover the analyses from the demographics of the sample group, the primary objective, the two secondary objectives and the comments received from the questionnaire.

The chapter ends with recommendations, verification that the study's objectives were met and recommendations for future study.

4.2 CONCLUSIONS

4.2.1 Conclusions on the demographics of the sample group

The sample group included all E-, F- and G-roles within ArcelorMittal, Vanderbijlpark Works. These roles include the categories of first-line management, technical support (technicians and engineers) and support functions (HR, SHERQ, Finance, Quality, Planning, IT, IM, Commercial).

From the analyses in chapter 3, the following can be concluded.

- A large number of this sample group are male (88%).
- The average age of this sample group is high (42.9 years).
- A large percentage of the sample group is already above the age of 50 (38%).

4.2.2 Conclusions on the primary objective

The conclusions are discussed in the two areas of research: performance measurement and personal development. The successful or unsuccessful implementation is indicated at the end of each statement.

4.2.2.1 Performance measurement

From the analyses in chapter 3 the following can be concluded.

- The BSC is well-entrenched in ArcelorMittal, Vanderbijlpark Works and the employees understand the principles and need of the BSC (effectively implemented).
- Only 55.81% of the respondents feel that they had input into the compilation of their BSC (not effectively implemented).
- Communication and feedback during the BSC process, is good (effectively implemented).
- The alignment of the KPI's with the company strategic objective is good (effectively implemented).
- The measurability of the KPIs on the BSC is ranked low (not effectively implemented).
- The weights allocated to the KPIs are seen as a drawback on the BSC system (not effectively implemented).
- A large percentage of the respondents see the BSC as a reflection of their "perceived" performance, and not of their actual performance (not effectively implemented).
- Only 41.36% of the respondents believe that the BSC reflects the effort of the input at the workplace (not effectively implemented).
- Only 45.61% of the respondents are comfortable that their annual remuneration can be linked to the BSC result (not effectively implemented).
- The BSC does not encourage innovation enough (not effectively implemented).

In summary, the BSC process is well-entrenched in ArcelorMittal, Vanderbijlpark Works, but lacks overall effectiveness.

4.2.2.2 Personal development

- The majority of the respondents agree that the BSC encourages them to self-develop (effectively implemented).
- Not enough time is available during normal working hours for training and self-development (not effectively implemented).
- The respondents do not believe that the company is serious about their development (not effectively implemented).
- Not enough action plans for the future development of the individual are derived after the BSC interview (not effectively implemented).
- The BSC does not allow for mistakes as part of the learning curve of the individual (not effectively implemented).
- A fair number of people (33.14%) are busy with studies / training outside of their normal working hours (effectively implemented).
- The respondents do take ownership of their own development (effectively implemented).
- The respondents do take every possible opportunity to learn / self-develop (effectively implemented).

The BSC encourages people to self-develop, but development plans are lacking; not enough time for training is given, and managers must show an intent to develop their people.

4.2.3 Conclusions on secondary objective 1

The conclusions are discussed in the two areas of research: performance measurement and personal development.

4.2.3.1 Performance measurement

- All the departments demonstrate a good understanding of the principles and need of the BSC. The Engineering department showed the highest percentage of understanding.
- More people in the Iron Making department ($\pm 10\%$ more than the other departments) indicated, that they had no input into the compilation of their BSC.
- One-on-one discussions in all the departments are at an acceptable level with Engineering at the highest percentage (90%).
- Formal feedback in the departments varies at levels between 88.57% (Engineering) and 75% (Iron).
- The alignment of the KPIs with the company strategic objectives is below expectation in the Iron Making Department (62.5%). All the other departments are between 70% and 75%.
- The measurability of the KPIs in all the departments is relatively low with specific concerns in the Engineering, Iron Making and Staff departments (all frequencies below 49%).
- A large number of respondents in all the departments answered neutrally on the question of weights allocated to the KPIs on the BSC. All departments see this as a possible drawback of the BSC system.
- Compared to the other departments far more people in the Steel Making and Rolling departments believe that their BSC point is a reflection of their "perceived" performance.
- Less than 50% of all departments do not believe that the BSC reflects the effort they put in at the workplace. This is far more evident in the very low frequency distributions in the Iron Making and Staff departments (both below 38%).
- The Engineering, Iron Making and Steel Making departments are far more uncomfortable than the Rolling and Staff departments with the linkage of the BSC result to their annual remuneration adjustment.
- The Engineering department shows the least encouragement for innovation on the BSC.

4.2.3.2 Personal development

- The belief that the BSC encourages self-development, is far greater in the Engineering department (13.37% more) than in the Iron Making and Steel Making departments.
- All the departments are in agreement that not enough time for training is available during normal workings hours. Only 22.36% of the respondents in the Staff department believe that they do have enough time available for training during normal working hours.
- All the departments are in agreement that the company is not serious about their development. In the Staff departments only 24.71% of the respondents believe that the company is serious about their development.
- In both the Iron Making and Steel Making departments less than 45% of the BSC interviews result in development plans to address the shortcomings of the individual.
- In the Engineering, Iron Making and Steel Making departments, less than 31% of all the respondents do not believe that the BSC allows for mistakes to be made as part of the individual's learning curve.
- The number of people who are busy with studies / training outside normal working hours, vary from almost 1 in every 2 at the Steel Making department, to 1 in every 5 people in the Rolling department.
- In all departments there is evidence that the respondents take ownership of their development.
- More people (20%) in the Steel Making department (compared to the Engineering department) try to make use of every opportunity to learn.

4.2.4 Conclusions on secondary objective 2

The conclusions are discussed in the two areas of research: performance measurement and personal development.

4.2.4.1 Performance measurement

- The distribution of the frequencies for the number of formal BSC's for the different role gradings indicates a downward trend from the top grade (E) to the lower grade (G). This may be because some of the lower grades are still engineers and technicians in training who follow a different performance management evaluation system.
- The higher than expected F-role grade frequency distribution, with regards to the understanding of the principles and need of the BSC, is an indicator that there is a strong level of communication from E-role downwards to the F-role level.
- It is evident from the analyses that the G-role grades are less involved in the compilation of their BSC's (compared to the E-, F-roles).
- The higher than expected F-role grade frequency distribution, with regards to formal one-on-one discussions, again indicates that the E-role level people are doing a good job on this level but can improve on their effort with the G-role level.
- All the grade levels to get feedback on the final BSC point allocated to them.
- The alignment of the KPIs with the company strategic objectives, decline as the level in the organisation descends (E-, F-, G-role).
- The measurability of the KPIs is less on the E-role and G-role levels.
- The response of all the grade levels on the weights allocated to the KPIs as a drawback of the BSC system, is similar.
- A similar response was noted on all the grade levels with regards to their "perceived" performance versus their actual input.
- The G-role level is more positive in that the BSC reflects the effort they put in at the workplace. The F-role level is most negative on this topic.
- The G-role level is the least comfortable that the BSC point can be linked to their annual remuneration adjustment.
- The level of encouragement for innovative solutions on the BSC increases as the levels in the organisation descends (G-roles see more of this on their BSC).

4.2.4.2 Personal development

- The encouragement on the BSC, for personal development, is far less on the E-role level.
- The time available for training / self-development during normal working hours, decreases as the levels in the organisation ascends (the higher levels have less time).
- The perception that the company is serious about their development increases as the levels in the organisation descends (less people on the higher E-role levels think that the company is serious about their development).
- Far less of the respondents on the E-role level see the outcome of their BSC interviews resulting in a development plan to address shortcomings.
- The allowance for mistakes to be made as part of the individual's learning curve descends as the level in the organisation ascends (least at the higher E-role level).
- The percentage of respondents doing training outside normal working hours is less on the G-role levels.
- All the grade levels do take ownership of their own development.
- The respondents on the F-role level take more action on any opportunity to self-develop.

4.3 RECOMMENDATIONS

From the study and the conclusions drawn, the following recommendations are made.

- Address the issue of mistrust between the employees and their supervisory management. This mistrust is evident from the general comments as noted in chapter 3 (paragraph 3.5). This stems from the newly implemented "ratification (normalisation)" process, which force ranks employees after the BSC process. Employees do not understand how this process works and how this ties in with the current BSC process. All the good work done on the BSC process, is destroyed because of this deemed unfair procedure.

- Managers should make allowance for individuals to make mistakes – this is part of the learning curve. The BSC is evidently more used to punish mistakes made, rather than to encourage innovation.
- Encourage innovation in the organisation. The encouragement for innovative solutions in the Engineering department is below par and is seen as a huge opportunity for improvement. Focus should also be on the E-, and F-role levels in the organisation.
- More effort should be applied to translate the company strategic objectives into workable (and measurable) KPIs at the lower levels of the organisation. The alignment of the KPIs in the Iron Making department should be checked. The measurability of the KPIs in the Engineering, Iron Making and Staff departments should be checked. Focus should be on E- and G-role levels.
- ArcelorMittal should make a concerned effort to allow more time for training and self-development during normal working hours. This, however, should go hand in hand with managers' developing training plans to address the shortcomings of their subordinates. Managers should take time to help the employees to manage their development plans, have regular follow-up discussions to address stumbling blocks, and provide support and resources. Focus should be put on the development of action plans in the Iron Making and Steel Making department. An overall check should be done on the development plan on the E-role level in the organisation.
- Revisit all KPIs for weight allocation. All the departments and all the levels in the organisation see this as a drawback of the BSC system.
- Test the applicability of the KPIs. Ensure that the KPIs on the BSC are clear and that it reflects the effort the company requires from the individual. Specific attention is needed in the Iron Making and Staff departments. Focus should also be on the F-role level in the organisation.
- Allow more participation of the individual during the compilation of the BSC (this will improve buy-in).
- The E-role level communicates very well downwards to the lower levels in the organisation. Take key learning aspects from this group, and skill the F- and G-role levels to the same extent.
- Allow for more KPIs to encourage and measure group performance.

4.4 ACHIEVEMENT OF THE STUDY'S OBJECTIVES

The study had one primary objective: to determine the effective use of the BSC as performance measurement and personal development tool within ArcelorMittal, Vanderbijlpark Works. This objective was met when results from the empirical study (which was linked to the literature study) proved that, although some aspects of the BSC process are well entrenched, the BSC is not effectively implemented.

Both the secondary objectives were also met when the researched showed that the effective implementation of the BSC do show variances within the different departments and different role gradings in ArcelorMittal, Vanderbijlpark Work.

4.5 RECOMMENDATIONS FOR FUTURE RESEARCH

This research was done within one of the four main centres of operation of ArcelorMittal, South Africa. Future research should be done in the other three centres (Newcastle, Vereeniging and Saldanha) in order to determine the overall status of the BSC implementation and to compare results. Possible centres of excellence may be duplicated in the centres as to improve the effectiveness of the BSC process in a very short period of time.

Further research could also be done within the ArcelorMittal Group (internationally) to determine best practises.

At present ArcelorMittal South Africa has implemented changes to the existing BSC process. Future research should be done in order to determine if these changes did improve the effectiveness of the BSC when compared to the previous system.

4.6 CHAPTER SUMMARY

This chapter summarised the findings as discussed in chapter 3. From this the following are evident.

- The BSC process is well-entrenched within ArcelorMittal, Vanderbijlpark Works.

- Communication with regards to the BSC process is good.
- Concerns are evident with regard to certain aspects of the BSC (alignment of KPIs, measurability of KPIs, weights allocated to KPIs, trust in the system to give a fair reflection of the effort put in at the workplace).
- People do take ownership of their own development.
- Concerns are evident with regards to time available for training during normal working hours and management's attitude towards training.

The chapter ends with recommendations for improvement on the current system as well as suggestions on future research on the same topic.

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ANNEXURE A
QUESTIONNAIRE



QUESTIONNAIRE TO DETERMINE THE EFFECTIVENESS OF THE BSC AS A PERFORMANCE MANAGEMENT AND A PERSONAL DEVELOPMENT TOOL, IN ARCELORMITTAL, VANDERBIJLPARK WORKS

JOB TITLE : _____ JOB GRADE : _____
DEPARTMENT : _____ AGE : _____
(Rolling, Steel, Iron, Engineering, Staff)
GENDER : _____ DATE : _____

Thank you for taking a moment to fill in this questionnaire. Your honest and complete response is valued highly as this will enable us to improve the effectiveness of our people management policies, strategies and practices. Please utilise this opportunity to reflect on your experiences and perceptions with regards to the BSC which was followed during the year ending 2008.

This questionnaire is anonymous and all information gathered from this questionnaire will be kept confidential. It will be analysed and consolidated with all other responses gathered during this survey and will be used only for research purposes to be able to make conclusions and recommendations on the above mentioned topic.

Please indicate your response with an X to each statement below. Where requested, please add any additional comments in text format. Please hand in the completed questionnaire at your HR consultant.

BSC = Balanced Scorecard

KPI's = Key Performance Indicators

SA: Strongly Agree	A: Agree	N: Neutral or uncertain	D: Disagree	SD: Strongly Disagree				
Performance Management Tool				SA	A	N	D	SD
1. I do have an approved BSC.								
2. My supervisor discussed the principles and need of a BSC with me.								
3. I had no input into the compilation of my BSC - it was given to me.								
4. I do have a formal one-on-one performance discussion with my supervisor at least twice a year.								
5. All the KPIs on my BSC are aligned with the ArcelorMittal Strategic objectives.								
6. All the KPIs on my BSC are clear and measurable.								
7. The weight allocated to the different KPIs on my BSC is the biggest drawback of the system.								
8. I do get feedback on the final BSC point allocated to me.								
9. My BSC point is a reflection of what my supervisor "thinks" of my performance.								
10. I am comfortable that my salary adjustment can be linked to my BSC point.								
11. The KPI's on my BSC encourages me to find new and better ways to do my job.								
12. My BSC reflects the effort I put in at my workplace.								
Personal Development Tool				SA	A	N	D	SD
1. The personal development portion of the BSC encourages me to accept the responsibility to self-develop.								
2. The BSC interview results in an action plan to address shortcomings in my personal development.								
3. My BSC caters for mistakes which may be part of my learning curve / experience.								
4. I get enough time for training and self-development during my normal working hours.								
5. I do studies / training outside of my normal working hours.								
6. I think the company is serious about my development.								
7. I do take ownership of my own development.								
8. I use every possible opportunity to self-develop.								

Comments

ANNEXURE B
DATA - ALL

Index	
Frequency distribution	77
Descriptive statistics	78
Data	79-87

Frequency distribution - All

pm1			pm2		pm3		pm4		pm5		pm6		pm7		pm8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	143	40.51%	102	28.90%	29	8.22%	97	27.48%	53	15.01%	26	7.37%	21	5.95%	68	19.29%
2	175	49.58%	208	58.92%	65	18.41%	203	57.51%	195	55.24%	156	44.19%	78	22.10%	217	62.00%
3	23	6.52%	28	7.93%	62	17.56%	29	8.22%	84	23.80%	110	31.16%	177	50.14%	26	7.62%
4	5	1.42%	6	1.70%	136	38.53%	17	4.82%	14	3.97%	46	13.03%	67	18.98%	26	7.62%
5	7	1.98%	9	2.55%	61	17.28%	7	1.98%	7	1.98%	15	4.25%	10	2.83%	16	4.71%
	353	100.01%	353	100.00%	353	100.00%	353	100.00%	353	100.00%	353	100.00%	353	100.00%	353	100.00%
		90.09%		87.82%		26.63%		84.99%		70.25%		51.56%		28.05%		21.81%
						55.81%										
pd1			pd2		pd3		pd4		pd5		pd6		pd7		pd8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	35	9.92%	16	4.53%	15	4.25%	5	1.42%	27	7.65%	11	3.12%	72	20.40%	54	15.30%
2	179	50.71%	164	46.46%	115	32.58%	101	28.61%	90	25.50%	90	25.50%	228	64.59%	199	56.37%
3	83	23.51%	103	29.18%	143	40.51%	95	26.91%	95	26.91%	148	41.93%	38	10.76%	84	23.80%
4	43	12.18%	52	14.73%	58	16.43%	100	28.33%	113	32.01%	68	19.26%	11	3.12%	12	3.43%
5	13	3.68%	18	5.10%	22	6.23%	52	14.73%	28	7.93%	36	10.20%	4	1.13%	4	1.13%
	353	100.00%	353	100.00%	353	100.00%	353	100.00%	353	100.00%	353	100.00%	353	100.00%	353	100.00%
		60.62%		50.99%		36.83%		30.03%		33.14%		28.61%		84.99%		
pm9			pm10		pm11		pm12									
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage								
	40	11.33%	24	6.80%	21	5.95%	28	7.93%								
	170	48.16%	137	38.81%	158	44.76%	118	33.43%								
	84	23.80%	75	21.25%	100	28.33%	87	24.65%								
	42	11.90%	68	19.26%	46	13.03%	72	20.40%								
	17	4.82%	49	13.88%	28	7.93%	48	13.60%								
	353	100.00%	353	100.00%	353	100.00%	353	100.00%								
		59.49%		45.61%		50.71%		41.36%								

Descriptive statistics - All

	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12
Mean	1.747875	1.90085	3.382436	1.963173	2.226629	2.626062	2.90625	2.167614	2.507082	2.946176	2.72238	2.983003
Standard Error	0.042701	0.043166	0.064026	0.045436	0.043753	0.050481	0.046392	0.051768	0.053393	0.063179	0.054774	0.063046
Median	2	2	4	2	2	2	3	2	2	3	2	3
Mode	2	2	4	2	2	2	3	2	2	2	2	2
Standard Deviation	0.802271	0.811021	1.202945	0.853671	0.82205	0.948444	0.870384	0.971255	1.003166	1.187024	1.029112	1.184533
Sample Variance	0.643639	0.657755	1.447077	0.728754	0.675766	0.899546	0.757568	0.943336	1.006342	1.409027	1.059072	1.403119
Kurtosis	4.044743	4.019745	-0.803367	2.442435	1.423697	0.00335	0.094856	1.729189	0.078115	-0.97368	-0.180136	-0.949359
Skewness	1.582564	1.532913	-0.454887	1.310523	0.854622	0.58828	-0.10396	1.347382	0.719133	0.360679	0.686913	0.239265
Range	4	4	4	4	4	4	4	4	4	4	4	4
Minimum	1	1	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5	5	5	5
Sum	617	671	1194	693	786	927	1023	763	885	1040	961	1053
Count	353	353	353	353	353	353	352	352	353	353	353	353
Confidence Level(95.0%)	0.08398	0.084896	0.125922	0.089361	0.086051	0.099282	0.09124	0.101815	0.10501	0.124256	0.107726	0.123995

		pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
pm1	1.747875								
pm2	1.90085								
pm3	3.382436	2.490085	2.694051	2.878187	3.263456	3.071023	3.07932	2	2.186969
pm4	1.963173	0.050923	0.050665	0.050411	0.057056	0.058389	0.052599	0.039104	0.041077
pm5	2.226629	2	2	3	3	3	3	2	2
pm6	2.626062	2	2	3	2	4	3	2	2
pm7	2.90625	0.956757	0.951908	0.947128	1.071981	1.095477	0.988254	0.734692	0.771768
pm8	2.167614	0.915384	0.906129	0.897051	1.149144	1.20007	0.976645	0.539773	0.595625
pm9	2.507082	0.174305	-0.101288	-0.178517	-1.075126	-0.838449	-0.40045	3.024439	1.244636
pm10	2.946176	0.74285	0.68521	0.386821	0.113281	-0.12832	0.284232	1.167142	0.709128
pm11	2.72238	4	4	4	4	4	4	4	4
pm12	2.983003	1	1	1	1	1	1	1	1
pd1	2.490085	5	5	5	5	5	5	5	5
pd2	2.694051	879	951	1016	1152	1081	1087	706	772
pd3	2.878187	353	353	353	353	352	353	353	353
pd4	3.263456	0.100152	0.099644	0.099144	0.112213	0.114837	0.103449	0.076906	0.080787
pd5	3.071023								
pd6	3.07932								
pd7	2								
pd8	2.186969								

Data - All

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Engineering	male	e	52	1	2	4	2	2	3	3	2	2	3	3	2	2	2	3	2	3	3	2	3
Engineering	male	e	36	1	2	3	2	4	3	1	2	4	5	4	4	3	4	4	4	3	3	2	2
Engineering	male	e	45	1	1	4	1	2	2	4	2	3	2	3	2	2	2	3	5	4	3	2	3
Engineering	male	e	46	1	2	3	2	2	3	4	2	2	3	3	2	2	3	3	4	4	2	2	2
Engineering	male	e	56	1	1	1	1	1	1	3	2	2	2	2	1	3	3	3	4	2	3	2	2
Engineering	male	e	45	1	1	5	1	1	1	3	1	5	5	5	5	3	3	3	5	4	3	2	2
Engineering	male	e	32	2	2	4	2	2	2	2	2	3	2	2	2	2	2	3	2	2	2	2	2
Engineering	male	e	53	1	2	1	2	2	3	3	1	3	3	3	3	2	3	3	4	4	3	3	3
Engineering	male	e	48	1	1	5	1	1	3	2	2	1	4	2	3	2	2	3	2	2	2	1	3
Engineering	male	e	58	2	2	4	2	2	2	4	2	2	2	2	2	2	2	3	2	3	3	2	3
Engineering	male	e		1	1	1	1	2	4	5	1	1	3	5	4	3	4	4	4	5	3	3	4
Engineering	male	e	54	2	2	3	3	1	5	3	2	3	4	5	4	3	2	3	4	4	3	3	3
Engineering	male	e	40	1	1	2	1	2	3	2	1	2	2	3	3	2	2	2	3	3	3	2	3
Engineering	male	e	53	2	2	4	2	3	3	2	2	2	3	2	2	2	2	4	4	3	3	2	2
Engineering	male	e	59	2	2	5	4	2	2	4	4	4	3	2	1	2	3	2	4	3	3	2	2
Engineering	male	e	59	2	2	4	2	2	3	3	2	2	4	3	5	2	3	3	5	4	3	2	2
Engineering	male	e	48	2	2	4	2	2	3	4	1	4	2	4	2	1	2	4	3	3	4	2	4
Iron Making	male	e	42	1	2	3	1	3	3	2	2	2	3	3	3	4	3	3	3	3	3	3	3
Iron Making	male	e	37	1	1	2	1	1	2	2	1	2	2	2	2	3	3	3	4	3	4	2	2
Iron Making	male	e		2	3	3	2	2	5	3	2	2	4	4	4	4	3	5	5	2	4	3	2
Iron Making	male	e	28	1	2	5	2	2	2	4	2	5	1	2	2	1	4	3	5	1	2	1	1
Iron Making	male	e	59	2	2	3	2	2	2	1	2	2	3	3	3	3	3	3	3	3	4	3	3
Iron Making	male	e	52	2	2	5	2	3	3	5	4	2	2	2	3	2	2	2	4	4	3	2	2
Iron Making	male	e	58	2	2	2	2	2	4	3	2	2	2	4	4	4	4	4	3	4	4	2	3
Iron Making	male	e	27	1	1	1	1	3	3	3	1	3	3	2	3	2	3	3	2	2	2	2	2
Iron Making	male	e	40	2	2	4	2	2	4	4	2	2	4	3	4	2	2	2	4	2	4	2	2
Iron Making	male	e	38	2	2	3	2	2	2	3	2	3	3	3	3	2	3	3	4	4	4	3	2
Iron Making	male	e	46	2	2	3	3	1	3	3	3	3	3	3	4	4	3	2	3	4	3	3	2
Iron Making	male	e	31	2	2	5	2	2	2	3	3	3	2	2	2	1	2	3	3	1	2	1	1
Iron Making	male	e	40	2	3	4	2	2	2	3	2	4	4	4	4	2	3	3	4	2	3	2	2
Rolling	female	e	36	2	2	4	2	3	2	4	2	2	2	3	2	3	3	4	3	4	2	2	3
Rolling	male	e	41	3	2	3	2	3	4	2	5	5	5	5	5	3	2	4	4	3	4	3	2
Rolling	male	e	46	1	1	4	1	1	1	4	1	1	1	1	1	3	3	2	4	3	2	2	2
Rolling	male	e	37	2	2	2	1	2	3	2	2	2	2	2	2	3	3	3	5	2	3	2	2
Rolling	male	e	58	1	1	5	1	1	2	3	2	2	2	2	2	2	3	4	2	2	2	2	2
Rolling	male	e	45	1	3	4	3	2	4	1	5	3	5	5	5	5	5	5	5	3	5	2	2
Rolling	male	e	51	2	2	2	2	2	2	3	2	2	3	3	2	2	3	3	3	3	3	2	2
Rolling	male	e	46	2	2	4	2	3	3	4	2	2	2	2	3	3	3	4	4	4	3	2	2

Data - All

<u>Department</u>	<u>Gender</u>	<u>Job</u>	<u>Age</u>																						
		<u>grade</u>		pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8		
Rolling	male	e	60	2	2	4	2	2	2	2	5	2	5	3	2	4	4	3	2	3	3	2	3		
Rolling	male	e	43	1	2	4	2	3	2	3	1	3	3	3	3	3	3	3	4	4	3	1	1		
Rolling	male	e	43	1	2	4	2	2	2	2	4	3	4	4	4	2	2	3	4	4	3	2	2		
Staff	female	e	30	2	2	4	2	2	2	3	2	4	2	1	3	2	2	2	3	2	2	2	2		
Staff	female	e	28	1	1	4	2	3	3	3	2	4	2	3	1	2	2	2	3	1	3	1	2		
Staff	female	e	43	1	2	2	1	2	3	3	1	2	3	2	3	2	3	2	4	5	5	3	2		
Staff	female	e	47	1	1	5	1	1	4	3	1	5	2	3	5	3	2	2	3	4	3	3	3		
Staff	male	e	59	1	1	4	1	1	3	2	2	2	1	2	4	2	2	5	4	2	5	1	2		
Staff	male	e	41	1	1	5	1	1	1	4	1	4	1	1	1	1	1	1	5	2	1	1	1		
Staff	male	e	36	2	2	3	2	2	3	3	2	2	3	3	2	3	3	3	4	4	4	3	3		
Staff	male	e	45	2	3	2	2	3	3	2	2	2	2	5	3	5	4	2	4	4	3	2	3		
Staff	male	e		2	3	2	2	2	2	4	2	2	2	2	2	2	2	4	4	2	3	2	2		
Staff	male	e	51	2	3	4	2	2	2	1	2	2	5	5	4	4	4	3	5	1	5	1	2		
Staff	male	e	39	1	2	5	1	2	4	3	2	1	2	3	3	3	2	3	5	1	2	1	1		
Staff	male	e	53	2	2	4	2	4	4	4	1	1	4	4	4	3	3	4	4	2	4	2	2		
Staff	male	e	53	2	2	4	2	2	2	4	2	2	3	3	3	3	3	4	3	3	3	2	3		
Staff	male	e	39	2	2	5	2	3	2	3	2	3	2	3	3	2	3	3	4	3	2	2	3		
Staff	male	e	53	2	2	4	2	4	4	2	2	4	3	3	3	4	4	4	4	4	3	2	2		
Staff	male	e	49	1	1	5	1	1	2	3	1	3	2	2	2	1	2	3	4	2	2	1	2		
Staff	male	e	51	1	1	4	5	3	3	1	2	4	2	4	5	3	4	4	5	2	3	2	4		
Staff	male	e	51	2	3	4	2	2	2	4	2	2	2	2	2	3	3	3	2	3	2	2	2		
Staff	male	e	54	2	3	2	4	3	3	2	2	3	3	4	5	4	4	5	3	2	4	2	2		
Staff	male	e	39	1	3	5	2	2	3	4	2	2	2	4	2	1	4	2	4	2	4	1	2		
Steel Making	male	e	38	2	2	4	2	2	2	4	2	4	2	3	4	3	3	3	5	2	3	2	2		
Steel Making	male	e	34	1	1	5	1	1	2	3	1	1	4	2	1	2	2	2	4	2	3	1	1		
Steel Making	male	e	38	2	2	4	2	2	2	3	2	2	3	3	3	3	3	4	5	2	4	2	2		
Steel Making	male	e		2	2	3	2	2	2	3	2	2	3	3	4	4	3	4	5	4	4	2	2		
Steel Making	male	e	36	1	1	4	2	2	2	3	1	2	4	2	4	3	2	3	5	2	4	1	2		
Steel Making	male	e	38	1	2	5	2	1	2	3	2	2	2	2	2	2	3	3	2	1	2	2	2		
Steel Making	male	e	30	2	3	2	4	2	3	2	4	4	4	3	4	4	4	4	5	2	3	2	1		
Steel Making	male	e	44	2	1	4	2	3	2	4	4	2	3	2	3	2	3	3	4	2	2	2	2		
Steel Making	male	e	53	2	2	4	2	2	2	2	2	4	2	2	2	2	2	2	2	2	4	1	2		
Steel Making	male	e	42	1	2	3	1	2	2	3	2	2	5	2	5	4	4	4	3	2	5	2	2		
Engineering	male	f		1	1	2	2	3	3	3	3	3	4	3	4	2	3	3	2	2	2	2	2		
Engineering	male	f	53	1	1	5	1	1	2	5	1	1	3	2	1	1	1	2	1	2	3	1	3		
Engineering	male	f	37	1	1	5	1	1	1	4	2	1	1	1	1	1	1	1	4	3	3	1	1		
Engineering	male	f	30	2	2	3	3	2	2	3	3	3	3	2	3	2	2	2	2	4	3	2	2		
Engineering	male	f	41	1	1	5	1	1	3	3	1	5	1	3	3	2	2	3	2	4	3	1	3		
Engineering	male	f	30	1	1	2	3	2	2	3	2	2	5	5	5	5	2	3	2	3	3	1	3		

Data - All

		Job																						
Department	Gender	grade	Age	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8	
Engineering	male	f	49	2	2	4	1	1	2	1	2	3	3	2	3	2	2	2	2	2	2	2	2	
Engineering	male	f	35	3	2	4	2	2	3	4	2	4	5	3	4	3	2	3	4	2	3	2	2	
Engineering	male	f	26	2	2	3	2	3	2	3	2	2	2	3	3	2	2	2	3	2	2	2	2	
Engineering	male	f	30	1	2	4	2	3	2	3	2	2	2	1	2	2	2	2	3	1	2	1	2	
Engineering	male	f		1	1	1	1	1	5	4	1	5	5	5	5	1	4	3	4	3	3	2	2	
Engineering	male	f		2	2	1	2	5	2	1	2	2	5	5	5	2	4	4	5	3	3	3	3	
Engineering	male	f	55	1	1	4	1	2	3	4	4	2	2	3	3	2	3	4	3	5	2	2	3	
Engineering	male	f	48	2	2	5	2	2	2	4	2	2	2	2	2	2	2	2	3	2	2	2	2	
Engineering	male	f	59	1	1	4	1	2	5	4	2	2	5	4	5	4	3	3	2	4	3	2	3	
Engineering	male	f	29	2	2	4	2	3	3	3	2	2	2	3	2	2	2	3	2	2	3	2	2	
Iron Making	male	f	27	1	1	2	1	2	3	2	1	2	2	2	3	2	2	4	4	2	4	2	1	
Iron Making	male	f	36	2	2	2	2	2	3	3	3	3	2	2	3	2	3	3	3	2	3	2	2	
Iron Making	male	f	31	3	3	4	2	3	4	2	3	2	3	3	3	4	4	3	3	1	4	2	2	
Iron Making	male	f	52	2	2	1	2	2	2	2	2	3	3	3	4	3	3	3	3	4	4	4	3	
Iron Making	male	f	55	1	1	5	2	2	2	3	2	5	2	1	2	2	2	2	3	4	2	2	2	
Iron Making	male	f	29	2	2	3	2	3	3	2	2	3	3	3	3	3	3	3	3	2	4	1	1	
Iron Making	male	f	38	2	2	3	2	3	2	3	2	2	3	3	3	3	3	3	3	2	3	2	2	
Iron Making	male	f	51	1	1	2	2	2	2	2	2	4	5	4	4	5	5	5	5	1	5	1	2	
Iron Making	male	f	25	2	1	4	1	2	2	3	3	3	5	2	5	3	3	3	3	4	3	2	2	
Rolling	female	f	33	1	1	5	1	2	2	4	1	3	4	3	2	3	2	2	4	2	3	2	2	
Rolling	male	f	40	1	1	5	1	1	1	5	1	2	2	2	2	2	2	2	4	1	2	1	1	
Rolling	male	f	52	1	1	5	1	2	2	3	1	3	2	3	2	2	2	2	2	2	2	2	2	
Rolling	male	f	59	2	2	4	2	2	4	1	2	2	4	4	4	3	2	3	4	3	3	2	2	
Rolling	male	f	51	2	2	2	2	3	2	3	5	1	5	5	5	4	4	4	4	3	4	2	2	
Rolling	male	f	26	5	4	5	4	2	2	3	2	2	2	2	1	1	2	3	3	2	3	1	1	
Rolling	male	f	52	1	2	4	2	2	2	4	2	5	5	2	5	2	2	3	2	2	4	2	2	
Rolling	male	f	47	1	1	4	1	1	1	3	1	1	3	2	3	2	2	3	2	3	2	1	2	
Rolling	male	f	25	2	2	4	2	2	3	4	2	3	2	3	2	2	3	3	3	1	3	2	2	
Rolling	male	f	37	1	2	4	2	2	2	4	3	2	2	2	3	2	3	3	3	3	3	2	2	
Rolling	male	f	47	1	1	5	2	2	3	4	2	2	2	3	3	4	4	4	4	3	5	2	2	
Rolling	male	f	40	1	1	4	1	2	1	2	2	4	4	2	4	4	4	4	4	4	3	3	4	
Rolling	male	f	27	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	4	4	2	2	4	
Rolling	male	f	47	1	1	4	1	1	1	4	2	4	2	2	2	2	2	3	2	2	2	2	2	
Rolling	male	f	25	1	2	3	2	2	2	3	2	2	2	2	3	2	3	2	2	2	2	1	2	
Rolling	male	f	41	2	2	4	2	2	3	4	2	2	4	4	4	4	4	3	4	2	3	2	2	
Rolling	male	f	54	2	2	3	2	2	2	2	2	2	4	4	5	3	3	2	4	2	3	2	1	
Rolling	male	f	38	1	1	4	1	2	2	5	2	2	2	2	2	3	2	2	2	4	4	2	4	
Rolling	male	f	53	1	1	5	1	3	3	3	1	1	4	3	5	3	3	3	4	3	3	1	2	
Rolling	male	f	28	3	2	2	2	4	4	2	5	2	4	3	4	4	4	2	2	4	3	2	2	

Data - All

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Rolling	male	f	29	2	2	3	2	2	2	3	2	2	2	2	3	2	2	2	3	4	2	2	2
Staff	female	f	43	1	2	3	4	1	3	1	5	3	4	3	4	1	5	4	4	1	3	1	1
Staff	female	f	47	1	2	2	2	2	2	2	2	2	2	3	3	2	3	3	5	3	3	3	3
Staff	female	f	33	2	3	3	2	3	2	2	5	1	5	3	5	3	5	5	5	3	5	2	2
Staff	female	f	29	2	2	5	2	2	2	3	2	4	2	2	2	1	2	2	2	2	3	2	2
Staff	female	f	31	2	2	1	2	3	4	3	2	1	2	3	4	2	2	3	3	1	3	1	1
Staff	female	f	44	1	1	5	1	1	3	3	2	2	2	5	4	4	3	3	4	5	5	3	3
Staff	female	f	48	2	2	4	2	2	2	2	4	3	3	2	4	3	3	3	3	3	3	3	3
Staff	female	f	47	2	2	4	2	3	2	2	2	4	4	4	4	2	3	3	2	3	3	2	2
Staff	female	f	26	2	2	3	2	3	2	3	3	4	3	2	3	2	2	2	3	3	3	2	2
Staff	female	f	33	1	1	3	1	1	2	4	1	4	2	2	2	2	2	2	5	3	5	1	3
Staff	female	f	27	2	2	4	2	3	4	3	2	5	3	4	4	2	2	3	5	1	3	2	1
Staff	female	f	27	2	2	4	2	3	4	3	2	5	3	4	4	2	2	3	5	1	3	2	1
Staff	female	f	31	2	2	4	2	3	3	3	4	2	5	5	5	3	3	4	5	5	1	1	1
Staff	female	f	33	1	1	5	1	2	2	4	1	3	4	3	2	3	2	2	4	2	3	2	2
Staff	female	f	39	1	1	5	1	1	3	2	1	1	1	2	1	2	2	2	4	4	4	4	1
Staff	female	f	39	1	1	5	1	2	2	4	2	3	2	2	2	2	2	2	3	3	3	2	2
Staff	female	f	44	1	1	4	1	2	3	2	1	2	4	2	3	2	2	3	5	4	3	2	2
Staff	male	f	54	1	2	4	2	2	2	3	2	2	2	2	2	2	2	2	3	5	4	2	2
Staff	male	f	50	1	5	1	2	3	3	2	4	3	3	3	4	2	3	3	2	3	4	2	2
Staff	male	f	42	1	1	4	1	1	2	3	1	1	1	1	2	2	3	3	4	2	3	2	2
Staff	male	f	41	2	2	3	2	2	2	3	2	2	2	2	3	2	2	2	2	3	2	2	2
Staff	male	f	25	2	1	5	2	2	2	3	2	4	2	2	3	2	2	2	3	2	2	2	1
Staff	male	f	31	3	1	3	1	1	2	3	1	1	1	1	1	1	1	1	3	1	1	1	1
Staff	male	f	45	1	2	1	1	2	3	3	2	2	2	2	3	3	3	3	4	5	5	3	3
Staff	male	f	42	1	2	1	2	2	3	3	2	3	2	3	3	4	3	4	5	4	4	3	4
Staff	male	f	34	3	5	1	3	5	5	3	5	1	5	3	5	1	5	5	5	2	5	1	1
Staff	male	f	45	1	2	4	2	2	2	4	2	2	2	2	2	2	2	4	2	4	4	2	2
Staff	male	f		1	2	5	1	3	3	3	2	2	1	2	2	2	2	2	2	4	3	2	2
Staff	male	f	46	1	1	2	1	2	2	3	1	2	4	2	3	2	3	3	4	3	2	2	3
Staff	male	f	25	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2
Staff	male	f	40	1	1	3	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	2	3
Staff	male	f	50	2	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	4	3	2	2
Staff	male	f	39	1	1	5	1	2	3	3	2	3	2	2	3	2	3	3	2	3	2	2	2
Staff	male	f	35	2	2	4	2	2	2	3	2	2	4	2	4	3	4	4	4	4	3	2	2
Staff	male	f	49	2	2	4	2	2	3	3	2	4	4	3	4	3	3	3	2	4	3	2	2
Staff	male	f	55	2	2	4	2	2	4	3	2	2	2	2	5	4	4	4	4	2	4	1	2
Staff	male	f	41	1	1	5	2	2	2	5	2	2	2	3	2	2	2	2	4	2	2	2	2
Staff	male	f		5	3	3	2	3	3	3	3	3	3	3	3	2	3	2	3	4	3	1	1

Data - All

Department	Gender	Job	Age																								
		grade		pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8				
Steel Making	female	f	26	1	2	5	3	2	4	3	2	3	3	4	4	2	3	3	4	3	5	1	2				
Steel Making	male	f	57	2	2	4	2	4	4	2	2	2	3	3	3	3	2	3	4	3	3	2	2				
Steel Making	male	f	33	1	1	1	2	5	5	4	2	2	2	3	2	4	5	5	5	1	5	1	1				
Steel Making	male	f	56	1	1	5	1	2	2	3	1	4	2	2	3	2	2	2	2	2	3	2	2				
Steel Making	male	f	41	2	1	5	2	2	2	3	1	2	5	2	1	1	2	2	3	5	2	2	2				
Steel Making	male	f	31	2	2	3	2	2	2	3	1	2	3	3	4	2	3	3	4	4	3	2	2				
Engineering	female	g	48	1	2	4	1	3	4	3	1	2	1	2	1	2	2	3	3	5	2	2	2				
Engineering	male	g	53	2	2	4	2	2	3	2	2	2	2	4	3	4	4	4	5	3	4	2	2				
Engineering	male	g	43	2	2	4	2	3	2	3	2	3	3	4	4	2	3	3	3	4	2	2	3				
Engineering	male	g	50	1	2	3	1	2	2	2	1	2	3	3	1	2	3	3	3	3	3	2	2				
Engineering	male	g	34	1	2	4	2	3	3	3	4	2	2	3	2	2	2	3	3	2	3	2	3				
Engineering	male	g	43	2	2	2	2	2	3	3	2	4	2	3	4	3	2	3	2	2	3	2	2				
Engineering	male	g	40	1	1	5	1	1	2	3	1	3	1	2	1	1	3	1	3	3	2	1	1				
Engineering	male	g	42	1	1	4	1	1	1	2	1	1	1	1	1	2	2	2	2	2	2	2	2				
Engineering	male	g	41	2	2	4	2	3	3	3	2	2	3	2	2	2	3	3	4	3	3	3	3				
Engineering	male	g	42	1	1	4	2	2	3	3	2	2	2	2	1	2	2	2	3	1	1	1	1				
Engineering	male	g	36	1	1	5	2	2	1	3	1	1	2	1	1	2	2	1	3	2	3	1	1				
Engineering	male	g	40	2	2	4	2	2	2	3	2	4	4	2	4	2	2	2	4	4	3	2	2				
Engineering	male	g	41	1	1	1	1	2	2	1	4	3	5	3	4	2	2	3	4	2	4	2	1				
Engineering	male	g	34	1	1	4	2	2	2	3	2	3	4	3	3	2	2	3	5	4	3	2	3				
Engineering	male	g	40	1	1	1	1	3	3	1	5	3	5	2	5	2	2	3	4	2	4	1	2				
Engineering	male	g	39	1	1	5	1	1	2	3	1	2	2	1	2	1	1	1	2	1	2	2	2				
Engineering	male	g	54	2	2	4	2	2	4	2	2	3	4	2	2	2	2	2	2	4	2	2	2				
Engineering	male	g	46	2	2	4	2	2	4	2	2	3	4	2	4	2	2	3	4	4	2	2	3				
Engineering	male	g	48	1	2	2	4	2	2	2	2	1	3	2	2	1	1	2	3	3	2	1	1				
Engineering	male	g	46	1	2	1	1	1	2	3	1	1	4	4	2	3	3	3	5	2	3	2	3				
Engineering	male	g	56	1	2	2	2	2	3	3	2	2	4	4	2	3	2	2	3	4	4	3	3				
Engineering	male	g	50	2	2	2	2	2	2	3	2	3	3	2	3	4	2	2	3	2	3	2	2				
Engineering	male	g	40	3	4	4	4	2	2	2	3	3	2	2	4	2	2	3	3	3	2	4	2				
Engineering	male	g	42	2	2	2	2	3	2	2	2	2	4	2	4	4	3	4	4	4	4	2	2				
Engineering	male	g	41	2	2	3	2	3	4	4	2	2	4	4	4	3	4	3	4	4	3	2	2				
Engineering	male	g	35	2	2	4	2	2	2	3	2	2	2	2	2	2	2	3	3	4	3	2	2				
Engineering	male	g		1	1	3	2	3	3	3	2	3	5	5	5	5	5	5	2	5	5	2	2				
Engineering	male	g	44	1	1	3	1	2	3	3	2	3	5	5	5	3	4	4	2	4	4	1	2				
Engineering	male	g	46	2	2	2	2	3	3	3	2	3	3	2	5	2	2	3	5	3	5	3	3				
Engineering	male	g	52	1	3	4	4	3	4	3	2	4	5	4	5	4	4	3	5	4	4	2	2				
Engineering	male	g	44	2	2	4	2	3	3	2	2	3	5	5	5	4	5	4	5	5	5	1	1				
Engineering	male	g	51	2	2	3	2	3	3	2	2	3	3	4	5	4	4	4	4	3	3	4	4				
Engineering	male	g	52	2	2	4	2	2	4	2	2	3	2	2	4	2	3	4	3	3	3	3	3				

Data - All

<u>Department</u>	<u>Gender</u>	<u>Job</u>	<u>Age</u>																								
		<u>grade</u>		pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8				
Engineering	male	g	50	2	2	3	2	2	4	2	2	4	4	4	4	3	4	3	2	4	3	2	2				
Engineering	male	g	39	1	1	2	1	3	3	2	2	1	3	5	2	5	4	3	3	5	5	1	3				
Engineering	male	g	51	1	2	3	2	2	2	4	2	2	2	3	2	2	2	2	2	2	3	2	2				
Engineering	male	g	52	1	3	3	1	2	2	3	2	2	3	3	4	2	3	3	3	3	3	2	2				
Iron Making	female	g	44	2	2	3	2	1	4	3	2	2	2	3	4	2	2	3	4	5	2	2	2				
Iron Making	female	g	38	2	1	3	1	1	1	3	2	3	4	5	4	3	3	4	5	1	3	1	1				
Iron Making	female	g	54	2	2	4	2	2	2	3	2	2	2	2	2	3	3	3	2	4	3	3	3				
Iron Making	male	g	29	1	2	4	1	2	2	3	2	3	2	2	2	2	2	3	2	1	3	2	2				
Iron Making	male	g	29	2	1	3	5	2	2	2	2	1	3	2	2	2	3	3	5	3	5	2	2				
Iron Making	male	g	53	2	2	3	2	4	4	3	2	2	3	2	3	2	2	2	2	3	3	2	2				
Iron Making	male	g	30	2	2	4	3	2	3	3	2	3	2	2	2	2	2	1	2	4	4	2	1				
Iron Making	male	g	53	1	1	5	1	1	1	3	1	1	1	1	1	1	1	1	1	5	1	1	1				
Iron Making	male	g	38	1	1	2	1	4	2	2	1	2	2	2	2	2	2	3	4	1	2	1	1				
Iron Making	male	g	54	2	2	2	2	3	2	4	2	2	4	3	2	3	4	4	3	4	3	2	3				
Iron Making	male	g	44	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4				
Iron Making	male	g	41	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3				
Iron Making	male	g	61	1	1	5	1	2	1	4	1	5	2	2	2	2	2	2	5	4	2	2	2				
Iron Making	male	g	36	1	1	5	1	1	1	4	1	1	2	1	1	1	1	1	2	1	2	1	1				
Iron Making	male	g	49	5	5	5	4	3	4	3	4	3	5	5	5	5	5	5	5	4	5	2	3				
Iron Making	male	g	25	3	5	1	4	3	3	3	5	3	4	3	3	3	3	3	2	2	4	2	2				
Iron Making	male	g	44	1	1	4	1	3	4	2	1	1	5	3	3	2	2	4	2	3	5	2	2				
Iron Making	male	g	23	3	2	2	3	3	3	3	2	2	3	3	3	3	3	3	2	3	3	1	1				
Iron Making	male	g	39	5	5	5	4	3	4	3	4	3	5	5	5	5	5	5	5	4	5	2	3				
Iron Making	male	g	47	2	2	4	2	2	4	4	2	5	5	2	5	2	4	4	4	4	2	2	2				
Iron Making	male	g	41	1	2	2	2	2	3	3	2	3	4	2	4	2	3	3	3	3	3	2	2				
Iron Making	male	g	39	1	2	2	2	1	3	3	2	3	4	2	4	2	4	3	2	2	4	1	1				
Iron Making	male	g	42	1	3	2	2	1	3	3	1	4	4	3	4	3	4	4	2	3	4	2	2				
Iron Making	male	g	47	2	2	2	2	2	4	3	2	2	5	4	4	4	4	4	3	4	4	2	3				
Iron Making	male	g	34	2	2	4	2	2	3	3	2	2	2	3	4	4	4	3	2	2	2	1	2				
Iron Making	male	g	39	2	3	2	2	4	2	2	3	2	5	4	3	3	3	2	2	5	5	2	2				
Iron Making	male	g	60	2	1	4	1	1	1	2	2	2	5	2	2	2	2	2	2	2	2	2	2				
Iron Making	male	g	38	1	1	4	2	2	2	4	2	2	3	2	2	1	2	2	2	4	2	2	2				
Iron Making	male	g	43	1	1	4	2	2	3	2	2	3	3	2	2	1	2	2	2	3	2	2	2				
Iron Making	male	g	46	4	2	2	2	2	4	3	3	4	3	4	4	2	2	4	2	2	4	2	3				
Iron Making	male	g	49	2	2	4	2	3	2	4	2	3	2	2	4	2	2	4	4	4	2	2	2				
Iron Making	male	g	45	2	2	3	2	3	5	3	5	2	4	3	5	3	4	4	3	3	3	2	3				
Iron Making	male	g	38	2	2	4	4	2	3	3	4	4	2	2	2	2	2	3	4	4	3	2	2				

Data - All

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Iron Making	male	g	28	2	3	2	2	2	2	3	2	2	2	2	2	2	2	2	2	1	2	2	2
Iron Making	male	g	54	2	2	1	1	3	3	2	2	4	5	3	5	2	2	3	5	3	3	4	2
Iron Making	male	g	23	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	3	2	1
Iron Making	male	g	46	2	2	4	2	3	2	3	2	2	2	2	2	3	3	3	3	4	4	3	2
Iron Making	male	g	53	2	2	3	2	4	4	2	2	2	4	3	1	1	2	2	4	4	4	1	1
Iron Making	male	g	47	2	2	4	2	2	2	3	2	2	2	2	2	3	3	3	2	4	4	3	3
Iron Making	male	g	33	2	2	3	2	3	3	3	2	2	3	2	3	2	2	2	3	3	2	2	2
Iron Making	male	g	45	1	2	2	2	2	2	4	1	2	5	4	2	2	3	3	1	1	3	1	2
Iron Making	male	g	42	2	2	3	2	2	2	2	4	2	4	2	4	2	2	2	2	2	2	2	2
Iron Making	male	g	39	2	2	2	2	2	2	2	4	2	4	2	4	2	2	2	2	2	2	2	2
Iron Making	male	g	52	3	2	2	3	4	4	1	2	2	5	4	3	3	3	4	3	5	3	3	2
Iron Making	male	g	48	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Iron Making	male	g	41	1	1	4	2	1	1	3	1	1	1	2	3	2	2	2	3	4	1	2	2
Iron Making	male	g	47	2	1	4	1	2	2	4	2	2	2	2	2	2	2	3	4	4	3	3	3
Iron Making	male	g	31	2	2	4	2	3	3	3	2	2	3	4	4	4	4	4	2	2	4	2	2
Iron Making	male	g	42	1	1	1	1	2	2	3	2	2	2	2	2	2	2	2	4	4	3	2	2
Iron Making	male	g	36	2	1	2	2	3	3	2	2	2	2	2	3	3	4	2	4	4	4	1	1
Rolling	female	g	34	1	5	2	1	2	2	3	3	3	3	2	2	1	1	2	5	3	1	1	1
Rolling	female	g	41	1	2	2	2	2	2	2	2	3	4	2	2	2	2	2	4	4	2	4	3
Rolling	male	g	47	2	2	4	2	2	2	3	2	2	4	2	2	2	2	2	2	3	2	2	2
Rolling	male	g	55	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Rolling	male	g	37	2	2	2	3	2	2	2	4	2	2	4	2	3	3	2	4	4	4	2	3
Rolling	male	g	48	3	3	2	4	3	5	2	4	4	4	4	5	3	4	3	3	4	3	2	2
Rolling	male	g	56	2	2	2	2	2	2	3	2	3	3	2	3	3	3	2	5	4	3	2	2
Rolling	male	g	45	1	1	4	1	1	1	4	1	2	1	2	2	2	2	4	3	4	2	1	2
Rolling	male	g	50	1	1	3	1	1	1	3	1	3	2	2	2	2	2	3	2	3	2	1	2
Rolling	male	g	27	2	2	5	2	2	5	3	2	2	2	2	2	2	2	2	3	2	3	2	2
Rolling	male	g	23	3	2	3	3	2	3	3	2	2	3	2	2	2	2	3	3	3	3	2	2
Rolling	male	g	28	1	1	1	1	1	1	1	1	2	1	5	5	2	2	4	2	3	2	2	3
Rolling	male	g	44	2	2	3	2	2	2	3	2	2	3	3	2	2	2	3	2	3	3	2	3
Rolling	male	g	55	3	3	2	5	3	4	2	3	3	5	4	4	4	4	4	3	3	5	2	3
Rolling	male	g	35	3	2	4	4	3	3	2	2	2	4	2	4	2	2	2	3	4	4	2	2
Rolling	male	g	52	1	3	4	2	2	4	4	2	3	4	4	4	3	4	4	4	5	4	3	2
Rolling	male	g	52	1	1	5	2	3	3	3	2	2	2	1	2	2	2	2	2	4	2	2	2
Rolling	male	g	47	2	2	3	2	3	3	2	2	2	3	3	2	2	2	2	2	4	3	2	2
Rolling	male	g	52	2	2	4	2	2	2	3	2	2	2	2	2	2	3	3	3	3	3	2	2
Rolling	male	g	44	1	2	1	2	2	3	3	2	2	4	3	4	3	2	3	3	3	3	2	3

Data - All

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Rolling	male	g	54	3	2	2	3	2	3	3	2	2	2	2	2	2	3	2	4	4	3	2	2
Rolling	male	g		1	1	5	1	1	1	3	1	1	1	1	1	1	1	1	3	2	1	1	1
Rolling	male	g	56	2	2	4	2	2	2	4	2	2	2	2	2	2	2	2	2	3	2	2	2
Rolling	male	g	38	2	2	1	3	2	3	3	2	1	3	2	3	2	2	3	3	2	3	2	2
Rolling	male	g	45	2	2	4	2	3	2	3	3	3	2	2	3	2	2	2	2	3	2	2	2
Rolling	male	g	48	2	2	4	1	1	1	1	2	2	2	2	2	2	2	2	3	4	4	2	2
Rolling	male	g	54	1	1	1	1	1	1	4	2	2	2	1	2	1	1	2	2	4	2	2	2
Rolling	male	g	42	2	2	4	3	2	2	4	2	2	2	2	2	3	2	2	2	3	3	2	3
Rolling	male	g	34	1	1	2	2	2	2	3	2	5	4	3	3	2	3	2	4	1	1	2	2
Rolling	male	g	49	2	3	4	2	2	2	2	3	3	2	3	3	2	2	2	4	3	3	2	2
Rolling	male	g	42	2	2	4	2	2	3	4	2	2	2	2	2	2	2	2	5	5	4	3	2
Rolling	male	g	54	2	2	4	2	3	2	4	2	4	2	2	2	2	2	2	2	4	4	5	5
Rolling	male	g	44	3	2	4	2	3	2	2	2	2	2	2	3	2	3	2	2	4	4	2	2
Rolling	male	g	46	2	3	3	2	2	2	3	2	2	2	2	3	2	2	2	4	3	3	2	2
Rolling	male	g	41	2	2	4	2	2	3	3	2	2	3	2	2	2	2	2	3	4	2	2	3
Rolling	male	g	45	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Rolling	male	g	38	3	2	4	2	3	3	3	2	2	4	3	3	4	4	4	4	4	3	3	3
Rolling	male	g	40	2	2	4	2	2	3	3	2	2	2	3	3	2	2	2	4	4	3	3	3
Rolling	male	g	43	2	2	4	3	2	2	3	2	2	2	2	2	2	2	2	3	4	3	2	2
Rolling	male	g	52	2	2	3	2	2	3	2	2	3	3	3	3	3	3	3	3	4	3	2	2
Rolling	male	g	44	1	1	4	2	3	3	2	2	2	3	3	3	3	2	2	2	4	4	4	4
Rolling	male	g	40	1	2	4	1	2	2	3	1	1	2	2	2	1	2	2	3	4	2	2	2
Rolling	male	g	54	1	1	4	3	2	2	2	4	3	4	3	5	3	2	3	2	4	4	2	3
Rolling	male	g	52	2	2	4	2	2	3	2	2	2	2	2	2	3	3	2	2	3	2	2	3
Rolling	male	g	44	1	1	2	1	2	5	1	2	3	5	5	5	1	5	5	5	5	5	2	2
Rolling	male	g	42	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	4	3	2	1	1
Rolling	male	g	40	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	3	3	2	2
Rolling	male	g	52	1	2	4	2	2	2	3	2	4	2	2	2	2	2	2	2	4	3	2	2
Rolling	male	g	47	2	2	3	2	2	2	3	2	3	2	2	3	2	3	3	2	3	3	2	2
Rolling	male	g	38	2	2	1	3	3	3	3	2	2	3	2	3	1	1	1	2	2	1	1	1
Rolling	male	g	44	2	2	3	2	2	2	1	2	2	5	4	5	2	3	3	2	2	4	2	1
Rolling	male	g	47	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	3	2	2
Rolling	male	g	46	5	5	1	5	3	3	1	5	3	5	3	5	5	5	5	5	5	5	4	4
Rolling	male	g	57	2	2	4	2	3	3	4	2	2	2	2	2	2	2	3	2	4	2	2	3
Staff	female	g	40	2	2	2	3	2	3	1	3	1	3	2	5	3	4	5	2	3	3	2	3
Staff	female	g	40	2	2	2	3	2	3	1	3	1	5	3	5	3	5	5	1	3	3	1	3
Staff	female	g	39	2	2	2	2	2	2	4	2	4	2	2	2	2	2	3	2	3	2	2	2
Staff	female	g	49	2	4	2	4	3	4	3	4	4	4	4	4	3	3	3	4	2	4	2	2

Data - All

Department	Gender	Job	Age	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
		grade																					
Staff	female	g	29	2	2	3	2	2	3	4	2	3	2	2	3	1	2	2	3	2	3	2	2
Staff	female	g	43	1	1	5	1	1	2	4	1	1	1	1	1	1	1	2	3	1	1	1	1
Staff	female	g	40	2	2	3	2	3	4	3	3	3	3	3	3	3	3	3	3	3	2	3	3
Staff	female	g		2	2	2	2	2	3	4	3	4	3	2	2	3	2	3	3	4	4	3	3
Staff	female	g	39	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	2	2
Staff	female	g	31	1	1	5	1	1	1	4	1	4	1	1	1	2	2	1	4	4	3	1	1
Staff	female	g	46	1	2	5	2	2	3	3	2	3	4	3	5	2	2	2	3	5	2	3	3
Staff	male	g	44	2	3	1	3	5	4	1	3	1	5	5	5	3	3	5	2	3	5	1	3
Staff	male	g	43	2	2	2	2	3	4	3	2	2	4	3	3	4	3	3	4	3	3	3	3
Staff	male	g	47	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Staff	male	g	47	2	2	2	2	2	5	2	2	5	5	5	5	5	5	5	5	5	5	5	5
Staff	male	g	41	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	1	2
Staff	male	g	51	2	2	3	2	2	3	3	2	2	2	2	2	2	2	2	2	3	2	2	2
Staff	male	g	48	2	2	5	2	2	2	2	2	2	2	2	2	2	2	2	3	4	2	2	3
Staff	male	g	45	1	1	5	1	1	2	3	1	1	1	2	2	1	1	1	3	5	3	2	1
Staff	male	g	41	1	1	3	1	2	2	3	1	2	2	1	2	2	2	1	2	4	3	2	2
Staff	male	g	39	1	1	5	1	1	1	3	2	3	2	2	2	3	4	4	2	4	3	2	3
Staff	male	g	41	1	1	5	1	1	1	3	1	1	1	2	2	2	2	2	3	4	3	2	3
Staff	male	g	45	2	2	4	2	2	2	2	3	2	4	2	4	2	2	3	4	2	3	2	2
Staff	male	g	59	1	1	4	1	2	2	4	1	4	2	2	2	2	2	2	4	1	2	2	2
Staff	male	g	38	1	2	4	1	3	4	3	2	2	3	4	3	4	2	5	5	4	4	2	3
Staff	male	g	59	2	2	4	2	2	3	4	2	3	4	3	3	3	4	3	3	4	3	2	3
Staff	male	g	47	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	2	2
Steel Making	female	g	47	2	2	4	2	2	2	3	2	3	3	3	3	2	2	2	2	5	3	3	2
Steel Making	female	g	49	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3
Steel Making	female	g	39	2	3	2	4	2	3	4	3	2	3	4	3	3	3	4	4	4	4	2	2
Steel Making	male	g	52	2	2	1	3	4	3	3	4	2	4	2	2	3	3	3	4	4	4	2	3
Steel Making	male	g	27	1	1	4	1	2	2	4	1	4	1	1	1	2	2	3	2	4	2	2	2
Steel Making	male	g	51	2	2	3	2	2	2	4	2	2	5	3	3	2	2	3	5	2	3	1	1
Steel Making	male	g	48	2	2	4	1	1	2	3	2	2	2	2	2	2	2	3	2	2	2	2	2
Steel Making	male	g	52	1	2	5	2	2	3	5	1	2	2	2	2	2	2	2	2	2	2	2	2
Steel Making	male	g	51	2	2	4	2	2	2	2	2	2	2	4	2	2	2	3	2	4	2	1	2
Steel Making	male	g	58	2	2	3	2	2	3	2	2	3	4	3	3	2	3	3	3	3	2	2	2
Steel Making	male	g	32	2	2	5	1	2	2	3	1	2	2	2	2	2	2	3	4	2	4	1	2
Steel Making	male	g	40	1	2	4	2	2	4	2	1	2	2	2	3	2	2	2	4	2	4	1	1
Steel Making	male	g	50	2	2	3	2	2	3	3	2	2	3	3	3	2	2	2	3	3	2	2	2
Steel Making	male	g	54	2	2	4	2	2	2	3	2	2	2	2	2	2	3	2	2	4	3	2	3
Steel Making	male	g	28	3	4	1	4	3	5	3	5	2	5	5	5	4	5	5	5	2	5	2	2
Steel Making	male	g		2	3	4	2	3	3	3	2	2	2	2	4	3	4	4	4	3	3	2	3
Steel Making	male	g	37	1	1	4	1	2	2	3	1	1	2	2	1	1	2	2	1	3	2	2	1
Steel Making	male	g	50	2	2	3	2	2	3	3	3	3	4	3	4	4	3	3	4	3	2	2	3
Steel Making	male	g	23	3	2	4	2	2	2	3	4	3	2	2	4	4	3	3	4	2	4	2	2
Steel Making	male	g	54	1	1	1	1	3	3	3	1	1	4	3	3	1	1	3	3	4	2	1	1
Steel Making	male	g	41	3	2	2	3	3	3	4	2	3	4	3	2	4	4	3	5	5	5	2	3
Steel Making	male	g	42	3	2	2	3	3	3	3	2	3	4	3	2	3	3	3	3	4	5	2	3
Steel Making	male	g	48	2	2	2	1	2	2	3	2	1	5	2	1	2	2	2	2	2	2	1	1
Steel Making	male	g	32	4	4	4	3	3	3	3	2	2	3	4	4	4	4	4	4	4	5	1	1

ANNEXURE C ENGINEERING

Index	Page
Frequency distribution	89
Descriptive statistics	90
Data	91-92

Frequency distribution - Engineering

pm1			pm2		pm3		pm4		pm5		pm6		pm7		pm8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	39	55.71%	25	35.71%	8	11.43%	24	34.29%	13	18.57%	5	7.14%	5	7.14%	15	21.43%
2	29	41.43%	42	60.00%	10	14.29%	39	55.71%	37	52.86%	27	38.57%	17	24.29%	47	67.14%
3	2	2.86%	2	2.86%	13	18.57%	3	4.29%	18	25.71%	27	38.57%	33	47.14%	3	4.29%
4	0	0.00%	1	1.43%	29	41.43%	4	5.71%	1	1.43%	8	11.43%	13	18.57%	4	5.71%
5	0	0.00%	0	0.00%	10	14.29%	0	0.00%	1	1.43%	3	4.29%	2	2.86%	1	1.43%
	70	100.00%	70	100.00%	70	100.00%	70	100.00%	70	100.00%	70	100.00%	70	100.00%	70	100.00%
		97.14%		95.71%		25.71%		90.00%		71.43%		45.71%		31.43%		21.43%
						55.71%										
pd1			pd2		pd3		pd4		pd5		pd6		pd7		pd8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	7	10.00%	4	5.71%	4	5.71%	1	1.43%	3	4.29%	1	1.43%	14	20.00%	7	10.00%
2	41	58.57%	36	51.43%	16	22.86%	19	27.14%	19	27.14%	18	25.71%	46	65.71%	37	52.86%
3	12	17.14%	17	24.29%	37	52.86%	21	30.00%	21	30.00%	39	55.71%	8	11.43%	23	33.14%
4	7	10.00%	11	15.71%	12	17.14%	19	27.14%	21	30.00%	8	11.43%	2	2.86%	3	4.29%
5	3	4.29%	2	2.86%	1	1.43%	10	14.29%	6	8.57%	4	5.71%	0	0.00%	0	0.00%
	70	100.00%	70	100.00%	70	100.00%	70	100.00%	70	100.00%	70	100.00%	70	100.00%	70	100.00%
		68.57%		57.14%		28.57%		28.57%		31.43%		27.14%		85.71%		
pm9		pm10		pm11		pm12										
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage									
9	12.86%	5	7.14%	5	7.14%	10	14.29%									
28	40.00%	21	30.00%	25	35.71%	20	28.57%									
22	31.43%	18	25.71%	19	27.14%	11	15.71%									
8	11.43%	13	18.57%	11	15.71%	16	22.86%									
3	4.29%	13	18.57%	10	14.29%	13	18.57%									
70	100.00%	70	100.00%	70	100.00%	70	100.00%									
	52.86%		37.14%		42.86%		42.86%									

Descriptive statistics - Engineering

	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12
Mean	1.471429	1.7	3.328571	1.814286	2.142857	2.671429	2.857143	1.985714	2.542857	3.114286	2.942857	3.028571
Standard Error	0.06663	0.071511	0.146345	0.091667	0.093883	0.110937	0.108224	0.094338	0.119844	0.147502	0.140814	0.162755
Median	1	2	4	2	2	3	3	2	2	3	3	3
Mode	1	2	4	2	2	3	3	2	2	2	2	2
Standard Deviation	0.557464	0.598307	1.224407	0.766941	0.785479	0.928165	0.90547	0.789292	1.002688	1.234091	1.178131	1.361706
Sample Variance	0.310766	0.357971	1.499172	0.588199	0.616977	0.861491	0.819876	0.622981	1.005383	1.522981	1.387992	1.854244
Kurtosis	-0.661642	1.804833	-0.669794	1.791924	1.451964	0.229722	-0.006555	3.616455	-0.009762	-1.058325	-0.80585	-1.284934
Skewness	0.632065	0.635277	-0.564448	1.126429	0.663444	0.486539	-0.071363	1.48192	0.500593	0.157693	0.387118	0.053366
Range	2	3	4	3	4	4	4	4	4	4	4	4
Minimum	1	1	1	1	1	1	1	1	1	1	1	1
Maximum	3	4	5	4	5	5	5	5	5	5	5	5
Sum	103	119	233	127	150	187	200	139	178	218	206	212
Count	70	70	70	70	70	70	70	70	70	70	70	70
Confidence Level(95.0%)	0.132923	0.142661	0.291949	0.182871	0.187291	0.221313	0.215902	0.1882	0.239082	0.294259	0.280915	0.324687

		pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
pm1	1.471429								
pm2	1.7								
pm3	3.328571	2.4	2.585714	2.857143	3.257143	3.114286	2.942857	1.971429	2.314286
pm4	1.814286	0.114027	0.11051	0.098194	0.126566	0.124682	0.097347	0.078736	0.08523
pm5	2.142857	2	2	3	3	3	3	2	2
pm6	2.671429	2	2	3	3	3	3	2	2
pm7	2.857143	0.954015	0.924589	0.821552	1.058926	1.043168	0.814465	0.658752	0.713084
pm8	1.985714	0.910145	0.854865	0.674948	1.121325	1.088199	0.663354	0.433954	0.508489
pm9	2.542857	0.919985	-0.063312	0.258745	-0.977894	-0.758086	0.820648	1.506736	-0.043688
pm10	3.114286	1.068034	0.703825	-0.210848	0.139757	0.001996	0.603621	0.655912	0.19528
pm11	2.942857	4	4	4	4	4	4	3	3
pm12	3.028571	1	1	1	1	1	1	1	1
pd1	2.4	5	5	5	5	5	5	4	4
pd2	2.585714	168	181	200	228	218	206	138	162
pd3	2.857143	70	70	70	70	70	70	70	70
pd4	3.257143	0.227477	0.22046	0.195892	0.252492	0.248734	0.194202	0.157074	0.170029
pd5	3.114286								
pd6	2.942857								
pd7	1.971429								
pd8	2.314286								

Data - Engineering

<u>Department</u>	<u>Gender</u>	<u>Job grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Engineering	male	e	52	1	2	4	2	2	3	3	2	2	3	3	2	2	2	3	2	3	3	2	3
Engineering	male	e	36	1	2	3	2	4	3	1	2	4	5	4	4	3	4	4	4	3	3	2	2
Engineering	male	e	45	1	1	4	1	2	2	4	2	3	2	3	2	2	2	3	5	4	3	2	3
Engineering	male	e	46	1	2	3	2	2	3	4	2	2	3	3	2	2	3	3	4	4	2	2	2
Engineering	male	e	56	1	1	1	1	1	1	3	2	2	2	2	1	3	3	3	4	2	3	2	2
Engineering	male	e	45	1	1	5	1	1	1	3	1	5	5	5	5	3	3	3	5	4	3	2	2
Engineering	male	e	32	2	2	4	2	2	2	2	2	3	2	2	2	2	2	3	2	2	2	2	2
Engineering	male	e	53	1	2	1	2	2	3	3	1	3	3	3	3	2	3	3	4	4	3	3	3
Engineering	male	e	48	1	1	5	1	1	3	2	2	1	4	2	3	2	2	3	2	2	2	1	3
Engineering	male	e	58	2	2	4	2	2	2	4	2	2	2	2	2	2	2	3	2	3	3	2	3
Engineering	male	e		1	1	1	1	2	4	5	1	1	3	5	4	3	4	4	4	5	3	3	4
Engineering	male	e	54	2	2	3	3	1	5	3	2	3	4	5	4	3	2	3	4	4	3	3	3
Engineering	male	e	40	1	1	2	1	2	3	2	1	2	2	3	3	2	2	2	3	3	3	2	3
Engineering	male	e	53	2	2	4	2	3	3	2	2	2	3	2	2	2	2	4	4	3	3	2	2
Engineering	male	e	59	2	2	5	4	2	2	4	4	4	3	2	1	2	3	2	4	3	3	2	2
Engineering	male	e	59	2	2	4	2	2	3	3	2	2	4	3	5	2	3	3	5	4	3	2	2
Engineering	male	e	48	2	2	4	2	2	3	4	1	4	2	4	2	1	2	4	3	3	4	2	4
Engineering	male	f		1	1	2	2	3	3	3	3	3	4	3	4	2	3	3	2	2	2	2	2
Engineering	male	f	53	1	1	5	1	1	2	5	1	1	3	2	1	1	1	2	1	2	3	1	3
Engineering	male	f	37	1	1	5	1	1	1	4	2	1	1	1	1	1	1	1	4	3	3	1	1
Engineering	male	f	30	2	2	3	3	2	2	3	3	3	3	2	3	2	2	2	2	4	3	2	2
Engineering	male	f	41	1	1	5	1	1	3	3	1	5	1	3	3	2	2	3	2	4	3	1	3
Engineering	male	f	30	1	1	2	3	2	2	3	2	2	5	5	5	5	2	3	2	3	3	1	3
Engineering	male	f	49	2	2	4	1	1	2	1	2	3	3	2	3	2	2	2	2	2	2	2	2
Engineering	male	f	35	3	2	4	2	2	3	4	2	4	5	3	4	3	2	3	4	2	3	2	2
Engineering	male	f	26	2	2	3	2	3	2	3	2	2	2	3	3	2	2	2	3	2	2	2	2
Engineering	male	f	30	1	2	4	2	3	2	3	2	2	2	1	2	2	2	2	3	1	2	1	2
Engineering	male	f		1	1	1	1	1	5	4	1	5	5	5	5	1	4	3	4	3	3	2	2
Engineering	male	f		2	2	1	2	5	2	1	2	2	5	5	5	2	4	4	5	3	3	3	3
Engineering	male	f	55	1	1	4	1	2	3	4	4	2	2	3	3	2	3	4	3	5	2	2	3
Engineering	male	f	48	2	2	5	2	2	2	4	2	2	2	2	2	2	2	2	3	2	2	2	2
Engineering	male	f	59	1	1	4	1	2	5	4	2	2	5	4	5	4	3	3	2	4	3	2	3
Engineering	male	f	29	2	2	4	2	3	3	3	2	2	2	3	2	2	2	3	2	2	3	2	2

Data - Engineering

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Engineering	male	g	53	2	2	4	2	2	3	2	2	2	2	4	3	4	4	4	5	3	4	2	2
Engineering	male	g	43	2	2	4	2	3	2	3	2	3	3	4	4	2	3	3	3	4	2	2	3
Engineering	male	g	50	1	2	3	1	2	2	2	1	2	3	3	1	2	3	3	3	3	3	2	2
Engineering	male	g	34	1	2	4	2	3	3	3	4	2	2	3	2	2	2	3	3	2	3	2	3
Engineering	male	g	43	2	2	2	2	2	3	3	2	4	2	3	4	3	2	3	2	2	3	2	2
Engineering	male	g	40	1	1	5	1	1	2	3	1	3	1	2	1	1	3	1	3	3	2	1	1
Engineering	male	g	42	1	1	4	1	1	1	2	1	1	1	1	1	2	2	2	2	2	2	2	2
Engineering	male	g	41	2	2	4	2	3	3	3	2	2	3	2	2	2	3	3	4	3	3	3	3
Engineering	female	g	48	1	2	4	1	3	4	3	1	2	1	2	1	2	2	3	3	5	2	2	2
Engineering	male	g	42	1	1	4	2	2	3	3	2	2	2	2	1	2	2	2	3	1	1	1	1
Engineering	male	g	36	1	1	5	2	2	1	3	1	1	2	1	1	2	2	1	3	2	3	1	1
Engineering	male	g	40	2	2	4	2	2	2	3	2	4	4	2	4	2	2	2	4	4	3	2	2
Engineering	male	g	41	1	1	1	1	2	2	1	4	3	5	3	4	2	2	3	4	2	4	2	1
Engineering	male	g	34	1	1	4	2	2	2	3	2	3	4	3	3	2	2	3	5	4	3	2	3
Engineering	male	g	40	1	1	1	1	3	3	1	5	3	5	2	5	2	2	3	4	2	4	1	2
Engineering	male	g	39	1	1	5	1	1	2	3	1	2	2	1	2	1	1	1	2	1	2	2	2
Engineering	male	g	54	2	2	4	2	2	4	2	2	3	4	2	2	2	2	2	4	2	2	2	2
Engineering	male	g	46	2	2	4	2	2	4	2	2	3	4	2	4	2	2	3	4	4	2	2	3
Engineering	male	g	48	1	2	2	4	2	2	2	2	1	3	2	2	1	1	2	3	3	2	1	1
Engineering	male	g	46	1	2	1	1	1	2	3	1	1	4	4	2	3	3	3	5	2	3	2	3
Engineering	male	g	56	1	2	2	2	2	3	3	2	2	4	4	2	3	2	2	3	4	4	3	3
Engineering	male	g	50	2	2	2	2	2	2	3	2	3	3	2	3	4	2	2	3	2	3	2	2
Engineering	male	g	40	3	4	4	4	2	2	2	3	3	2	2	4	2	2	3	3	3	2	4	2
Engineering	male	g	42	2	2	2	2	3	2	2	2	2	4	2	4	4	3	4	4	4	4	2	2
Engineering	male	g	41	2	2	3	2	3	4	4	2	2	4	4	4	3	4	3	4	4	3	2	2
Engineering	male	g	35	2	2	4	2	2	2	3	2	2	2	2	2	2	2	3	3	4	3	2	2
Engineering	male	g		1	1	3	2	3	3	3	2	3	5	5	5	5	5	5	2	5	5	2	2
Engineering	male	g	44	1	1	3	1	2	3	3	2	3	5	5	5	3	4	4	2	4	4	1	2
Engineering	male	g	46	2	2	2	2	3	3	3	2	3	3	2	5	2	2	3	5	3	5	3	3
Engineering	male	g	52	1	3	4	4	3	4	3	2	4	5	4	5	4	4	3	5	4	4	2	2
Engineering	male	g	44	2	2	4	2	3	3	2	2	3	5	5	5	4	5	4	5	5	5	1	1
Engineering	male	g	51	2	2	3	2	3	3	2	2	3	3	4	5	4	4	4	4	3	3	4	4
Engineering	male	g	52	2	2	4	2	2	4	2	2	3	2	2	4	2	3	4	3	3	3	3	3
Engineering	male	g	50	2	2	3	2	2	4	2	2	4	4	4	4	3	4	3	2	4	3	2	2
Engineering	male	g	39	1	1	2	1	3	3	2	2	1	3	5	2	5	4	3	3	5	5	1	3
Engineering	male	g	51	1	2	3	2	2	2	4	2	2	2	3	2	2	2	2	2	2	3	2	2
Engineering	male	g	52	1	3	3	1	2	2	3	2	2	3	3	4	2	3	3	3	3	3	2	2

ANNEXURED
IRON MAKING

Index	
Frequency distribution	94
Descriptive statistics	95
Data	96-97
Page	

Frequency distribution - Iron Making

pm1			pm2		pm3		pm4		pm5		pm6		pm7		pm8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	21	29.17%	20	27.78%	5	6.94%	16	22.22%	10	13.89%	6	8.33%	2	2.78%	11	15.28%
2	41	56.94%	43	59.72%	20	27.78%	44	61.11%	35	48.61%	28	38.89%	18	25.00%	43	59.72%
3	4	5.56%	6	8.33%	15	20.83%	7	9.72%	19	26.39%	20	27.78%	38	52.78%	7	9.72%
4	4	5.56%	0	0.00%	23	31.94%	4	5.56%	8	11.11%	16	22.22%	13	18.06%	9	12.50%
5	2	2.78%	3	4.17%	9	12.50%	1	1.39%	0	0.00%	2	2.78%	1	1.39%	2	2.78%
	72	100.00%	72	100.00%	72	100.00%	72	100.00%	72	100.00%	72	100.00%	72	100.00%	72	100.00%
		86.11%		87.50%		34.72%		44.44%		83.33%		62.50%		47.22%		27.78%
																19.44%
pd1			pd2		pd3		pd4		pd5		pd6		pd7		pd8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	7	9.72%	2	2.78%	3	4.17%	2	2.78%	10	13.89%	2	2.78%	14	19.44%	14	19.44%
2	33	45.83%	28	38.89%	19	26.39%	23	31.94%	17	23.61%	18	25.00%	43	59.72%	42	58.33%
3	18	25.00%	24	33.33%	30	41.67%	20	27.78%	13	18.06%	22	30.56%	10	13.89%	14	19.44%
4	11	15.28%	15	20.83%	16	22.22%	18	25.00%	28	38.89%	24	33.33%	5	6.94%	2	2.78%
5	3	4.17%	3	4.17%	4	5.56%	9	12.50%	4	5.56%	6	8.33%	0	0.00%	0	0.00%
	72	100.00%	72	100.00%	72	100.00%	72	100.00%	72	100.00%	72	100.00%	72	100.00%	72	100.00%
		55.56%		41.67%		30.56%		34.72%		37.50%		27.78%		79.17%		
pm9		pm10		pm11		pm12										
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage									
5	6.94%	3	4.17%	3	4.17%	3	4.17%									
36	50.00%	24	33.33%	34	47.22%	22	30.56%									
18	25.00%	17	23.61%	19	26.39%	19	26.39%									
9	12.50%	16	22.22%	13	18.06%	22	30.56%									
4	5.56%	12	16.67%	3	4.17%	6	8.33%									
72	100.00%	72	100.00%	72	100.00%	72	100.00%									
	56.94%		37.50%		51.39%		34.72%									

Descriptive statistics - Iron Making

	<i>pm1</i>	<i>pm2</i>	<i>pm3</i>	<i>pm4</i>	<i>pm5</i>	<i>pm6</i>	<i>pm7</i>	<i>pm8</i>	<i>pm9</i>	<i>pm10</i>	<i>pm11</i>	<i>pm12</i>
Mean	1.958333	1.930556	3.152778	2.027778	2.347222	2.722222	2.901408	2.277778	2.597222	3.138889	2.708333	3.083333
Standard Error	0.107317	0.101488	0.137976	0.096844	0.101166	0.117389	0.092266	0.114008	0.116448	0.138889	0.112653	0.124706
Median	2	2	3	2	2	3	3	2	2	3	2	3
Mode	2	2	4	2	2	2	3	2	2	2	2	2
Standard Deviation	0.910618	0.861155	1.170767	0.82175	0.858425	0.99608	0.777449	0.967387	0.988094	1.178511	0.955894	1.058167
Sample Variance	0.829225	0.741588	1.370696	0.675274	0.736894	0.992175	0.604427	0.935837	0.97633	1.388889	0.913732	1.119718
Kurtosis	2.733682	4.927026	-1.015293	2.336437	-0.404549	-0.686493	0.12027	0.727649	0.177501	-1.097529	-0.319131	-0.890019
Skewness	1.465073	1.769252	-0.089024	1.201	0.354668	0.238158	-0.013069	1.041516	0.80289	0.201079	0.622847	0.049926
Range	4	4	4	4	3	4	4	4	4	4	4	4
Minimum	1	1	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	4	5	5	5	5	5	5	5
Sum	141	139	227	146	169	196	206	164	187	226	195	222
Count	72	72	72	72	72	72	71	72	72	72	72	72
Confidence Level(95.0%)	0.213985	0.202362	0.275117	0.193102	0.20172	0.234067	0.184019	0.227325	0.232191	0.276937	0.224624	0.248657

		<i>pd1</i>	<i>pd2</i>	<i>pd3</i>	<i>pd4</i>	<i>pd5</i>	<i>pd6</i>	<i>pd7</i>	<i>pd8</i>
<i>pm1</i>	1.958333								
<i>pm2</i>	1.930556								
<i>pm3</i>	3.152778	2.583333	2.847222	2.986111	3.125	2.986111	3.194444	2.083333	2.055556
<i>pm4</i>	2.027778	0.118265	0.109523	0.111001	0.128092	0.140551	0.118081	0.092246	0.083659
<i>pm5</i>	2.347222	2	3	3	3	3	3	2	2
<i>pm6</i>	2.722222	2	2	3	2	4	4	2	2
<i>pm7</i>	2.901408	1.003515	0.92933	0.941875	1.086894	1.192619	1.001954	0.782736	0.709868
<i>pm8</i>	2.277778	1.007042	0.863654	0.887128	1.181338	1.42234	1.003912	0.612676	0.503912
<i>pm9</i>	2.597222	-0.184152	-0.487559	-0.261404	-0.940968	-1.107784	-0.744651	0.69981	0.315972
<i>pm10</i>	3.138889	0.581771	0.421664	0.132195	0.218956	-0.280053	-0.059165	0.757731	0.405989
<i>pm11</i>	2.708333	4	4	4	4	4	4	3	3
<i>pm12</i>	3.083333	1	1	1	1	1	1	1	1
<i>pd1</i>	2.583333	5	5	5	5	5	5	4	4
<i>pd2</i>	2.847222	186	205	215	225	215	230	150	148
<i>pd3</i>	2.986111	72	72	72	72	72	72	72	72
<i>pd4</i>	3.125	0.235815	0.218382	0.22133	0.255408	0.280252	0.235448	0.183934	0.166811
<i>pd5</i>	2.986111								
<i>pd6</i>	3.194444								
<i>pd7</i>	2.083333								
<i>pd8</i>	2.055556								

Data - Iron Making

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Iron Making	male	e	42	1	2	3	1	3	3	2	2	2	3	3	3	4	3	3	3	3	3	3	3
Iron Making	male	e	37	1	1	2	1	1	2	2	1	2	2	2	2	3	3	3	4	3	4	2	2
Iron Making	male	e		2	3	3	2	2	5	3	2	2	4	4	4	4	3	5	5	2	4	3	2
Iron Making	male	e	28	1	2	5	2	2	2	4	2	5	1	2	2	1	4	3	5	1	2	1	1
Iron Making	male	e	59	2	2	3	2	2	2	1	2	2	3	3	3	3	3	3	3	3	4	3	3
Iron Making	male	e	52	2	2	5	2	3	3	5	4	2	2	2	3	2	2	2	4	4	3	2	2
Iron Making	male	e	58	2	2	2	2	2	4	3	2	2	2	4	4	4	4	4	3	4	4	2	3
Iron Making	male	e	27	1	1	1	1	3	3	3	1	3	3	2	3	2	3	3	2	2	2	2	2
Iron Making	male	e	40	2	2	4	2	2	4	4	2	2	4	3	4	2	2	2	4	2	4	2	2
Iron Making	male	e	38	2	2	3	2	2	2	3	2	3	3	3	3	2	3	3	4	4	4	3	2
Iron Making	male	e	46	2	2	3	3	1	3	3	3	3	3	3	4	4	3	2	3	4	3	3	2
Iron Making	male	e	31	2	2	5	2	2	2	3	3	3	2	2	2	1	2	3	3	1	2	1	1
Iron Making	male	e	40	2	3	4	2	2	2	3	2	4	4	4	4	2	3	3	4	2	3	2	2
Iron Making	male	f	27	1	1	2	1	2	3	2	1	2	2	2	3	2	2	4	4	2	4	2	1
Iron Making	male	f	36	2	2	2	2	2	3	3	3	3	2	2	3	2	3	3	3	2	3	2	2
Iron Making	male	f	31	3	3	4	2	3	4	2	3	2	3	3	3	4	4	3	3	1	4	2	2
Iron Making	male	f	52	2	2	1	2	2	2	2	2	3	3	3	4	3	3	3	3	4	4	4	3
Iron Making	male	f	55	1	1	5	2	2	2	3	2	5	2	1	2	2	2	2	3	4	2	2	2
Iron Making	male	f	29	2	2	3	2	3	3	2	2	3	3	3	3	3	3	3	3	2	4	1	1
Iron Making	male	f	38	2	2	3	2	3	2	3	2	2	3	3	3	3	3	3	3	2	3	2	2
Iron Making	male	f	51	1	1	2	2	2	2	2	2	4	5	4	4	5	5	5	5	1	5	1	2
Iron Making	male	f	25	2	1	4	1	2	2	3	3	3	5	2	5	3	3	3	3	4	3	2	2
Iron Making	male	g	29	1	2	4	1	2	2	3	2	3	2	2	2	2	2	3	2	1	3	2	2
Iron Making	male	g	29	2	1	3	5	2	2	2	2	1	3	2	2	2	3	3	5	3	5	2	2
Iron Making	male	g	53	2	2	3	2	4	4	3	2	2	3	2	3	2	2	2	2	3	3	2	2
Iron Making	male	g	30	2	2	4	3	2	3	3	2	3	2	2	2	2	2	1	2	4	4	2	1
Iron Making	male	g	53	1	1	5	1	1	1	3	1	1	1	1	1	1	1	1	1	5	1	1	1
Iron Making	male	g	38	1	1	2	1	4	2	2	1	2	2	2	2	2	2	3	4	1	2	1	1
Iron Making	male	g	54	2	2	2	2	3	2	4	2	2	4	3	2	3	4	4	3	4	3	2	3
Iron Making	male	g	44	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Iron Making	male	g	48	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Iron Making	male	g	41	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3
Iron Making	male	g	61	1	1	5	1	2	1	4	1	5	2	2	2	2	2	2	5	4	2	2	2

Data - Iron Making

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Iron Making	male	g	36	1	1	5	1	1	1	4	1	1	2	1	1	1	1	1	2	1	2	1	1
Iron Making	male	g	49	5	5	5	4	3	4	3	4	3	5	5	5	5	5	5	5	4	5	2	3
Iron Making	male	g	25	3	5	1	4	3	3	3	5	3	4	3	3	3	3	3	2	2	4	2	2
Iron Making	male	g	44	1	1	4	1	3	4	2	1	1	5	3	3	2	2	4	2	3	5	2	2
Iron Making	male	g	23	3	2	2	3	3	3	3	2	2	3	3	3	3	3	3	2	3	3	1	1
Iron Making	male	g	39	5	5	5	4	3	4	3	4	3	5	5	5	5	5	5	5	4	5	2	3
Iron Making	male	g	47	2	2	4	2	2	4	4	2	5	5	2	5	2	4	4	4	4	2	2	2
Iron Making	male	g	41	1	2	2	2	2	3	3	2	3	4	2	4	2	3	3	3	3	3	2	2
Iron Making	male	g	39	1	2	2	2	1	3	3	2	3	4	2	4	2	4	3	2	2	4	1	1
Iron Making	male	g	42	1	3	2	2	1	3	3	1	4	4	3	4	3	4	4	2	3	4	2	2
Iron Making	male	g	47	2	2	2	2	2	4	3	2	2	5	4	4	4	4	4	3	4	4	2	3
Iron Making	male	g	34	2	2	4	2	2	3	3	2	2	2	3	4	4	4	3	2	2	2	1	2
Iron Making	male	g	39	2	3	2	2	4	2	2	3	2	5	4	3	3	3	2	2	5	5	2	2
Iron Making	male	g	60	2	1	4	1	1	1	2	2	2	5	2	2	2	2	2	2	2	2	2	2
Iron Making	male	g	41	1	1	4	2	1	1	3	1	1	1	2	3	2	2	2	3	4	1	2	2
Iron Making	male	g	38	1	1	4	2	2	2	4	2	2	3	2	2	1	2	2	2	4	2	2	2
Iron Making	male	g	43	1	1	4	2	2	3	2	2	3	3	2	2	1	2	2	2	3	2	2	2
Iron Making	male	g	47	2	1	4	1	2	2	4	2	2	2	2	2	2	2	3	4	4	3	3	3
Iron Making	male	g	46	4	2	2	2	2	4	3	3	4	3	4	4	2	2	4	2	2	4	2	3
Iron Making	male	g	49	2	2	4	2	3	2	4	2	3	2	2	4	2	2	4	4	4	2	2	2
Iron Making	male	g	31	2	2	4	2	3	3	3	2	2	3	4	4	4	4	4	2	2	4	2	2
Iron Making	male	g	42	1	1	1	1	2	2	3	2	2	2	2	2	2	2	2	4	4	3	2	2
Iron Making	male	g	45	2	2	3	2	3	5	3	5	2	4	3	5	3	4	4	3	3	3	2	3
Iron Making	male	g	36	2	1	2	2	3	3	2	2	2	2	2	3	3	4	2	4	4	4	1	1
Iron Making	male	g	38	2	2	4	4	2	3	3	4	4	2	2	2	2	2	3	4	4	3	2	2
Iron Making	male	g	28	2	3	2	2	2	2	3	2	2	2	2	2	2	2	2	2	1	2	2	2
Iron Making	male	g	54	2	2	1	1	3	3	2	2	4	5	3	5	2	2	3	5	3	3	4	2
Iron Making	male	g	23	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	3	2	1
Iron Making	female	g	44	2	2	3	2	1	4	3	2	2	2	3	4	2	2	3	4	5	2	2	2
Iron Making	female	g	38	2	1	3	1	1	1	3	2	3	4	5	4	3	3	4	5	1	3	1	1
Iron Making	male	g	46	2	2	4	2	3	2	3	2	2	2	2	2	3	3	3	3	4	4	3	2
Iron Making	male	g	53	2	2	3	2	4	4	2	2	2	4	3	1	1	2	2	4	4	4	1	1
Iron Making	male	g	47	2	2	4	2	2	2	3	2	2	2	2	2	3	3	3	2	4	4	3	3
Iron Making	female	g	54	2	2	4	2	2	2	3	2	2	2	2	2	3	3	3	2	4	3	3	3
Iron Making	male	g	33	2	2	3	2	3	3	3	2	2	3	2	3	2	2	2	3	3	2	2	2
Iron Making	male	g	45	1	2	2	2	2	2	4	1	2	5	4	2	2	3	3	1	1	3	1	2
Iron Making	male	g	42	2	2	3	2	2	2	2	4	2	4	2	4	2	2	2	2	2	2	2	2
Iron Making	male	g	39	2	2	2	2	2	2	2	4	2	4	2	4	2	2	2	2	2	2	2	2
Iron Making	male	g	52	3	2	2	3	4	4	1	2	2	5	4	3	3	3	4	3	5	3	3	2

ANNEXURE E
STEEL MAKING

Index	
Frequency distribution	99
Descriptive statistics	100
Data	101
Page	

Frequency distribution - Steel Making

pm1			pm2		pm3		pm4		pm5		pm6		pm7		pm8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	12	30.00%	9	22.50%	4	10.00%	9	22.50%	3	7.50%	0	0.00%	0	0.00%	11	27.50%
2	23	57.50%	25	62.50%	5	12.50%	23	57.50%	26	65.00%	22	55.00%	6	15.00%	21	52.50%
3	4	10.00%	4	10.00%	8	20.00%	5	12.50%	8	20.00%	13	32.50%	26	65.00%	3	7.50%
4	1	2.50%	2	5.00%	16	40.00%	3	7.50%	2	5.00%	3	7.50%	7	17.50%	4	10.00%
5	0	0.00%	0	0.00%	7	17.50%	0	0.00%	1	2.50%	2	5.00%	1	2.50%	1	2.50%
	40	100.00%	40	100.00%	40	100.00%	40	100.00%	40	100.00%	40	100.00%	40	100.00%	40	100.00%
		87.50%		85.00%		22.50%		57.50%		80.00%		72.50%		55.00%		15.00%
																20.00%
pd1			pd2		pd3		pd4		pd5		pd6		pd7		pd8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	3	7.50%	1	2.50%	0	0.00%	1	2.50%	2	5.00%	0	0.00%	12	30.00%	9	22.50%
2	19	47.50%	17	42.50%	11	27.50%	10	25.00%	17	42.50%	13	32.50%	26	65.00%	24	60.00%
3	9	22.50%	15	37.50%	20	50.00%	7	17.50%	8	20.00%	11	27.50%	2	5.00%	7	17.50%
4	9	22.50%	5	12.50%	7	17.50%	13	32.50%	10	25.00%	9	22.50%	0	0.00%	0	0.00%
5	0	0.00%	2	5.00%	2	5.00%	9	22.50%	3	7.50%	7	17.50%	0	0.00%	0	0.00%
	40	100.00%	40	100.00%	40	100.00%	40	100.00%	40	100.00%	40	100.00%	40	100.00%	40	100.00%
		55.00%		45.00%		27.50%		27.50%		47.50%		32.50%		95.00%		
pm9		pm10		pm11		pm12										
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage									
4	10.00%	1	2.50%	1	2.50%	5	12.50%									
24	60.00%	14	35.00%	18	45.00%	11	27.50%									
7	17.50%	11	27.50%	16	40.00%	12	30.00%									
5	12.50%	9	22.50%	4	10.00%	10	25.00%									
0	0.00%	5	12.50%	1	2.50%	2	5.00%									
40	100.00%	40	100.00%	40	100.00%	40	100.00%									
	70.00%		37.50%		47.50%		40.00%									

Descriptive statistics - Steel Making

	<i>pm1</i>	<i>pm2</i>	<i>pm3</i>	<i>pm4</i>	<i>pm5</i>	<i>pm6</i>	<i>pm7</i>	<i>pm8</i>	<i>pm9</i>	<i>pm10</i>	<i>pm11</i>	<i>pm12</i>
Mean	1.85	1.975	3.425	2.05	2.3	2.625	3.075	2.075	2.325	3.075	2.65	2.825
Standard Error	0.110651	0.115955	0.192445	0.128851	0.125064	0.132469	0.103698	0.157657	0.131009	0.173159	0.126845	0.175
Median	2	2	4	2	2	2	3	2	2	3	3	3
Mode	2	2	4	2	2	2	3	2	2	2	2	3
Standard Deviation	0.699817	0.733362	1.217132	0.814925	0.790975	0.837808	0.655842	0.997111	0.828576	1.095152	0.80224	1.106797
Sample Variance	0.489744	0.537821	1.48141	0.664103	0.625641	0.701923	0.430128	0.994231	0.686538	1.199359	0.64359	1.225
Kurtosis	1.074038	1.529486	-0.464803	0.71427	2.909201	1.48773	1.098375	1.142201	0.14358	-0.906646	0.700649	-0.766178
Skewness	0.6875	0.86044	-0.624721	0.803442	1.361346	1.372586	0.498366	1.150529	0.736446	0.338209	0.735516	0.005897
Range	3	3	4	3	4	3	3	4	3	4	4	4
Minimum	1	1	1	1	1	2	2	1	1	1	1	1
Maximum	4	4	5	4	5	5	5	5	4	5	5	5
Sum	74	79	137	82	92	105	123	83	93	123	106	113
Count	40	40	40	40	40	40	40	40	40	40	40	40
Confidence Level(95.0%)	0.223812	0.23454	0.389257	0.260625	0.252966	0.267944	0.209748	0.318891	0.264991	0.350246	0.256569	0.353971

		<i>pd1</i>	<i>pd2</i>	<i>pd3</i>	<i>pd4</i>	<i>pd5</i>	<i>pd6</i>	<i>pd7</i>	<i>pd8</i>
<i>pm1</i>	1.85								
<i>pm2</i>	1.975								
<i>pm3</i>	3.425	2.6	2.75	3	3.475	2.875	3.25	1.75	1.95
<i>pm4</i>	2.05	0.14676	0.1421	0.129099	0.186009	0.172417	0.174496	0.085859	0.100957
<i>pm5</i>	2.3	2	3	3	4	3	3	2	2
<i>pm6</i>	2.625	2	2	3	4	2	2	2	2
<i>pm7</i>	3.075	0.928191	0.898717	0.816497	1.176424	1.09046	1.103607	0.543021	0.638508
<i>pm8</i>	2.075	0.861538	0.807692	0.666667	1.383974	1.189103	1.217949	0.294872	0.407692
<i>pm9</i>	2.325	-0.951498	0.34351	0.119324	-1.139286	-0.878935	-1.223496	-0.224842	-0.395255
<i>pm10</i>	3.075	0.299718	0.752953	0.595018	-0.235422	0.384433	0.316263	-0.126422	0.040437
<i>pm11</i>	2.65	3	4	3	4	4	3	2	2
<i>pm12</i>	2.825	1	1	2	1	1	2	1	1
<i>pd1</i>	2.6	4	5	5	5	5	5	3	3
<i>pd2</i>	2.75	104	110	120	139	115	130	70	78
<i>pd3</i>	3	40	40	40	40	40	40	40	40
<i>pd4</i>	3.475	0.29685	0.287423	0.261128	0.376238	0.348746	0.35295	0.173666	0.204205
<i>pd5</i>	2.875								
<i>pd6</i>	3.25								
<i>pd7</i>	1.75								
<i>pd8</i>	1.95								

Data - Steel Making

		<u>Job</u>	<u>Age</u>																						
<u>Department</u>	<u>Gender</u>	<u>grade</u>		pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8		
Steel Making	male	e	38	2	2	4	2	2	2	4	2	4	2	3	4	3	3	3	5	2	3	2	2		
Steel Making	male	e	34	1	1	5	1	1	2	3	1	1	4	2	1	2	2	2	4	2	3	1	1		
Steel Making	male	e	38	2	2	4	2	2	2	3	2	2	3	3	3	3	3	4	5	2	4	2	2		
Steel Making	male	e		2	2	3	2	2	2	3	2	2	3	3	4	4	3	4	5	4	4	2	2		
Steel Making	male	e	36	1	1	4	2	2	2	3	1	2	4	2	4	3	2	3	5	2	4	1	2		
Steel Making	male	e	38	1	2	5	2	1	2	3	2	2	2	2	2	2	3	3	2	1	2	2	2		
Steel Making	male	e	30	2	3	2	4	2	3	2	4	4	4	3	4	4	4	4	5	2	3	2	1		
Steel Making	male	e	44	2	1	4	2	3	2	4	4	2	3	2	3	2	3	3	4	2	2	2	2		
Steel Making	male	e	53	2	2	4	2	2	2	2	2	4	2	2	2	2	2	2	2	2	4	1	2		
Steel Making	male	e	42	1	2	3	1	2	2	3	2	2	5	2	5	4	4	4	3	2	5	2	2		
Steel Making	male	f	57	2	2	4	2	4	4	2	2	2	3	3	3	3	2	3	4	3	3	2	2		
Steel Making	male	f	33	1	1	1	2	5	5	4	2	2	2	3	2	4	5	5	5	1	5	1	1		
Steel Making	male	f	56	1	1	5	1	2	2	3	1	4	2	2	3	2	2	2	2	2	3	2	2		
Steel Making	female	f	26	1	2	5	3	2	4	3	2	3	3	4	4	2	3	3	4	3	5	1	2		
Steel Making	male	f	41	2	1	5	2	2	2	3	1	2	5	2	1	1	2	2	3	5	2	2	2		
Steel Making	male	f	31	2	2	3	2	2	2	3	1	2	3	3	4	2	3	3	4	4	3	2	2		
Steel Making	male	g	52	2	2	1	3	4	3	3	4	2	4	2	2	3	3	3	4	4	4	2	3		
Steel Making	male	g	27	1	1	4	1	2	2	4	1	4	1	1	1	2	2	3	2	4	2	2	2		
Steel Making	male	g	51	2	2	3	2	2	2	4	2	2	5	3	3	2	2	3	5	2	3	1	1		
Steel Making	male	g	48	2	2	4	1	1	2	3	2	2	2	2	2	2	2	3	2	2	2	2	2		
Steel Making	male	g	52	1	2	5	2	2	3	5	1	2	2	2	2	2	2	2	2	2	2	2	2		
Steel Making	male	g	51	2	2	4	2	2	2	2	2	2	2	4	2	2	2	3	2	4	2	1	2		
Steel Making	male	g	58	2	2	3	2	2	3	2	2	3	4	3	3	2	3	3	3	3	2	2	2		
Steel Making	male	g	32	2	2	5	1	2	2	3	1	2	2	2	2	2	2	3	4	2	4	1	2		
Steel Making	female	g	47	2	2	4	2	2	2	3	2	3	3	3	3	2	2	2	2	5	3	3	2		
Steel Making	male	g	40	1	2	4	2	2	4	2	1	2	2	2	3	2	2	2	4	2	4	1	1		
Steel Making	male	g	50	2	2	3	2	2	3	3	2	2	3	3	3	2	2	2	3	3	2	2	2		
Steel Making	male	g	54	2	2	4	2	2	2	3	2	2	2	2	2	2	3	2	2	4	3	2	3		
Steel Making	male	g	28	3	4	1	4	3	5	3	5	2	5	5	5	4	5	5	5	2	5	2	2		
Steel Making	male	g		2	3	4	2	3	3	3	2	2	2	2	4	3	4	4	4	3	3	2	3		
Steel Making	male	g	37	1	1	4	1	2	2	3	1	1	2	2	1	1	2	2	1	3	2	2	1		
Steel Making	male	g	50	2	2	3	2	2	3	3	3	3	4	3	4	4	3	3	4	3	2	2	3		
Steel Making	male	g	23	3	2	4	2	2	2	3	4	3	2	2	4	4	3	3	4	2	4	2	2		
Steel Making	male	g	54	1	1	1	1	3	3	3	1	1	4	3	3	1	1	3	3	4	2	1	1		
Steel Making	female	g	49	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3		
Steel Making	female	g	39	2	3	2	4	2	3	4	3	2	3	4	3	3	3	4	4	4	4	2	2		
Steel Making	male	g	41	3	2	2	3	3	3	4	2	3	4	3	2	4	4	3	5	5	5	2	3		
Steel Making	male	g	42	3	2	2	3	3	3	3	2	3	4	3	2	3	3	3	3	4	5	2	3		
Steel Making	male	g	48	2	2	2	1	2	2	3	2	1	5	2	1	2	2	2	2	2	2	1	1		
Steel Making	male	g	32	4	4	4	3	3	3	3	2	2	3	4	4	4	4	4	4	4	5	1	1		

ANNEXURE F

ROLLING

Index	Page
Frequency distribution	103
Descriptive statistics	104
Data	105-106

Frequency distribution - Rolling

pm1			pm2		pm3		pm4		pm5		pm6		pm7		pm8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	34	39.53%	22	25.58%	6	6.98%	21	24.42%	12	13.95%	11	12.79%	8	9.30%	13	14.83%
2	39	45.35%	53	61.63%	16	18.60%	49	56.98%	52	60.47%	41	47.67%	20	23.26%	56	64.71%
3	10	11.63%	7	8.14%	13	15.12%	10	11.63%	20	23.26%	24	27.91%	37	43.02%	6	6.98%
4	0	0.00%	1	1.16%	40	46.51%	3	3.49%	1	1.16%	6	6.98%	18	20.93%	4	4.65%
5	3	3.49%	3	3.49%	11	12.79%	3	3.49%	1	1.16%	4	4.65%	3	3.49%	7	8.14%
	86	100.00%	86	100.00%	86	100.00%	86	100.00%	86	100.00%	86	100.00%	86	100.00%	86	100.00%
		84.88%		87.21%		25.58%		81.40%		74.42%		60.47%		32.56%		36.59%
						59.30%								24.42%		
pd1			pd2		pd3		pd4		pd5		pd6		pd7		pd8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	8	9.30%	5	5.81%	3	3.49%	0	0.00%	3	3.49%	4	4.65%	12	13.95%	9	10.47%
2	45	52.33%	44	51.16%	40	46.51%	31	36.05%	16	18.60%	24	27.91%	62	72.09%	54	62.79%
3	22	25.58%	23	26.74%	27	31.40%	22	25.58%	30	34.88%	38	44.19%	7	8.14%	16	18.60%
4	8	9.30%	10	11.63%	12	13.95%	25	29.07%	32	37.21%	14	16.28%	3	3.49%	5	5.81%
5	3	3.49%	4	4.65%	4	4.65%	8	9.30%	5	5.81%	6	6.98%	2	2.33%	2	2.33%
	86	100.00%	86	100.00%	86	100.00%	86	100.00%	86	100.00%	86	100.00%	86	100.00%	86	100.00%
		61.63%		56.98%		50.00%		36.05%		22.09%		32.56%		86.05%		
pm9		pm10		pm11		pm12										
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage									
8	9.30%	5	5.81%	5	5.81%	4	4.65%									
49	56.98%	39	45.35%	44	51.16%	39	45.35%									
20	23.26%	15	17.44%	22	25.58%	21	24.42%									
5	5.81%	17	19.77%	9	10.47%	9	10.47%									
4	4.65%	10	11.63%	6	6.98%	13	15.12%									
86	100.00%	86	100.00%	86	100.00%	86	100.00%									
	66.28%		51.16%		56.98%		50.00%									

Descriptive statistics - Rolling

	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12
Mean	1.825581	1.953488	3.395349	2.046512	2.151163	2.430233	2.860465	2.255814	2.395349	2.860465	2.616279	2.860465
Standard Error	0.09672	0.090457	0.122981	0.097727	0.076728	0.104011	0.104826	0.112412	0.098246	0.125058	0.107412	0.125058
Median	2	2	4	2	2	2	3	2	2	2	2	2.5
Mode	2	2	4	2	2	2	3	2	2	2	2	2
Standard Deviation	0.896947	0.838864	1.140475	0.906278	0.711543	0.964557	0.972115	1.042464	0.911096	1.159744	0.996094	1.159744
Sample Variance	0.804514	0.703694	1.300684	0.821341	0.506293	0.930369	0.945007	1.086731	0.830096	1.345007	0.992202	1.345007
Kurtosis	3.513281	4.604863	-0.595599	2.607118	2.261494	0.695556	-0.280812	1.898536	1.49832	-0.879079	0.323736	-0.618097
Skewness	1.556305	1.680404	-0.588205	1.363278	0.775255	0.806409	-0.106749	1.506245	1.130758	0.510334	0.913359	0.695656
Range	4	4	4	4	4	4	4	4	4	4	4	4
Minimum	1	1	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5	5	5	5
Sum	157	168	292	176	185	209	246	194	206	246	225	246
Count	86	86	86	86	86	86	86	86	86	86	86	86
Confidence Level(95.0%)	0.192306	0.179853	0.244519	0.194307	0.152555	0.206801	0.208422	0.223505	0.195339	0.24865	0.213563	0.24865

		pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
pm1	1.825581								
pm2	1.953488								
pm3	3.395349	2.453488	2.581395	2.697674	3.116279	3.232558	2.930233	2.081395	2.267442
pm4	2.046512	0.098771	0.101244	0.099341	0.108992	0.101527	0.10302	0.081395	0.088186
pm5	2.151163	2	2	2.5	3	3	3	2	2
pm6	2.430233	2	2	2	2	4	3	2	2
pm7	2.860465	0.915963	0.938899	0.921249	1.010749	0.941518	0.955365	0.754829	0.817808
pm8	2.255814	0.838988	0.881532	0.8487	1.021614	0.886457	0.912722	0.569767	0.66881
pm9	2.395349	0.684424	0.374046	0.073012	-1.12361	-0.354426	-0.048311	4.948092	2.103475
pm10	2.860465	0.845735	0.849974	0.736452	0.321625	-0.312453	0.307579	1.711951	1.183514
pm11	2.616279	4	4	4	3	4	4	4	4
pm12	2.860465	1	1	1	2	1	1	1	1
pd1	2.453488	5	5	5	5	5	5	5	5
pd2	2.581395	211	222	232	268	278	252	179	195
pd3	2.697674	86	86	86	86	86	86	86	86
pd4	3.116279	0.196383	0.201301	0.197516	0.216705	0.201862	0.204831	0.161836	0.175338
pd5	3.232558								
pd6	2.930233								
pd7	2.081395								
pd8	2.267442								

Data - Rolling

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Rolling	male	e	41	3	2	3	2	3	4	2	5	5	5	5	5	3	2	4	4	3	4	3	2
Rolling	male	e	46	1	1	4	1	1	1	4	1	1	1	1	1	3	3	2	4	3	2	2	2
Rolling	male	e	37	2	2	2	1	2	3	2	2	2	2	2	2	3	3	3	5	2	3	2	2
Rolling	male	e	58	1	1	5	1	1	2	3	2	2	2	2	2	2	3	4	2	2	2	2	2
Rolling	male	e	45	1	3	4	3	2	4	1	5	3	5	5	5	5	5	5	5	3	5	2	2
Rolling	male	e	51	2	2	2	2	2	2	3	2	2	3	3	2	2	3	3	3	3	3	2	2
Rolling	male	e	46	2	2	4	2	3	3	4	2	2	2	2	3	3	3	4	4	4	3	2	2
Rolling	female	e	36	2	2	4	2	3	2	4	2	2	2	3	2	3	3	4	3	4	2	2	3
Rolling	male	e	60	2	2	4	2	2	2	2	5	2	5	3	2	4	4	3	2	3	3	2	3
Rolling	male	e	43	1	2	4	2	3	2	3	1	3	3	3	3	3	3	3	4	4	3	1	1
Rolling	male	e	43	1	2	4	2	2	2	2	4	3	4	4	4	2	2	3	4	4	3	2	2
Rolling	male	f	40	1	1	5	1	1	1	5	1	2	2	2	2	2	2	2	4	1	2	1	1
Rolling	male	f	52	1	1	5	1	2	2	3	1	3	2	3	2	2	2	2	2	2	2	2	2
Rolling	male	f	59	2	2	4	2	2	4	1	2	2	4	4	4	3	2	3	4	3	3	2	2
Rolling	male	f	51	2	2	2	2	3	2	3	5	1	5	5	5	4	4	4	4	3	4	2	2
Rolling	male	f	26	5	4	5	4	2	2	3	2	2	2	2	1	1	2	3	3	2	3	1	1
Rolling	male	f	52	1	2	4	2	2	2	4	2	5	5	2	5	2	2	3	2	2	4	2	2
Rolling	male	f	47	1	1	4	1	1	1	3	1	1	3	2	3	2	2	3	2	3	2	1	2
Rolling	male	f	25	2	2	4	2	2	3	4	2	3	2	3	2	2	3	3	3	1	3	2	2
Rolling	male	f	37	1	2	4	2	2	2	4	3	2	2	2	3	2	3	3	3	3	3	2	2
Rolling	male	f	47	1	1	5	2	2	3	4	2	2	2	3	3	4	4	4	4	3	5	2	2
Rolling	male	f	40	1	1	4	1	2	1	2	2	4	4	2	4	4	4	4	4	4	3	3	4
Rolling	male	f	27	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	4	4	2	2	4
Rolling	female	f	33	1	1	5	1	2	2	4	1	3	4	3	2	3	2	2	4	2	3	2	2
Rolling	male	f	47	1	1	4	1	1	1	4	2	4	2	2	2	2	2	3	2	2	2	2	2
Rolling	male	f	25	1	2	3	2	2	2	3	2	2	2	2	3	2	3	2	2	2	2	1	2
Rolling	male	f	41	2	2	4	2	2	3	4	2	2	4	4	4	4	4	3	4	2	3	2	2
Rolling	male	f	54	2	2	3	2	2	2	2	2	2	4	4	5	3	3	2	4	2	3	2	1
Rolling	male	f	38	1	1	4	1	2	2	5	2	2	2	2	2	3	2	2	2	4	4	2	4
Rolling	male	f	53	1	1	5	1	3	3	3	1	1	4	3	5	3	3	3	4	3	3	1	2
Rolling	male	f	28	3	2	2	2	4	4	2	5	2	4	3	4	4	4	2	2	4	3	2	2
Rolling	male	f	29	2	2	3	2	2	2	3	2	2	2	2	3	2	2	2	3	4	2	2	2
Rolling	male	g	47	2	2	4	2	2	2	3	2	2	4	2	2	2	2	2	2	3	2	2	2
Rolling	male	g	55	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Rolling	male	g	37	2	2	2	3	2	2	2	4	2	2	4	2	3	3	2	4	4	4	2	3
Rolling	male	g	48	3	3	2	4	3	5	2	4	4	4	4	5	3	4	3	3	4	3	2	2
Rolling	male	g	56	2	2	2	2	2	2	3	2	3	3	2	3	3	3	2	5	4	3	2	2
Rolling	male	g	45	1	1	4	1	1	1	4	1	2	1	2	2	2	2	4	3	4	2	1	2
Rolling	male	g	50	1	1	3	1	1	1	3	1	3	2	2	2	2	2	3	2	3	2	1	2
Rolling	male	g	27	2	2	5	2	2	5	3	2	2	2	2	2	2	2	2	3	2	3	2	2

Data - Rolling

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Rolling	male	g	23	3	2	3	3	2	3	3	2	2	3	2	2	2	2	3	3	3	3	2	2
Rolling	male	g	28	1	1	1	1	1	1	1	1	2	1	5	5	2	2	4	2	3	2	2	3
Rolling	male	g	44	2	2	3	2	2	2	3	2	2	3	3	2	2	2	3	2	3	3	2	3
Rolling	male	g	55	3	3	2	5	3	4	2	3	3	5	4	4	4	4	4	3	3	5	2	3
Rolling	male	g	35	3	2	4	4	3	3	2	2	2	4	2	4	2	2	2	3	4	4	2	2
Rolling	male	g	52	1	3	4	2	2	4	4	2	3	4	4	4	3	4	4	4	5	4	3	2
Rolling	male	g	52	1	1	5	2	3	3	3	2	2	2	1	2	2	2	2	2	4	2	2	2
Rolling	male	g	47	2	2	3	2	3	3	2	2	2	3	3	2	2	2	2	2	4	3	2	2
Rolling	male	g	52	2	2	4	2	2	2	3	2	2	2	2	2	2	3	3	3	3	3	2	2
Rolling	male	g	44	1	2	1	2	2	3	3	2	2	4	3	4	3	2	3	3	3	3	2	3
Rolling	male	g	54	3	2	2	3	2	3	3	2	2	2	2	2	2	3	2	4	4	3	2	2
Rolling	male	g		1	1	5	1	1	1	3	1	1	1	1	1	1	1	1	3	2	1	1	1
Rolling	female	g	34	1	5	2	1	2	2	3	3	3	3	2	2	1	1	2	5	3	1	1	1
Rolling	male	g	56	2	2	4	2	2	2	4	2	2	2	2	2	2	2	2	2	3	2	2	2
Rolling	female	g	41	1	2	2	2	2	2	2	2	3	4	2	2	2	2	2	4	4	2	4	3
Rolling	male	g	38	2	2	1	3	2	3	3	2	1	3	2	3	2	2	3	3	2	3	2	2
Rolling	male	g	45	2	2	4	2	3	2	3	3	3	2	2	3	2	2	2	2	3	2	2	2
Rolling	male	g	48	2	2	4	1	1	1	1	2	2	2	2	2	2	2	2	3	4	4	2	2
Rolling	male	g	54	1	1	1	1	1	1	4	2	2	2	1	2	1	1	2	2	4	2	2	2
Rolling	male	g	42	2	2	4	3	2	2	4	2	2	2	2	2	3	2	2	2	3	3	2	3
Rolling	male	g	34	1	1	2	2	2	2	3	2	5	4	3	3	2	3	2	4	1	1	2	2
Rolling	male	g	49	2	3	4	2	2	2	2	3	3	2	3	3	2	2	2	4	3	3	2	2
Rolling	male	g	42	2	2	4	2	2	3	4	2	2	2	2	2	2	2	2	5	5	4	3	2
Rolling	male	g	54	2	2	4	2	3	2	4	2	4	2	2	2	2	2	2	2	4	4	5	5
Rolling	male	g	44	3	2	4	2	3	2	2	2	2	2	2	3	2	3	2	2	4	4	2	2
Rolling	male	g	46	2	3	3	2	2	2	3	2	2	2	2	3	2	2	2	4	3	3	2	2
Rolling	male	g	41	2	2	4	2	2	3	3	2	2	3	2	2	2	2	2	4	3	4	2	3
Rolling	male	g	45	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Rolling	male	g	38	3	2	4	2	3	3	3	2	2	4	3	3	4	4	4	4	4	3	3	3
Rolling	male	g	40	2	2	4	2	2	3	3	2	2	2	3	3	2	2	2	4	4	3	3	3
Rolling	male	g	43	2	2	4	3	2	2	3	2	2	2	2	2	2	2	2	3	4	3	2	2
Rolling	male	g	52	2	2	3	2	2	3	2	2	3	3	3	3	3	3	3	3	4	3	2	2
Rolling	male	g	44	1	1	4	2	3	3	2	2	2	3	3	3	3	2	2	2	4	4	4	4
Rolling	male	g	40	1	2	4	1	2	2	3	1	1	2	2	2	1	2	2	3	4	2	2	2
Rolling	male	g	54	1	1	4	3	2	2	2	4	3	4	3	5	3	2	3	2	4	4	2	3
Rolling	male	g	52	2	2	4	2	2	3	2	2	2	2	2	2	3	3	2	2	3	2	2	3
Rolling	male	g	44	1	1	2	1	2	5	1	2	3	5	5	5	1	5	5	5	5	5	2	2
Rolling	male	g	42	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	4	3	2	1	1
Rolling	male	g	40	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	3	3	2	2
Rolling	male	g	52	1	2	4	2	2	2	3	2	4	2	2	2	2	2	2	2	4	3	2	2
Rolling	male	g	47	2	2	3	2	2	2	3	2	3	2	2	3	2	3	3	2	3	3	2	2
Rolling	male	g	38	2	2	1	3	3	3	3	2	2	3	2	3	1	1	1	2	2	1	1	1
Rolling	male	g	44	2	2	3	2	2	2	1	2	2	5	4	5	2	3	3	2	2	4	2	1
Rolling	male	g	47	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	3	2	2
Rolling	male	g	46	5	5	1	5	3	3	1	5	3	5	3	5	5	5	5	5	5	5	4	4
Rolling	male	g	57	2	2	4	2	3	3	4	2	2	2	2	2	2	2	3	2	4	2	2	3

ANNEXURE G
STAFF

Index	Page
Frequency distribution	109
Descriptive statistics	109
Data	110-111

Frequency distribution - Staff

pm1			pm2			pm3			pm4			pm5			pm6			pm7			pm8		
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency
1	37	43.53%	26	30.59%	6	7.06%	27	31.76%	15	17.65%	4	4.71%	6	7.06%	18								
2	43	50.59%	45	52.94%	14	16.47%	48	56.47%	45	52.94%	38	44.71%	17	20.00%	50								
3	3	3.53%	9	10.59%	13	15.29%	4	4.71%	19	22.35%	26	30.59%	43	50.59%	7								
4	0	0.00%	2	2.35%	28	32.94%	3	3.53%	2	2.35%	13	15.29%	16	18.82%	5								
5	2	2.35%	3	3.53%	24	28.24%	3	3.53%	4	4.71%	4	4.71%	3	3.53%	5								
	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85
		94.12%		83.53%		23.53%		88.24%		70.59%		49.41%		27.06%		22.35%							
						61.18%																	
pd1			pd2			pd3			pd4			pd5			pd6			pd7			pd8		
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency
1	10	11.76%	4	4.71%	5	5.88%	1	1.18%	9	10.59%	4	4.71%	20	23.53%	15								
2	41	48.24%	39	45.88%	29	34.12%	18	21.18%	21	24.71%	17	20.00%	51	60.00%	42								
3	22	25.88%	24	28.24%	29	34.12%	25	29.41%	23	27.06%	38	44.71%	11	12.94%	24								
4	8	9.41%	11	12.94%	11	12.94%	25	29.41%	22	25.88%	13	15.29%	1	1.18%	2								
5	4	4.71%	7	8.24%	11	12.94%	16	18.82%	10	11.76%	13	15.29%	2	2.35%	2								
	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85	100.00%	85
		60.00%		50.59%		40.00%		22.35%		35.29%		24.71%		83.53%									
pm9			pm10			pm11			pm12														
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
14	16.47%	10	11.76%	7	8.24%	6	7.06%																
33	38.82%	39	45.88%	37	43.53%	26	30.59%																
17	20.00%	14	16.47%	24	28.24%	24	28.24%																
15	17.65%	13	15.29%	9	10.59%	15	17.65%																
6	7.06%	9	10.59%	8	9.41%	14	16.47%																
85	100.00%	85	100.00%	85	100.00%	85	100.00%																
	55.29%		57.65%		51.76%		37.65%																

Descriptive statistics - Staff

	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12
Mean	1.670588	1.952941	3.588235	1.905882	2.235294	2.705882	2.917647	2.178571	2.6	2.670588	2.694118	3.058824
Standard Error	0.082653	0.098882	0.136271	0.098481	0.101318	0.102931	0.097893	0.111271	0.12658	0.128978	0.117184	0.130021
Median	2	2	4	2	2	3	3	2	2	2	2	3
Mode	2	2	4	2	2	2	3	2	2	2	2	2
Standard Deviation	0.762019	0.911643	1.256356	0.907948	0.934103	0.948979	0.902533	1.019812	1.167007	1.18912	1.080383	1.198739
Sample Variance	0.580672	0.831092	1.578431	0.82437	0.872549	0.90056	0.814566	1.040017	1.361905	1.414006	1.167227	1.436975
Kurtosis	6.867391	2.924406	-0.769775	3.598653	1.838427	-0.102687	0.19587	1.772818	-0.675671	-0.606313	-0.118214	-0.936482
Skewness	1.962884	1.446027	-0.573473	1.655276	1.124188	0.626406	-0.133461	1.376356	0.465772	0.626594	0.700001	0.224231
Range	4	4	4	4	4	4	4	4	4	4	4	4
Minimum	1	1	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5	5	5	5
Sum	142	166	305	162	190	230	248	183	221	227	229	260
Count	85	85	85	85	85	85	85	84	85	85	85	85
Confidence Level(95.0%)	0.164364	0.196637	0.27099	0.19584	0.201481	0.20469	0.194672	0.221313	0.251718	0.256487	0.233033	0.258562

		pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
pm1	1.670588								
pm2	1.952941								
pm3	3.588235	2.470588	2.741176	2.929412	3.435294	3.035714	3.164706	1.988235	2.223529
pm4	1.905882	0.106627	0.11121	0.120443	0.115284	0.130587	0.115769	0.086147	0.092243
pm5	2.235294	2	2	3	3	3	3	2	2
pm6	2.705882	2	2	2	4	4	3	2	2
pm7	2.917647	0.98305	1.02531	1.110429	1.06287	1.196848	1.06734	0.794237	0.850441
pm8	2.178571	0.966387	1.051261	1.233053	1.129692	1.432444	1.139216	0.630812	0.723249
pm9	2.6	0.42234	-0.119445	-0.523584	-0.997085	-0.923674	-0.420898	3.687072	1.31939
pm10	2.670588	0.77692	0.746978	0.462689	-0.039917	-0.026941	0.203901	1.335207	0.739537
pm11	2.694118	4	4	4	4	4	4	4	4
pm12	3.058824	1	1	1	1	1	1	1	1
pd1	2.470588	5	5	5	5	5	5	5	5
pd2	2.741176	210	233	249	292	255	269	169	189
pd3	2.929412	85	85	85	85	84	85	85	85
pd4	3.435294	0.212039	0.221154	0.239514	0.229256	0.259732	0.23022	0.171313	0.183436
pd5	3.035714								
pd6	3.164706								
pd7	1.988235								
pd8	2.223529								

Data - Staff

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Staff	male	e	59	1	1	4	1	1	3	2	2	2	1	2	4	2	2	5	4	2	5	1	2
Staff	female	e	30	2	2	4	2	2	2	3	2	4	2	1	3	2	2	2	3	2	2	2	2
Staff	female	e	28	1	1	4	2	3	3	3	2	4	2	3	1	2	2	2	3	1	3	1	2
Staff	male	e	41	1	1	5	1	1	1	4	1	4	1	1	1	1	1	1	5	2	1	1	1
Staff	female	e	43	1	2	2	1	2	3	3	1	2	3	2	3	2	3	2	4	5	5	3	2
Staff	male	e	36	2	2	3	2	2	3	3	2	2	3	3	2	3	3	3	4	4	4	3	3
Staff	male	e	45	2	3	2	2	3	3	2	2	2	2	5	3	5	4	2	4	4	3	2	3
Staff	male	e		2	3	2	2	2	2	4	2	2	2	2	2	2	2	4	4	2	3	2	2
Staff	male	e	51	2	3	4	2	2	2	1	2	2	5	5	4	4	4	3	5	1	5	1	2
Staff	male	e	39	1	2	5	1	2	4	3	2	1	2	3	3	3	2	3	5	1	2	1	1
Staff	male	e	53	2	2	4	2	4	4	4	1	1	4	4	4	3	3	4	4	2	4	2	2
Staff	male	e	53	2	2	4	2	2	2	4	2	2	3	3	3	3	3	4	3	3	3	2	3
Staff	male	e	39	2	2	5	2	3	2	3	2	3	2	3	3	2	3	3	4	3	2	2	3
Staff	male	e	53	2	2	4	2	4	4	2	2	4	3	3	3	4	4	4	4	4	3	2	2
Staff	male	e	49	1	1	5	1	1	2	3	1	3	2	2	2	1	2	3	4	2	2	1	2
Staff	male	e	51	1	1	4	5	3	3	1	2	4	2	4	5	3	4	4	5	2	3	2	4
Staff	male	e	51	2	3	4	2	2	2	4	2	2	2	2	2	3	3	3	2	3	2	2	2
Staff	male	e	54	2	3	2	4	3	3	2	2	3	3	4	5	4	4	5	3	2	4	2	2
Staff	female	e	47	1	1	5	1	1	4	3	1	5	2	3	5	3	2	2	3	4	3	3	3
Staff	male	e	39	1	3	5	2	2	3	4	2	2	2	4	2	1	4	2	4	2	4	1	2
Staff	male	f	54	1	2	4	2	2	2	3	2	2	2	2	2	2	2	2	3	5	4	2	2
Staff	female	f	43	1	2	3	4	1	3	1	5	3	4	3	4	1	5	4	4	1	3	1	1
Staff	male	f	50	1	5	1	2	3	3	2	4	3	3	3	4	2	3	3	2	3	4	2	2
Staff	female	f	47	1	2	2	2	2	2	2	2	2	2	3	3	2	3	3	5	3	3	3	3
Staff	female	f	33	2	3	3	2	3	2	2	5	1	5	3	5	3	5	5	5	3	5	2	2
Staff	male	f	42	1	1	4	1	1	2	3	1	1	1	1	2	2	3	3	4	2	3	2	2
Staff	male	f	41	2	2	3	2	2	2	3	2	2	2	2	3	2	2	2	2	3	2	2	2
Staff	male	f	25	2	1	5	2	2	2	3	2	4	2	2	3	2	2	2	3	2	2	2	1
Staff	male	f	31	3	1	3	1	1	2	3	1	1	1	1	1	1	1	1	3	1	1	1	1
Staff	female	f	29	2	2	5	2	2	2	3	2	4	2	2	2	1	2	2	2	2	3	2	2
Staff	male	f	45	1	2	1	1	2	3	3	2	2	2	2	3	3	3	3	4	5	5	3	3
Staff	female	f	31	2	2	1	2	3	4	3	2	1	2	3	4	2	2	3	3	1	3	1	1
Staff	male	f	42	1	2	1	2	2	3	3	2	3	2	3	3	4	3	4	5	4	4	3	4
Staff	male	f	34	3	5	1	3	5	5	3	5	1	5	3	5	1	5	5	5	2	5	1	1
Staff	female	f	44	1	1	5	1	1	3	3	2	2	2	5	4	4	3	3	4	5	5	3	3
Staff	male	f	45	1	2	4	2	2	2	4	2	2	2	2	2	2	2	4	2	4	4	2	2
Staff	male	f		1	2	5	1	3	3	3	2	2	1	2	2	2	2	2	2	4	3	2	2
Staff	female	f	48	2	2	4	2	2	2	2	4	3	3	2	4	3	3	3	3	3	3	3	3

Data - Staff

<u>Department</u>	<u>Gender</u>	<u>Job</u>	<u>Age</u>																								
		<u>grade</u>		pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8				
Staff	female	f	47	2	2	4	2	3	2	2	2	4	4	4	4	2	3	3	2	3	3	2	2				
Staff	female	f	26	2	2	3	2	3	2	3	3	4	3	2	3	2	2	2	3	3	3	2	2				
Staff	male	f	46	1	1	2	1	2	2	3	1	2	4	2	3	2	3	3	4	3	2	2	3				
Staff	male	f	25	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2				
Staff	female	f	33	1	1	3	1	1	2	4	1	4	2	2	2	2	2	2	5	3	5	1	3				
Staff	male	f	40	1	1	3	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	2	3				
Staff	male	f	50	2	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	4	3	2	2				
Staff	female	f	27	2	2	4	2	3	4	3	2	5	3	4	4	2	2	3	5	1	3	2	1				
Staff	female	f	27	2	2	4	2	3	4	3	2	5	3	4	4	2	2	3	5	1	3	2	1				
Staff	male	f	39	1	1	5	1	2	3	3	2	3	2	2	3	2	3	3	2	3	2	2	2				
Staff	male	f	35	2	2	4	2	2	2	3	2	2	4	2	4	3	4	4	4	4	3	2	2				
Staff	male	f	49	2	2	4	2	2	3	3	2	4	4	3	4	3	3	3	2	4	3	2	2				
Staff	male	f	55	2	2	4	2	2	4	3	2	2	2	2	5	4	4	4	4	2	4	1	2				
Staff	male	f	41	1	1	5	2	2	2	5	2	2	2	3	2	2	2	2	4	2	2	2	2				
Staff	female	f	31	2	2	4	2	3	3	3	4	2	5	5	5	3	3	3	4	5	5	1	1				
Staff	male	f		5	3	3	2	3	3	3	3	3	2	3	3	2	3	2	3	4	2	3	2				
Staff	female	f	33	1	1	5	1	2	2	4	1	3	4	3	2	3	2	2	4	4	4	4	1				
Staff	female	f	39	1	1	5	1	1	3	2	1	1	1	2	1	2	2	2	4	4	4	4	1				
Staff	female	f	39	1	1	5	1	2	2	4	2	3	2	2	2	2	2	2	3	3	3	2	2				
Staff	female	f	44	1	1	4	1	2	3	2	1	2	4	2	3	2	2	3	5	4	3	2	2				
Staff	female	g	40	2	2	2	3	2	3	1	3	1	3	2	5	3	4	5	2	3	3	2	3				
Staff	female	g	40	2	2	2	3	2	3	1	3	1	5	3	5	3	5	5	1	3	3	1	3				
Staff	male	g	44	2	3	1	3	5	4	1	3	1	5	5	5	3	3	5	2	3	5	1	3				
Staff	male	g	43	2	2	2	2	3	4	3	2	2	4	3	3	4	3	3	4	3	3	3	3				
Staff	female	g	39	2	2	2	2	2	2	4	2	4	2	2	2	2	2	3	2	3	2	2	2				
Staff	male	g	47	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5				
Staff	female	g	49	2	4	2	4	3	4	3	4	4	4	4	4	3	3	3	4	2	4	2	2				
Staff	male	g	47	2	2	2	2	2	5	2	2	5	5	5	5	5	5	5	5	5	5	5	5				
Staff	male	g	41	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	1	2				
Staff	male	g	51	2	2	3	2	2	3	3	2	2	2	2	2	2	2	2	2	3	2	2	2				
Staff	female	g	29	2	2	3	2	2	3	4	2	3	2	2	3	1	2	2	3	2	3	2	2				
Staff	male	g	48	2	2	5	2	2	2	2	2	2	2	2	2	2	2	2	3	4	2	2	3				
Staff	male	g	45	1	1	5	1	1	2	3	1	1	1	2	2	1	1	1	3	5	3	2	1				
Staff	male	g	41	1	1	3	1	2	2	3	1	2	2	1	2	2	2	1	2	4	3	2	2				
Staff	male	g	39	1	1	5	1	1	1	3	2	3	2	2	2	3	4	4	2	4	3	2	3				
Staff	male	g	41	1	1	5	1	1	1	3	1	1	1	2	2	2	2	2	3	4	3	2	3				
Staff	female	g	43	1	1	5	1	1	2	4	1	1	1	1	1	1	1	2	3	1	1	1	1				
Staff	male	g	45	2	2	4	2	2	2	2	3	2	4	2	4	2	2	3	4	2	3	2	2				
Staff	female	g	40	2	2	3	2	3	4	3	3	3	3	3	3	3	3	3	3	3	3	2	3				
Staff	female	g		2	2	2	2	2	2	3	4	3	2	2	3	2	2	3	3	4	4	3	3				
Staff	male	g	59	1	1	4	1	2	2	4	1	4	2	2	2	2	2	2	2	4	1	2	2				
Staff	male	g	38	1	2	4	1	3	4	3	2	2	3	4	3	4	2	5	5	4	4	2	3				
Staff	female	g	39	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	2	2				
Staff	female	g	31	1	1	5	1	1	1	4	1	4	1	1	1	2	2	1	4	4	3	1	1				
Staff	female	g	46	1	2	5	2	2	3	3	2	3	4	3	5	2	2	2	3	5	2	3	3				
Staff	male	g	59	2	2	4	2	2	3	4	2	3	4	3	3	3	4	3	3	4	3	2	3				
Staff	male	g	47	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	2	3	2	2	2				

ANNEXURE H E ROLES

Index	Page
Frequency distribution	113
Descriptive statistics	114
Data	115-116

Frequency distribution - E roles

pm1			pm2		pm3		pm4		pm5		pm6		pm7		pm8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	32	45.07%	18	25.35%	4	5.63%	20	28.17%	14	19.72%	4	5.63%	5	7.04%	16	22.54%
2	38	53.52%	42	59.15%	10	14.08%	44	61.97%	40	56.34%	32	45.07%	16	22.54%	45	63.38%
3	1	1.41%	10	14.08%	12	16.90%	3	4.23%	14	19.72%	24	33.80%	30	42.25%	2	2.82%
4	0	0.00%	0	0.00%	30	42.25%	3	4.23%	3	4.23%	9	12.68%	18	25.35%	5	7.04%
5	0	0.00%	1	1.41%	15	21.13%	1	1.41%	0	0.00%	2	2.82%	2	2.82%	3	4.23%
	71	100.00%	71	100.00%	71	100.00%	71	100.00%	71	100.00%	71	100.00%	71	100.00%	71	100.00%
		98.59%		84.51%		19.72%		90.14%		76.06%		50.70%		29.58%		28.17%
						63.38%										
pd1			pd2		pd3		pd4		pd5		pd6		pd7		pd8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	6	8.45%	1	1.41%	1	1.41%	0	0.00%	6	8.45%	1	1.41%	14	19.72%	7	9.86%
2	29	40.85%	24	33.80%	14	19.72%	10	14.08%	26	36.62%	16	22.54%	45	63.38%	44	61.97%
3	23	32.39%	32	45.07%	34	47.89%	15	21.13%	18	25.35%	33	46.48%	12	16.90%	17	23.94%
4	11	15.49%	13	18.31%	18	25.35%	30	42.25%	19	26.76%	16	22.54%	0	0.00%	3	4.23%
5	2	2.82%	1	1.41%	4	5.63%	16	22.54%	2	2.82%	5	7.04%	0	0.00%	0	0.00%
	71	100.00%	71	100.00%	71	100.00%	71	100.00%	71	100.00%	71	100.00%	71	100.00%	71	100.00%
		49.30%		35.21%		21.13%		14.08%		45.07%		23.94%		83.10%		
pm9		pm10		pm11		pm12										
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage									
6	8.45%	4	5.63%	3	4.23%	6	8.45%									
35	49.30%	28	39.44%	25	35.21%	22	30.99%									
14	19.72%	21	29.58%	26	36.62%	19	26.76%									
12	16.90%	11	15.49%	10	14.08%	16	22.54%									
4	5.63%	7	9.86%	7	9.86%	8	11.27%									
71	100.00%	71	100.00%	71	100.00%	71	100.00%									
	57.75%		45.07%		39.44%		39.44%									

Descriptive statistics - E roles

	<i>pm1</i>	<i>pm2</i>	<i>pm3</i>	<i>pm4</i>	<i>pm5</i>	<i>pm6</i>	<i>pm7</i>	<i>pm8</i>	<i>pm9</i>	<i>pm10</i>	<i>pm11</i>	<i>pm12</i>
Mean	1.56338	2.056338	3.591549	1.887324	2.084507	2.619718	2.943662	2.070423	2.619718	2.84507	2.901408	2.971831
Standard Error	0.062582	0.185909	0.135429	0.093122	0.089142	0.104941	0.111488	0.114051	0.124254	0.127896	0.122277	0.137485
Median	2	2	4	2	2	2	3	2	2	3	3	3
Mode	2	2	4	2	2	2	3	2	2	2	3	2
Standard Deviation	0.527322	1.5665	1.141146	0.784662	0.751123	0.884246	0.939412	0.961011	1.046985	1.077668	1.030325	1.15847
Sample Variance	0.278068	2.453924	1.302213	0.615694	0.564185	0.781891	0.882495	0.923541	1.096177	1.161368	1.061569	1.342052
Kurtosis	-1.348657	49.54265	-0.325111	3.873311	0.269843	0.167035	-0.290669	2.574855	-0.30002	-0.46537	-0.287038	-0.855281
Skewness	0.040689	6.466239	-0.677262	1.480901	0.483719	0.581409	-0.204736	1.545569	0.671721	0.529109	0.524779	0.169626
Range	2	13	4	4	3	4	4	4	4	4	4	4
Minimum	1	1	1	1	1	1	1	1	1	1	1	1
Maximum	3	14	5	5	4	5	5	5	5	5	5	5
Sum	111	146	255	134	148	186	209	147	186	202	206	211
Count	71	71	71	71	71	71	71	71	71	71	71	71
Confidence Level(95.0%)	0.124815	0.370784	0.270105	0.185726	0.177788	0.209297	0.222355	0.227467	0.247817	0.25508	0.243874	0.274205

		<i>pd1</i>	<i>pd2</i>	<i>pd3</i>	<i>pd4</i>	<i>pd5</i>	<i>pd6</i>	<i>pd7</i>	<i>pd8</i>
<i>pm1</i>	1.56338								
<i>pm2</i>	2.056338								
<i>pm3</i>	3.591549	2.633803	2.84507	3.140845	3.732394	2.788732	3.112676	1.971831	2.225352
<i>pm4</i>	1.887324	0.112121	0.093335	0.100893	0.115164	0.121882	0.105291	0.07225	0.080734
<i>pm5</i>	2.084507	3	3	3	4	3	3	2	2
<i>pm6</i>	2.619718	2	3	3	4	2	3	2	2
<i>pm7</i>	2.943662	0.944751	0.786455	0.850139	0.970386	1.027	0.887199	0.608789	0.680277
<i>pm8</i>	2.070423	0.892555	0.618511	0.722736	0.94165	1.054728	0.787123	0.370624	0.462777
<i>pm9</i>	2.619718	-0.22464	-0.344357	-0.083825	-0.748369	-0.891066	-0.173425	-0.198456	0.6296
<i>pm10</i>	2.84507	0.385699	0.283685	0.153712	-0.397693	0.114859	0.279405	0.01264	0.527029
<i>pm11</i>	2.901408	4	4	4	3	4	4	2	3
<i>pm12</i>	2.971831	1	1	1	2	1	1	1	1
<i>pd1</i>	2.633803	5	5	5	5	5	5	3	4
<i>pd2</i>	2.84507	187	202	223	265	198	221	140	158
<i>pd3</i>	3.140845	71	71	71	71	71	71	71	71
<i>pd4</i>	3.732394	0.223619	0.186151	0.201224	0.229687	0.243087	0.209996	0.144098	0.161019
<i>pd5</i>	2.788732								
<i>pd6</i>	3.112676								
<i>pd7</i>	1.971831								
<i>pd8</i>	2.225352								

Data - E roles

Department	Gender	Job	Age																						
		grade		pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8		
Engineering	male	e	52	1	2	4	2	2	3	3	2	2	3	3	2	2	2	3	2	3	3	2	3		
Engineering	male	e	36	1	2	3	2	4	3	1	2	4	5	4	4	3	4	4	4	3	3	2	2		
Engineering	male	e	45	1	1	4	1	2	2	4	2	3	2	3	2	2	2	3	5	4	3	2	3		
Engineering	male	e	46	1	2	3	2	2	3	4	2	2	3	3	2	2	3	3	4	4	2	2	2		
Engineering	male	e	56	1	1	1	1	1	1	3	2	2	2	2	1	3	3	3	4	2	3	2	2		
Engineering	male	e	45	1	1	5	1	1	1	3	1	5	5	5	5	3	3	3	5	4	3	2	2		
Engineering	male	e	32	2	2	4	2	2	2	2	2	3	2	2	2	2	2	3	2	2	2	2	2		
Engineering	male	e	53	1	2	1	2	2	3	3	1	3	3	3	3	2	3	3	4	4	3	3	3		
Engineering	male	e	48	1	1	5	1	1	3	2	2	1	4	2	3	2	2	3	2	2	2	1	3		
Engineering	male	e	58	2	2	4	2	2	2	4	2	2	2	2	2	2	2	3	2	3	3	2	3		
Engineering	male	e		1	1	1	1	2	4	5	1	1	3	5	4	3	4	4	4	5	3	3	4		
Engineering	male	e	54	2	2	3	3	1	5	3	2	3	4	5	4	3	2	3	4	4	3	3	3		
Engineering	male	e	40	1	1	2	1	2	3	2	1	2	2	3	3	2	2	2	3	3	3	2	3		
Engineering	male	e	53	2	2	4	2	3	3	2	2	2	3	2	2	2	2	4	4	3	3	2	2		
Engineering	male	e	59	2	2	5	4	2	2	4	4	4	3	2	1	2	3	2	4	3	3	2	2		
Engineering	male	e	59	2	2	4	2	2	3	3	2	2	4	3	5	2	3	3	5	4	3	2	2		
Engineering	male	e	48	2	2	4	2	2	3	4	1	4	2	4	2	1	2	4	3	3	4	2	4		
Iron Making	male	e	42	1	2	3	1	3	3	2	2	2	3	3	3	4	3	3	3	3	3	3	3		
Iron Making	male	e	37	1	1	2	1	1	2	2	1	2	2	2	2	3	3	3	4	3	4	2	2		
Iron Making	male	e		2	3	3	2	2	5	3	2	2	4	4	4	4	3	5	5	2	4	3	2		
Iron Making	male	e	28	1	2	5	2	2	2	4	2	5	1	2	2	1	4	3	5	1	2	1	1		
Iron Making	male	e	59	2	2	3	2	2	2	1	2	2	3	3	3	3	3	3	3	3	4	3	3		
Iron Making	male	e	52	2	2	5	2	3	3	5	4	2	2	2	3	2	2	2	4	4	3	2	2		
Iron Making	male	e	58	2	2	2	2	2	4	3	2	2	2	4	4	4	4	4	3	4	4	2	3		
Iron Making	male	e	27	1	1	1	1	3	3	3	1	3	3	2	3	2	3	3	2	2	2	2	2		
Iron Making	male	e	40	2	2	4	2	2	4	4	2	2	4	3	4	2	2	2	4	2	4	2	2		
Iron Making	male	e	38	2	2	3	2	2	2	3	2	3	3	3	3	2	3	3	4	4	4	3	2		
Iron Making	male	e	46	2	2	3	3	1	3	3	3	3	3	3	4	4	3	2	3	4	3	3	2		
Iron Making	male	e	31	2	2	5	2	2	2	3	3	3	2	2	2	1	2	3	3	1	2	1	1		
Iron Making	male	e	40	2	3	4	2	2	2	3	2	4	4	4	4	2	3	3	4	2	3	2	2		
Rolling	female	e	36	2	2	4	2	3	2	4	2	2	2	3	2	3	3	4	3	4	2	2	3		
Rolling	male	e	41	3	2	3	2	3	4	2	5	5	5	5	5	3	2	4	4	3	4	3	2		
Rolling	male	e	46	1	1	4	1	1	1	4	1	1	1	1	1	3	3	2	4	3	2	2	2		

Data - E roles

		Job																						
Department	Gender	grade	Age	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8	
Rolling	male	e	37	2	2	2	1	2	3	2	2	2	2	2	2	3	3	3	5	2	3	2	2	
Rolling	male	e	58	1	1	5	1	1	2	3	2	2	2	2	2	2	3	4	2	2	2	2	2	
Rolling	male	e	45	1	3	4	3	2	4	1	5	3	5	5	5	5	5	5	3	5	2	2	2	
Rolling	male	e	51	2	2	2	2	2	2	3	2	2	3	3	2	2	3	3	3	3	3	2	2	
Rolling	male	e	46	2	2	4	2	3	3	4	2	2	2	2	3	3	3	4	4	4	3	2	2	
Rolling	male	e	60	2	2	4	2	2	2	2	5	2	5	3	2	4	4	3	2	3	3	2	3	
Rolling	male	e	43	1	2	4	2	3	2	3	1	3	3	3	3	3	3	3	4	4	3	1	1	
Rolling	male	e	43	1	2	4	2	2	2	2	4	3	4	4	4	2	2	3	4	4	3	2	2	
Staff	female	e	30	2	2	4	2	2	2	3	2	4	2	1	3	2	2	2	3	2	2	2	2	
Staff	female	e	28	1	1	4	2	3	3	3	2	4	2	3	1	2	2	2	3	1	3	1	2	
Staff	female	e	43	1	2	2	1	2	3	3	1	2	3	2	3	2	3	2	4	5	5	3	2	
Staff	female	e	47	1	1	5	1	1	4	3	1	5	2	3	5	3	2	2	3	4	3	3	3	
Staff	male	e	59	1	1	4	1	1	3	2	2	2	1	2	4	2	2	5	4	2	5	1	2	
Staff	male	e	41	1	1	5	1	1	1	4	1	4	1	1	1	1	1	1	5	2	1	1	1	
Staff	male	e	36	2	2	3	2	2	3	3	2	2	3	3	2	3	3	3	4	4	4	3	3	
Staff	male	e	45	2	3	2	2	3	3	2	2	2	2	5	3	5	4	2	4	4	3	2	3	
Staff	male	e		2	3	2	2	2	2	4	2	2	2	2	2	2	2	4	4	2	3	2	2	
Staff	male	e	51	2	3	4	2	2	2	1	2	2	5	5	4	4	4	3	5	1	5	1	2	
Staff	male	e	39	1	2	5	1	2	4	3	2	1	2	3	3	3	2	3	5	1	2	1	1	
Staff	male	e	53	2	2	4	2	4	4	4	1	1	4	4	4	3	3	4	4	2	4	2	2	
Staff	male	e	53	2	2	4	2	2	2	4	2	2	3	3	3	3	3	4	3	3	3	2	3	
Staff	male	e	39	2	2	5	2	3	2	3	2	3	2	3	3	2	3	3	4	3	2	2	3	
Staff	male	e	53	2	2	4	2	4	4	2	2	4	3	3	3	4	4	4	4	4	3	2	2	
Staff	male	e	49	1	1	5	1	1	2	3	1	3	2	2	2	1	2	3	4	2	2	1	2	
Staff	male	e	51	1	1	4	5	3	3	1	2	4	2	4	5	3	4	4	5	2	3	2	4	
Staff	male	e	51	2	3	4	2	2	2	4	2	2	2	2	2	3	3	3	2	3	2	2	2	
Staff	male	e	54	2	3	2	4	3	3	2	2	3	3	4	5	4	4	5	3	2	4	2	2	
Staff	male	e	39	1	3	5	2	2	3	4	2	2	2	4	2	1	4	2	4	2	4	1	2	
Steel Making	male	e	38	2	2	4	2	2	2	4	2	4	2	3	4	3	3	3	5	2	3	2	2	
Steel Making	male	e	34	1	1	5	1	1	2	3	1	1	4	2	1	2	2	2	4	2	3	1	1	
Steel Making	male	e	38	2	2	4	2	2	2	3	2	2	3	3	3	3	3	4	5	2	4	2	2	
Steel Making	male	e		2	2	3	2	2	2	3	2	2	3	3	4	4	3	4	5	4	4	2	2	
Steel Making	male	e	36	1	1	4	2	2	2	3	1	2	4	2	4	3	2	3	5	2	4	1	2	
Steel Making	male	e	38	1	2	5	2	1	2	3	2	2	2	2	2	2	3	3	2	1	2	2	2	
Steel Making	male	e	30	2	3	2	4	2	3	2	4	4	4	3	4	4	4	4	5	2	3	2	1	
Steel Making	male	e	44	2	5	4	2	3	2	4	4	2	3	2	3	2	3	3	4	2	2	2	2	
Steel Making	male	e	53	2	2	4	2	2	2	2	2	4	2	2	2	2	2	2	2	2	4	1	2	
Steel Making	male	e	42	1	2	3	1	2	2	3	2	2	5	2	5	4	4	4	3	2	5	2	2	

ANNEXURE I

F ROLES

Index	Page
Frequency distribution	118
Descriptive statistics	119
Data	120-122

Frequency distribution - F roles

pm1			pm2		pm3		pm4		pm5		pm6		pm7		pm8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	46	51.11%	37	41.11%	9	10.00%	31	34.44%	14	15.56%	5	5.56%	4	4.44%	19	21.11%
2	37	41.11%	47	52.22%	10	11.11%	53	58.89%	52	57.78%	48	53.33%	19	21.11%	54	59.44%
3	5	5.56%	3	3.33%	16	17.78%	4	4.44%	19	21.11%	24	26.67%	45	50.00%	8	8.89%
4	0	0.00%	1	1.11%	32	35.56%	2	2.22%	2	2.22%	9	10.00%	18	20.00%	4	4.44%
5	2	2.22%	2	2.22%	23	25.56%	0	0.00%	3	3.33%	4	4.44%	4	4.44%	5	5.56%
	90	100.00%	90	100.00%	90	100.00%	90	100.00%	90	100.00%	90	100.00%	90	100.00%	90	100.00%
		92.22%		93.33%		21.11%		93.33%		73.33%		58.89%		25.56%		24.44%
						61.11%										
pd1			pd2		pd3		pd4		pd5		pd6		pd7		pd8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	9	10.00%	3	3.33%	2	2.22%	1	1.11%	11	12.22%	1	1.11%	22	24.44%	17	18.89%
2	49	54.44%	43	47.78%	32	35.56%	24	26.67%	29	32.22%	21	23.33%	59	65.56%	55	60.56%
3	19	21.11%	29	32.22%	41	45.56%	26	28.89%	23	25.56%	45	50.00%	7	7.78%	14	15.56%
4	11	12.22%	10	11.11%	11	12.22%	28	31.11%	21	23.33%	13	14.44%	2	2.22%	4	4.44%
5	2	2.22%	5	5.56%	4	4.44%	11	12.22%	6	6.67%	10	11.11%	0	0.00%	0	0.00%
	90	100.00%	90	100.00%	90	100.00%	90	100.00%	90	100.00%	90	100.00%	90	100.00%	90	100.00%
		64.44%		51.11%		37.78%		27.78%		44.44%		24.44%		90.00%		
pm9		pm10		pm11		pm12										
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage									
11	12.22%	6	6.67%	5	5.56%	6	6.67%									
43	47.78%	39	43.33%	39	43.33%	23	25.56%									
19	21.11%	17	18.89%	31	34.44%	28	31.11%									
11	12.22%	15	16.67%	9	10.00%	20	22.22%									
6	6.67%	13	14.44%	6	6.67%	13	14.44%									
90	100.00%	90	100.00%	90	100.00%	90	100.00%									
	60.00%		50.00%		48.89%		32.22%									

Descriptive statistics - F roles

	<i>pm1</i>	<i>pm2</i>	<i>pm3</i>	<i>pm4</i>	<i>pm5</i>	<i>pm6</i>	<i>pm7</i>	<i>pm8</i>	<i>pm9</i>	<i>pm10</i>	<i>pm11</i>	<i>pm12</i>
Mean	1.611111	1.711111	3.555556	1.744444	2.2	2.544444	2.988889	2.146067	2.533333	2.888889	2.688889	3.122222
Standard Error	0.083156	0.082478	0.13325	0.068077	0.089666	0.096326	0.092805	0.104239	0.113066	0.12685	0.101971	0.121196
Median	1	2	4	2	2	2	3	2	2	2.5	3	3
Mode	1	2	4	2	2	2	3	2	2	2	2	3
Standard Deviation	0.78889	0.782454	1.264121	0.645836	0.850644	0.913828	0.880429	0.983391	1.072642	1.203408	0.967383	1.149771
Sample Variance	0.622347	0.612235	1.598002	0.417104	0.723596	0.835081	0.775156	0.967058	1.150562	1.44819	0.93583	1.321973
Kurtosis	5.885175	5.859511	-0.537076	1.832761	2.458175	0.679948	0.196929	2.284175	-0.033009	-0.91563	0.293271	-0.822524
Skewness	1.940647	1.856512	-0.673921	0.808907	1.16944	0.949917	0.021885	1.459912	0.749612	0.4951	0.741877	0.073299
Range	4	4	4	3	4	4	4	4	4	4	4	4
Minimum	1	1	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	4	5	5	5	5	5	5	5	5
Sum	145	154	320	157	198	229	269	191	228	260	242	281
Count	90	90	90	90	90	90	90	89	90	90	90	90
Confidence Level(95.0%)	0.16523	0.163882	0.264765	0.135268	0.178164	0.191397	0.184402	0.207154	0.22466	0.252049	0.202614	0.240815

		<i>pd1</i>	<i>pd2</i>	<i>pd3</i>	<i>pd4</i>	<i>pd5</i>	<i>pd6</i>	<i>pd7</i>	<i>pd8</i>
<i>pm1</i>	1.611111								
<i>pm2</i>	1.711111								
<i>pm3</i>	3.555556	2.422222	2.677778	2.811111	3.266667	2.808989	3.111111	1.877778	2.055556
<i>pm4</i>	1.744444	0.096088	0.097186	0.089239	0.108099	0.120516	0.097975	0.066719	0.076374
<i>pm5</i>	2.2	2	2	3	3	3	3	2	2
<i>pm6</i>	2.544444	2	2	3	4	2	3	2	2
<i>pm7</i>	2.988889	0.911571	0.921988	0.846599	1.025517	1.136946	0.929473	0.632949	0.724547
<i>pm8</i>	2.146067	0.830961	0.850062	0.716729	1.051685	1.292646	0.86392	0.400624	0.524969
<i>pm9</i>	2.533333	0.32495	0.374779	0.38767	-0.977102	-0.845507	-0.08761	1.744838	0.796262
<i>pm10</i>	2.888889	0.782016	0.86718	0.601354	0.078987	0.148741	0.547338	0.645229	0.640405
<i>pm11</i>	2.688889	4	4	4	4	4	4	3	3
<i>pm12</i>	3.122222	1	1	1	1	1	1	1	1
<i>pd1</i>	2.422222	5	5	5	5	5	5	4	4
<i>pd2</i>	2.677778	218	241	253	294	250	280	169	185
<i>pd3</i>	2.811111	90	90	90	90	89	90	90	90
<i>pd4</i>	3.266667	0.190925	0.193107	0.177317	0.21479	0.2395	0.194674	0.132568	0.151753
<i>pd5</i>	2.808989								
<i>pd6</i>	3.111111								
<i>pd7</i>	1.877778								
<i>pd8</i>	2.055556								

Data - F roles

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Engineering	male	f		1	1	2	2	3	3	3	3	3	4	3	4	2	3	3	2	2	2	2	2
Engineering	male	f	53	1	1	5	1	1	2	5	1	1	3	2	1	1	1	2	1	2	3	1	3
Engineering	male	f	37	1	1	5	1	1	1	4	2	1	1	1	1	1	1	1	4	3	3	1	1
Engineering	male	f	30	2	2	3	3	2	2	3	3	3	3	2	3	2	2	2	2	4	3	2	2
Engineering	male	f	41	1	1	5	1	1	3	3	1	5	1	3	3	2	2	3	2	4	3	1	3
Engineering	male	f	30	1	1	2	3	2	2	3	2	2	5	5	5	5	2	3	2	3	3	1	3
Engineering	male	f	49	2	2	4	1	1	2	1	2	3	3	2	3	2	2	2	2	2	2	2	2
Engineering	male	f	35	3	2	4	2	2	3	4	2	4	5	3	4	3	2	3	4	2	3	2	2
Engineering	male	f	26	2	2	3	2	3	2	3	2	2	2	3	3	2	2	2	3	2	2	2	2
Engineering	male	f	30	1	2	4	2	3	2	3	2	2	2	1	2	2	2	2	3	1	2	1	2
Engineering	male	f		1	1	1	1	1	5	4	1	5	5	5	5	1	4	3	4	3	3	2	2
Engineering	male	f		2	2	1	2	5	2	1	2	2	5	5	5	2	4	4	5	3	3	3	3
Engineering	male	f	55	1	1	4	1	2	3	4	4	2	2	3	3	2	3	4	3	5	2	2	3
Engineering	male	f	48	2	2	5	2	2	2	4	2	2	2	2	2	2	2	2	3	2	2	2	2
Engineering	male	f	59	1	1	4	1	2	5	4	2	2	5	4	5	4	3	3	2	4	3	2	3
Engineering	male	f	29	2	2	4	2	3	3	3	2	2	2	3	2	2	2	3	2	2	3	2	2
Iron Making	male	f	27	1	1	2	1	2	3	2	1	2	2	2	3	2	2	4	4	2	4	2	1
Iron Making	male	f	36	2	2	2	2	2	3	3	3	3	2	2	3	2	3	3	3	2	3	2	2
Iron Making	male	f	31	3	3	4	2	3	4	2	3	2	3	3	3	4	4	3	3	1	4	2	2
Iron Making	male	f	52	2	2	1	2	2	2	2	2	3	3	3	4	3	3	3	3	4	4	4	3
Iron Making	male	f	55	1	1	5	2	2	2	3	2	5	2	1	2	2	2	2	3	4	2	2	2
Iron Making	male	f	29	2	2	3	2	3	3	2	2	3	3	3	3	3	3	3	3	2	4	1	1
Iron Making	male	f	38	2	2	3	2	3	2	3	2	2	3	3	3	3	3	3	3	2	3	2	2
Iron Making	male	f	51	1	1	2	2	2	2	2	2	4	5	4	4	5	5	5	5	1	5	1	2
Iron Making	male	f	25	2	1	4	1	2	2	3	3	3	5	2	5	3	3	3	3	4	3	2	2
Rolling	female	f	33	1	1	5	1	2	2	4	1	3	4	3	2	3	2	2	4	2	3	2	2
Rolling	male	f	40	1	1	5	1	1	1	5	1	2	2	2	2	2	2	2	4	1	2	1	1

Data - F roles

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Rolling	male	f	52	1	1	5	1	2	2	3	1	3	2	3	2	2	2	2	2	2	2	2	2
Rolling	male	f	59	2	2	4	2	2	4	1	2	2	4	4	4	3	2	3	4	3	3	2	2
Rolling	male	f	51	2	2	2	2	3	2	3	5	1	5	5	5	4	4	4	4	3	4	2	2
Rolling	male	f	26	5	4	5	4	2	2	3	2	2	2	2	1	1	2	3	3	2	3	1	1
Rolling	male	f	52	1	2	4	2	2	2	4	2	5	5	2	5	2	2	3	2	2	4	2	2
Rolling	male	f	47	1	1	4	1	1	1	3	1	1	3	2	3	2	2	3	2	3	2	1	2
Rolling	male	f	25	2	2	4	2	2	3	4	2	3	2	3	2	2	3	3	3	1	3	2	2
Rolling	male	f	37	1	2	4	2	2	2	4	3	2	2	2	3	2	3	3	3	3	3	2	2
Rolling	male	f	47	1	1	5	2	2	3	4	2	2	2	3	3	4	4	4	4	3	5	2	2
Rolling	male	f	40	1	1	4	1	2	1	2	2	4	4	2	4	4	4	4	4	4	3	3	4
Rolling	male	f	27	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	4	4	2	2	4
Rolling	male	f	47	1	1	4	1	1	1	4	2	4	2	2	2	2	2	3	2	2	2	2	2
Rolling	male	f	25	1	2	3	2	2	2	3	2	2	2	2	3	2	3	2	2	2	2	1	2
Rolling	male	f	41	2	2	4	2	2	3	4	2	2	4	4	4	4	4	3	4	2	3	2	2
Rolling	male	f	54	2	2	3	2	2	2	2	2	2	4	4	5	3	3	2	4	2	3	2	1
Rolling	male	f	38	1	1	4	1	2	2	5	2	2	2	2	2	3	2	2	2	4	4	2	4
Rolling	male	f	53	1	1	5	1	3	3	3	1	1	4	3	5	3	3	3	4	3	3	1	2
Rolling	male	f	28	3	2	2	2	4	4	2	5	2	4	3	4	4	4	2	2	4	3	2	2
Rolling	male	f	29	2	2	3	2	2	2	3	2	2	2	2	3	2	2	2	3	4	2	2	2
Staff	female	f	43	1	2	3	4	1	3	1	5	3	4	3	4	1	5	4	4	1	3	1	1
Staff	female	f	47	1	2	2	2	2	2	2	2	2	2	3	3	2	3	3	5	2	3	3	3
Staff	female	f	33	2	3	3	2	3	2	2	5	1	5	3	5	3	5	5	5	3	5	2	2
Staff	female	f	29	2	2	5	2	2	2	3	2	4	2	2	2	1	2	2	2	2	3	2	2
Staff	female	f	31	2	2	1	2	3	4	3	2	1	2	3	4	2	2	3	3	1	3	1	1
Staff	female	f	44	1	1	5	1	1	3	3	2	2	2	5	4	4	3	3	4	5	5	3	3
Staff	female	f	48	2	2	4	2	2	2	2	4	3	3	2	4	3	3	3	3	3	3	3	3
Staff	female	f	47	2	2	4	2	3	2	2	2	4	4	4	4	2	3	3	2	3	3	2	2
Staff	female	f	26	2	2	3	2	3	2	3	3	4	3	2	3	2	2	2	3	3	3	2	2
Staff	female	f	33	1	1	3	1	1	2	4	1	4	2	2	2	2	2	2	5	3	5	1	3

Data - F roles

Department	Gender	Job	Age	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
		grade																					
Staff	female	f	27	2	2	4	2	3	4	3	2	5	3	4	4	2	2	3	5	1	3	2	1
Staff	female	f	27	2	2	4	2	3	4	3	2	5	3	4	4	2	2	3	5	1	3	2	1
Staff	female	f	31	2	2	4	2	3	3	3	4	2	5	5	5	3	3	3	4	5	5	1	1
Staff	female	f	33	1	1	5	1	2	2	4	1	3	4	3	2	3	2	2	4	2	3	2	2
Staff	female	f	39	1	1	5	1	1	3	2	1	1	1	2	1	2	2	2	4	4	4	4	1
Staff	female	f	39	1	1	5	1	2	2	4	2	3	2	2	2	2	2	2	3	3	3	2	2
Staff	female	f	44	1	1	4	1	2	3	2	1	2	4	2	3	2	2	3	5	4	3	2	2
Staff	male	f	54	1	2	4	2	2	2	3	2	2	2	2	2	2	2	2	3	5	4	2	2
Staff	male	f	50	1	5	1	2	3	3	2	4	3	3	3	4	2	3	3	2	3	4	2	2
Staff	male	f	42	1	1	4	1	1	2	3	1	1	1	1	2	2	3	3	4	2	3	2	2
Staff	male	f	41	2	2	3	2	2	2	3	2	2	2	2	3	2	2	2	2	3	2	2	2
Staff	male	f	25	2	1	5	2	2	2	3	2	4	2	2	3	2	2	2	3	2	2	2	1
Staff	male	f	31	3	1	3	1	1	2	3	1	1	1	1	1	1	1	1	3	1	1	1	1
Staff	male	f	45	1	2	1	1	2	3	3	2	2	2	2	3	3	3	3	4	5	5	3	3
Staff	male	f	42	1	2	1	2	2	3	3	2	3	2	3	3	4	3	4	5	4	4	3	4
Staff	male	f	34	3	5	1	3	5	5	3	5	1	5	3	5	1	5	5	5	2	5	1	1
Staff	male	f	45	1	2	4	2	2	2	4	2	2	2	2	2	2	2	4	2	4	4	2	2
Staff	male	f		1	2	5	1	3	3	3	2	2	1	2	2	2	2	2	2	4	3	2	2
Staff	male	f	46	1	1	2	1	2	2	3	1	2	4	2	3	2	3	3	4	3	2	2	3
Staff	male	f	25	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2
Staff	male	f	40	1	1	3	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	2	3
Staff	male	f	50	2	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	4	3	2	2
Staff	male	f	39	1	1	5	1	2	3	3	2	3	2	2	3	2	3	3	2	3	2	2	2
Staff	male	f	35	2	2	4	2	2	2	3	2	2	4	2	4	3	4	4	4	4	3	2	2
Staff	male	f	49	2	2	4	2	2	3	3	2	4	4	3	4	3	3	3	2	4	3	2	2
Staff	male	f	55	2	2	4	2	2	4	3	2	2	2	2	5	4	4	4	4	2	4	1	2
Staff	male	f	41	1	1	5	2	2	2	5	2	2	2	3	2	2	2	2	4	2	2	2	2
Staff	male	f		5	3	3	2	3	3	3	3	3	2	3	3	2	3	2	3	4	3	1	1
Steel Making	female	f	26	1	2	5	3	2	4	3	2	3	3	4	4	2	3	3	4	3	5	1	2
Steel Making	male	f	57	2	2	4	2	4	4	2	2	2	3	3	3	3	2	3	4	3	3	2	2
Steel Making	male	f	33	1	1	1	2	5	5	4	2	2	2	3	2	4	5	5	5	1	5	1	1
Steel Making	male	f	56	1	1	5	1	2	2	3	1	4	2	2	3	2	2	2	2	2	3	2	2
Steel Making	male	f	41	2	1	5	2	2	2	3	1	2	5	2	1	1	2	2	3	5	2	2	2
Steel Making	male	f	31	2	2	3	2	2	2	3	1	2	3	3	4	2	3	3	4	4	3	2	2

ANNEXURE J

G ROLES

Index	Page
Frequency distribution	124
Descriptive statistics	125
Data	126-130

Frequency distribution - G roles

pm1			pm2		pm3		pm4		pm5		pm6		pm7		pm8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	65	33.85%	46	23.96%	16	8.33%	46	23.96%	25	13.02%	17	8.85%	2	3.70%	33	17.19%
2	100	52.08%	119	61.98%	45	23.44%	106	55.21%	103	53.65%	76	39.58%	16	29.63%	118	60.41%
3	17	8.85%	15	7.81%	34	17.71%	22	11.46%	51	26.56%	62	32.29%	29	53.70%	16	29.63%
4	5	2.60%	5	2.60%	74	38.54%	12	6.25%	9	4.69%	28	14.58%	7	12.96%	17	8.85%
5	5	2.60%	7	3.65%	23	11.98%	6	3.13%	4	2.08%	9	4.69%	0	0.00%	8	4.35%
	192	100.00%	192	100.00%	192	100.00%	192	100.00%	192	100.00%	192	100.00%	54	100.00%	192	100.00%
		85.94%		85.94%		31.77%		79.17%		66.67%		48.44%		33.33%		12.96%
						50.52%										
pd1			pd2		pd3		pd4		pd5		pd6		pd7		pd8	
bins	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	20	10.42%	12	6.25%	12	6.25%	4	2.08%	10	5.21%	9	4.69%	36	18.75%	30	15.63%
2	101	52.60%	97	50.52%	69	35.94%	67	34.90%	36	18.75%	53	27.60%	124	64.58%	100	52.08%
3	41	21.35%	42	21.88%	68	35.42%	54	28.13%	53	27.60%	70	36.46%	19	9.90%	53	27.60%
4	21	10.94%	29	15.10%	29	15.10%	42	21.88%	73	38.02%	39	20.31%	9	4.69%	5	2.60%
5	9	4.69%	12	6.25%	14	7.29%	25	13.02%	20	10.42%	21	10.94%	4	2.08%	4	2.08%
	192	100.00%	192	100.00%	192	100.00%	192	100.00%	192	100.00%	192	100.00%	192	100.00%	192	100.00%
		63.02%		56.77%		42.19%		36.98%		23.96%		32.29%		83.33%		
pm9		pm10		pm11		pm12										
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage									
23	11.98%	14	7.29%	13	6.77%	16	8.33%									
92	47.92%	70	36.46%	94	48.96%	73	38.02%									
51	26.56%	37	19.27%	43	22.40%	40	20.83%									
19	9.90%	42	21.88%	27	14.06%	36	18.75%									
7	3.65%	29	15.10%	15	7.81%	27	14.06%									
192	100.00%	192	100.00%	192	100.00%	192	100.00%									
	59.90%		43.75%		55.73%		46.35%									

Descriptive statistics - G roles

	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12
Mean	1.880208	2	3.223958	2.09375	2.291667	2.666667	2.853403	2.213542	2.453125	3.010417	2.671875	2.921875
Standard Error	0.062717	0.062663	0.085066	0.067747	0.05992	0.071345	0.060742	0.070107	0.068799	0.087999	0.076092	0.087353
Median	2	2	4	2	2	3	3	2	2	3	2	3
Mode	2	2	4	2	2	2	3	2	2	2	2	2
Standard Deviation	0.869027	0.86829	1.178716	0.938732	0.830274	0.988591	0.839471	0.971437	0.953303	1.219345	1.054356	1.2104
Sample Variance	0.755208	0.753927	1.389371	0.881217	0.689354	0.977312	0.704712	0.94369	0.908786	1.486802	1.111666	1.465069
Kurtosis	3.018575	3.681828	-0.953731	1.594034	1.216151	-0.206914	0.265866	1.401399	0.316706	-1.101409	-0.223938	-0.975641
Skewness	1.444357	1.600242	-0.30837	1.192828	0.795224	0.447816	-0.14846	1.256177	0.703389	0.242588	0.743863	0.348105
Range	4	4	4	4	4	4	4	4	4	4	4	4
Minimum	1	1	1	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5	5	5	5
Sum	361	384	619	402	440	512	545	425	471	578	513	561
Count	192	192	192	192	192	192	191	192	192	192	192	192
Confidence Level(95.0%)	0.123706	0.123601	0.16779	0.133629	0.11819	0.140726	0.119815	0.138284	0.135703	0.173574	0.150088	0.172301

	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12
pm1	1.880208											
pm2	2											
pm3	3.223958											
pm4	2.09375											
pm5	2.291667											
pm6	2.666667											
pm7	2.853403											
pm8	2.213542											
pm9	2.453125											
pm10	3.010417											
pm11	2.671875											
pm12	2.921875											
pd1	2.46875											
pd2	2.645833											
pd3	2.8125											
pd4	3.088542											
pd5	3.296875											
pd6	3.052083											
pd7	2.067708											
pd8	2.234375											

Data - G roles

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Engineering	female	g	48	1	2	4	1	3	4	3	1	2	1	2	1	2	2	3	3	5	2	2	2
Engineering	male	g	53	2	2	4	2	2	3	2	2	2	2	4	3	4	4	4	5	3	4	2	2
Engineering	male	g	43	2	2	4	2	3	2	3	2	3	3	4	4	2	3	3	3	4	2	2	3
Engineering	male	g	50	1	2	3	1	2	2	2	1	2	3	3	1	2	3	3	3	3	3	2	2
Engineering	male	g	34	1	2	4	2	3	3	3	4	2	2	3	2	2	2	3	3	2	3	2	3
Engineering	male	g	43	2	2	2	2	2	3	3	2	4	2	3	4	3	2	3	2	2	3	2	2
Engineering	male	g	40	1	1	5	1	1	2	3	1	3	1	2	1	1	3	1	3	3	2	1	1
Engineering	male	g	42	1	1	4	1	1	1	2	1	1	1	1	1	2	2	2	2	2	2	2	2
Engineering	male	g	41	2	2	4	2	3	3	3	2	2	3	2	2	2	3	3	4	3	3	3	3
Engineering	male	g	42	1	1	4	2	2	3	3	2	2	2	2	1	2	2	2	3	1	1	1	1
Engineering	male	g	36	1	1	5	2	2	1	3	1	1	2	1	1	2	2	1	3	2	3	1	1
Engineering	male	g	40	2	2	4	2	2	2	3	2	4	4	2	4	2	2	2	4	4	3	2	2
Engineering	male	g	41	1	1	1	1	2	2	1	4	3	5	3	4	2	2	3	4	2	4	2	1
Engineering	male	g	34	1	1	4	2	2	2	3	2	3	4	3	3	2	2	3	5	4	3	2	3
Engineering	male	g	40	1	1	1	1	3	3	1	5	3	5	2	5	2	2	3	4	2	4	1	2
Engineering	male	g	39	1	1	5	1	1	2	3	1	2	2	1	2	1	1	1	2	1	2	2	2
Engineering	male	g	54	2	2	4	2	2	4	2	2	3	4	2	2	2	2	2	2	4	2	2	2
Engineering	male	g	46	2	2	4	2	2	4	2	2	3	4	2	4	2	2	3	4	4	2	2	3
Engineering	male	g	48	1	2	2	4	2	2	2	2	1	3	2	2	1	1	2	3	3	2	1	1
Engineering	male	g	46	1	2	1	1	1	2	3	1	1	4	4	2	3	3	3	5	2	3	2	3
Engineering	male	g	56	1	2	2	2	2	3	3	2	2	4	4	2	3	2	2	3	4	4	3	3
Engineering	male	g	50	2	2	2	2	2	2	3	2	3	3	2	3	4	2	2	3	2	3	2	2
Engineering	male	g	40	3	4	4	4	2	2	2	3	3	2	2	4	2	2	3	3	3	2	4	2
Engineering	male	g	42	2	2	2	2	3	2	2	2	2	4	2	4	4	3	4	4	4	4	2	2
Engineering	male	g	41	2	2	3	2	3	4	4	2	2	4	4	4	3	4	3	4	4	3	2	2
Engineering	male	g	35	2	2	4	2	2	2	3	2	2	2	2	2	2	2	3	3	4	3	2	2
Engineering	male	g		1	1	3	2	3	3	3	2	3	5	5	5	5	5	5	2	5	5	2	2
Engineering	male	g	44	1	1	3	1	2	3	3	2	3	5	5	5	3	4	4	2	4	4	1	2
Engineering	male	g	46	2	2	2	2	3	3	3	2	3	3	2	5	2	2	3	5	3	5	3	3
Engineering	male	g	52	1	3	4	4	3	4	3	2	4	5	4	5	4	4	3	5	4	4	2	2
Engineering	male	g	44	2	2	4	2	3	3	2	2	3	5	5	5	4	5	4	5	5	5	1	1
Engineering	male	g	51	2	2	3	2	3	3	2	2	3	3	4	5	4	4	4	4	3	3	4	4
Engineering	male	g	52	2	2	4	2	2	4	2	2	3	2	2	4	2	3	4	3	3	3	3	3
Engineering	male	g	50	2	2	3	2	2	4	2	2	4	4	4	4	3	4	3	2	4	3	2	2
Engineering	male	g	39	1	1	2	1	3	3	2	2	1	3	5	2	5	4	3	3	5	5	1	3
Engineering	male	g	51	1	2	3	2	2	2	4	2	2	2	3	2	2	2	2	2	2	3	2	2
Engineering	male	g	52	1	3	3	1	2	2	3	2	2	3	3	4	2	3	3	3	3	3	2	2

Data - G roles

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Iron Making	female	g	44	2	2	3	2	1	4	3	2	2	2	3	4	2	2	3	4	5	2	2	2
Iron Making	female	g	38	2	1	3	1	1	1	3	2	3	4	5	4	3	3	4	5	1	3	1	1
Iron Making	female	g	54	2	2	4	2	2	2	3	2	2	2	2	2	3	3	3	2	4	3	3	3
Iron Making	male	g	29	1	2	4	1	2	2	3	2	3	2	2	2	2	2	3	2	1	3	2	2
Iron Making	male	g	29	2	1	3	5	2	2	2	2	1	3	2	2	2	3	3	5	3	5	2	2
Iron Making	male	g	53	2	2	3	2	4	4	3	2	2	3	2	3	2	2	2	2	3	3	2	2
Iron Making	male	g	30	2	2	4	3	2	3	3	2	3	2	2	2	2	2	1	2	4	4	2	1
Iron Making	male	g	53	1	1	5	1	1	1	3	1	1	1	1	1	1	1	1	1	5	1	1	1
Iron Making	male	g	38	1	1	2	1	4	2	2	1	2	2	2	2	2	2	3	4	1	2	1	1
Iron Making	male	g	54	2	2	2	2	3	2	4	2	2	4	3	2	3	4	4	3	4	3	2	3
Iron Making	male	g	44	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Iron Making	male	g	41	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3
Iron Making	male	g	61	1	1	5	1	2	1	4	1	5	2	2	2	2	2	2	5	4	2	2	2
Iron Making	male	g	36	1	1	5	1	1	1	4	1	1	2	1	1	1	1	1	2	1	2	1	1
Iron Making	male	g	49	5	5	5	4	3	4	3	4	3	5	5	5	5	5	5	5	4	5	2	3
Iron Making	male	g	25	3	5	1	4	3	3	3	5	3	4	3	3	3	3	3	2	2	4	2	2
Iron Making	male	g	44	1	1	4	1	3	4	2	1	1	5	3	3	2	2	4	2	3	5	2	2
Iron Making	male	g	23	3	2	2	3	3	3		2	2	3	3	3	3	3	3	2	3	3	1	1
Iron Making	male	g	39	5	5	5	4	3	4	3	4	3	5	5	5	5	5	5	5	4	5	2	3
Iron Making	male	g	47	2	2	4	2	2	4	4	2	5	5	2	5	2	4	4	4	4	2	2	2
Iron Making	male	g	41	1	2	2	2	2	3	3	2	3	4	2	4	2	3	3	3	3	3	2	2
Iron Making	male	g	39	1	2	2	2	1	3	3	2	3	4	2	4	2	4	3	2	2	4	1	1
Iron Making	male	g	42	1	3	2	2	1	3	3	1	4	4	3	4	3	4	4	2	3	4	2	2
Iron Making	male	g	47	2	2	2	2	2	4	3	2	2	5	4	4	4	4	4	3	4	4	2	3
Iron Making	male	g	34	2	2	4	2	2	3	3	2	2	2	3	4	4	4	3	2	2	2	1	2
Iron Making	male	g	39	2	3	2	2	4	2	2	3	2	5	4	3	3	3	2	2	5	5	2	2
Iron Making	male	g	60	2	1	4	1	1	1	2	2	2	5	2	2	2	2	2	2	2	2	2	2
Iron Making	male	g	38	1	1	4	2	2	2	4	2	2	3	2	2	1	2	2	2	4	2	2	2
Iron Making	male	g	43	1	1	4	2	2	3	2	2	3	3	2	2	1	2	2	2	3	2	2	2
Iron Making	male	g	46	4	2	2	2	2	4	3	3	4	3	4	4	2	2	4	2	2	4	2	3
Iron Making	male	g	49	2	2	4	2	3	2	4	2	3	2	2	4	2	2	4	4	4	2	2	2
Iron Making	male	g	45	2	2	3	2	3	5	3	5	2	4	3	5	3	4	4	3	3	3	2	3
Iron Making	male	g	38	2	2	4	4	2	3	3	4	4	2	2	2	2	2	3	4	4	3	2	2
Iron Making	male	g	28	2	3	2	2	2	2	3	2	2	2	2	2	2	2	2	2	1	2	2	2
Iron Making	male	g	54	2	2	1	1	3	3	2	2	4	5	3	5	2	2	3	5	3	3	4	2
Iron Making	male	g	23	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	3	2	1
Iron Making	male	g	46	2	2	4	2	3	2	3	2	2	2	2	2	3	3	3	3	4	4	3	2
Iron Making	male	g	53	2	2	3	2	4	4	2	2	2	4	3	1	1	2	2	4	4	4	1	1

Data - G roles

<u>Department</u>	<u>Gender</u>	<u>Job grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Iron Making	male	g	47	2	2	4	2	2	2	3	2	2	2	2	2	3	3	3	2	4	4	3	3
Iron Making	male	g	33	2	2	3	2	3	3	3	2	2	3	2	3	2	2	2	3	3	2	2	2
Iron Making	male	g	45	1	2	2	2	2	2	4	1	2	5	4	2	2	3	3	1	1	3	1	2
Iron Making	male	g	42	2	2	3	2	2	2	2	4	2	4	2	4	2	2	2	2	2	2	2	2
Iron Making	male	g	39	2	2	2	2	2	2	2	4	2	4	2	4	2	2	2	2	2	2	2	2
Iron Making	male	g	52	3	2	2	3	4	4	1	2	2	5	4	3	3	3	4	3	5	3	3	2
Iron Making	male	g	48	4	2	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Iron Making	male	g	41	1	1	4	2	1	1	3	1	1	1	2	3	2	2	2	3	4	1	2	2
Iron Making	male	g	47	2	1	4	1	2	2	4	2	2	2	2	2	2	2	3	4	4	3	3	3
Iron Making	male	g	31	2	2	4	2	3	3	3	2	2	3	4	4	4	4	4	2	2	4	2	2
Iron Making	male	g	42	1	1	1	1	2	2	3	2	2	2	2	2	2	2	2	4	4	3	2	2
Iron Making	male	g	36	2	1	2	2	3	3	2	2	2	2	2	3	3	4	2	4	4	4	1	1
Rolling	female	g	34	1	5	2	1	2	2	3	3	3	3	2	2	1	1	2	5	3	1	1	1
Rolling	female	g	41	1	2	2	2	2	2	2	2	3	4	2	2	2	2	2	4	4	2	4	3
Rolling	male	g	47	2	2	4	2	2	2	3	2	2	4	2	2	2	2	2	3	2	2	2	2
Rolling	male	g	55	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Rolling	male	g	37	2	2	2	3	2	2	2	4	2	2	4	2	3	3	2	4	4	4	2	3
Rolling	male	g	48	3	3	2	4	3	5	2	4	4	4	4	5	3	4	3	3	4	3	2	2
Rolling	male	g	56	2	2	2	2	2	2	3	2	3	3	2	3	3	3	2	5	4	3	2	2
Rolling	male	g	45	1	1	4	1	1	1	4	1	2	1	2	2	2	2	4	3	4	2	1	2
Rolling	male	g	50	1	1	3	1	1	1	3	1	3	2	2	2	2	2	3	2	3	2	1	2
Rolling	male	g	27	2	2	5	2	2	5	3	2	2	2	2	2	2	2	2	3	2	3	2	2
Rolling	male	g	23	3	2	3	3	2	3	3	2	2	3	2	2	2	2	3	3	3	3	2	2
Rolling	male	g	28	1	1	1	1	1	1	1	1	2	1	5	5	2	2	4	2	3	2	2	3
Rolling	male	g	44	2	2	3	2	2	2	3	2	2	3	3	2	2	2	3	2	3	3	2	3
Rolling	male	g	55	3	3	2	5	3	4	2	3	3	5	4	4	4	4	4	3	3	5	2	3
Rolling	male	g	35	3	2	4	4	3	3	2	2	2	4	2	4	2	2	2	3	4	4	2	2
Rolling	male	g	52	1	3	4	2	2	4	4	2	3	4	4	4	3	4	4	4	5	4	3	2
Rolling	male	g	52	1	1	5	2	3	3	3	2	2	2	1	2	2	2	2	2	4	2	2	2
Rolling	male	g	47	2	2	3	2	3	3	2	2	2	3	3	2	2	2	2	2	4	3	2	2
Rolling	male	g	52	2	2	4	2	2	2	3	2	2	2	2	2	2	3	3	3	3	3	2	2
Rolling	male	g	44	1	2	1	2	2	3	3	2	2	4	3	4	3	2	3	3	3	3	2	3
Rolling	male	g	54	3	2	2	3	2	3	3	2	2	2	2	2	2	3	2	4	4	3	2	2
Rolling	male	g		1	1	5	1	1	1	3	1	1	1	1	1	1	1	1	3	2	1	1	1
Rolling	male	g	56	2	2	4	2	2	2	4	2	2	2	2	2	2	2	2	2	3	2	2	2
Rolling	male	g	38	2	2	1	3	2	3	3	2	1	3	2	3	2	2	3	3	2	3	2	2
Rolling	male	g	45	2	2	4	2	3	2	3	3	3	2	2	3	2	2	2	2	3	2	2	2
Rolling	male	g	48	2	2	4	1	1	1	1	2	2	2	2	2	2	2	2	3	4	4	2	2
Rolling	male	g	54	1	1	1	1	1	1	4	2	2	2	1	2	1	1	2	2	4	2	2	2
Rolling	male	g	42	2	2	4	3	2	2	4	2	2	2	2	2	3	2	2	2	3	3	2	3
Rolling	male	g	34	1	1	2	2	2	2	3	2	5	4	3	3	2	3	2	4	1	1	2	2
Rolling	male	g	49	2	3	4	2	2	2	2	3	3	2	3	3	2	2	2	4	3	3	2	2
Rolling	male	g	42	2	2	4	2	2	3	4	2	2	2	2	2	2	2	2	5	5	4	3	2
Rolling	male	g	54	2	2	4	2	3	2	4	2	4	2	2	2	2	2	2	2	4	4	5	5

Data - G roles

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Rolling	male	g	44	3	2	4	2	3	2	2	2	2	2	2	3	2	3	2	2	4	4	2	2
Rolling	male	g	46	2	3	3	2	2	2	3	2	2	2	2	3	2	2	2	4	3	3	2	2
Rolling	male	g	41	2	2	4	2	2	3	3	2	2	3	2	2	2	2	2	3	4	2	2	3
Rolling	male	g	45	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Rolling	male	g	38	3	2	4	2	3	3	3	2	2	4	3	3	4	4	4	4	4	3	3	3
Rolling	male	g	40	2	2	4	2	2	3	3	2	2	2	3	3	2	2	2	4	4	3	3	3
Rolling	male	g	43	2	2	4	3	2	2	3	2	2	2	2	2	2	2	2	3	4	3	2	2
Rolling	male	g	52	2	2	3	2	2	3	2	2	3	3	3	3	3	3	3	3	4	3	2	2
Rolling	male	g	44	1	1	4	2	3	3	2	2	2	3	3	3	3	2	2	2	4	4	4	4
Rolling	male	g	40	1	2	4	1	2	2	3	1	1	2	2	2	1	2	2	3	4	2	2	2
Rolling	male	g	54	1	1	4	3	2	2	2	4	3	4	3	5	3	2	3	2	4	4	2	3
Rolling	male	g	52	2	2	4	2	2	3	2	2	2	2	2	2	3	3	2	2	3	2	2	3
Rolling	male	g	44	1	1	2	1	2	5	1	2	3	5	5	5	1	5	5	5	5	5	2	2
Rolling	male	g	42	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	4	3	2	1	1
Rolling	male	g	40	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	3	3	2	2
Rolling	male	g	52	1	2	4	2	2	2	3	2	4	2	2	2	2	2	2	2	4	3	2	2
Rolling	male	g	47	2	2	3	2	2	2	3	2	3	2	2	3	2	3	3	2	3	3	2	2
Rolling	male	g	38	2	2	1	3	3	3	3	2	2	3	2	3	1	1	1	2	2	1	1	1
Rolling	male	g	44	2	2	3	2	2	2	1	2	2	5	4	5	2	3	3	2	2	4	2	1
Rolling	male	g	47	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	3	2	2
Rolling	male	g	46	5	5	1	5	3	3	1	5	3	5	3	5	5	5	5	5	5	5	4	4
Rolling	male	g	57	2	2	4	2	3	3	4	2	2	2	2	2	2	2	3	2	4	2	2	3
Staff	female	g	40	2	2	2	3	2	3	1	3	1	3	2	5	3	4	5	2	3	3	2	3
Staff	female	g	40	2	2	2	3	2	3	1	3	1	5	3	5	3	5	5	1	3	3	1	3
Staff	female	g	39	2	2	2	2	2	2	4	2	4	2	2	2	2	2	3	2	3	2	2	2
Staff	female	g	49	2	4	2	4	3	4	3	4	4	4	4	4	3	3	3	4	2	4	2	2
Staff	female	g	29	2	2	3	2	2	3	4	2	3	2	2	3	1	2	2	3	2	3	2	2
Staff	female	g	43	1	1	5	1	1	2	4	1	1	1	1	1	1	1	2	3	1	1	1	1
Staff	female	g	40	2	2	3	2	3	4	3	3	3	3	3	3	3	3	3	3	3	3	2	3
Staff	female	g		2	2	2	2	2	2	3	4	3	2	2	3	2	2	3	3	4	4	3	3
Staff	female	g	39	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	3	2	2	2	2
Staff	female	g	31	1	1	5	1	1	1	4	1	4	1	1	1	2	2	1	4	4	3	1	1
Staff	female	g	46	1	2	5	2	2	3	3	2	3	4	3	5	2	2	2	3	5	2	3	3
Staff	male	g	44	2	3	1	3	5	4	1	3	1	5	5	5	3	3	5	2	3	5	1	3
Staff	male	g	43	2	2	2	2	3	4	3	2	2	4	3	3	4	3	3	4	3	3	3	3
Staff	male	g	47	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Staff	male	g	47	2	2	2	2	2	5	2	2	5	5	5	5	5	5	5	5	5	5	5	5
Staff	male	g	41	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	1	2
Staff	male	g	51	2	2	3	2	2	3	3	2	2	2	2	2	2	2	2	2	3	2	2	2

Data - G roles

<u>Department</u>	<u>Gender</u>	<u>Job</u> <u>grade</u>	<u>Age</u>	pm1	pm2	pm3	pm4	pm5	pm6	pm7	pm8	pm9	pm10	pm11	pm12	pd1	pd2	pd3	pd4	pd5	pd6	pd7	pd8
Staff	male	g	48	2	2	5	2	2	2	2	2	2	2	2	2	2	2	2	3	4	2	2	3
Staff	male	g	45	1	1	5	1	1	2	3	1	1	1	2	2	1	1	1	3	5	3	2	1
Staff	male	g	41	1	1	3	1	2	2	3	1	2	2	1	2	2	2	1	2	4	3	2	2
Staff	male	g	39	1	1	5	1	1	1	3	2	3	2	2	2	3	4	4	2	4	3	2	3
Staff	male	g	41	1	1	5	1	1	1	3	1	1	1	2	2	2	2	2	3	4	3	2	3
Staff	male	g	45	2	2	4	2	2	2	2	3	2	4	2	4	2	2	3	4	2	3	2	2
Staff	male	g	59	1	1	4	1	2	2	4	1	4	2	2	2	2	2	2	2	4	1	2	2
Staff	male	g	38	1	2	4	1	3	4	3	2	2	3	4	3	4	2	5	5	4	4	2	3
Staff	male	g	59	2	2	4	2	2	3	4	2	3	4	3	3	3	4	3	3	4	3	2	3
Staff	male	g	47	2	2	4	2	2	2	3	2	2	2	2	2	2	2	2	2	3	2	2	2
Steel Making	female	g	47	2	2	4	2	2	2	3	2	3	3	3	3	2	2	2	2	5	3	3	2
Steel Making	female	g	49	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3
Steel Making	female	g	39	2	3	2	4	2	3	4	3	2	3	4	3	3	3	4	4	4	4	2	2
Steel Making	male	g	52	2	2	1	3	4	3	3	4	2	4	2	2	3	3	3	4	4	4	2	3
Steel Making	male	g	27	1	1	4	1	2	2	4	1	4	1	1	1	2	2	3	2	4	2	2	2
Steel Making	male	g	51	2	2	3	2	2	2	4	2	2	5	3	3	2	2	3	5	2	3	1	1
Steel Making	male	g	48	2	2	4	1	1	2	3	2	2	2	2	2	2	2	3	2	2	2	2	2
Steel Making	male	g	52	1	2	5	2	2	3	5	1	2	2	2	2	2	2	2	2	2	2	2	2
Steel Making	male	g	51	2	2	4	2	2	2	2	2	2	2	4	2	2	2	3	2	4	2	1	2
Steel Making	male	g	58	2	2	3	2	2	3	2	2	3	4	3	3	2	3	3	3	3	2	2	2
Steel Making	male	g	32	2	2	5	1	2	2	3	1	2	2	2	2	2	2	3	4	2	4	1	2
Steel Making	male	g	40	1	2	4	2	2	4	2	1	2	2	2	3	2	2	2	4	2	4	1	1
Steel Making	male	g	50	2	2	3	2	2	3	3	2	2	3	3	3	2	2	2	3	3	2	2	2
Steel Making	male	g	54	2	2	4	2	2	2	3	2	2	2	2	2	2	3	2	2	4	3	2	3
Steel Making	male	g	28	3	4	1	4	3	5	3	5	2	5	5	5	4	5	5	5	2	5	2	2
Steel Making	male	g		2	3	4	2	3	3	3	2	2	2	2	4	3	4	4	4	3	3	2	3
Steel Making	male	g	37	1	1	4	1	2	2	3	1	1	2	2	1	1	2	2	1	3	2	2	1
Steel Making	male	g	50	2	2	3	2	2	3	3	3	3	4	3	4	4	3	3	4	3	2	2	3
Steel Making	male	g	23	3	2	4	2	2	2	3	4	3	2	2	4	4	3	3	4	2	4	2	2
Steel Making	male	g	54	1	1	1	1	3	3	3	1	1	4	3	3	1	1	3	3	4	2	1	1
Steel Making	male	g	41	3	2	2	3	3	3	4	2	3	4	3	2	4	4	3	5	5	5	2	3
Steel Making	male	g	42	3	2	2	3	3	3	3	2	3	4	3	2	3	3	3	3	4	5	2	3
Steel Making	male	g	48	2	2	2	1	2	2	3	2	1	5	2	1	2	2	2	2	2	2	1	1
Steel Making	male	g	32	4	4	4	3	3	3	3	2	2	3	4	4	4	4	4	4	4	5	1	1

END