

**CORPORATE DASHBOARD FOR PAYPHONE SERVICE:
CASE STUDY OF PERNEC PAYPOINT REQUIREMENT**

HEZLIN SHADAN

**UNIVERSITI UTARA MALAYSIA
2012**

**< CERTIFICATE OF PROJECT PAPER
(PINK FORM BEFORE HARD COVER BINDING)>**

Abstrak

Dengan tujuan untuk menyediakan perkhidmatan telefon awam yang berkualiti tinggi dan menyeluruh, cabaran utama untuk Pernec PayPoint, peneraju utama dalam industri telefon awam di Malaysia, ialah dalam membuat keputusan yang bijak dalam setiap operasinya. Dengan kaedah semasa, proses ini sangat memakan masa dan dari segi kebolehpercayaan terhadap hasilnya adalah kurang memuaskan. Oleh itu, satu “Papan Pemuka Korporat” yang sistematik dan bermaklumat perlu disediakan untuk peringkat pengurusan bagi menyokong mereka dalam proses pembuatan keputusan. Projek ini mengkaji pembangunan rekabentuk aplikasi “Papan Pemuka” dengan menyediakan paparan skrin tunggal yang mengandungi analisis metric perniagaan yang relevan dan kritikal, bagi membolehkan proses membuat keputusan lebih efisien dan efektif. Metodologi yang digunakan dalam kajian ini dibahagikan kepada fasa keperluan, reka bentuk dan pelaksanaan. Pelaksanaan yang menggunakan sampel data telah mempamerkan potensi akan penggunaan “Papan Pemuka”. Penemuan ini boleh digunapakai oleh pihak pengurusan sebagai titik permulaan untuk mengenal pasti punca masalah dan mengambil tindakan yang perlu untuk menyelesaikan masalah tersebut.

Abstract

With the commitment to provide extensive high quality payphone services, the major challenge for PayPoint, the leader in the payphone industry in Malaysia, is in making a good decision in its operation. With current practice, the process is very time consuming and the result may not be reliable. Therefore, a systematic and informative corporate dashboard need to be provided especially for managerial level in supporting their decision making process. This study propose a dashboard application design that provides a single-screen display of relevant and critical business metrics analytics to enable faster and more effective decision making. The methodology used in this research is divided into requirement, design and implementation phases. The implementation using samples data has demonstrated the potential use of the dashboard. The findings can be used by management as starting point to identify the root cause and to take the necessary actions to solve the problem.

Acknowledgement



First of all, I would like to seize this opportunity to thank Allah S.W.T the Almighty, given his consent for me to complete this project, give me health, strength and patience throughout the completion of this research.

With a deep sense of gratitude, I wish to express my sincere thanks to my supervisor; Associate Prof Fadzilah Siraj for her valuable advices, assistances and guidelines throughout this project completion, without your assistances, this study would have never been possible. I am grateful to my evaluators, the time spend, reviewing this research and giving valuable suggestions and comments on my work. I am also thankful to all my lectures, Universiti Utara Malaysia for the guidance and lectures during my Master study.

I would also like to give my sincere thanks to the management and staffs of Northern Region, Pernec PayPoint Sdn Bhd, for giving me cooperation and support throughout the whole process of completing this project.

To my beloved husband, Mr Mohd Nazri Ramli, who always encourage and support me, thank you for making this task easier with the care, love, advice, help and understanding. I really appreciate for your patience and support. To my lovely kids, Muhd Aqmar Najmi, Muhd Farhan Najmi and Muhd Raihan Najmi, apologies from mama for the minimal time spent for you, thanks for your patience and understanding. My special thanks and gratitude go to my dearest parents, parents in law and family for their pray, support and encouragement; which motivate me to do my best in this study.

Last, but not least, I would like to thank all who show concern and stand by my side throughout the whole process of completing this study.

Table of Contents

Abstrak.....	i
Abstract.....	ii
Acknowledgement	iii
Table of Contents.....	iv
List of Tables	ix
List of Figures.....	x
List of Appendices	xi
List of Abbreviations	xii
CHAPTER ONE INTRODUCTION	1
1.1 Introduction.....	1
1.2 Background	2
1.3 Problem Statement	2
1.4 Research Questions	6
1.5 Objectives of the Study	6
1.6 Scope of the Study	7
1.7 Significance of the Study	8
1.8 Report Structure	8
CHAPTER TWO LITERATURE REVIEW	10
2.1 Explanation of Terminologies and Technologies	10
2.1.1 Payphone.....	10
2.1.2 Decision Support System (DSS).....	11
2.1.3 Business Intelligence (BI).....	12
2.1.4 Data Visualization.....	13
2.1.5 Dashboard	14
2.1.6 KPI and Metric.....	15
2.1.7 Scorecard, Dashboards and Reports.....	17
2.2 Related Works.....	19
2.3 Dashboard Benefits	20
2.4 Dashboard Characteristic	20
2.4.1 Recommendation by Stephen Few.....	20

2.4.1.1 High-level summaries.....	21
2.4.1.2 Concise, clear, and intuitive display mechanisms	21
2.4.1.3 Include performance measurements.	22
2.4.1.4 Display information based on user objective.	22
2.4.1.5 Can be view by any platform.....	22
2.4.2 Recommendation by Malik Shadan	22
2.4.3 Synergetic	22
2.4.4 Monitor KPIs	23
2.4.5 Accurate	23
2.4.6 Responsive	23
2.4.7 Timely	23
2.5 Defining KPI.....	23
2.5.1 Data Source(s).....	24
2.5.2 Granularity	25
2.5.2.1 Time.....	25
2.5.2.2 Geography	25
2.5.2.3 Product.....	25
2.5.3 Calculation	26
2.5.4 Variance	26
2.6 Key Elements to Designing Effective Dashboard.....	27
2.7 Dashboard Design Principles	28
2.7.1 Keep it Simple.....	28
2.7.2 Do Not Turn Dashboard into a Data Mart	29
2.7.3 Forget about the Fancy Formatting.....	29
2.7.4 Skip the Unnecessary Chart Junk.....	30
2.7.5 Limit each Dashboard to One Viewable Page or Screen	32
2.7.6 Use layout and Placement to Draw Focus	33
2.8 Dashboard Layout	33
2.9 Usability	36
2.10 Microsoft Excel and Dashboard.....	37
2.10.1 Familiarity with Excel.....	37
2.10.2 Built-in Flexibility	37

2.10.3 Rapid Development	37
2.10.4 Powerful Data Connectivity and Automation Capabilities.....	38
2.10.5 Little to No Incremental Costs	38
CHAPTER THREE METHODOLOGY	39
3.1 Introduction	39
3.2 Requirement Phase.....	40
3.2.1 Literature Study	40
3.2.2 Requirements Elicitation and Data Collection.....	41
3.2.2.1 Interview	42
3.2.2.2 Observation.....	43
3.2.2.3 Studying documentation	43
3.3 Design Phase	43
3.4 Implementation Phase	44
3.4.1 Developing and Testing Dashboard.....	44
3.4.2 Review and Feedback	44
CHAPTER FOUR DATA COLLECTION	45
4.1 Functional and Non-Functional Requirements	45
4.2 Dashboard Requirement.....	45
4.2.1 User (Audience) Information	45
4.2.2 Information Requirement.....	46
4.2.2.1 Objective.....	46
4.2.2.2 Performance Measure & KPI	46
4.2.2.2.1 Data Source.....	48
4.2.2.2.2 Granularity	48
4.2.2.2.3 Calculation	52
4.2.2.2.4 Variance	53
CHAPTER FIVE DESIGN PHASE	54
5.1 UML Diagrams.	54
5.2 Dashboard Layout	55
5.2.1 Main Client Layout	55
5.2.2 Content Page Layout.....	56

5.2.3 Dimension & Filter	58
5.3 Selecting and Designing Chart	58
5.3.1 Component 1: Determination of the Company Strength and Health	59
5.3.2 Component 2: Revenue Trend and Status	60
5.3.3 Component 3: Density of Payphone and Revenue	61
5.3.4 Component 4: Relationship between Phone Type and Revenue	62
5.3.5 Component 5: Payphone Performance by Category	63
5.3.6 Component 6: Overall Business ‘Strength and Health’ Over the Time	64
5.3.7 Component 7: Detail status for each area	64
CHAPTER SIX IMPLEMENTATION & FINDINGS	66
6.1 Prototype Development	66
6.1.1 Prototype Scope	66
6.1.2 Prototype Tools	67
6.1.2.1 Excel Functions	67
6.1.2.2 Macro	68
6.1.2.3 Develop Data Model	69
6.1.3 Prototype Screen	71
6.2 Prototype Findings	71
6.2.1 Component 1: Determination of the Company Strength and Health	71
6.2.2 Component 2: Revenue Trend and Status	72
6.2.3 Component 3: Density of Payphone and Revenue	73
6.2.4 Component 5: Payphone Performance by Category	75
6.2.5 Component 6: Overall Business ‘Strength and Health’ Over the Time	76
6.2.6 Component 7: Detail status for each area	77
6.3 Testing & Validation	78
6.3.1 Usability Testing	78
6.3.1.1 Respondent Background Information	79
6.3.1.2 Testing Result	79
CHAPTER SEVEN CONCLUSION	84
7.1 Research Limitation	84
7.2 Conclusion of the Study	85

7.3 Evaluation Conclusion	86
7.4 Contribution of the Study	88
7.5 Recommendation and Future Work	88
7.5.1 Usability Elements	88
7.5.2 Security Elements	89
REFERENCES.....	90

List of Tables

Table 2.1 Dashboard applications and domain area.....	19
Table 4.1: Data Source.....	48
Table 4.2: Grains for Revenue	49
Table 4.3: Grains for Population.....	50
Table 4.4: Grains for Phone Performance.....	50
Table 4.5: Grains for Complaints.....	51
Table 4.6: Grains for Others	51
Table 6.1: Prototype Model Requirements Scope.....	67
Table 6.1: Respondent Background Information	79
Table 6.2: End User - Overall Reaction.....	80
Table 6.3: End User – Screens	81
Table 6.4: End User – Terminology and message display	82
Table 6.5: End User – Learning	82
Table 6.6: End User – Perceive usefulness and easy to use.....	83
Table 7.1 The details of Questions with High “Agree”Feedback.	87

List of Figures

Figure 2.1: The four elements of KPI	24
Figure 2.2: Three basic dimensions that determine the grain of a KPI.....	26
Figure 2.3: Overview of alternative dashboard layouts	34
Figure 2.4: The simple structure recommended by SAP.	35
Figure 2.5: Users' attention of a document.....	36
Figure 3.1: Methodology	39
Figure 5.1: Main client page layout	56
Figure 5.2: Content page layout.....	57
Figure 5.3: Different shapes and colours is selected to indicate status and signify alert	59
Figure 5.4: Combination charts is selected to visualize the revenue trend and variances	61
Figure 5.5: Stacked bar chart is selected to visualize the relationship of the categories.....	62
Figure 5.6: Combination of charts is selected to visualize the significance of the phone type in contribution revenue for the month.....	63
Figure 5.7: Gauge chart is selected to visualize the status of payphone performance	63
Figure 5.7: The combination of variance charts is selected to visualize the status of KPIs over time	64
Figure 5.8: Table form is selected to compare details status among areas	65
Figure 6.1: Data model separates data, analysis, and presentation layers.....	69
Figure 6.2: The icons shapes and color visualized the business performance.	71
Figure 6.3: The chart visualize the revenue trend and variances	72
Figure 6.4: Stacked bar chart visualizes the relationship of the revenue density segment. ...	74
Figure 6.5: Chart visualizes the significance of the phone type in contribution revenue for the month.	74
Figure 6.6: Chart visualizes the status of payphone performance (serviceability) for each phones category.	75
Figure 6.7: The combination of variance charts highlights the status of all KPIs over time.	76
Figure 6.8: Table form used to provide details status and comparison among areas.....	77

List of Appendices

Appendix A List of Requirements	96
Appendix B Use Case Diagram	99
Appendix C Use Case Specification	101
Appendix D Activity Diagram.....	108
Appendix E Sequence Diagram	110
Appendix F Communication Diagram.....	115
Appendix G Sample Macro	120
Appendix H Prototype Screenshot.....	123
Appendix I Questionnaire	126

List of Abbreviations

BI	Business Intelligence
DSS	Decision Support System
HML	High, Medium and Low
KPI	Key Performance Indicator
PCD	Payphone Corporate Dashboard
PMS	Payphone Management System
POINTS	Payphone Operation Information System
UML	Unified Modeling Language

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Making assured that managements are kept apprised of what is happening in the company is no small task in today's business landscape. The business processes employed in this century generate an astonishing quantity of data, which is gathered and stored in disparate systems across several locations. The challenge facing business organizations is how to consolidate that data, then extract and deliver useful information to key decision makers.

Furthermore, in the business world, executives must react and make decisions based on the data they received about the company's performance and operations. It is imperative for the data to be presented to all key decision makers in a way that allows them to rely on their finely tuned business instincts to make quick, yet accurate decisions. Fortunately, for companies and their executives, there are effective ways to do just that. One of the ways is by using corporate dashboard.

As the leader in the payphone industry in Malaysia, Pernec PayPoint Sdn Bhd faces the same challenges. With the commitment to provide extensive high quality payphone services, the major challenge for PayPoint in making a good decision in its operation. With current practice of pre-payment which depend on the manual operative mode the process is very time consuming and not much reliability on the

The contents of
the thesis is for
internal user
only

REFERENCES

Afolabi, M. (1992). The review of related literature in research. *International journal of information and library research*, 4(1), 59-66.

Alexander, M. & Walkenbach, J. (2010). Excel dashboards & reports. New Jersey, NJ : Wiley Publishing, Inc.

Bose, R. (2006). Understanding management data systems for enterprise performance management. *Industrial Management & Data Systems*, 106 (1) , 43-59.

Bourner, T. (1996). The research process: four steps to success. *Research methods: guidance for postgraduates*, T. Greenfield, ed. 7-11.

Business chart (n.d). Retrieved on April 20, 2012 from Mr. Dashboard website:
<http://www.mrdashboard.com/BusinessChart.html>

Corn, J. (2007). Where did the Likert scale come from?. Retrieved on May 10, 2012 from Jamie Corn's Talent Management NewsBlog website:
<http://jcsoftwaresales.blogspot.com/2007/08/where-did-likert-scale-come-from.html>

Dashboard component types. (n.d). Retrieved on April 20, 2012 from salesforce.com website: http://login.salesforce.com/help/doc/en/dashboards_component_types.htm

Dashboard gauge control. (n.d). Retrieved on April 20, 2012 from Dundas website:
<http://www.dundas.com/dashboard/features/dvcontrols/gauge/>

Davis, F.D. (1993). User acceptance of computer technology; system characteristic, use perception and behavioral impacts. *International Journal of Man-machine studies* 38(3)

- Eckerson, W. (2011, February 17). How to design effective dashboard displays. Retrieved on 3 April 2012 from <http://www.dashboardinsight.com/articles/digital-dashboards/fundamentals/how-to-design-effective-dashboard-displays.aspx?page=1>
- Eckerson, W. (2006). Performance dashboards: measuring, monitoring, and managing your business. Retrieved from <http://www.bpmpartners.com/documents/Chapter1Excerpt.pdf>
- Emma (n.d). Will you benefit from Microsoft Excel Formulas? Retrieved on April 15, 2012, from Excel Formulas website: <http://www.excelformulas.net/will-you-benefit-from-microsoft-excel-formulas/>
- Few, S. (2008). With dashboard, formatting and layout definitely matter [White paper]. Retrieved on 12 March from Perceptual Edge website: http://www.perceptualedge.com/articles/Whitepapers/Formatting_and_Layout_Matter.pdf
- Few, S. (2006). *Information dashboard design: The effective visual communication of data*. Sebastapol, CA: O' Reilly Media, 2006
- Few, S. (2006). Common pitfalls in dashboard design. Retrieved on May 2, 2012 from Perceptual Edge website: http://www.perceptualedge.com/articles/Whitepapers/Common_Pitfalls.pdf
- Few, S. (2004, March 20). Dashboard confusion. Retrieved on April 3, 2012 from http://www.perceptualedge.com/articles/ie/dashboard_confusion.pdf
- Gafney, G. (1999). Usability testing. Retrieved on May 10, 2012 from Information & Design website: <http://www.infodesign.com.au/ftp/UsabilityTesting.pdf>
- Gonzalez, T. (n.d). Dashboard design: Key performance indicators and metrics - Choosing the right data to display. Retrieved on April 3, 2012 from BrightPoint Consulting website: <http://www.brightpointinc.com/Articles.asp?File=Dashboard%20Design%20Metrics%20and%20KPIs.htm>

- Information management (n.d). Business intelligence. Retrieved May 1, 2012 from info-mgmt.com website: <http://www.information-management.com/channels/business-intelligence.html>
- Jonathan. (2011). 11 quick and easy tips to light up your dashboard (BIME tips). Retrieved on May 1, 2012 from Bime website: <http://bimeanalytics.com/blog/11-quick-and-easy-tips-to-transform-your-dashboard-bime-tips/>
- Kerzner, H. (2011). Project management. Metrics, KPIs, and dashboards - A guide to measuring and monitoring project performance. New Jersey, NJ: John Wiley & Sons
- Laitinen, O.V. & Yigitbasioglu. O.M. (2012). The use of dashboards in performance management: Evidence from Sales Managers. *The International Journal of Digital Accounting Research*, 12, 39 – 58.
- Mahendrawathi, E.R., Pranantha, D. & Utomo, J.D. (2010). Development of dashboard for hospital logistics management Open Systems (ICOS). *2010 IEEE Conference*, 86 – 90. doi: 10.1109/ICOS.2010.5720069
- Malik, S. (2005). Enterprise dashboards: Design and best practices for IT. New Jersey, NJ: John Wiley & Sons
- Marcus, A. (2006). Dashboards in your future. *Interaction*, 13(1), 48-60. Doi: 10.1145/1109069.1109103
- Martin, E. & Di Bernardo, V. (2008). Enterprise dashboard tools for management of share-use University Laboratory. *University/Government/Industry Micro/Nano Symposium, 2008. UGIM 2008. 17th Biennial*, 24-27. doi: 10.1109/UGIM.2008.13
- Math dictionary (n.d). Retrieved on April 20, 2012 from iCoachMath.com website: http://www.icoachmath.com/math_dictionary/Stacked_Bar_Graph.html
- MicroStrategy (n.d). Decision support system. Retrieved from <http://www.microstrategy.com/decision-support-system/>

- Negash, S. & Gray, P. (2008). Business intelligence. *Handbook on decision support system* 2, VII, 175-193, DOI: 10.1007/978-3-540-48716-6_9
- Nielsen, J. (n.d). Usability 101: Introduction to usability. Retrieved on 28 April 2012
<http://www.useit.com/alertbox/20030825.html>
- Nielsen, T. D. (2007). Outage management systems real-time dashboard for electric distribution companies. *Power Engineering Society General Meeting, 2007 IEEE*, 1-3. Doi: 10.1109/PES.2007.385707
- Oslin, G. P. (1992). The story of telecommunications. Macon, Georgia: Mercer University Press
- Perneq PayPoint Sdn Bhd. (n.d). About us. Retrieved on February 28, 2012 from Perneq PayPoint website: <http://www.helo.com.my/>
- Person, R (2008). Balanced scorecards and operational dashboards with Microsoft Excel. Indianapolis, IN: John Wiley & Sons.
- Pirttimaki, V. (2007). Business intelligence as a managerial tool in large finnish companies. Ph.D. thesis, Tampere University of Technology, Publication 646, 2007. Retrieved on May 1, 2012 from
<http://dspace.cc.tut.fi/dpub/bitstream/handle/123456789/134/pirttimaki.pdf?sequence=1>
- Power, D. (2010, Jan 10). Ask Dan! about DSS. Do small businesses need DSS? Retrieved on April 3, 2012 from DSSResources.com website:
<http://dssresources.com/faq/index.php?action=artikel&id=200>
- Power, D. (2006, May 2). Ask Dan! about DSS. What is a "performance" dashboard? Retrieved on 3 April 2012 from
<http://dssresources.com/faq/index.php?action=artikel&id=107>

- Power, D. (2003). A brief history of decision support systems. Retrieved on April 5, 2012, from DSSResources.com website:
<http://dssresources.com/history/dsshistoryv28.html>
- SAP business one UI design guidelines for dashboards. (2010). Retrieved on April 20, 2012 from Scribd website: <http://www.scribd.com/doc/39968915/Dashboard-UI-Guidelines>
- Schiff, C. (August 1, 2004). Maximize business performance: Industry dashboards to the rescue. Retrieved on 28 April 2012 from DMReview.com website:
http://www.dmreview.com/article_sub.cfm?articleId=1007643.
- Sherman, R. (n.d). Ten key elements for effective dashboard design. Retrieved on 3 April 2012 from <http://searchbusinessanalytics.techtarget.com/tip/Ten-key-elements-for-effective-dashboard-design>
- Sloane, E. B., Rosow, E., Adam, J. & Shine, D. (2006). JEDI – an executive dashboard and decision support system for lean global military medical resource and logistics management. *Engineering in Medicine and Biology Society, 2006. EMBS '06. 28th Annual International Conference of the IEEE*, 5440 – 5443. doi: 10.1109/IEMBS.2006.25965
- Washington State School Directors' Association (2008). Data dashboards for school directors. (ERIC Document Reproduction Service No. ED521609)
- Whelchel, J. (2011, December 21). Decision support systems. Retrieved on April 3, 2012, from DSS interactive website: <http://www.dss-int.com/>
- Yuen, A. (2011). SAP user interface guidelines for dashboard design. Retrieved on April 10, 2012 from Collaboration workspace from SAP website:
<https://cw.sdn.sap.com/cw/docs/DOC-142813>
- Turban, E., Aronson, J. E. & Liang, T. P. (2007). Decision support and business intelligence system. 8th Edition, Pearson Education International, 52-75.

Uebersax, J.S.(2006). Likert scales: dispelling the confusion. Retrieved on May 10, 2012 from Statistical Methods for Rater Agreement website: <http://john-uebersax.com/stat/likert.htm>.