Customer Relationship Management using Business Intelligence

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By

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To the few that matter the most

Salena, Neil and Graham

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LIST OF ABBREVIATIONS

ABC	Activity Based Costing
AET	Affective Events Theory
AI	Application Integration
APS	Advanced Planning and Scheduling
ASAP	Accelerated SAP Methodology
B2B	Business to Business
BI	Business Intelligence
BCG	Boston Consulting Group
BIM	Business Intelligence Management
BIS	Business Intelligence System
BPR	Business Process Reengineering
CEO	Chief Executive Officer
CIO	Chief Information Officer
COBRA	Common Object Request Broker Architecture
COO	Chief Operations Officer
CPFR	Collaborative Planning, Forecasting and Replenishment
CRM	Customer Relationship Management
CSF	Critical Success Factors
CTO	Chief Technology Officer
DAS	Digital Advertising Displays
DBMS	Data Base Management Systems
DM	Data Mining
DSS	Decision Support Systems
DW	Data Warehouse
EAI	Enterprise Application Integration
EDI	Electronic Data Interchange
EDW	Enterprise Data Warehouse
EIS	Enterprise Information System
EPT	Electronic Price Tags
ERP	Enterprise Resource Planning
ES	Enterprise System
ETL	Extract Transform and Load
EWS	Enterprise Wide System
GIS	Geographic IS
GPS	Global Positioning System
GQM	Goals/Questions/Metrics
GSM	Grand Strategy Matrix

GUI	Graphical User Interface
HEI	Higher Education Institution
ICT	Information and Communications Technology
IE	Internal External
IO	Industrial Organisations
IS	Information System/s
IT	Information Technology
JIT	Just In Time
KPI	Key Performance Indicators
LAN	Local Area Network
MCP	Most Critical Processes
MES	Manufacturing Execution Systems
MRP	Material Requirements Planning
MRPII	Manufacturing Resource Planning
MS	Master Schedule
NM	Neuromarketing
OLAP	Online Analytical Processing
OLTP	Online Transaction Processing
PIR	Post Implementation Review
POS	Point Of Sale
PQM	Process Quality Management
PSA	Personal Shopping Assistant
RBV	Resource Based View
RDBMS	Relational Database Management Systems
RFID	Radio Frequency Identification
RFT	Regulatory Focus Theory
RFT	Radio Frequency Technology
ROA	Return on Assets
ROI	Return on Investment
SCM	Supply Chain Management
SME	Small and Medium Enterprise
SPACE	Strategic Position and Action Evaluation
SOLAP	Spatial OLAP
SQL	Structured Query Language
SWOT	Strength Weakness Opportunities and Threats
TAM	Technology Acceptance Model
TMS	Transportation Management Systems
TQM	Total Quality Management
UPC	Universal Product Scanning
VMI	Vendor Managed Inventory
WMS	Warehouse Management Systems

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I would like to sincerely thank Professor John Rijsman and Professor Eamonn Murphy for their assistance, and Dr Mícheál Ó hAodha, Dr Joseph Roevens, and Dr Marc Van Gastel, for their advice and invaluable contributions to this volume. I would also like to take this opportunity to thank Norman Sturdy, Pat Lyons, and Pat Nash of Baunacloka, who all provided varying degrees of support and assistance. To all of the above and to everyone else who shared this journey with me, I would like to borrow a few words from the Ballad of Reading Jail by Oscar Wilde:

Yet each man kills the thing he loves
By each let this be heard,
Some do it with a bitter look,
Some with a flattering word,
The coward does it with a kiss,
The brave man with a sword!

—Oscar Wilde.

About the Author

Born in Dublin Ireland, Graham is an independent management consultant, who holds an MSc honours degree in Technology Management from the National University of Ireland Galway (NUIG) having originally graduated from the University of Limerick in Computer Engineering. Graham has considerable experience in Business Intelligence and Customer Relationship Management, being both a researcher and a professor in both of these disciplines. Graham also offers consultancy services in these and other disciplines to a range of organisations throughout Europe.

His publications include: *Business Process Reengineering Strategies for Occupational Health and Safety*, which provides a well-researched and comprehensive resource for understanding and implementing Business Process Reengineering and is an invaluable read for all practitioners of the subject and for those wishing to learn more about BPR (Sturdy 2010), *Developing a Manufacturable Process for the Deposition of Thick Polysilicon Films for Micro Machined Devices* (Sturdy 2000), and *Statistical Process Control on Passivation Schemes for VLSI Technology* (Sturdy et al 1996).

Graham has two sons and is currently located in Brussels Belgium.

FOREWORD

In this book, Graham provides a well-researched and comprehensive resource for understanding and implementing Enterprise Resource Planning, and Business Intelligence systems. It provides an essential resource for those who are considering implementing such systems within their own organisations, or for managers who wish to maximise the potential of ERP and BI systems that they currently operate. It provides a complete resource for understanding and implementing ERP and BI in relation to the needs of the business as a whole, and it includes in-depth coverage of all the key areas essential to the IT function. Graham provides specific and practical guidance on implementing ERP and BI systems that he has formulated along with a number of academic practitioners and industry experts. Importantly, Graham demonstrates how these initiatives can be implemented in a real-world environment and in accordance with stated business objectives so as to achieve positive and productive change.

Graham addresses the subject area of "The Psychology of BI Integration" which has not been previously explored to any great extent within the literature, in which he proposes the use of the "BI Psychology Adoption Model" which provides new thinking as to how employees react, when confronted with new technology within the workplace. The correct application of the model should assist in the task of informing management of the extent and scope of emotive reactions to the introduction of technology within the workplace.

"I thoroughly recommend this comprehensive study of ERP and BI. It is well-researched and explores the wide range of research literature that is available on this subject in a manner that is both practical and comprehensive."
—Dr Marc Van Gastel Flanders Investment and Trade

"The approaches and studies presented are all well-supported by the available evidence and the research draws on real-world examples are based on valuable years spent working in the industrial and research sectors."
—Dr Mícheál Ó hAodha, University of Limerick

INTRODUCTION

The ability to extract and present information in a meaningful way is vital within the organisational context. Enterprise systems have become essential tools for the support of strategic initiatives and organisational activities, which greatly assist in aligning their competitive strategy towards their key objectives. Where, once these tools remained in the preserve of large organisations, they are now increasingly being adopted by a broad spectrum of organisations and enterprises. In the face of shrinking markets, Business Intelligence (BI) vendors are now targeting a more diverse range of organisations of varying sizes; however, many programmes fail due to poor planning, lack of resources, organisational immaturity and failure to understand the complexities of integrating such applications within the existing business structure. It is the intent of this volume to examine the implementation of an Enterprise Resource Planning (ERP) tool within a retail outlet chain located in Belgium, which, was then complimented with a BI system in order to improve the availability of operational and strategic planning information by harnessing the large amounts of data which could be accessed through the use of data warehousing and other BI techniques. With ever-increasing competition and rapidly changing customer needs and technologies, enterprise decision makers are looking for new ways to view and evaluate key performance indicators. Management have always had a need to have their queries in relation to organisational performance answered in a timely manner, which can now be achieved through the provision of actionable information from analytic applications using real-time business performance data. Both ERP and BI tools are discussed from the perspective of selection, integration strategies and delivery platforms best suited to the organisation under discussion. The case study demonstrates how a highly effective BI solution was built on top of an ERP Implementation, to; track customer behaviour, improve services and relationships, in order to gain a sustainable competitive advantage. The author presents a “BI Psychology Adoption Model” which represents new and innovative thinking in relation to how employees within organisations react to the introduction of new technology within the workplace.

Who should read this book?

This book will be a valuable resource to anyone who has an interest in promoting the Customer Relationship Model (CRM) through the use of Business Intelligence. Its purpose is to provide a greater understanding of how organisations can implement a combination of strategic management techniques from both an internal and external perspective in order to gain a sustained competitive advantage. It shall be demonstrated how the implementation of an ERP can greatly enhance the internal capabilities of an organisation through the use of the Resource-Based View (RBV) framework. Having put in place the framework to allow for strategic advantage through its internal capabilities, it will then be demonstrated how this capability was then built upon to enhance the availability of both operational, and strategic planning information, in order to extend the strategic capabilities into the external environment through the use of Business Intelligence Management (BIM) techniques. The synergy created by the implementation of these two systems is a key element in creating a more complete CRM model. Therefore, this volume should be of interest to the following groups of people:

- Students of Enterprise Resource Planning, Business Intelligence and, Customer Relationship Management, who wish to gain a fuller understanding of the academic writings, research and concepts which underline these important subject areas within Strategic and Operations Management.

- Executives, managers and supervisors who have an interest in the application of Information Technology systems and wish to gain a fuller understanding of their application within a BI context, and also to observe a practical instance of the technology within the CRM framework.

- System administrators, who wish to gain a working knowledge of the tools and techniques which can be applied to align technology with the strategic vision of the organisation.

- Professionals who have an interest in the methods that can be applied to leverage, IT and IS systems in order to dramatically improve the Customer Relationship Model.

CHAPTER ONE

ERP EVOLUTION

"The greatest composer does not sit down to work because he is inspired, but becomes inspired because he is working."
—Ernest Newman

Information Technology has changed both social and economic structures and its development has offered various opportunities for innovative business concepts to emerge. Nearly 40 years ago, Intel co-founder Gordon Moore forecast the rapid pace of technology innovation. His prediction, popularly known as "Moore's Law," states that transistor density on integrated circuits doubles about every two years. This is brought about, as the scale of integrated devices gets smaller and smaller. The current state of the technology allows for the printing of individual features smaller than a virus and 1,000 times thinner than a human hair and the manufacturing of microprocessors with features as thin as five atomic layers. Commercially available microprocessors now contain billions of transistors, which means that the real cost of processing power has shrunk by many orders of magnitude since Moore first made his prediction. Hard disk drives were invented in the 1950's by IBM. They started as large disks up to 20 inches in diameter holding just a few megabytes. But it wasn't until the middle of the 1980's that people began to use hard disks in more standard PC's, and since then development has surged ahead. Komorowski has researched the relationship between hard drive storage and cost. Figure 1 illustrates the very strong exponential correlation in the space/cost ratio of hard drives over the last 30 years, beginning in 1980 during which the space per unit cost of a typical hard drive has doubled approximately every 14 months, demonstrating an order of magnitude increase every 48 months. The strong correlation is confirmed by the R^2 value of 0.9812. Today, the hard drive is found everywhere, from the PC's that we use daily to MP3 players and memory sticks. A similar decline has been noted in the cost of data warehousing, whereas the average warehousing budget was in the region of $2 million about 10 years ago, this is now much closer to $1 million today. These

costs continue to decline as computing power and capacity increases, and storage technologies become cheaper and faster.

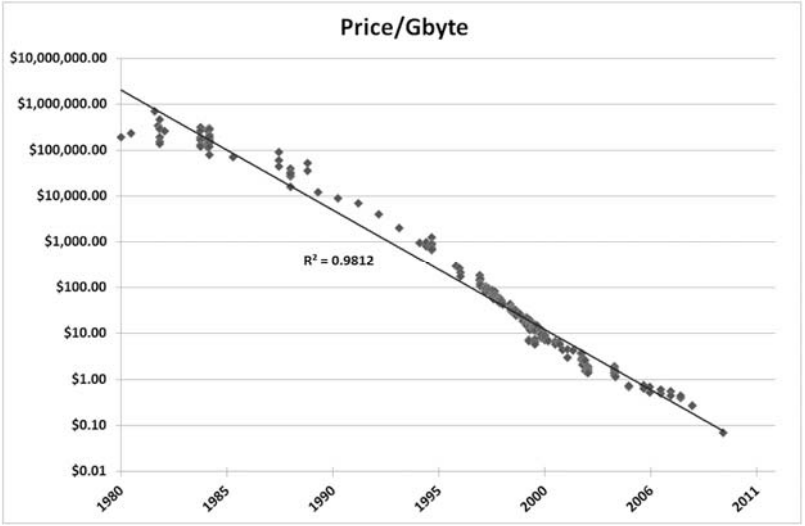

Figure 1: Hard Drive Cost per Gigabyte 1980 - 2010

Over the same time frame marketing research in retail settings has also undergone a radical transformation, and IT, has played a major role in enabling this transformation to occur. This has occurred in what (Schiller, 1987) has described as a set of "waves". The first wave was led by the big superstore operators, and this can be traced back to the early 1970's. This was then followed by a second wave, which started around a decade later, and featured increasingly sophisticated retail warehouse operations. The third wave centred on the area of comparison shopping. The first wave of change occurred when retailers adopted Point of Sale (POS) systems with Universal Product Scanning (UPC) barcode scanning. This gave companies the ability to track real-time data in relation to customer purchase transactions and it also provided accurate estimates of product sales and market share, and this enabled them to measure far more accurately the overall productivity of their supply chains. By modelling the data as a function of variables, such as product price, display activities, and feature advertising, marketing analysts were able to gauge far more accurately the performance and profitability of their marketing investments (Blattberg and Neslin, 1990). Scanner data is in widespread

use today and is used to support many critical business decisions. The second wave of change came about as a result of retailers starting to track and analyse the purchases of individual shoppers, along with their shopping habits. Around that same time a number of retailers, especially in the grocery industry, launched frequent shopper and customer loyalty programmes to collect these data. Shoppers who participated in these types of programmes usually identified themselves through the use of loyalty cards at the point of sale in exchange for coupons and other enticements, such as books of stamps which could be used to buy a range of items, and could even be used to contribute to the cost of air travel to foreign destinations. Companies can also identify repeat customers by requesting their telephone numbers, capturing information from their credit and debit cards, and by the placing and reading of "cookies" which have been stored on their computer disk drives as a result of visiting the retailer's Website. This information is often combined with geo-demographic and behavioural data from other public and private sources to create a profile and purchase history for each customer or household. These data can be used to estimate customer value and loyalty, measure individual-level response to direct mail and other targeted promotions, and conduct shopping basket analyses to identify product complementarities among other applications (Berson and Smith, 2002).

We have now entered and are well into the third wave of change, there are even those who talk about an emerging fourth wave, which embraces warehouse clubs, factory outlet centres and airport retailing (Fernie, 2005). Within the third wave, the technology drivers are the digital representation of the shopping environment and the real-time tracking of customers as they enter the retail outlet, walk through the various sections, and select and purchase products. In a similar fashion to the earlier innovations, it provides the capability to capture variations in consumer behaviour over time and across different purchasing groups, but it also adds to the environment, the critical element of context. This new wave of marketing intelligence provides marketing analysts with the tools that they require to measure consumer response to the in-store environment and manage the shopping process. It is the foundation for customer experience management (Burke, 2010). Table 1 demonstrates how every generation of marketing intelligence has enhanced the overall understanding of how marketing, customer, and environmental factors affect consumer behaviour and retail outlet performance.

	Wave I	Wave II	Wave III
	Brand and category management	*Customer relationship management*	*Customer experience management*
Enabling technologies	UPC barcode scanning	Customer loyalty cards, credit/debit cards	Real-time customer tracking (RFID, GPS, video, clickstream, portable shopping devices)
Causal variables	Product assortment Shelf space Price Promotions Displays Feature advertising	Wave I, plus: Customer attributes (geo-demographics) Purchase history Targeted promotion	Wave II, plus: Store layout Store atmosphere Navigational aids Product adjacencies Service levels Queues/crowding In-store events
Performance measures	Sales Market share Gross margin Sales/square foot Turn rate GMROII	Customer retention Customer loyalty Share of customer Lifetime value ROC curves	Store traffic Shopping path Aisle penetration Dwell time Product interaction Conversion rate

Table 1: The Evolution of Marketing Intelligence

The increased focus on the shopping process has fuelled two recent trends in retailing research. The first is the increased use of observational and ethnographic research (Underhill, 2008). The second trend in retailing research is the increased use of computer hardware and software tools to track customer behaviour in both online and conventional retail shopping environments. Unlike traditional ethnographic research, which can be very time consuming and subjective, computer tracking provides an efficient and reliable means of collecting and analysing data on the consumer shopping process. Both the internal and external operational environments are presenting increasing challenges across a wide array of organisations today. Many organisations are now recognising the need to present a consistent "look and feel" to all of their customers, to respond rapidly to their demands, and to seek out economies of scale. In this context, the capabilities offered by IT, are being re-examined, leading many organisations to evaluate the feasibility of installing ERP systems. ERP's are usually installed in order to replace a firm's existing diverse transaction processing systems, with an integrated system that embodies

the concept of tight interdependencies among a firm's many and diverse functional units. ERP's have the potential to revitalise IT infrastructures and enable global business process integration; however, implementation of these planning systems has proven to be very expensive in some instances, and the rewards for implementation can, at times be difficult to define. In a model, which was developed by (Ross 1999), illustrated in Figure 2, which is based upon 15 case studies of ERP implementation, a top level perspective of the stages involved in ERP implementation, are:

- Design
- Implementation
- Stabilisation
- Continuous improvement
- Transformation

The design phase is essentially a planning phase in which the critical guidelines and decision making for the implementation process are determined. Ross describes the process as follows: Stabilisation takes place during the implementation stage, in which system problems and issues are addressed and then resolved, and as a result, organisational performance consequently improves. The expectation is that this will be followed by a continuous period of steady improvement in which additional functionality continues to be added. Eventually, the expectation is to reach the stage of transformation in which all of the organisational boundaries and systems are fully coordinated. For many organisations the challenge that is presented in implementing ERP systems is not the introduction of a new system, nor is it due to the simple fact of change. The real challenge arises out of the fact that ERP implementations can necessitate a level of disciple within organisations that may not have existed within the organisation up until that point in time. In order for the organisation to achieve the level of discipline required in the implementation of an ERP system, the level of organisational change required can be quite considerable, and not without its challenges. In the initial stages of transformation, the changes that are brought about may not immediately appear like an improvement to those who are impacted by the systems. The implication of this is, that for many managers, the installation of ERP systems often involves much more than addressing the technical obstacles to ERP implementation.

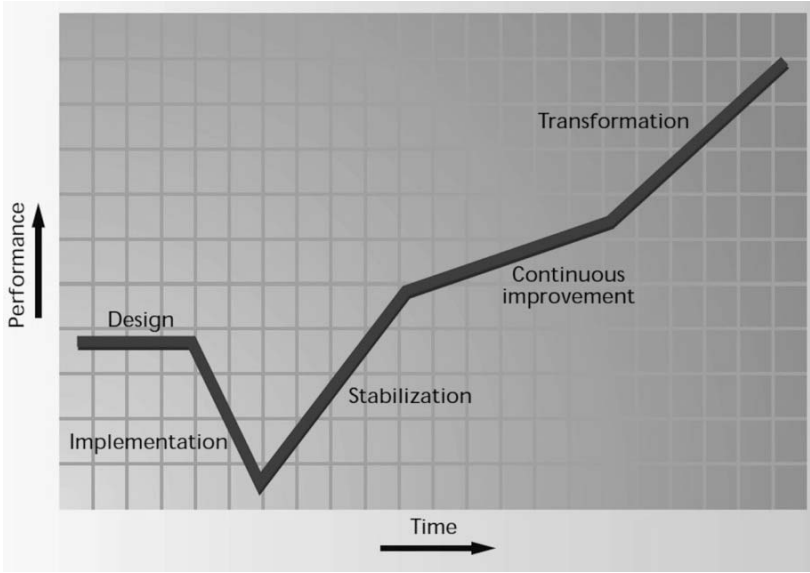

Figure 2: ERP Stages

The goal of an ERP implementation should be to lead to a new organisational reality, which is characterised by an increased emphasis on process and strategic partnerships. Within this context the focus on organisational change requires a high level of managerial skill, along with the technical and process expertise that will allow for a constant reassessment of organisational processes and the systems they depend upon. A question that that has a high priority, in terms of strategic management within many an organisation is; how to develop information architecture and, IT infrastructure that can support the goals of the organisation when business conditions and technologies are in a constant state of change, and the rate at which new technologies are introduced must seem bewildering to many managers. Meeting the business and technology challenges of today's digital economy requires redesigning the organisation, and building new information architecture and IT infrastructure. Information architecture is the particular form that IT takes in an organisation that allows it to achieve selected goals or functions. It represents a design for the business application systems that serve each functional specialty and level of the organisation and the specific way that they are used by each organisation. As firms move toward digital firm organisations and technologies, information architectures are increasingly

being designed around business processes and clusters of system applications spanning multiple functions and organisational levels (Kalakota and Robinson, 2001). Because managers and employees directly interact with these systems, it is critical for organisational success, that the information architecture meet the requirements of the business now and in the future. Effective information architecture provides the ability to step logically through a system in a systematic way in order to extract the information that is required. Information architecture is most commonly associated with Websites and Intranets, but it can be used in the context of any information structures or computer systems. Many organisations in recent years have implemented ERP systems in an effort to coordinate activities, across different functional areas and also to increase the efficiency of their extended supply chains. Not all of these implementations have been successful, nor have they achieved in many cases, the type of results that were initially envisaged at the outset.

The key benefits that managers seek to derive from the implementation of ERP systems are to: considerably reduce or totally eliminate the fragmentation of current systems, to allow a process of standardisation, to give more visibility on data across the entire corporation, and, in doing so, obtain competitive advantage (Sammon and Adam, 2004a). ERP programmes have been described in this context by (Shakir, 2000) as strategic programmes with success or failure that will greatly impact the organisation. It has been noted however, by a number of authors that failed implementations can be very costly for the implementing organisation, and that few ERP implementations have been entirely successful (Kalakota and Robinson, 2001). One of the reasons that ERP programmes fail to realise their potential, is that programme teams can get immersed in the implementation of ERP while forgetting the reasons that lie behind the implementation from a strategic perspective, and they allow ERP to become a “driver” rather, than the “enabler” that it is intended to be. IT is purported to be both an “enabler” and “driver” of change (Azvine *et al*., 2005). It demands the fashioning and incorporation of new roles, responsibilities, relationships, lines of authority, control mechanisms, work processes and work flows; in short, new organisational designs (Porter and Millar, 1985). In this way it enables the rationalisation of work and the better functioning of teams and by the transformation of work practices (Heinemann and Rau, 2003), and increasing process efficiency, changing the locus of knowledge and power, forcing old organisational structures into new configurations (Kaplan and Haenlein, 2010). Figure 3

illustrates the essential elements of information architecture, for each of the major functional areas within an organisation.

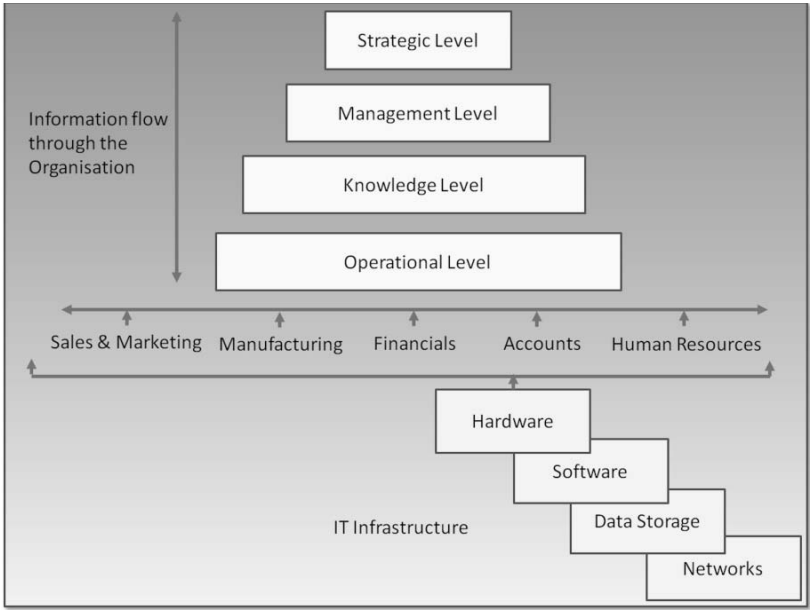

Figure 3: Information Architecture of the Organisation

A number of limitations with regard to the capabilities and the usability of ERP systems in providing effective Supply Chain Management (SCM) support, have been identified by (Akkermans *et al*., 2003), which are: their insufficient extended enterprise functionality in crossing organisational boundaries, their inflexibility to ever-changing supply chain needs, their lack of functionality beyond managing transactions, and their closed and non-modular system architecture. Along with these (Häkkinen and Hilmola, 2008), also identify, what they describe as key limitations of ERP systems in providing effective business support, such as; the inflexibility of current ERP systems to ever-changing business needs, and their lack of functionality beyond managing transactions. As the ERP methodology has become more popular, software applications have emerged to help business managers implement ERP. These applications are normally composed of several modules, such as; human resources, sales, finance and production, which provide, cross-organisational integration of transaction based data throughout a range of business processes, and these software packages can

be customised to the specific needs of each organisation up to certain limits (Esteves and Pastor, 1999). At the heart of an enterprise system is a central database that draws data from, and feeds data into a series of applications supporting diverse company functions. Using a single database, dramatically streamlines the flow of information throughout a business (Davenport, 1998a), this concept is illustrated in Figure 4.

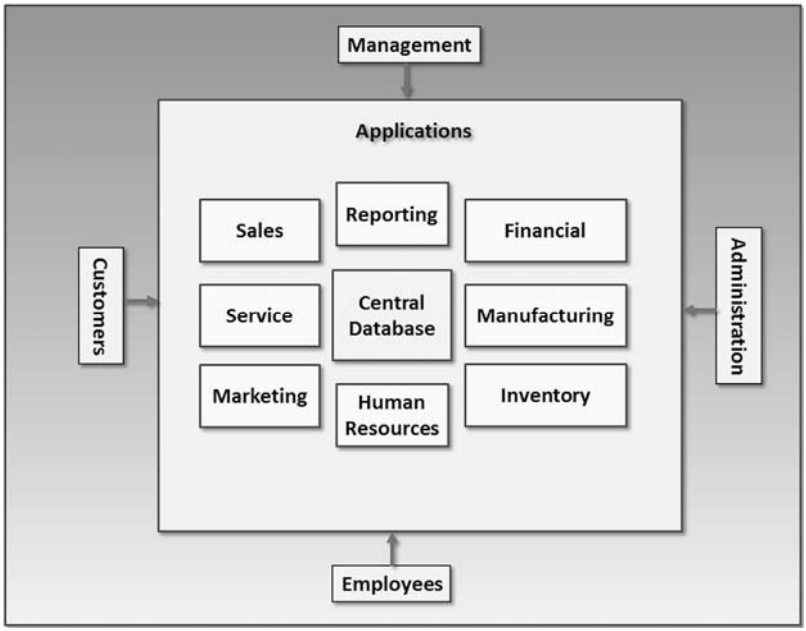

Figure 4: Anatomy of an Enterprise System

ERP software packages and solutions represent a multi-billion dollar industry that includes the world's fourth largest software vendor, several of the largest software firms and the world's largest management consulting organisations. These comprehensive, packaged software solutions seek to integrate the complete range of a business's processes and functions in order to present a holistic view of the business from a single information and IT architecture (Gable *et al*., 1997). The origins of ERP can be traced back to the Industrial Revolution and the initial attempts at optimising industrial activities around functions such as; the purchasing of raw materials and the sale of finished goods. According to (Gilbert and Schonberger, 1983), the history of inventory-based

production control systems, leading to the development of Material Requirements Planning (MRP) dates back to at least 1744, when an advertisement for a Franklin stove consisted of an illustrated Bill of Materials illustrating the quantity of each component in the product and its assembly location; however, it was not until the early 20th century, when the car industry in America in the 1910's and 1920's, became more competitive, and the impact of material flow and availability of the manufacturing process, became a subject of managerial interest. It was this recognition, of the need for more flexible control techniques, as well as an understanding of the importance of forecasting in relation to manufacturing and, the provision of finished product, that was the catalyst for what we accept today as the development of inventory management and control techniques. These techniques are at the core of all ERP and SCM systems (O'Gorman, 2004).

ERP represents the result of a series of different approaches that have been brought to bear throughout the history of enterprise-level performances. Within the modern era, the focus of manufacturing systems in the 1960's was on Inventory Control. Most of the software packages at that time were designed to handle inventory, which was based on traditional inventory concepts. In the late 1970's and well into the 1980's it was not uncommon for many companies who had an automated computerised system, to write their own software code for it, in order to control their business processes. This can be an expensive approach, since many of these processes occur across various types of businesses (Chang *et al*., 2000). At this time, the focus shifted to MRP systems that translated the Master Schedule (MS) built for the end items into "time-phased" net requirements for the sub-assemblies, components and raw materials planning and procurement. If common reusable software such as an ERP system is used, this provides for the possibility of a cost effective alternative to customised software. ERP software can cater to a wide range of industries, from service sectors like software vendors and hospitals, to manufacturing industries and even, to government departments (Chang *et al*., 2000). In the early 1990's, MRP-II was further extended to cover areas like; engineering, finance, human resources and project management. At the beginning of this decade, IT commentators had suggested that ERP systems were not enabling businesses to become more profitable, but were in fact slowly strangling them, because the main idea behind ERP itself, which involves the tight integration of business processes, was not giving businesses the synergy that was expected. Also, the high cost of ERP implementation and initial low return on investment was one of the main factors taken into consideration when IT