# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declaration</td>
<td>i</td>
</tr>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>iii</td>
</tr>
<tr>
<td>Content</td>
<td>iv</td>
</tr>
<tr>
<td>List of Figures</td>
<td>viii</td>
</tr>
<tr>
<td>List of Tables</td>
<td>ix</td>
</tr>
</tbody>
</table>

## Introduction

1.1 Background to Study                        | 1    |
1.2 Background to Problem                     | 2    |
1.3 Hypothesis                                | 3    |
1.4 Research Objectives                       | 3    |
1.5 Significance                              | 3    |
1.6 Layout of the Study                       | 4    |

## Literature Survey

2.1 Introduction                              | 6    |
2.2 Quality                                   | 6    |
2.2.1 Definition of Quality                   | 6    |
2.2.2 Quality Measurement for Customer Needs | 9    |
2.2.3 Quality Measurement with QFD and Garvin’s Eight Dimensions | 11   |
2.3 Paper                                     | 13   |
2.3.1 Classification of Paper                 | 13   |
2.3.2 Customer Needs                          | 15   |
2.4 Manufacture of Fluting-paper              | 19   |
2.4.1 Technical Specifications of Fluting-Paper | 23  |
2.5 Process Measurement: Cull                 | 24   |
2.6 Summary of the Quality of Fluting-paper   | 25   |
PROCESS MEASUREMENT: CULL

6.1 Initial Study 65
6.2 Introduction 66
6.3 Results of Cull Produced per Mill 68
6.4 Technical Specifications 70
6.5 Comparison of Cull to Technical Specifications 71
6.6 Comparison of Cull to Customer Complaints 73
6.7 Comparison of Cull to Customer Needs 74
6.8 Observations 75

DISCUSSION

7.1 Introduction 77
7.2 Objective 1 78
7.3 Objective 2 79
7.3.1 Identification of Customer Needs 79
7.3.2 Relationship between Customer Needs and Technical Specifications 82
7.4 Objective 3 83
7.5 Objective 4 84
7.6 Limitations 87

CONCLUSIONS

8.1 Conclusions 88
8.1.1 Objective 1 88
8.1.2 Objective 2 89
8.1.3 Objective 3 90
8.1.4 Objective 4 91
8.2 Hypothesis 91
8.3 Recommendations 92

BIBLIOGRAPHY 95
APPENDICES

3.1 Percentage of Sales Volumes
3.2 Paper Tests
4.1 Customer Complaints Data
5.1 Customer Survey Ratings
5.2 Customer Survey Results
6.1 Regression Analysis Results
6.2 Mill Original Process Data

GLOSSARY
<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Figure Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Classification of Paper</td>
<td>13</td>
</tr>
<tr>
<td>2.2</td>
<td>Containerboard Construction</td>
<td>15</td>
</tr>
<tr>
<td>2.3</td>
<td>An Overview of the Papermaking Process</td>
<td>19</td>
</tr>
<tr>
<td>2.4</td>
<td>The Papermachine</td>
<td>22</td>
</tr>
<tr>
<td>2.5</td>
<td>Flute Formation</td>
<td>23</td>
</tr>
<tr>
<td>3.1</td>
<td>Value Chain of Fluting-paper</td>
<td>32</td>
</tr>
<tr>
<td>3.2</td>
<td>Quality Function Deployment Matrix</td>
<td>38</td>
</tr>
<tr>
<td>4.1</td>
<td>Graphical Representation: Observed and Expected Values</td>
<td>46</td>
</tr>
<tr>
<td>6.1</td>
<td>The Quality of Fluting-paper</td>
<td>67</td>
</tr>
<tr>
<td>6.2</td>
<td>Comparisons made with the Reasons for Cull</td>
<td>68</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 2.1: Garvin’s Eight Dimensions of Quality (Garvin, 1987, p43) 8
Table 2.2 Summary of Important Customer Needs and Technical Characteristics from Literature 18
Table 3.1: Summary of the Ratings for the Customer Needs 36
Table 4.1: Summary of Reasons for Customer Complaints 43
Table 4.2: Customer Complaints Observed Values 45
Table 4.3: Customer Complaints Expected Values 45
Table 4.4: Chi-squared Values for Customer Complaints 45
Table 4.5: Technical Customer Complaints: Frequency and Percentage 48
Table 5.1: Customer Needs Before and After Pilot Study 52
Table 5.2: Rating of Importance of Customer Needs 54
Table 5.3: Ratings of Comparison of Company to Competitor 55
Table 5.4: Rating of Sales Point 57
Table 5.5: Technical Characteristics for Customer Needs 59
Table 5.6: Relationship between Technical Characteristics and Customer Needs 60
Table 5.7: Quality Function Deployment Matrix 62
Table 6.1: Volumes of Cull Produced per Mill 69
Table 6.2: Technical Specifications (SABS 431) for Fluting-paper 70
Table 6.3: Technical Specifications (Company) for Fluting-paper 70
Table 6.4: Comparison of Cull to Technical Specifications 72
Table 6.5: Comparison of Cull to Customer Complaints 73
Table 6.6: Comparison of Customer Needs to Reasons for Cull 75