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ERP System Implementation in UK Joinery SMEs

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ERP SYSTEM IMPLEMENTATION IN UK JOINERY SMES

By
Anoud Ibrahim Bani-Hani

A dissertation thesis submitted in partial fulfilment of the requirements for the award of the degree Doctor of Engineering (EngD), at Loughborough University

November 2013

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ACKNOWLEDGEMENTS

To begin with, I give all praise to Allah, the most merciful, and the most beneficent. My Lord, the one I call on in the brightness of the day and in the darkness of the night; in public and in private; in misery and in joy; in sickness and in health. Thank you for standing by me in all times good and bad, happy and sad.

An endeavour of this magnitude requires the support of many and indeed many have contributed to make it possible. My sincere gratitude goes to my Supervisors Professor **Chris Hinde** and Professor **Thomas Jackson** for their endless support, guidance and encouragement. No words can thank you enough for your help on both academic and personal matters; you've stood by me through hard times, thank you very much.

Many thanks to JCK Joinery for sponsoring this research and giving me this opportunity, I was happy to be working with you and very glad to be part of the JCK family. Special thanks to **Anthony** and **Paul**, To **Trevor** who sat next to my desk for years and was always there to support me, share food and tell me all the gossips when I'm away, to **Laura**, **Ruth** and **Emma**, to **Kenny** and **David** and **Julie**. More thanks to the **shop floor** workers who supported me through the years explaining processes, sharing events and cakes, I'll never forget all of you; you really made this journey worth it.

I'm also grateful the **CICE** centre staff in particular **Steve** for listening to me when I had trouble, **Sara** and **Natalie** for their administrative support. Special thanks to staff in the Computer Science department, in particular Prof. **Eran Edirisinghe** for his support through the years.

I also would like to give my most thanks to my Family, There were many times, I had wondered if the journey will be successfully completed. My foremost and sincere gratitude therefore goes to them, My Dad **Ibrahim** for believing in me through all my life and through difficult times, for his prayers and love, for coming over and over from Jordan every time he hears me crying or feeling tired or discouraged, for standing by me in the tough times and telling me how I deserve better because I'm the best, I love you so much and will never be able to thank you enough. I'm a proud daughter of an amazing father.
My Mom **Dalal**, Thank you for always being there for me, for hugging me and believing in me, thank you for your long prayers and for your unconditional love, for your endless support by coming here or on the phone and even when I'm home for holidays, can't believe how lucky I am to have you and Dad standing next to me, sorry for all the troubles I gave you, all the worries, I love you so much, thank you for being my amazing Mom. I wouldn't be here now without you and Dad who through all the changing scenes remained constant and has guided this to a successful completion.

My brothers and sisters and their families: **Rudaina** for her long amazing phone calls, for always believing in me and loving me no matter what, you always stood by my side listened to my crazy thoughts and mood swings, thanks for having me in Canada to see you and your family, thanks for all the advices and all fashion tips, love you loads. **Omaya** for his love and prayers. **Amro** for always being there to tell me how proud he is of me, standing by me. **Hera** for all the love, pictures and gossips from Jordan, **Hashim** for his support, love and funny stories.

Special thanks for my best friends, **Nesreen**, can't thank you enough for standing by me in crazy good times and horrible bad times, those years were a rollercoaster for me and you was always there with me through the ride. Sorry for the long nights and tears, I love you so much.

Abeer thank you very much for being there for me, love you. My Friend **Ghada** who supported me from USA, thank you. **Giounona** for all the late hours at the office writing up and long walks from university to town every day; I'm going to really miss you. My friends from the office: **Iffat, Fraz, Sara, Andrew, Niraj** and my **Omani** friends, thank you all for the talks, lunches and badminton games.

Dr.Shadi for standing by my side all this time can't thank you enough for your support.

I would also like to thank my second families here, **Raghida & Yahya**, **Hariri's** family and Abu **Mahdi's** family, thank you all very much for your love and support.

Thanks to each one of you without your support I would not be the person I am today. Thank you for keeping me going.

Al Hamdulellah, Anoud.

ABSTRACT

The capabilities of an Enterprise Resource Planning (ERP) system to integrate all necessary business functions into a single system with a shared database efficiently and effectively has persuaded organisations to adopt them. Research shows that ERP implementation in both large and small to medium enterprises has been a difficult challenge for organisations throughout the years. Despite the many advantages of ERP systems, there isn't a clear and easy way of implementing them in Small to Medium Enterprises (SMEs). The motivation for the research is to investigate the barriers to ERP software system implementation in an SME using a case study approach, and to identify the steps to overcome these barriers and investigate the claim of ERP vendors that their ERP solutions improve the performance of their customers, the profitability and efficiency of work processes. This research identifies the barriers to ERP implementation in an SME, provides an overview of the traditional and current approaches of ERP implementation and discusses the effects of adopting an ERP system on the company's overall performance. The research uses a mix of methods including case study research and action research. Un-structured interviews and semi structured interviews approaches with negotiation and change management techniques were also used in order to generate knowledge concerning the problems at the case study.

The case study has determined reasons for failed implementations, unlike previous research which suggests education level impact upon the implementation of the ERP system, the study demonstrates that an insufficient education level is not a necessary condition for resistance to change. It has also been shown in this research that high level management can have a direct influence on the ERP implementation in SMEs. This research suggests that SMEs need to standardize processes into business routines which will influence the introduction of a different knowledge store that helps the development of the new system; however employee's resistance to change, lack of trust of the new system and lack of knowledge has limited the implementation process by increasing mistakes and duplication of data. The ERP system has been evaluated by the end users at the case study organisation, and the results suggests that the implementation of an ERP system has improved the overall business and has increased the performance, the profitability and the efficiency of work processes. This research adds to the overall knowledge of ERP implementation in SMEs by deriving a better understanding of the problem in the body of knowledge and identifying the barriers to ERP implementation in SMEs. It provides recommendations that have been tested in the case study organisation for overcoming ERP implementation barriers in SMEs, and a financial model of the implementation costs and benefits. Finally, the recommendations presented in this thesis and suggested areas for further research set out the potential way forward to advance knowledge in this area.

KEY WORDS

SMEs, ERP system, implementation, barriers, process, economic benefits, education

PREFACE

The research behind this thesis was undertaken between 2009 and 2013 in partial fulfilment of the requirements of an Engineering Doctorate (EngD) at the Centre for Innovative and Collaborative Engineering (CICE), Loughborough University. The research programme was supervised by CICE, funded by the Engineering Physical Sciences Research Council and sponsored by JCK Joinery.
The EngD is a four-year, industry based, doctoral programme. Whilst as prestigious as a Philosophy Doctorate (PhD), the EngD has enhanced doctorate features such as: management training, master's level courses, and applied research focus to meeting essential industry demands and high degree of involvement from collaborating organisations. The research presented in this thesis has been split into five chapters:

Chapter 1 gives an overview of the background of the research, aims and objectives, topics overview and what the research design is.
Chapter 2 reviews the related work to the subject of the thesis.
Chapter 3 justifies the research method chosen for this research.
Chapter 4 presents the research undertaken to meet the aims and objectives.
Chapter 5 presents the finding and implications of the research and concludes the research done on the industrial sponsor and describes the impact of the research on SMEs in general.

This thesis is supported by one accepted journal paper and four published conference papers and another submitted (awaiting results) journal paper. As these papers are an essential part of this thesis, they should be read when referenced in conjunction with the thesis as they offer a more in depth perspective on the issues presented. The papers can be found in Appendices A-F. Additional elements of the research undertaken are then added in Appendix G: supporting documents section.

USED ACRONYMS / ABBREVIATIONS

B&G	Bowen & Groves
CM	Contact Management
CRM	Customer Relationship Management
DM	Document Management
DMR	Discrepant Material Return
EQ	Estimating/Quoting Management
ERP	Enterprise resource planning
EngD	Engineering Doctorate
GL	General Ledger
IM	Inventory Management
JM	Job Management
LR	Literature Review
MISC	Miscellaneous
OM	Order Management
PM	Purchasing Management
PU	Perceived usefulness
PEOU	Perceived ease-of-use
Q	Quotes
RMA	Return Material Authorization
SC	Scheduling
SFE	Shop Floor Entry (Data Collection)
SH	Shipping Management
SME	Small to Medium sized Enterprise
SQL	Structured Query Language
TCM	Timecard Management
TAM	Technology Acceptance Model
VB	Visual Basic Script
YTD	Year To Date

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The following papers, included in the appendices, have been produced in partial fulfilment of the award requirements of the Engineering Doctorate during the course of the research.

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Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., "Barriers to Knowledge Management in Small Low Tech Enterprises", Software Quality Management XVIII, Dawson, R., Ross M. and Staples G., Southampton Solent University, Southampton, Software Quality Management XVIII, BCS London, April 2010, pp. 41-52, ISBN: 978-0-9557300-8-5.

PAPER 2 (SEE APPENDIX A)

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., "Knowledge Validation in SMES", Proceedings of KMIS 2010, Filipe, J. & Kacprzyk, J., SciTePress, KMIS 2010, Valencia, Spain, October 2010, pp.354-357, ISBN:978-989-8425-30-0.

PAPER 3 (SEE APPENDIX C)

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., "Knowledge Management, Sharing and ERP Systems in a Small Company", Proceedings of International Conference on Information & Communication Systems, Wail Mardini, Faculty of Computer & Information Technology, Jordan University of Science & Technology, International Conference on Information & Communication Systems, Irbid, Jordan, June 2011, pp.24-27, ISBN:978-1-4507-8208-1.

PAPER 4 (SEE APPENDIX D)

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., “Economic Benefits of an ERP System to a Low Tech SME”, Proceedings of the International Conference on Knowledge Management and Information Sharing, ISBN: 978-989-8565-31, KMIS 2012, Barcelona, Spain.

PAPER 5 (SEE APPENDIX E)

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., “The Economic Benefits of knowledge validation of an ERP System to a Low Tech SME”, International Journal of Information Technology and Business Management, 2013, Vol. 13, PP. 100-107.

PAPER 6 (SEE APPENDIX F)

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., “Identifying and overcoming barriers to implementing ERP in SMEs”. To be submitted.

1 INTRODUCTION

1.1 INTRODUCTION

This chapter provides an introduction to the problem under investigation. It defines the background to the research undertaken, describes the context of the study and presents justification for the research. The industrial sponsor is also introduced followed by the aims and objectives of the project, before introducing the remaining structure of the thesis. A summary is provided for each of the papers that have been published over the four years of the EngD. These papers should be read in conjunction with the discourse.

1.2 BACKGROUND OF RESEARCH

Over the last few years knowledge management has been an issue capturing attention from companies and researchers in order to find a way to transfer and use knowledge effectively within organisations. With increasing competitiveness between organisations it is very important to keep track of information as knowledge resides in many different places such as, databases, knowledge bases, filing cabinets and employee's heads (Singh, Kant 2008). Trying to install a system that will manage knowledge and information is a complex process. Not only the technical issues have to be overcome, but also changing business processes and cultures need to be addressed. Before discussing the issues related to companies and business processes, is it important to define knowledge? How does it differ from information, data and wisdom?
Knowledge in general has been identified as the understanding of unorganized data and turning it into useful information. It has been defined by the Oxford English Dictionary as "expertise, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject, what is known in a particular field or in total; facts and information or awareness or familiarity gained by experience of a fact or situation" (Singh 2008). Another definition of knowledge is described in the Figure 1 below. Data is the basic element or what is called the real facts, information is data, which are transferred into a more meaningful context, Shannon (1948, 1949) defines information as the change of beliefs when presented with these facts and knowledge is the formula gained through experience and study, which relates those items of information. And finally wisdom is how those formulas are applied to work and get results.

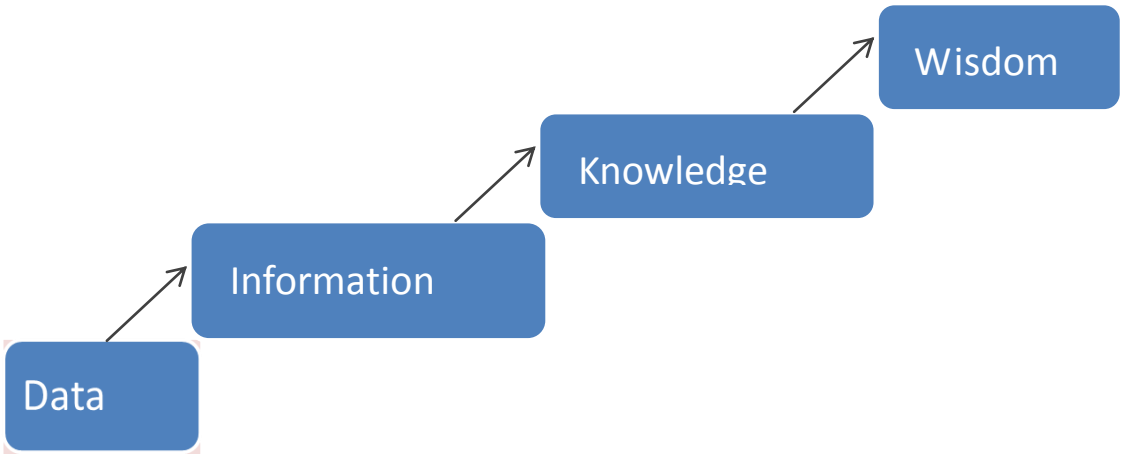


Figure 1: Data, Information, knowledge and wisdom. "The Impact of knowledge management On SMEs" (Rasheed 2005)

It was found that defining data, information and knowledge is difficult, but with collecting, organizing, and summarizing data we get to information (Shannon 1948, 1949), which are an organized set of data and with analysis knowledge is perceived as meaningful information that leads to decision making and when those are applied we get wisdom.
There are two types of knowledge, tacit knowledge and explicit knowledge. Explicit knowledge is what can be captured and shared through information technology, the most common forms of explicit knowledge are written work, knowledge objects, training objects, codes, forums and other types of transferable knowledge. While tacit is the unseen information, like the experience people get from work or training and for it to be useful to others it needs to be transferred into explicit knowledge (Reige 2005). Managing human knowledge and resources is invaluable and shouldn't be wasted as with the help of technology, good management and other means of support this knowledge can be transformed, recorded and shared (Smith 2001) to help with the growth of business, culture, leadership and marketplace. Companies who recognize the importance of transferring knowledge from tacit to explicit enhance their overall performance of work and help with solving problems and achieving goals. A thorough discussion of tacit and explicit knowledge is provided in paper 1, page 3, appendix A.

1.3 THE INDUSTRIAL SPONSOR

JCK Joinery has a history dating back to the 1830s, and was one of the founder members of the Leicestershire branch of the British Woodworking Federation (BWF). Proud to be a British door manufacturing company, JCK Joinery operates from within the East Midlands and supplies nationally and internationally. They continue to command a reputation and drive for high quality doorsets. This can only be achieved by sourcing first rate materials, investing in trained operatives and comprehensive research and development (R&D). One last development is the recycling of timber waste in a completely automated process to produce timber briquettes for domestic fuel.
JCK prides itself to be the first company in the UK to produce timber doorsets with the Secured by Design (SBD) license. SBD Licensees and all security products are Q-mark certified with BM TRADA (Chiltern Dynamics), which covers PAS 23/24, DD171 and BS7950/6375. They also have additional test evidence concerning operational life, acoustic, thermal and fire properties. They supply doors, windows, and joinery components throughout the UK for refurbishment and

new-build projects, including works for housing associations, councils, national and regional construction companies, as well as many individual bespoke orders. The vision of the company: "Our overall vision is to ensure the Company's future by progressing our existing products and developing innovative additions. We will make a range of quality doorsets at realistic prices to satisfy our customer's desires and needs, albeit against a difficult trading environment. We will continually upgrade our doorsets to keep pace with current requirements for security, fire, thermal, sustainable and acoustic performance, whilst also being responsible in our choice of materials and methods to minimise waste and protect the environment." (JCK, 2013)

1.4 PROBLEM OVERVIEW

SMEs have smaller overheads to cover and less staff to communicate which means there is potentially less cost (time, money, labour) involved in changes. SMEs tend to be more flexible than larger organizations. However, organizations not only need to be able to adapt quickly, but also need to obtain stable processes in order to be efficient. Many of these companies rely on extensive use of IT, often by installing general Enterprise Resource Planning (ERP) systems. While modern information systems like ERP/MRP systems provide the stable processes the SME needs, the close management environment in SMEs allows a much easier flow of knowledge and information through the enterprise potentially allowing tighter control over the business procedures. However, the information will generally be held by various specialists and could easily disappear when that person leaves the company. This is especially true when there is only one person in a particular role, which is the case in most SMEs and the company in particular.

The ERP system at the industrial sponsor was purchased years ago after two previous trials but they were not able to customise it. Results from the informal interviews at the company show that:

1. ERP is needed because of the loss of information, as not all of the documents are filed and there is a lot of paper work flowing throughout the organisation, which makes it easy to mislay or lose important documentation;
2. New sales enquiries are not tracked through any system, so when it comes to finding a job employees need to track them manually, which impacts upon their time;
3. Staff retirement or attrition - when employees leave or are off on holiday, it becomes nearly impossible for employees to take over their work as there is no system in place to show what is left to do;
4. When a customer enquires about a new job all the pricing and product details are calculated manually, which takes a long time, especially if it is a big order for hundreds of doors for a new building site; as everything is entered manually into Excel sheets, the risk of information being entered incorrectly increases (no field validation);
5. Accounting problems - if an invoice is lost, this leads to long-term funding problems, which lead to financial risk. See section 4.2.1.1 for details why the manual system failed. Results were published Bani-Hani et al. 2010 a (Appendix a, section 4).

1.5 JUSTIFICATION AND SCOPE OF THE RESEARCH

The justification for this research derives from the need for change at SMEs, as part of their development and growth. They would like to share knowledge quickly and effectively to help

with communication between different departments. The investigation starts with the manual system and then proceeds with trials of general ERP systems to help with the sharing of knowledge process. At the outset the important steps needed to be taken into consideration before the transformation process were unknown.
The nature of an SME provides the flexibility and the ability to customize products at a relatively low cost, but not choosing the right package and finding the right person to do the customisation could lead to a disastrous situation which happened at the industrial sponsor before this project started.

1.6 AIM AND OBJECTIVES

The research aim and objectives were developed to balance the academic purpose of the study while achieving the industrial sponsor's needs. The aim of this research is to apply a structured approach to overcome the implementation barriers of an ERP system at the industrial sponsor's site focusing on how the management of information through ERP can be an effective tool in a SME. In particular how an ERP system can enhance access to information, what training is required for the workforce given their initial skills.
To help with the industrial sponsor business challenges, a set of specific objectives were developed to meet the aim:

1. To critically review literature in the identified area to help by learning from other researchers and to contribute to theory by generalising results from the company, this is explained in detail in chapter 2.
2. To identify, in collaboration with the industrial sponsor's senior management, the problems and barriers to the use of the enterprise resource planning system and the reason why the ERP implementation process failed before.
3. To design and map the business processes to improve information access at the company.
4. To implement the dormant system with the industrial sponsor and improve it with customisation.
5. To justify the implementation of the dormant system.
6. To implement solutions defined during the research period within the industrial sponsor;
7. To evaluate the impact of these solutions on the industrial sponsor and overall industry.
8. To test the research results through publication.

1.7 RESEARCH DESIGN

This research uses action research and consists of several stages, the diagnostic and action planning phase (Concept development stage) that includes the analysis and process mapping of the research, the action taking phase (System building stage) that includes the implementation, customisation, training and testing, and finally, the evaluation and specifying learning phase (System evaluation stage) that includes evaluation from users and the outcome of the implementation process. Details about each stage are discussed in chapter 3 along with the tools used and the findings of each stage are in chapter 5.

1.8 STRUCTURE OF THE THESIS

The Thesis is organised into five chapters, structured as follow:
Chapter 1 describes the background of the research, aim and objectives, problem overview and what the research design is. The chapter also outlines the papers published during the research period and included in the thesis.

Chapter 2 reviews the related work to the subject of the thesis. It starts with the need for ERP in general then in SMEs specifically, followed by the suggested implementation approaches in the literature.
Chapter 3 justifies the research method chosen for this research and what other methods have been suggested.
Chapter 4 presents the research undertaken to meet the aims and objectives. This includes the investigation and analysis of the situation at the industrial sponsor followed by the system customisation process, testing and evaluation.
Chapter 5 presents the finding and implications of the research, and a detailed evaluation from users of the system and describes the impact of the research on SMEs in general, and what the future recommendations are, what research could be derived after this and what the contribution of this research to this knowledge is.
References list of the publications used in the progress of this research and literature.
Appendix A to F contains the list of peer reviewed papers which are the primary outcomes of this research. These papers should be read alongside the thesis, references to the papers are provided where applicable.
Appendix G contains the supporting documents to this thesis, for example questionnaires and analysis reports.

1.9 SUMMARY OF PAPERS

Table 1 summarises six of the publications resulting from this research and included in this thesis. The table contains information regarding the title, status of the paper, and the place of publication of each paper. In addition, a brief description showing how each paper contributed to the fulfilment of the research aims and objectives is provided. Each paper can be identified by the ID.

Table 1: List of Research Papers

ID	Title	Journal / Conference	Status	Description
Paper 1 Appendix A	Barriers to Knowledge Management in Small Low Tech Enterprises	Proceedings of Software Quality Management **conference** XVIII, Dawson, R., Ross M. and Staples G., Southampton Solent University, Southampton, Software Quality Management XVIII, BCS London, April 2010, pp. 41-52, ISBN: 978-0-9557300-8-5.	Published	This paper reviews the literature on knowledge management within SMEs. It then introduces the company and identifies the knowledge management issues within the company and what the expected benefits could be if a KM system was implemented.

Paper 2 Appendix B	Knowledge Validation in SMES	Proceedings of KMIS 2010 **conference**, Filipe, J. & Kacprzyk, J., SciTePress, KMIS 2010, Valencia, Spain, October 2010, pp.354-357, ISBN:978-989-8425-30-0.	Published	This paper describes the difficulties in transferring the tacit and explicit knowledge into the ERP system, the validation of this knowledge and the process of putting all of this together into a knowledge management (KM) system and the challenge due to the barriers of installing a KM in an SME.
Paper 3 Appendix C	Knowledge Management, Sharing and ERP Systems in a Small Company	Proceedings of International **Conference** on Information & Communication Systems, Wail Mardini, Faculty of Computer & Information Technology, Jordan University of Science & Technology, International Conference on Information & Communication Systems, Irbid, Jordan, June 2011, pp.24-27, ISBN: 978-1-4507-8208-1	Published	This paper present a literature review of ERP systems, SMEs, knowledge sharing, followed by a description of the ERP system implementation in the company, what problems were found, focusing on the knowledge sharing issues, brief description of the results and expected outcomes of using this system.
Paper 4 Appendix D	Economic Benefits of an ERP System to a Low Tech SME	Proceedings of the International **Conference** on Knowledge Management and Information Sharing, ISBN: 978-989-8565-31, KMIS 2012, Barcelona, Spain	Published	This paper investigate the claim of ERP vendors that their ERP solutions increase the performance of their customers, increase profitability and efficiency of work processes and discusses what effects the system has had on the company's overall performance, what the benefits up until now are, and where there could be an enhancement to SMEs from the ERP system.
Paper 5 Appendix E	The economic benefits of knowledge validation of ERP system in a Low Tech SME	International **Journal** of Information Technology and Business Management (JITBM), Vol. 17 ISSN: 2304-0777	Published	This Journal paper is an extended version of conference papers No.3 & 4 This paper analyses the main problem of validating knowledge in more detail and identifies the consequences of failing to do this. It also

				describes the potential economic benefits for installing enterprise resource planning system in SMEs.
Paper 6 Appendix F	Case Study: Identifying and overcoming barriers to implementing ERP in SMEs	Awaiting	Submitted to: Journal of Enterprise Information	This Journal paper investigates the barriers to enterprise resource planning software system implementation in small to medium enterprises and identifies the steps to overcoming these barriers as applied in the company, focusing on senior management. It also demonstrates that these barriers have been overcome and tangible benefits have arisen.

1.10 SUMMARY

This chapter has provided a general introduction to the subject domain and justified the need for the research. The structure of the thesis was presented and an outline provided of each of the published papers that are to be read alongside the discourse. Chapter 2 details the background to the research.

2 REVIEW OF RELATED WORK

2.1 INTRODUCTION

This chapter provides a literature review for the proposed company and analyses the proposed methodologies for solving the ERP system implementation problems and limitations. The chapter starts by justifying the need for ERP to SMEs, identifying knowledge, and knowledge management, the need of sharing information between people and what the difference is between large and small enterprises and if the methodologies used for ERP in large enterprises can work with SMEs, followed by the barriers to a successful ERP implementation in SMEs.

2.2 THE NEED FOR SHARING KNOWLEDGE

In knowledge, facilitating the sharing of knowledge between organisation's employees has been attributed to improving competitive advantage (Delahaye, 2005). More purposeful and improved sharing of knowledge will come with increased learning and innovation at the individual, group and organisational levels. This increased learning and innovation will, in return, bring the development of better products and ideas that can be brought to market both more effectively and more efficiently (Delahaye, 2005). It could be argued that regardless of the size of the organisation, increasing the sharing of knowledge through the medium of information will make more relevant information available both within direct communications and through any potential system used by employees. The quality of information across the organisation will be higher and employees will be able to share information without the fear of how it might affect them. Metaxiotis (2009) stated that in today's business the success of an organization depends on how they manage their knowledge. Therefore, different scholars and researchers have found several different steps and tools in order to achieve successful knowledge sharing within the organization. Dieng et al. (1999) suggested that each firm should have their own corporate memory, which will include non-computational, document-based; knowledge based case-based and distributed corporate memory. Dougherty (1999) argues that knowledge sharing can use Information Technology (IT) as an assistance tool.

Ghobadian and Gallear (1997) makes the point that in a small enterprise with a small number of people are usually united together under the same values and thinking, which implies that it is usually easier to create a knowledge sharing environment in a smaller organization than a larger one. Wong (2004) said that in smaller organizations the cultural values and beliefs of the employees can be influenced by the owners. This can be a problem if the owner doesn't trust his employees or doesn't encourage a sharing and transferring knowledge environment. In this case, the owner can obstruct the development of knowledge rather than enhance it. At the industrial sponsor it is reversed, the employees do not trust the owner with transferring the knowledge, and that's due to some serious decisions that were taken earlier that led to business failure.

Failure of the knowledge sharing and validation process, not understanding what is happening with the system and not contributing in the work usually leads to rejection of the system from employees. According to Durikova and Gray (2009) an ERP System must be implemented with care in order to encourage contributors to go for this challenge and provide valuable points to get the desired results from the knowledge management system. They have also noted that contributing to the implementation can enhance employee's perception of knowledge quality and their faith in the system. Without this sharing and validation process, Probst (2000), the ERP system loses its credibility with employees and this is one of the things that happened at the industrial sponsor, where employees no longer believed in the importance of the system.

Within any organisation any investment made must be able to show a return, but it is difficult to measure the success of knowledge sharing. However, it may be possible to determine the barriers that exist within a small to medium organisation. If the barriers towards a knowledge sharing environment can be determined it would have a significant effect upon an organisation, and it could provide an indication of the potential return on investment if they could be overcome. Leknes (2006) found that some of the barriers to knowledge validation and knowledge sharing between different work departments are caused by system unreliability and lack of training as well as information overload and change management, and how this might be solved by following a knowledge sharing communication process between the implementer and the people involved in the system. However, what is unclear from the literature is the value of a knowledge system in a low tech small to medium enterprise (Rasheed, 2005).
Now that it has been established that knowledge sharing is the way forward to communicate within the industry and to overcome the knowledge validation problem, the next step is to define SMEs, the place where this research will be conducted, followed by a comparison between SMEs and larger enterprises.

2.3 SMALL TO MEDIUM ENTERPRISES

This section explores the definition of SMEs, their advantages and disadvantages followed by the difference between them and larger enterprises.
The definition of an SME (small to medium sized enterprise) used by the South West Ventures Fund (NCipher 2012) is a business or company that has fewer than 250 employees or an annual turnover not exceeding £24 million. Small to medium sized enterprises usually have a small numbers of employees between 20-250, and usually in most of the organisations in UK SMEs are companies that have around 50 employees and this has its advantages where it will be much easier to spread knowledge between people (Baxter 2010), however it also has some disadvantages that make it difficult to use knowledge management. Some of the weaknesses of SMEs that have been described by Egbu (2001) are:

- Inability to fund long-term and risky knowledge management programmes.
- Weaknesses in technological competencies, which make use of knowledge hard, as it needs an IT system to spread knowledge easier, faster, and more cost effectively.
- Weakness in giving training and education to employees.

One more weakness that has been identified by Rothwell and Dodgson (1994) that "SMEs have little management experience". And that applies because usually the manager of an SME is the owner of the organisation which makes decision making less formal and less professional. The strengths on the other hand are:

- Its less formal strategies increase the communication of knowledge, speed of decision making and improve informality.
- Less formal communication improves employee commitment and their receptiveness of knowledge management changes.
- Increased ability to react faster to the market changes requirements and knowledge changing to satisfy market needs.

One of the problems employees at SMEs have is being unable to refer to each other's work, if information was transferred effectively from one employee to another through an organized system, then problems would be solved easier, and learning will be in a better place in the organisation. Some of this work is tacit knowledge; knowledge that needs to be transferred from one employee to another and here is where the conversion techniques need to be used.

2.3.1 THE DIFFERENCE BETWEEN LARGE ENTERPRISES AND SMES

It has been discussed that the differences between small and large enterprises, focuses on Management, Structure, Culture, and Human Resources, and it was described that SMEs have fewer layers of management, which means that decision making takes a shorter time than in larger organisations, but at the same time, it means less thinking, less searching and less use of knowledge management strategies. In the following areas:

- Structure; SMEs have an advantage over large enterprises, as they have a less complex structure which makes the ability to change easier and better.
- Culture; SMEs tend to have a more flexible culture than larger organisations. Small number of people with same beliefs and values, which makes it easier for smaller organisations to change and spread knowledge.
- Human resource; SMEs have a problem in attracting highly skilled people, as they tend to go to larger organisations, where they will have higher salaries and bonuses.

The next sections define ERP systems mainly SMEs and their implementation methods focusing on action research and problem solving techniques.

2.4 ERP IMPLEMENTATION METHODS

The body of research related to ERP implementation in SMEs has been increasing rapidly over the last few years; SMEs use knowledge to manage their daily work. It may be explicit and held in documents, an information system, ERP, or tacit and held in employee's minds. When an ERP system is adopted by SMEs, it tends to be simple. Most SMEs consider cost when thinking about an ERP system, and are reluctant to invest after start-up. However, some SMEs take into consideration the changes an ERP system can do for their business, mainly those looking for future development and growth. ERP is a system to manage all information and functions in a company from many departments and data stores, it is very important to use ERP system in a company where information needs to be shared easily, and securely. Research has shown ERP systems are very complicated processes in practice. In theory an ERP has to solve a lot of business problems, and should transfer all of the knowledge in a business environment efficiently into a database where everything can be connected together (Leknes 2006), but it is not that simple, as implementing ERP would lead to changes within the organization there is a possibility that some employees will be made redundant. Haines and Goodhue (2003) stated that the difficulties in transferring this knowledge between the different departments, and actors like employees, and customers have shown an interest in how KM may support ERP system.
Several scholars have proposed different theories about ERP implementation (Sahran 2010, Esteves-Souza et al., 1999, Holland and Davis, 1998, Sarker 2003). A number of approaches were suggested for the implementation of ERP in general (mostly in larger enterprises) like ERP Life-Cycle, Action research, Change Management techniques and different implementation procedures to help with the implementation process. A review of literature reveals that the use of action research and other mixed approaches and techniques in parallel could lead to an easier ERP implementation (Chiasson et al. 2008) as action research solves a certain problem while enhancing theoretical knowledge at the same time. Sahran (2010) used action research cycles to implement ERP in SMEs in Malaysia and discusses the complexities that occur practically. He has broken it down into five steps, starting with diagnosing, action planning, and action taking, evaluating, and specifying learning which was a model by Susman and Evered (1978) that is called the canonical model. It has been validated in Malaysia by Sahran (2010), and has been identified as a successful method for implementing ERP. The success factors for this study were;

the focus on top management commitment, teamwork, effective project management, clear understanding of ERP and its uses and goals, changes in management programme culture, data accuracy, suitability of software and hardware, IT support, educational level of employees, and user involvement; however in the case of lack of management support or any of the mentioned factors above this breaking down of the action research method wouldn't work and would lead to a failure of the implementation process. Chiasson et al. (2008) mentioned in their research that action research can take different forms when it comes to information systems, and focused on the importance of the balance in action research as sometimes it leans more toward the practical side which leads to lack of generalisation of knowledge which doesn't contribute to theory and the other way around can have little practical effect. For this reason it is important when using action research to make a balance between both by putting more attention on the problem and learning specific skills and mixing it with other research activities and approaches in order to produce knowledge to implement information systems in general.
For the purpose of this research action research was mixed with problem solving techniques like change management and also a number of approaches like interviews and semi structured interviews to be able to analyse the problems at the company that's causing the failure of the implementation. Chiasson et al. (2008) also mentioned that the approaches can be used either sequentially, parallel, dominant, multi methodology or in a multi-level way. With action research it was important to verify the changes along with the implementation of the system, so research methods, techniques and approaches were executed at the same time starting with management of change which can help to deal with the problem in a systematic way, both at an organizational and individual level.

2.5 ERP IMPLEMENTATION TECHNIQUES (PROBLEM SOLVING TECHNIQUES)

At some certain stages of a company's life cycle, change becomes mandatory as a way of increasing profit and keeping up to date with technology and competitors in the same field. As customer needs increase with time, it is very important to have consistent data, speed in responding to customers queries and quality assurance system to insure they have the best asked for. Madhumathi (2011) has mentioned in a course given in IIT Madras University that the conditions that facilitate an organization to change, and why it needed and have are described them as follow:

- A dramatic crisis, like recession, loss of money, or breaking down.
- Leadership turnover, change of organisation's leaders.
- Stage of life-cycle, changes to increase profit.
- Age of the organization.
- Size of organization
- Strength of current culture

This list of reasons to make changes to the work environment involves not only learning something new but unlearning as well, as it needs to take off some unwanted selfish attitudes by employees and change them into a useful attitude that will help everyone with sharing their knowledge and benefit work. To be able to change the work environment there must be a motivation to change, something like describing the benefits to employees and how this will help their work get less complicated, or it will be time consuming, depending on the work type.
Most employees don't like change as it might be threatening to their jobs and self-concept, and that usually leads to resistance to change towards anything new, but with the right explanation of

why this is needed and how with training and help everyone will be on board with the work these fears can be minimised, Mumford (1983) suggested that if employees are not part of the change process, the system will not probably meet their needs and the system introduced will not get their satisfaction and it will turn into a disaster, this can cause financial risks, organizational risks and human relation risks too and lead to failure of the change. Hutchinson (1991) suggested that enterprises should try to affect key members in each department, which will lead to a successful transition to ERP helping with negotiating change. Change should be taken as a multistage cycle with all stages planned and negotiated, as forcing change will only lead to problems; change is not only rational management but also emotional management. Trying to affect key members in each department will lead to a very successful transition to anything new and will also help with negotiating the change. There are two types of Resistance to Change, Individual and Organizational, which are both described below:

Individual resistance can be a habit of an individual feeling of insecurity worrying they might have to leave their jobs and a more trained, qualified person takes their place. It may also be a fear of the unknown, not being able to go with the new process of work and also losing the job. Economic factors can also affect the process of change. Other forms of resistance to change described by Hutchinson (1991) are, personal inertia, a form of laziness, inaction when it comes to using the new system for example and also asking a lot of questions trying to prove how change can be harmful to the organisation. Another way or resistance would be by describing all negative aspects of change; 'too expensive', a waste of time, too hard and this will give other employees the fear of change. Some employees do this as a way of expressing their fear of being isolated from their work groups or as an admission of inadequacies, and this is what is called a social mask against resistance. These forms of resistance all lead to one form of resistance, which is to put responsibility elsewhere onto someone else, just as a way of refusing change.

Organizational resistance can be as structural inertia, not wanting to change the process of work to fit into new software for example and asking to change everything to fit into the structure even if it is somehow wrong or hasn't been working properly. Group inertia: as the power groups usually affect individuals, and that's why it is important to find key members of each group and try to focus in convincing them of the change and what benefits it may bring to the organization. Threat to expertise, threat to established power relationships and a threat to established resource allocations are also other types of organisational resistance. All of these factors faced when changing in organizations, need the right solution to overcome resistance to change.

2.5.1 MANAGEMENT OF CHANGE

It is the activities involved in defining the new values and behaviours into the organisation to support overcoming resistance to change, and planning, testing the transiting from one structure to another in each department within the organization. The purpose of management of change (MOC) to verify that changes made to facilities, documentation, personnel, or operations are evaluated and managed to ensure it meets requirements and all risks and problems arising from it are controlled. Some steps for managing change can be through:

- Education and communication
- Participation
- Facilitation and support
- Negotiation
- Manipulation and cooperation.
- Coercion

But before starting to use any of these steps, there are three critical best practices to do identified by SunMicro systems (OGC 2009), and listed as follow:

- Scope: It is very important to select the scope of changes that will affect the change management process, and this should be specified according to the size of the organization, budget, and type of change.
- Project management: Almost all of the change management is about good project management. One very common methodology is the Prince2 methodology (OGC 2009), which cuts the work process into stages that helps identify the work plan.
- Communication: It is very important through the change process to get employees on board with how the change management process works, and what projects will be affected and why is it very important to the organization.

These three practices are very important when starting to change to any new system, as they ensure that every individual in the organization can understand the benefits occurring from this change. In order to get the change right, there must be a sequence in implementing the work, starting with planning, phasing, processes, strategies, monitoring, implementation team, minimum control, review and feedback, action effective, implementation of change, adaptation (dealing with consequence of change), support, training, and resources. Thurley and Wirdenius (1973) have also defined five approaches to change, which are:

- Directive strategies: a very quick approach to change, which means that managers have the authority to apply change with no involvement of other people, which is good in implementing the new system quickly but the disadvantage of it that it doesn't take into consideration users involvement and views and might lead a huge system resistance and failure.
- Expert Strategies: Experts plays a major role in the solution as they implement a quick way of involving a small number of users.
- Negotiation Strategies: this approach says that those affected by the change have the right to say how change would be implemented and what the expected outcomes are.
    - The good thing about this strategy is that individuals can feel involved in the change and would be more supportive.
    - The disadvantage is taking a very long time for the change to take effect.
- Educative Strategies: is the approach that works on changing people's value and beliefs by winning their minds, and take full support, this will be a mixture of training, education, consultation and persuasion, but again the disadvantage of this approach is the time it takes.
- Participative strategies: the approach of this strategy is the full involvement of all participants in every little detail of the process, and this will cause delays, unexpected outcomes, and also longer payments of consultants and experts, but at the same time, change will be supported and individuals will be more committed to success of the system.

These five strategies described by Thurley and Wirdenius (1973) are used independently, testing which one is more effective to change depending on the type of organizations. An information system theory models how a user accepts and uses technology. The model suggests by Davis that when a user has to deal with a new system, a number of factors influence the use of it (Davis 1989):

- Perceived usefulness (PU): "the degree to which a person believes that using a particular system would enhance his or her job performance".
- Perceived ease-of-use (PEOU): "the degree to which a person believes that using a particular system would be free from effort".

The goal of this model is to explain user behaviours toward computing technology and at the same time being able to justify it theoretically. So according to TAM, if users of an information system believes that it could perform to their needs, and have some positive thinking, then they will not resist the change to using the system and are likely accept the system and support it to work. This Model, assumes that if PU and PEOU are working together then this should affect the user's attitude towards change. These models along with some others have been tested in JCK and will be discussed in further details in the methods used for solving problems and overcoming the barriers found.

2.6 BARRIERS TO THE IMPLEMENTATION PROCESS

One of the studies by Bullinger (1997) says that the main barriers to knowledge management are the scarcity of time and lack of awareness about KM, another study by the same author (Bullinger, 1997) has identified three major barriers to implementation namely:

- Scarcity of time.
- Lack of awareness.
- Lack of top management support.

Based on lessons captured from leading organisations, two of the studies (Esteves-Souza et al., 1999, Holland and Davis, 1998) have proposed four:

- Lack of time
- Lack of understanding of KM and its benefits
- Lack of funding
- Lack of senior management support

And five key barriers respectively to KM initiatives (Esteves-Souza et al., 1999):

- Lack of time
- The sharing of one's own knowledge
- An unclear strategy
- Weaknesses of information communication technology support
- Unclear information demand.

Other barriers could be failure to validate the system process and not understanding the contribution the system will add to the SME work, which is why validating information is a must in such small companies to be able to convince employees with the importance the system brings. Other barriers identified in literature and published in this study are summarised in table 2:

Table 2: Barriers in literature

Focus of the study	Research by	Summary of barriers in SMEs
To explore the challenges of ERP system implementation in order to deepen the knowledge on ERP system implementation in SMEs.	Sahran, 2010	• Insufficient educational level. • Lack of internal cooperation and communication. • No Recruitment of IT Staff. • Bad Data quality. • Top management doesn't want to learn from experience. • ERP system over budget.
To explore the critical success factors (CSFs) of enterprise resource planning (ERP) system implementation in small and medium-sized enterprises (SMEs).	Poti et al,, 2011 Hutchinson, 1991 Snider at al., 2008 Thurley and Wirdenius, 1973	• Part time dedication to implementing the ERP system. • Lack of formal Communication. Software modification. • Lack of top management support.
To explore the barriers of enterprise resource planning (ERP) system implementation in small and medium-sized enterprises (SMEs).	Esteves-Souza et al., 1999. Holland and Davis, 1998. Bullinger, 1997.	• Lack of motivation to endorse the system. • Lack of training. • Scarcity of time. • Lack of awareness. • Lack of top management support.

Despite continual attempts to find information on solving problems with ERP systems and SMEs, research as it stands today suffers from many shortcomings as it was hard to find successful implementation stories from the literature.

2.7 SUMMARY

The literature review was undertaken at the beginning of the research and through the different stages as the project was progressing. The initial literature looked at general information like knowledge sharing, ERP systems, SMEs and the relationship between them and resulted in paper 1 (Appendix 1), this helped to understand the project as a whole. The next stage was about identifying problems facing SMEs when implementing ERP projects and what approaches were used to identify these problems. This helped with identifying the gaps in the current approaches to justify the use of the proposed approach at the industrial sponsor. In addition, the literature review looked at change management techniques to develop the most suitable approach as this is a unique case at the industrial sponsor.

This chapter has provided an overview of the relevant research that has been undertaken. The need for implementing ERP in SMEs has been reviewed and also the challenges and barriers that face the successful implementation process. It also provides a knowledge foundation on which to build, making sure that this research adds to knowledge rather than duplicating other work.

3 ADOPTED METHODOLOGY

3.1 INTRODUCTION

"Methodology of a research is the strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice of methods to the desired outcomes" (Crotty 1998).
This chapter outlines the research methods and explains the reasons for choosing the method used. The choice of the research methodology is important as it should support the aims and objectives outlined in the first chapter. The chapter then details the adopted methods, and how they were used in the industrial sponsor.

3.2 RESEARCH METHODOLOGY

Research methods can be classified in various different ways; constructive research, nomothetic and idiographic research methods. However the most common types of research for case studies is idiographic research which is concerned with exploring particular situations and keen to bring researchers to a level of understanding a particular context and accentuating the analysis with day to day activities (Conford 2006). Another two broad streams of research defined by Galliers (1991) is the positivist (also known as scientific or quantitative) which focuses on theories, field and laboratory experiments, and interpretivist approach (sometimes referred to as qualitative or humanistic approach) which focuses on subjective, future and action research. Based on the review of the different approaches, action research was more relevant to the nature of the project as it was important to focus on solving problems at the company while enhancing theoretical knowledge. It was necessary for the author to take an active role in the research as, had she not done so, the research would not have taken place within the timescales of this project. It was therefore selected as the primary research method along with a number of methods used as problem solving techniques to help achieve the understanding of the research and discussed in section 3.6. The objective of this research project done in JCK Joinery requires the use of multiple approaches focusing on action research (qualitative or interpretivist) to enable the researcher to interact with information resources like humans, databases, work processes, and quantitative approach to analyse this data and put it into patterns and more structure form for a better understanding.
Action research methodology as described in words by Benbasat et al. (1987) 'The original intent to conduct research while effecting change'. It was used to achieve the main objective of this research project, where the researcher started their role by taking part in the work processes at the company, the way every single department works and how to solve the problems.
The data collection methods used for this research are explained in section 3.6 and can be summarised as: literature review, interviews, documentation, ERP implementation groups, development tools, experiments (prototypes) and questionnaires.

3.3 METHODOLOGICAL CONSIDERATION

The industrial context had a great impact on choosing the method used for the design of this research. The nature of the company and problems has distinguished this research from other research done on SMEs. The research adopted in this thesis is considered to be practice driven and can use action research approach as it is best suited for case studies along with change management techniques to help users to adopt the change. The features observed in the context of this research project are outlined as:

- **The research topic**: In practice driven research, the research topic is mostly defined by the industrial sponsor and not by the academic research team. In this project, JCK Joinery's contribution was huge when it comes to defining the topic, which was easier exchange of information and sharing knowledge.
- **The end point of the research**: The end point of the research could not be exactly specified and was expected to change during the four years duration of the project as it depends on solving problems in a real organisation and not theory.
- **The nature of the phenomena**: The boundaries of this project were not predefined by the research team or the industrial sponsor but were defined during the project period.
- **The research design**: Unlike other approaches in research, this project included observation and action research. A key method for capturing all the necessary information was through informal interviews of employees from different departments who would be using the system. For this reason the definition of the project and research design were framed during the four years of the research and defined by both the academic team and the industrial sponsor depending on the understanding of the study.

Benefits from action research can be observed clearly since it is applied directly to the industrial sponsor, giving direct results through intervention in problems while re-informing existing theories in the studied area (Jackson, 2001). However action research is different when it comes to generalising the findings as it is usually restricted to a single organisation and in this case to the industrial sponsor.

3.4 ADOPTED METHODOLOGIES

The end point of the EngD project, as set out by the industrial sponsor involved the implementation of an ERP system that will connect different departments of the company together and make knowledge sharing easier. It starts from quotation to shipment of the product and includes stock control, bill of materials and purchasing orders and different types of system development. Action research methodology mixed with a number of problems solving techniques such as change management which was suggested by Chiasson et al. (2008), and adopted in this research The diagnosing stage of the action research was conducted to develop the concept of the study to understand the problems at the company, how they got the system and what the main barriers to implementation are. Research took form of observation and action research.
The adopted research methodology for this research incorporates four main Phases of action research and three different stages of system development including a number of actions and processes, see Table 3.

Table 3: Research Stages actions and processes

Action Research Phase	Stage	Action	Process
Diagnostic Phase Action planning Phase	**Concept development**	Investigation Analysis Design	• Informal Interviews • Formal Interviews • Observation • Documentation • Defining work processes • Working alongside employees • Rebuilding work processes • Developing system requirements • Outlining the aims and objectives
Action taking Phase	**System implementation**	Learning Observing Programming Testing	• Investigate provided system • Learning programming language • Previous system developers • System development • Developing system functionality • Re-organising system data • Module testing • System Testing
Evaluation and Specifying learning Phase	**System Evaluation**	Research evaluation System evaluation	• Evaluate aims and objectives • Evaluate approach and results • Evaluate user acceptance • Determine research contributions • Determine research implications to the industrial sponsor and the wider industry • Evaluate overall solution • JCK Joinery system evaluation

Each stage involved various actions/processes such as: investigation, analysis, design, learning, observation, programming, testing, research, and system evaluation. Table 3 shows a breakdown of the actions and processes involved in each stage of this research. The main outcomes of the first two phases of action research led to developing the **concept** of the study and included:

- Outlining the project's aims and objectives.
- Producing a literature review of the research area (discussed in Chapters 1 and 2).
- Defining and analysing the work process for a full understanding of how to develop the system and defining the limitations of it.

This involved interviews with employees, learning user requirements and through observation and documentation analysis of paper work at the company and following each work process with employees. Members consisted of JCK's manager who was acting as the end customer in the

project, the research engineer, academics from Loughborough University and members of B&G system, which were providers of the ERP system and trainers for the researcher. This was followed by a literature review to get a deeper understanding of the research. Analysis led to the identification of the future steps to be taken to develop the research and project requirements and resulted in the design of the system.

The action taking phase, were the system **implementation** stage started based on the design chosen in the concept development stage, it was important to develop the system as a proof of the concept to demonstrate that the chosen system can be implemented and built to help employees overcome the problems they faced and show them the difference in their work process before and after the ERP implementation. This stage involved learning programming languages and investigating the system provided from B&G and chosen by the industrial sponsor along with Loughborough University. This was followed by observing work processes in the shop floor and learning from employees the functionality of each stage. System building then followed, and since there were previous trials of building the system, the first stage was to re-organise the data previously entered, entering employee's info and changing security settings and removing duplications. Individual units were built tested and integrated to obtain the final system.

The **evaluation** and specifying learning phase, during this stage the system was tested as the employees using it and feedback were collected from both the end users at the industrial sponsor and the change of what the customers of the industrial sponsor received, from more accurate prices, quotes and product details. Comments and errors were taken into account and resolved immediately. The research evaluation of this stage included meeting aims and objectives set at the beginning of the four years research project and determining the research implications for the industrial sponsor and the wider industry. The final stage of this project included training another employee to take over the changes for the market and product changes required in the future and learning from the project to help enhance theoretical knowledge and other companies going through the same projects. This chapter assisted the choice of methodology chosen for the research. The following chapters discuss the work involved and achievements obtained from the System Development and System Evaluation stages along with the challenges faced during the implementation in detail.

3.5 RESEARCH PLAN

To successfully achieve research aims and objectives and reach the different stages in the research, the following figure shows the research sequence during the four years project:

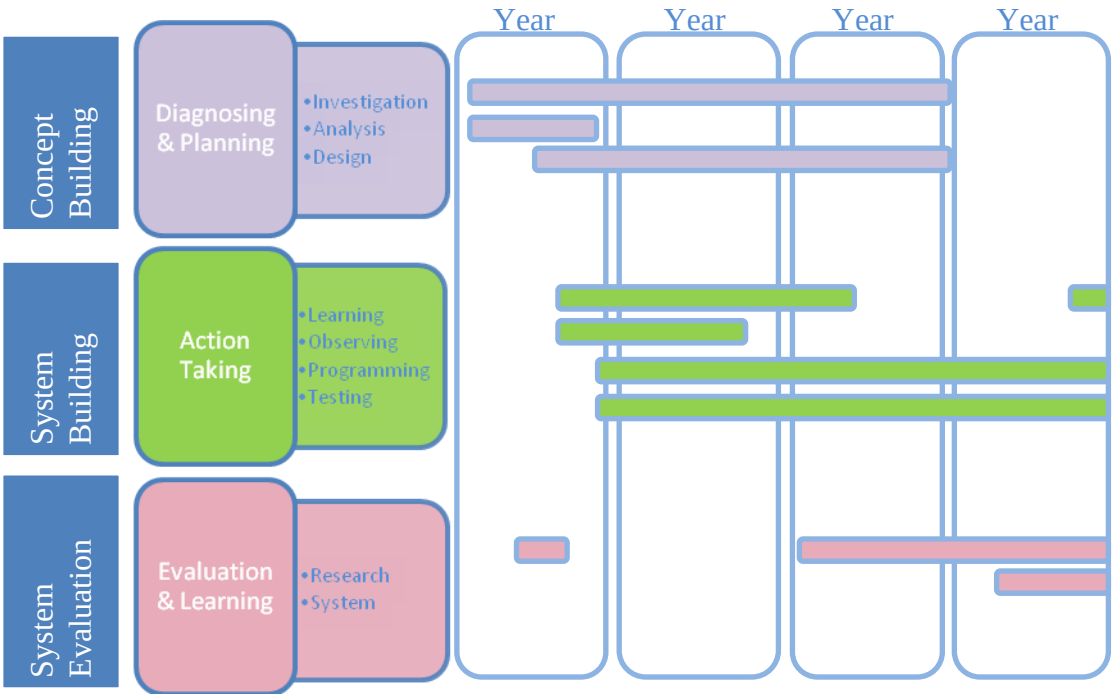


Figure 2: Research Sequence

3.6 METHODS/TOOLS USED

The successful selection of the research methods is a key component of any project; this section presents the overall research methods used for this project and the reasons for using them. The table below gives a summary of the methods used for data collection followed by a brief justification for using them. Further details about the undertaken research will be explained in chapter 4.
Keys: Literature review (LR), Informal Interviews (II), Documentation (D), Questionnaire (Q), Development Tools (DT), Online Groups (OG) and Experiments (EX).

Table 4: Research Road map

Objectives	Work Tasks	Actions/Processes	Methods	Output
Analyse and evaluate existing models and look at new approaches KM, ERP, SME	Review latest expert findings	• Investigate research area • Investigate development use requirements • Produce literature review • Investigate possible solutions	LR	Paper 1
Identify the barriers to the use of the enterprise resource planning	Determine the system information requirements for the implementation	• Learning from documentation and B&G experts. • Reading materials online and taking software programming courses. • Further development of system requirements.	D LR	Paper 4
	Analysis of M1's system modules and processes	• Observation of work in shop floor. • Literature review	II	Paper 3
	Identifying problems and barriers to the implementation	• Literature review • Interviews with employees • Industrial sponsor history	EX DT	Papers 1-6
	Implement the M1 system and create test samples	• Further development of system requirements • Learning programming skills • Prototype creation	EX DT	System
Specify the use of knowledge within the enterprise and the changes required to enhance capturing knowledge	Test Literature suggestions on employees at industrial sponsor.	• Literature review	EX LR	Paper 6
Compare the situation before and after the enterprise resource planning system	Measure system performance and identify potential steps for overcoming the ERP implementation issues	• System experiments • User's comments	EX DT LR II	Paper 6 & Thesis

Evaluate the use of the enterprise resource planning system	Evaluate industrial sponsor users satisfaction with the system	• System Evaluation	II Q	Paper 6 & Thesis
	Critical evaluation of results of the system & measure the system effect on the company and compare it to similar work	• Literature Review • Cost model	LR EX	Paper 4 & Thesis

3.6.1 INFORMAL INTERVIEWS

Interviews in general are an important tool for capturing information between the researchers and employees or participants. Informal interviews are considered as conversations or chats that lead to important information as the research can draw a full analysis of the participant's thoughts without having fixed questions that might make them uncomfortable. The advantages of informal interviews is that the participants feel more relaxed when giving information, non-threatened when it comes to answering questions that is related to their work, they are also much easier to arrange than formal interviews as it was hard to take employees off their daily jobs.
Informal interviews were the key method for capturing information as it made it easier to get participants thoughts about the ERP system and their fears of using it without the influence of other employees and without being worried about others judgement as described by employees at the industrial sponsor. Punch (1998) described informal interviews as a way to understand the complex behaviour of people without invading their space or making them feel uncomfortable, which might limit their answers. Informal interviews provided a deeper understanding of the work processes at the industrial sponsor, which led to a better evaluation of the current situation of the ERP system. The informal interviews continued to be useful throughout all the research period as a foundation of trust was built with employees that led to better cooperation during the implementation process (See section 4.2.1.4 to see how interviews were done).

3.6.2 DOCUMENTATION

More useful information was gathered through company documentation, which was related to the work processes, ERP system manual, and through observation of the work processes on the shop floor, working alongside employees. Reports from employees about each job also helped with analysing shop floor loads, how many hours each type of door takes, who worked on the job (experienced employee or an apprentice), which helped to build a skills matrix for employees, and also helped in clarifying the scheduling approaches they use. B&G, the providers of the ERP system, provided a source of information, in particular the history of the system, training and also an idea of how they deal with other companies working on ERP implementation. This information was used to identify the areas the research should focus on, as it gave a wider understanding of the company's type of work.

3.6.3 ERP IMPLEMENTATION ONLINE GROUPS

Another source of information was through ERP implementation online groups, where different ERP developers ask questions and get answers about certain issues they face. This helped with looking at different solutions suggested by non-research ERP users and developers and also helped with getting different opinions about problems occurring at the industrial sponsor. Wellman (1997) mentioned that one good advantage of online groups is the ability to reach larger groups from different sides of the world where there are answers and ideas that can't be found in research publications, this is easier than trying to group different participants in a face to face meeting to get answers. Other advantages are saving time and cost. In this research, online groups helped to gain a bigger picture of the situation at the industrial sponsor and with getting answers to certain problems faced.

3.6.4 DEVELOPMENT TOOLS

A major part of this research involved developing the ERP system through SQL and VB script and learning how to work on different types of software. M1 System by B&G is software purchased by the industrial sponsor after two previous failed trials of different ready to use software. The decision for purchasing M1 came along with the help of Loughborough University academics after looking at several presentations from different potential ERP developers. A previous KTP researcher was based at the industrial sponsor at that stage and helped to choose the software. M1 is developed for Microsoft SQL Server and runs on Windows, which made it easier to learn, run and maintain for both researcher and participants at industrial sponsor. It also integrates with outlook emails and Microsoft office where employees can import and export to and from Excel sheets, Word documents and PowerPoint graphics. The M1 system was fully customised to the industrial sponsor needs using design studio and Crystal Reports.

3.6.5 EXPERIMENTS

Experiments, testing and prototyping were a number of trials were made in order to let employees try the system they would be getting at the end of the project and to test the system in hand. Experiments helped addressing problems and improving accuracy, it also helped in showing what is supposed to happen with the system to employees which was important to insure that the change is what the (end user) employees need rather than what the researcher thinks. The advantages of the prototyping and experiments conducted was the benefit of exploring ideas from users and exchanging feedbacks which helped with applying the change to the processed mapped into the ERP system, it also gave the employees a sense of involvement which helps with using the system after the implementation process completes. It is important to create a prototype of what employees ask for in order to solve the problems in hand and respond to the types of change during the implementation process (Numann and Jenkins 1982). The process of implementation involved trial and error especially with the development of the configurators for estimation purposes. The only disadvantage found with it was the time it takes to create and test and then implement into the live system.

3.6.6 QUESTIONNAIRE

Questionnaires may be used to gather information from an organization to find the opinions of the staff about certain issues. Questionnaires can be used as an important part of research and as a good tool for collecting data (Oppenheim, 1966). Oppenheim mentioned that when preparing the questionnaire for the research, it was important to decide the aim of the questionnaire and start by reviewing information related to the organisation, designing a sample and selecting the people to

be approached. The questionnaire used in this research was at the end of the project and the aim was to evaluate the use of the system and get the results of user satisfaction of the system and also to find out whether the barriers and problems found were solved at the end of the project. Questionnaire type used in this research was Likert scale as it is used to find people's attitudes and to measure learner's characteristics (Likert 1932, Turner 1993). The questionnaire addresses whether the problems and barriers were overcome and pays particular attention to cover the objectives of the research. The people approached in this questionnaire were the employees at the industrial sponsor. It consisted of 77 questions and it was split into:

1. General questions about the system.
2. Questionnaire about each module.
3. Questionnaire for shop floor employees.

A brief introduction about the research, along with instructions on how to complete it was given at the beginning of each questionnaire. They were assured that all their answers will be treated with confidentiality. Although this type of convenience sampling may not be enough for generalisation (Bryman and Bell 2003), it covers the purpose of this study as it's focused on the company for confidentiality purposes. Questionnaires can be found at the end of the thesis in the supporting documents, Appendix G. The results of the questionnaires have been extremely useful as it helped to find whether barriers and problems at the company were overcome.

3.7 SUMMARY

This Chapter has introduced the different methodologies used and justified the decisions made for using these methods. It started with a research strategy and the methodological consideration for the four years project, followed by a discussion of the specific tasks and processes used. More details of how these methodologies have been used are explained in the next chapter.

4 THE RESEARCH UNDERTAKEN

4.1 INTRODUCTION

This chapter concentrates on the design and development of the four years EngD project undertaken at the industrial sponsor to meet the aims and objectives described in section 1.6 focusing on both the software development and the change management techniques used to approach employees at the industrial sponsor. Technical details will be presented from the programming side of the research alongside the activities made to work with employees. The phases of the research undertaken as described in table 3 of the research methodology chapter are: Diagnostic and action planning phase section 4.2, which included investigating the problems at the industrial sponsor and mapping processes to make it ready for the next phase which is the action taking phase section 4.3, which included the implementation of the ERP system and the actions taken to solve the problems, programming and customisation followed by the testing of the system and finally the system evaluation phase section 4.4, which included the questionnaire and lessons learnt from the project. The key outcomes are outlined at the end of each phase in this chapter and then discussed in findings and implications chapter 5. To avoid repetition, references are made to papers, or other information in the appendices.

4.2 DIAGNOSTIC AND ACTION PLANNING PHASE (CONCEPT DEVELOPMENT STAGE)

This phase was undertaken to explore the situation at the industrial sponsor and other researcher's findings in the same area of this research where applicable and find whether the proposed solutions would be accepted and used for the situation at the industrial sponsor. It includes three main actions, starting by investigating and analysing the literature review and the situation at the company followed by the proposed research design suggested for completing this phase.

4.2.1 INVESTIGATION AND ANALYSIS

At the start of this project, the requirements were defined by both the academic side and the industrial sponsor, but as the researcher was based at the industrial sponsor and after further investigation and the study of the literature, the requirements were refined as follows:

1. The need for justifying why the manual system failed: Define problems at the industrial sponsor, the effects of these problems.
2. Identify the reasons for the failed ERP system implementation; connect these reasons to literature and what expert's findings are.
3. Investigate the ERP system modules; and
4. Develop the process maps.

Investigating these areas at the industrial sponsor was very important to understand the situation and expected outcomes of this research. For this reason literature investigation was the first step for this project to get an overall picture of the information available about this project, which was explained in chapter 1 and chapter 2 and resulted in Paper 1 (Appendix A). Further explanation of each step is explained next after a brief explanation of the situation at the industrial sponsor before using the ERP system.

4.2.1.1 Why the Manual system failed at the industrial sponsor

For many years at the industrial sponsor, employees had been using a paper based system and Excel spread sheets for making orders starting by recording a customer call until shipment of the order. Some orders were large, e.g., for building sites, and others for retail customers making changes to their homes. The process was very basic and employees were coping with the workload entailed, but with an increased customer base, the consequent increase of jobs coming to the company due to changes in marketing, website launching and other technologies made it very hard to keep track of the work without assessing how it would affect the company. Due to the increased level of orders, mistakes began to occur because the lack of a formal system meant that a quote could vary depending on who prepared it. As records of quotes were paper based the customer could receive two quite different quotes for the same item. Other factors were staff turnover and as a result of all this problems occurred and change was necessary.

QUOTE	CUSTOMER	JOB NO.	QUANTITY	COMMENTS	EST HR	SPRAY	DRGS ISSUED DATE	DRGS SIGNED OFF DATE	DRGS LISTED & IN WATERFALL DATE
N/A	JCK TEST DOORS	2813-MISC UN	1 NO. FD30 & 1 NO. FD60	TEST DATE TBA	4			22-Feb	04-Mar
JULY									
Q7671B	SKANSKA - CLAY FARM	2958-JCKccc FF	1 NO. FLUSH CASEMENT CANOPY FIXED WINDOW	THURS 25/7	9.5	2	26-Jun	2-Jul	08-Jul
7295-a	SKANSKA	2909-JCKccc B FF	3 NO. PAIR LOUVRED BIN STORE D/S	THURS 25/7	57	10	21-May		11-Jun
	SARAH ORCHARD - BRIGHTON	2849 REM	1 NO. REPLACEMENT DOOR ONLY	DS FITTING FRI 26/7					18-Jun
7275	ST MODWEN - B'HAM	2845-SPIRIT A FF	12 NO. SBD SOLAR DOORSETS	MON 29TH	123	24	12-Jun	13-Jun	14-Jun
7574	DCB KENT - WESTDENE	2947-JCK PR	20 NO. SBD FD60 INT S/C DOORSETS	MON 29TH			2-Jul	5-Jul	08-Jul
7320	HOWARTH HOMES - MIDDLESEX	2880-JCK A ccc PR	11 NO. SBD A/C FD30 FLAT ENTRANCE	MON 29TH	55	5.5			03-May
7320	HOWARTH HOMES - MIDDLESEX	2880-JCK B ccc PR	16 NO. SBD A/C FD30 FLAT ENTRANCE	MON 29TH	80	8			03-May
q7579	ENFIELD DOORS	2925-JCK PR	25 NO. SBD FD30 OAK VEN INT S/C D/S	TUES 30TH	118.75	8.25	11-Jun	21-Jun	24-Jun
Q7430	JKR SERVICES - SOUNDCRAFT	2924-JCK FF/GZ	1 NO. SALISBURY DOORSET & ARCHITRAVE	TUES 30TH - EMAILED 18/7 ADVISED DEL W/C 29/7	16.25	1.5	6-Jun	12-Jun	12-Jun
Q7643-13	UNIVERSITY OF LEICESTER	2940-JCK PR	1 NO. NFR PRIMED SOLID CORE DOORSET	TUES 30TH - EMAILED 18/7 TO ADVISE DEL W/C 29/7 - CONF OK	5.25	1	1-Jul	8-Jul	10-Jul
Q7576	UNIVERSITY OF LEICESTER	2946-JCK	1 NO. NON-SBD INTERNAL SOLID CORE DOOR	TUES 30TH - EMAILED 18/7 TO ADVISE DEL W/C 29/7 - CONF OK	5.5	0	1-Jul	8-Jul	NLR
Q5809-12	WESTLEIGH - WINDSOR AVE, P'BORO	2819-JCK PR	27 NO. SBD FLAT ENTRANCE	EMAILED 18/7 TO ADVISE DELAY ON DOOR BLANKS - NO PROBLEM WITH	81	9			04-Jun
AUGUST									
Q7602	CRADDOCK CONSTRUCTION	2942-JCK FF/GZ	2 NO. SBD 2XG & 2 NO. SBD HEKALU	EMAILED 18/7 ADVISED DEL W/E 2/8/13 - CONF OK	41.5	16	26-Jun	1-Jul	08-Jul
Q7630	FRIAR LANE	2938-JCK	WINDOWS		64	16			NLR (c/o A McKay)
Q7588	MATTERS - AMHURST PARK	2926-JCK FF/GZ	4 NO. LUKIN D/S WITH STOREY LIGHT	MOVE TO W/C 5/8	80	16	17-Jun	18-Jun	24-Jun
7275	ST MODWEN - B'HAM	2845-SPIRIT B FF	7 NO. SBD SOLAR DOORSETS		71.75	14	13-Jun	13-Jun	14-Jun
	WESTLEIGH - ERSKINE ST	2868-JCK PR	6 NO. SBD FLAT ENT	EMAILED 18/7 TO CHECK STILL REQUIRED BY W/C 12/8	18	2			04-Jun
	CHRIS HINDE		COLLECT DOOR & REPAINT		1	2			NLR
Q7544	PRIME DOORS UK	2929-JCK FF	10 NO. SBD FD30 INT S/C D/S		32.5	10	12-Jun	21-Jun	24-Jun
q7667	GUSTO - CAMBS	2955-JCK FF/GZ	6 NO. SBD JACOB & 2 NO. SBD RILEY		64	11.5	2-Jul	10-Jul	22-Jul

Figure 3: Manual Scheduling on Excel sheet

As employees were saving most of the experience they got like training, customer information all on their personal computers and sometimes in their own heads (Tacit Knowledge) (Nonaka 1994); other employees were finding it really hard to get that information. This was especially true when employees were on holiday or made redundant due to financial strain or when trying to access scheduling sheets (See Figure 3), as documents are not filed there is a lot of paper work flowing throughout the organisation, which makes it easy to mislay or lose important documentation. It was hard to enquire about new sales as they are not tracked through any system, so in order to find a job employees needed to track them manually, which took time. Staff retirement or attrition made it nearly impossible for employees to take over each other's work as there was no system in place to show what was left to do. The lack of information system meant product pricing was calculated manually which takes longer time and increased the risk of

information being entered incorrectly and one major problem that happened at the industrial sponsor was an accounting problem that led to putting the company at a financial risk and causing a long term funding problem.
For this they decided to find a better way of recording information in one place where everyone can reach it and problems can be sorted. One suggested solution was to save all their Excel sheets on one server with unique numbers in folders, but as the file numbers started to exceed thousands, this wasn't an efficient way to do the work, as is clearly shown in Figure 4 the list keeps going and this was only for one of the estimators.

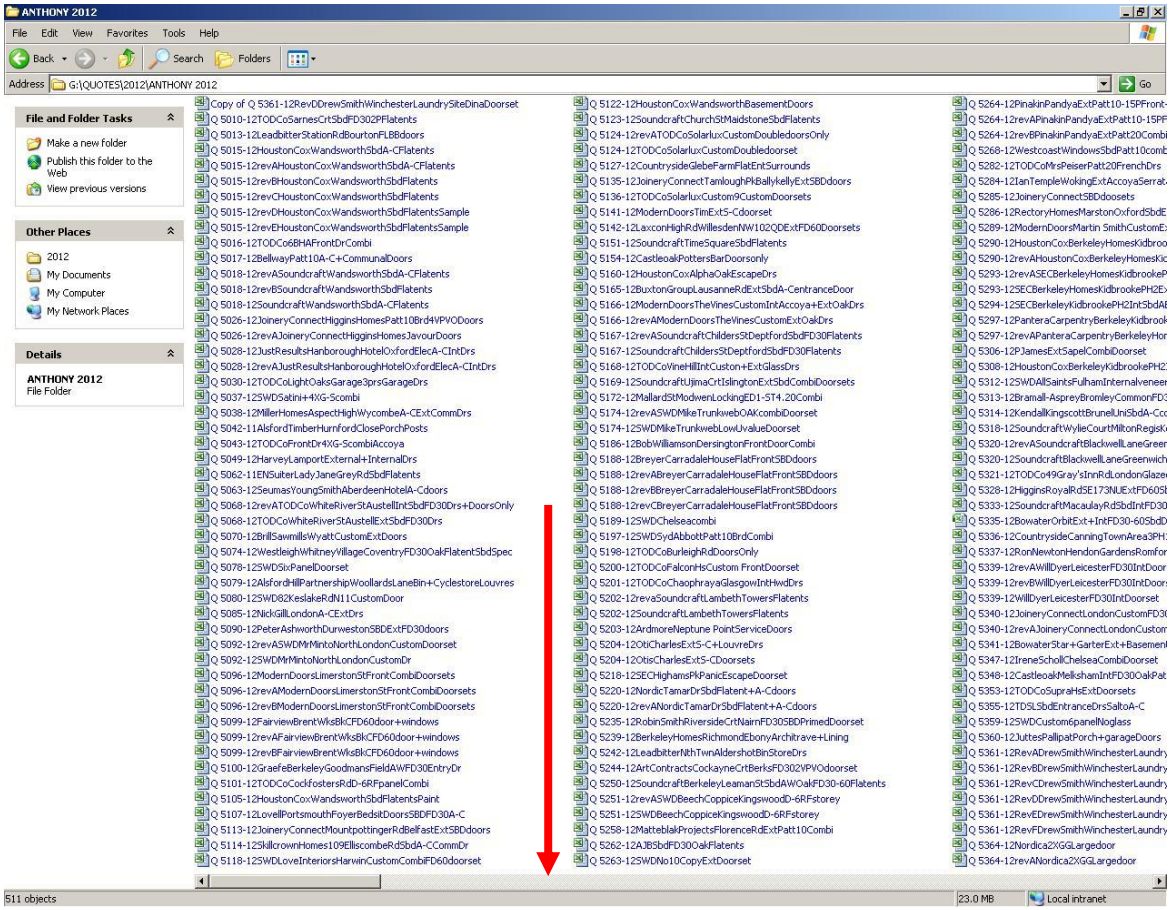


Figure 4: Quotes files done manually (Red arrow shows how long employees can scroll to find files)

Defining these problems did not result in a direct change to the way the industrial sponsor worked. However, they were keen to find a way to solve these problems and help save the company from falling into a financial crisis.

4.2.1.2 Reasons for the failed ERP system implementation

After several attempts by the industrial sponsor to find a solution to their problems and buying two off the shelf software systems that failed to work at the company, due to their rigid looks, inability to be customised and lack of training, they started a KTP project with Loughborough university in 2006 after a deep analysis; this resulted in purchasing the M1 system by B&G which was found as a better solution as it can be customised to the company's needs and can be connected to different types of software (See Figure 5). The KTP researcher based at the company started the implementation and customisation of the project and started by defining the work processes, but failed to convince employees to use the system by complicating processes and not involving them in the process which led to a failed implementation. As a result the

researcher left the company and the ERP system was not used from 2007 until 2009 except for the purchasing module.
When this project was restarted again in 2009 for the EngD research project employees lacked the motivation to endorse the system; they were complaining that they have already tried this system before and due to the financial problems the company had because of the loss of information and accounting problems a number of employees were made redundant which led to increasing the fear for other employees from losing their jobs at the company and fear towards endorsing the system.

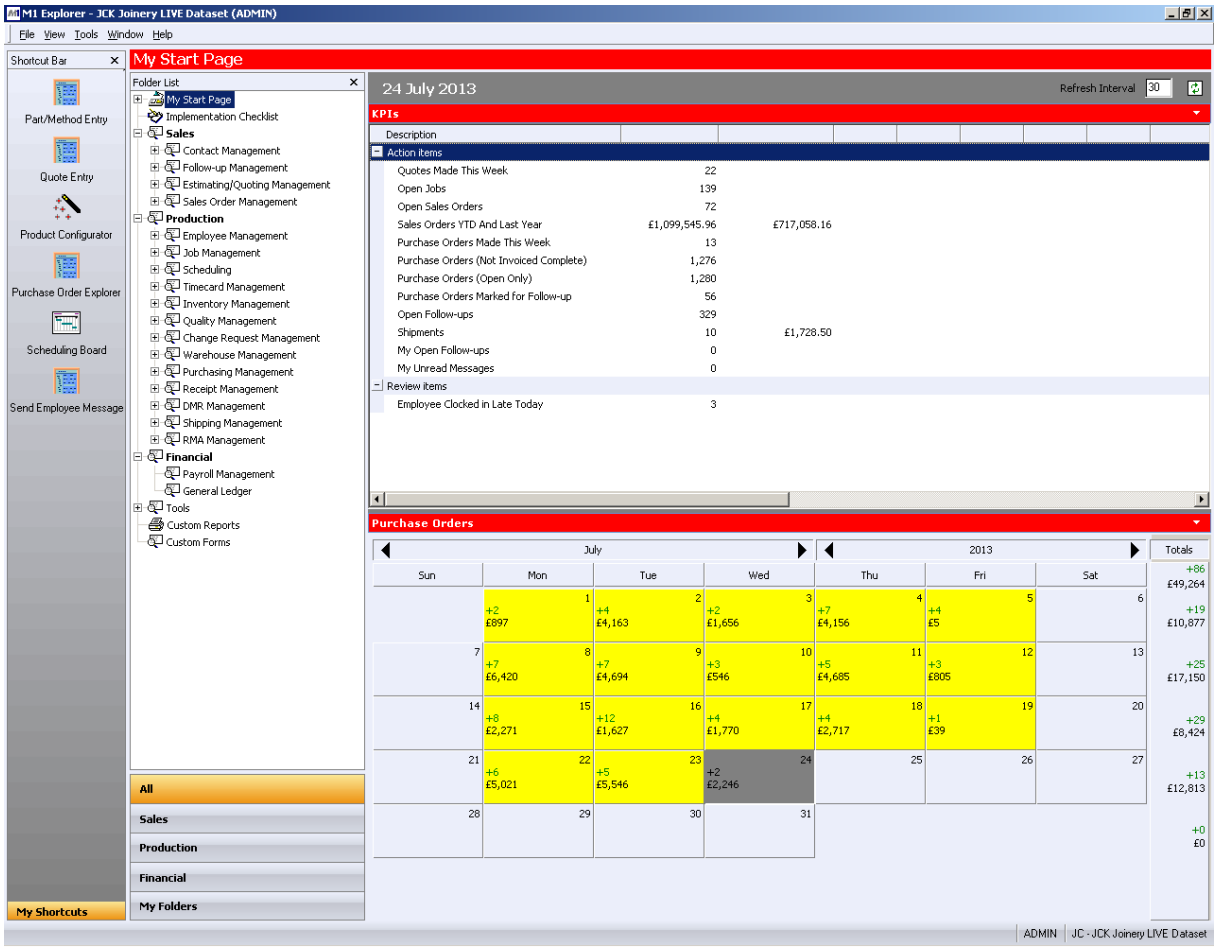


Figure 5: M1 at industrial sponsor

In order to investigate the situation at the industrial sponsor it was important to talk to employees about the change, formal interviews were conducted twice with focus groups from within the company but it was found that employees didn't feel comfortable in a formal interview with their manager sitting in the same room and were more comfortable with informal interviews (See section 3.6.2 for more details about methods used). As the researcher was based at the industrial sponsor it was easy to chat with employees about their fears of the system and why they're reluctant to use it. A number of comments from employees were made, some to do with their fear of losing their jobs if they can't use it and other were suggesting that their education levels can't handle this complicated type of system and due to the lack of training.
Barriers to ERP implementation can be different from one organisation to another, and literature defined a number of barriers to the ERP implementation which can be found in chapter 2.6 and also in Papers 1, 2, 4, 5 and 6 in Appendices. They review the barriers in the literature as insufficient educational level, lack of internal cooperation and communication, no recruitment of

IT staff, bad data quality, senior management doesn't want to learn from experience, language and gender (Sahran 2010), also others (Poti et al,, 2011, Hutchinson, 1991, Snider at al., 2008, Thurley and Wirdenius, 1973) defined barriers as part time dedication to implementing the ERP system, lack of formal communication, software modification, lack of top management support. Esteves-Souza et al. (1999) and Holland and Davis (1998) also mentioned that lack of motivation to endorse the system can be a barrier to implementing the ERP system. A domain analysis was carried out to investigate the existing barriers to the successful implementation at the industrial sponsor, which can be found in paper 6 and summarised as:

- Lack of training due to financial costs and lack of time, as it removes an employee away from their 'day-job'.
- Lack of interest from the Top Management.
- Inadequate project resources.
- Resistance to change.
- Unrealistic expectations.
- Lack of project planning.
- Fear of losing authority/ job insecurity.
- Lack of transaction time and cost during implementation of ERP.
- SMEs are less disciplined when it comes to process definition and improving practices.

It was important to investigate barriers found in literature and as some employees suggested that their education levels could be a reason for them not using the system, the researcher decided to gather all employees CVs at the industrial sponsor and look at their educational levels, See table 5. Barriers of language and gender were not found at the company.

Table 5: Education Level at the Industrial sponsor

Role at the company	Level of Education	Time at the company	Use of the ERP system
Company Director	BSc in Engineering	40 Y	Search for item only
Production Manager	MSc in Engineering and Management	1 Y	Job management
General Manager	Advanced craft Joinery from West Notts College	2 Months	Scheduling and Job management
Purchasing Manager	ONC HNC CIOB	38 Y	Do purchase order.
Sales Manager	Business administration NVQ Level II RSA I & II – Word Processing Core text processing	6 Y	Create all sales order, Glass purchase orders.
Estimator, Marketing	MSc in digital marketing	10 Y	Create quotes.
Estimator	City & Guilds Carpentry & Joinery	7 Y	Creating quotes
Estimator	A Levels	2 Y	Quoting, Sales order, purchases, attachments, scheduling
Administration	NVQ Business Administration Level 3	8 Y	Purchase orders and receipting.
CAD	BSC in Furniture design	5 Y	Search for items only
CAD	N/A	9 Y	Search for items only
Machining Foreman	City and Guilds Carpentry and Joinery (Wood Machining)	10 Y	Time sheets/ Job travellers
Machining Worker (2 employees)	City and Guilds Carpentry and Joinery - NVQ-3	Avg of 9.5 Y	Time sheets/ Job travellers
CNC	None	7 Y	Time sheets/ Job travellers
Assembly Foreman (2 employees)	NVQ-3 Advanced	Avg of 10 Y	Time sheets/ Job travellers
Assembly (5 employees)	City & Guilds Carpentry & Joinery - NVQ-3	Avg of 8.6 Y	Time sheets/ Job travellers
Assembly (2 employees)	Apprentice	Avg of 3 Y	Time sheets/ Job travellers
Spraying (2 employees)	NVQ-2	Avg of 9 Y	Time sheets/ Job travellers

From the above table, it was shown that employees who are involved with office work that requires high knowledge of the ERP system have good educational level and have used computers through their studies. Further discussion of who used the system and what education levels they have will be discussed in section (4.3.1.1).

4.2.1.3 Investigation of the ERP system

The next part of the investigation and analysis phase was the analysis of the system functions through documentation and system analysis to know its capabilities and prepare to the action taking phase, and it was found that M1 essential functions are:

- Maintaining contact details for customers and suppliers.
- Organize work processes from quotes to shipments.
- Scheduling production to efficiently make use of resources.
- Managing production jobs through job costing.
- Controlling inventory of raw materials, finished goods and sub-assemblies.
- Analysing pre- and post-sales activities.
- Ensuring quality and managing warranties.

The purchased modules by the industrial sponsor are summarised in table 6 below (B&G 2013):

Table 6: M1 Modules

Contact Management	Save documents, specific contact details for all customers and suppliers, including email and internet addresses, manage multiple related locations and individual contacts, create tasks and appointments by contact, and view product availability by quantity on hand, in production and on order for a selected part.
Estimating/ Quoting Management	Create quotes for customers, save their details, create different type of doors configurators, configure products easily within a short time of a customer's call or email, view multiple quotes at once, automatically pull orders and create jobs if a quote turns into an order, get accurate up to date prices from recent purchase orders, pull up to date hours from shop floor tracking hours management.
Order Management	Track all details and transactions relating to a specific order; create jobs for make-to-order items, improve on-time delivery performance by managing sales orders, view multiple orders at once to plan production demands more efficiently, automatically create back-orders when partially completed orders are shipped, E-mail order acknowledgments directly to customers.
Job Management	Automatically updates job costs with every job transaction, update raw material demands automatically with each job, compare estimated job costs to the actual costs as the job progress and manage complex production jobs with multi-level bills-of-materials.
Inventory Management	Control raw materials, finished goods and sub-assemblies, ensure accurate stock records through automatic allocations, stock receipts and issues, obtain accurate stock valuations, view future demands on your inventory, track standard, average and last costs for all parts and view the method of manufacturing for any part.
Purchasing Management	Purchase raw materials directly to the job, raise purchase orders for subcontract operations in a job, create manual purchase orders for miscellaneous items such as office supplies and

	services, add unplanned purchases directly to the job, track all outstanding orders, including back-orders, measure and monitor delivery performance of suppliers and manage purchase orders for stock purposes.
Shipping Management	Ship goods to a customer from either a job or an order, ship goods directly from work in progress, print shipping and packing labels when you process a customer's shipment, create shipments for miscellaneous items, add freight charges when you create a shipment, monitor your on-time delivery performance to your customers, report on all shipments due for delivery on a specified date.
Labour Management	Collect and control employees' labour hours, define shifts with start and end times, record critical information relating to each employee, track employees to see who has clocked in, view the jobs currently in operation on the shop floor without physically visiting the factory, verifies accuracy of time cards prior to payroll processing.
Scheduling	Control the shop floor with backwards and forwards scheduling of individual or multiple jobs, view available capacity to overload situations for each work centre or department, reschedule multiple jobs with a single screen, define a work centre by its crew size and number of machines, to provide a detailed Planned Material Requirements report, automatically schedule all assemblies within a job to come together for final assembly.
Quality/ Warranty Management	Enter non-conformances to manage, control and analyse rework and scrap, manage the inspection process, quarantine parts under inspection, ensure recovery of costs on non-conforming material, process return authorizations and claims from customers, create, track, follow-up, verify and sign off on corrective and preventative actions and determine whether a claim is covered under warranty.
System Security	Control user access to company information, view a complete audit trail of changes, view the change type, date, and user, view details of what changed and specify the report and component security.

Having identified the problems and barriers to the implementation by experts and by interview and observation, and having identified the essential functions of the system, the next step was to identify the system design and requirements by mapping the work processes at the industrial sponsor.

4.2.1.4 Develop the process maps

Being based at the industrial sponsor, it was important to gain insight into the operations at the organisation and being able to map the processes as part of the preparation to the system building process. This started by interviewing shop floor employees, which was a key method for capturing all the necessary information from different departments who would be using the system, the researchers could talk to colleagues at work and know how the system would support

their roles, Figure 6 shows the main works process at the company from a customer enquiry to an order shipment.

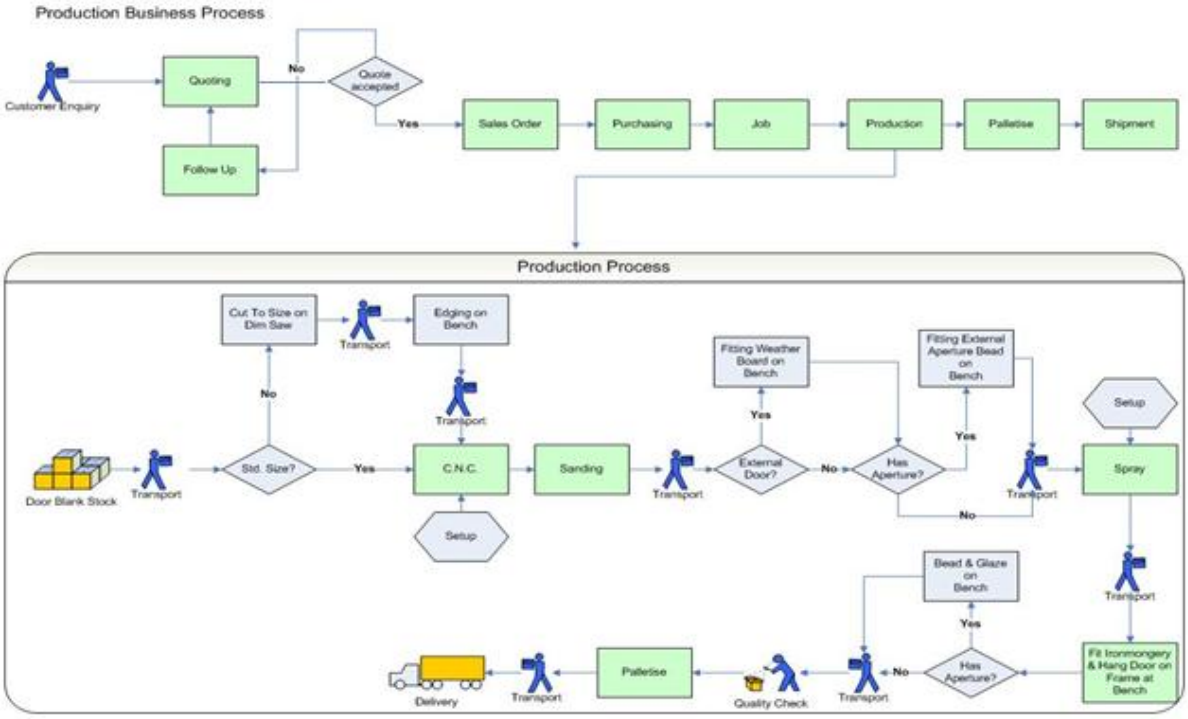


Figure 6: Main Production Process

The interviews were done in stages, first with the 9 office employees. The second and harder stage was with the 19 shop floor employees who only deal with the system for clocking in and out. As it was hard to get information from them, the researcher had to start working around them on a daily basis for over two months to gain their trust and start getting information about their work processes and sequence and what they want, as they would be using the system more often later at the next phase. Some standard processes at the industrial sponsor are:

- Machining Process:
  Each door and frame made at industrial sponsor goes through the machining process, which can be summarised in Figures 7, 8 and 9 below.

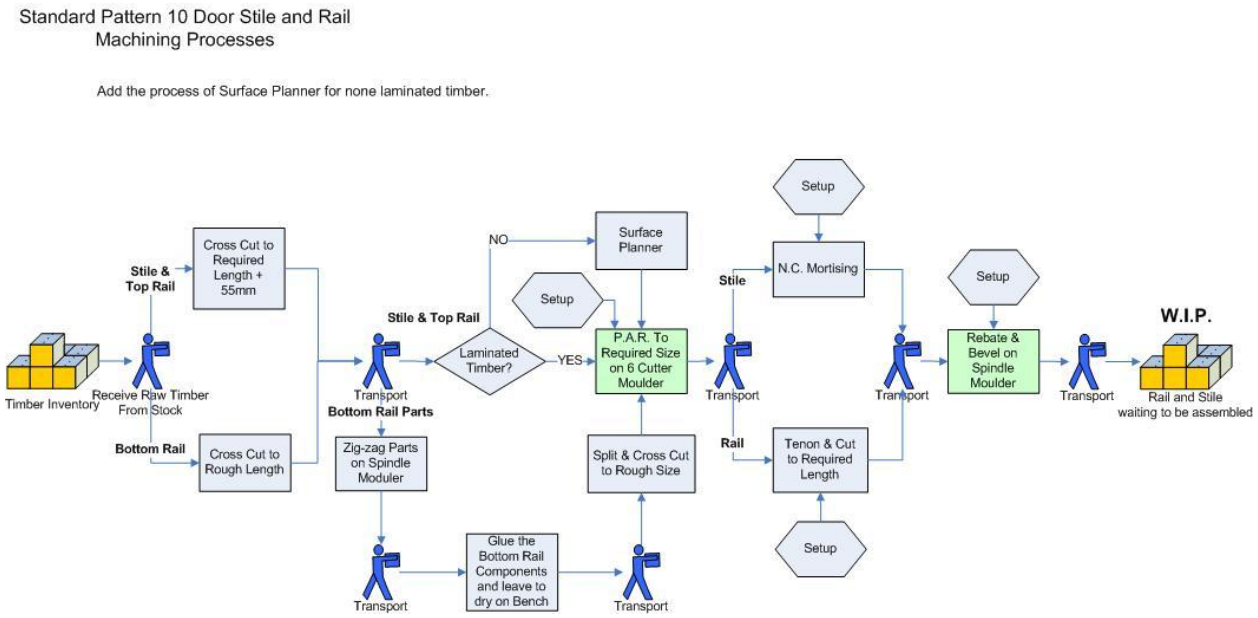


Figure 7: Standard Door Machining Process

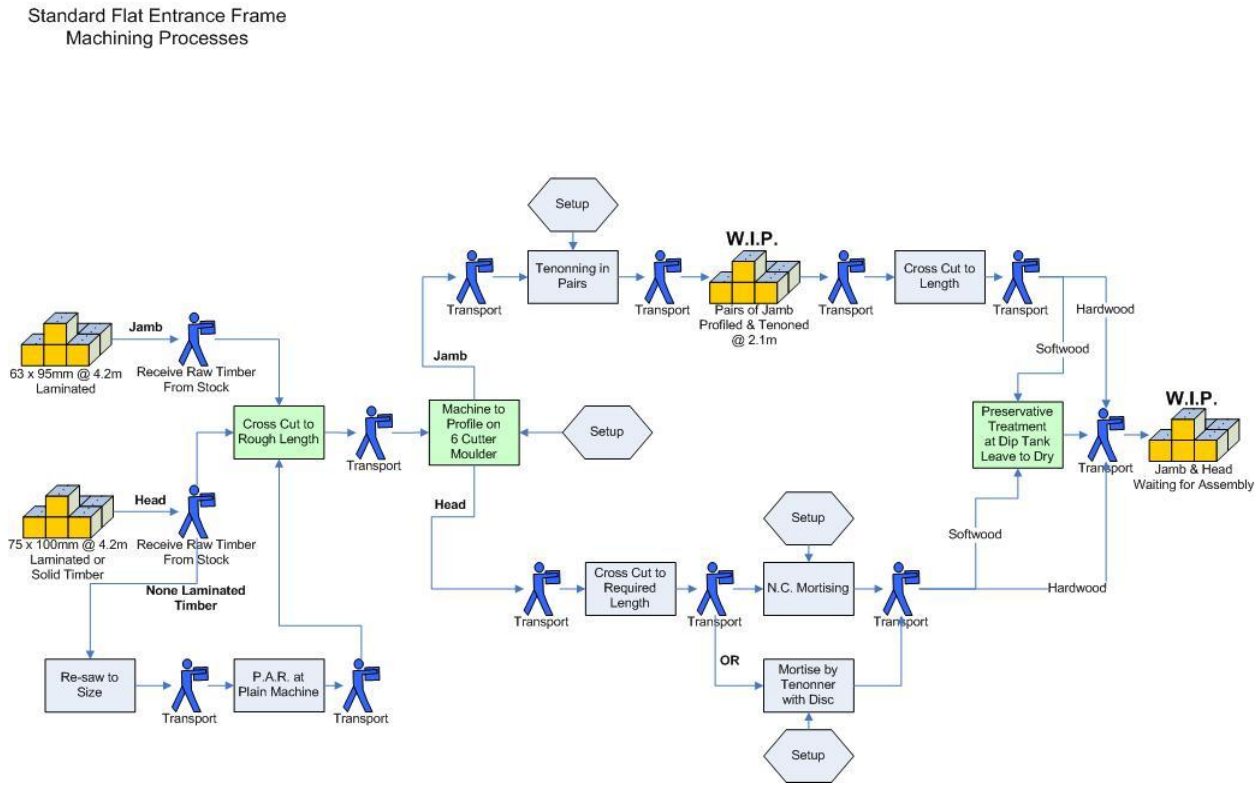


Figure 8: Standard Frame Machining Process

- Assembly Process:
  The assembly process is where shop floor workers fit the door together with all the ironmongery before and after spraying.

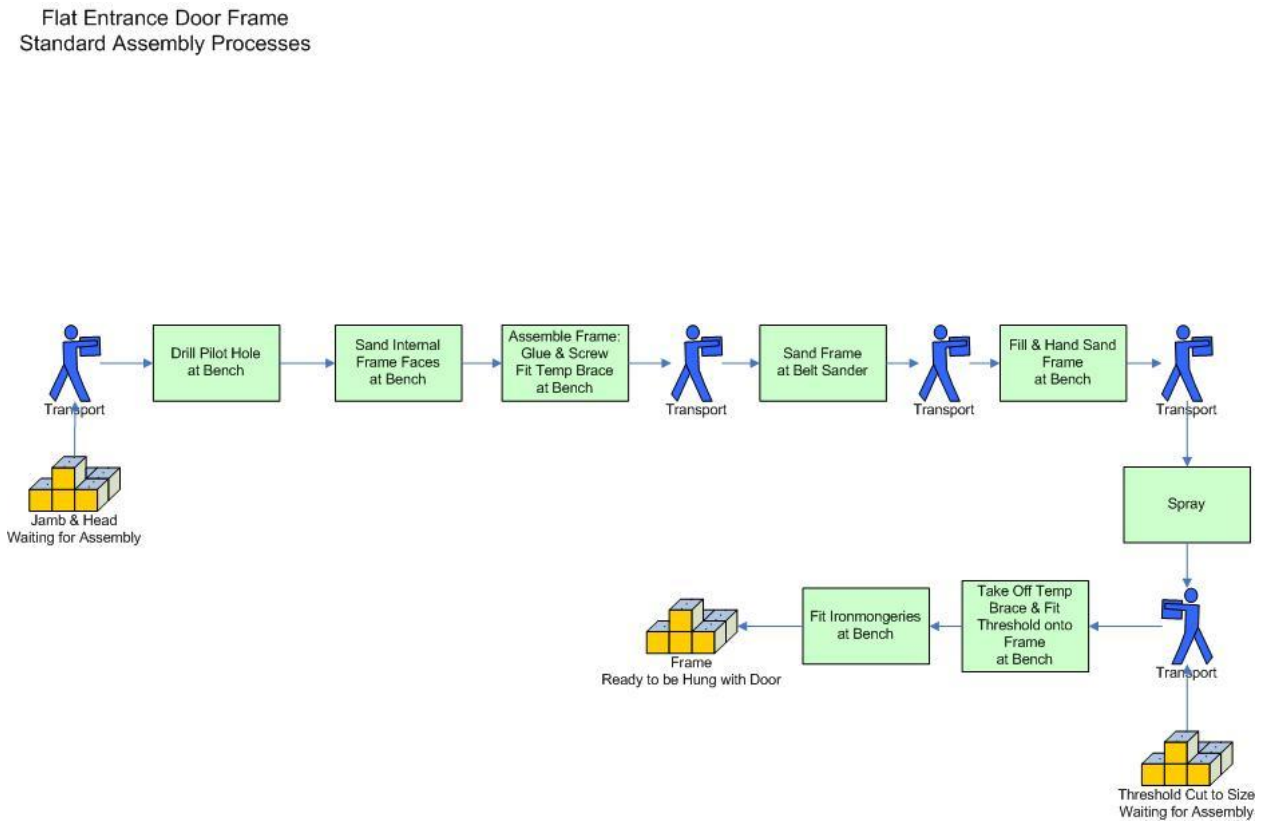


Figure 9: Standard Door Assembly Process

A number of work processes were defined at industrial sponsor, in order to understand how the work goes and be able to understand the system requirements and design. Key outcome of this phase of the research are:

Barriers:

- Lack of interest from the Top Management.
- Unrealistic expectations.
- Lack of project planning.
- Fear of losing authority/ job insecurity.
- Lack of transaction time and cost during implementation of ERP.
- Lack of process mapping – a map should define every activity at the organisation. It should include a step-by-step process for every information flow, but this takes time to develop and it could be argued, needs to be conducted by an outside expert.
- SMEs are less disciplined when it comes to process definition and improving practices, this would lead to big number of customizations that will take the entire project budget.

4.3 ACTION TAKING PHASE (SYSTEM BUILDING STAGE)

This phase was to explore the ERP system in depth and work on customising the system into what the industrial sponsor needed. It included four main actions, starting by Programming and learning new languages through B&G, the company who provided the ERP system, followed by testing and evaluation and a summary of the challenges that faced the industrial sponsor during the building stage. Please note references to research publications are made here to avoid duplication of information.

4.3.1 IMPLEMENTATION/ CUSTOMIZATION (CONFIGURATORS STORY)

This stage started with learning more about the programming language used to develop the M1 system and this was organised with B&G to train the researcher. The plan was to take around 28 full day sessions at the B&G development centre in Mansfield where one of the B&G employee's would explain the basic steps to develop the M1 system, how to access the database, how to write SQL code and how to work with VB script and Crystal reports, but as this training had started before with the previous KTP program not many training sessions were left and the industrial sponsor got a training fund for the researcher to continue the training sessions.

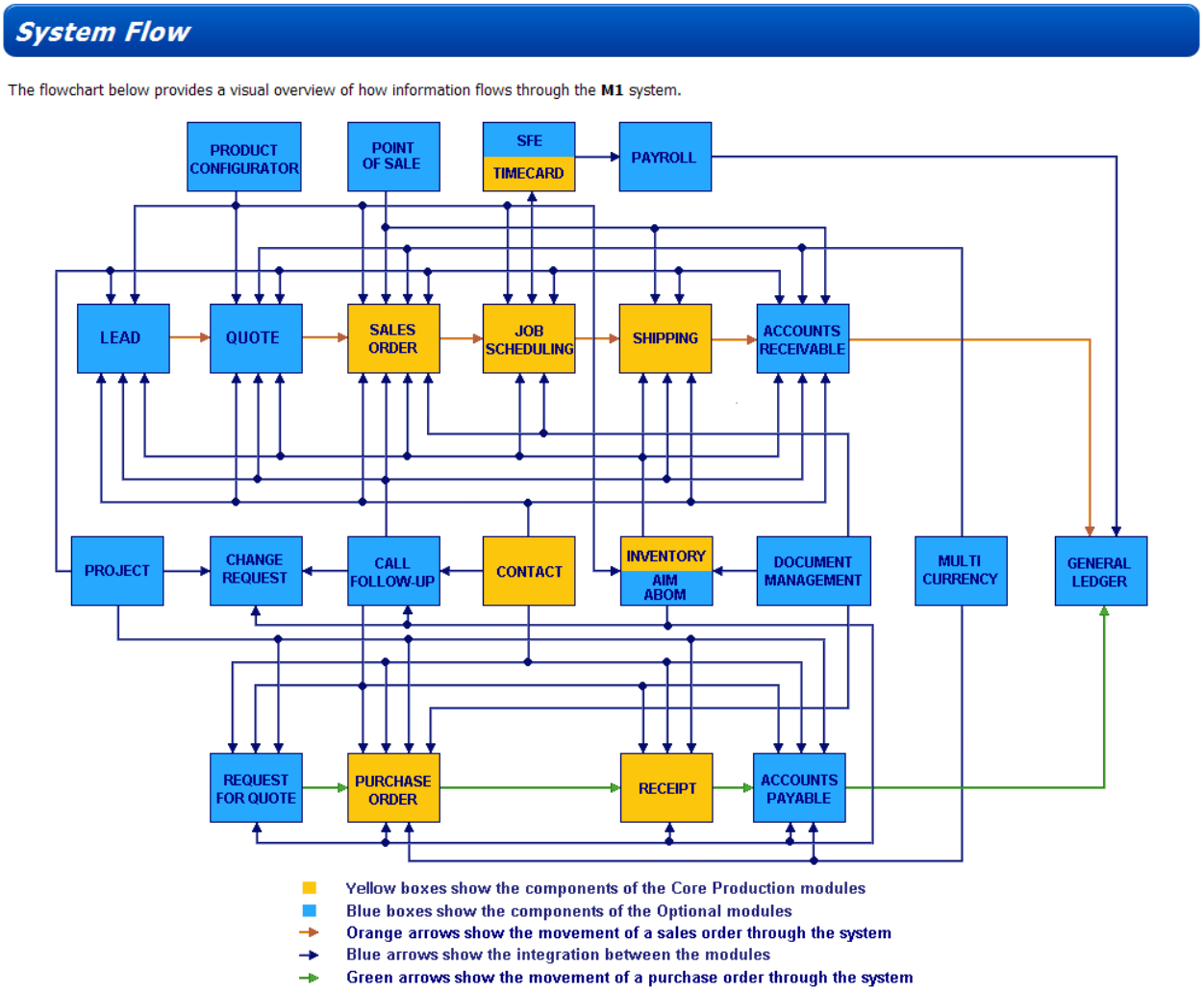


Figure 10: M1 System Flow (B&G 2013)

The ERP system used at industrial sponsor (M1) has the basic information that most SMEs need but it is not bespoke to the company's needs, and for this reason it was important to understand the main modules of the system and choose what's needed and start customising them to the company's needs. As shown in Figure 10 and Table 6 before, M1 has a number of modules but not all were purchased by the industrial sponsor as they already had alternative software that they use and were happy with. The accounting package used was Sage, and a method was needed to feed all information into Sage from M1. See Table 6 for modules that have been purchased for the industrial sponsor.

After several meetings with employees and potential users of the system at the industrial sponsor, requirements for the system were established and phases for programming it were decided. The

start was to look at what was already in the system like parts, general ledger, and employee's information and do some changes, remove duplications and update fields. As the Purchase Management module was the only module being used by employees at the industrial sponsor, it was found that due to the lack of knowledge of using the system and lack of training, that employees did not know how to search for parts or follow a standard approach for adding them, meaning that when employees couldn't find a certain part they would create it, and having been doing this for years, they ended up with more than 9898 parts in the system, this problem needed immediate action and that was by going through all duplications, gather them together and meeting with users, going through all parts and agreeing on a method of searching and adding which led to reducing the number of parts to only the ones used, un-duplicated ones which were 1765 parts only, more information about parts duplication can be found in paper 2 appendix B.

After this stage the implementation of the modules began and the first start was with the Estimating Quoting module where estimators (2 of them) get calls/emails from customers for quotes for certain type of doors. The manual way of quoting a door is by using an Excel sheet, where each estimator has an Excel template sheet and they fill in information accordingly. Customer details, followed by the order details and also the specification sheet of the door, which seems to be fine, but as this template became old and there was no update to material prices, the prices were out of date and the company was either overestimating or underestimating doors but certainly not giving accurate prices (For info about the quotation testing see paper 4 appendix D). Other issues occurring with manual quoting were the copying and pasting of certain types of doors to the template, so there were some specifications that cannot be made together or if made cannot pass the security testing standards. This led to customer dissatisfaction and very many errors in production. For this reason it was important to customise the Estimating Quoting module and create a configurator to create an up to date door with correct customer information.

The first configurator was made on a test database (prototype) and it had all the information a door can need, it pulled up to date prices from the Purchase Management module and the recent customer information saved in the Contact Management module. When introduced to estimators they were afraid to use it and said that not every door gets to have all of this info and it is much easier to use the manual way than using the new configurator. They also found it hard to trust that the system is pulling up to date prices from purchase orders. This configurator contained more than 100 fields to look at, and with scrolling all the way down to fill them, it was difficult and awkward to use. For that it was decided to split this configurator into 2 configurators as a start for the two different ranges they have (JCK Doors and Spirit Doors), trying this didn't differ from the one configurator they had before and same complaints from users were received, for this reason it was decided to split it into 7 different configurators and each one of them would contain configurator revisions where similar doors with same specifications were grouped together and ended up as shown in Table 7:

Table 7: Configurators for Estimation

Configurator	Contains
Spirit Doors	1. Naturella Range 2. Primera Range 3. Vision / Deco Range 4. Eco-Elite Range
Fire Doors	5. SBD Fire Doors 6. Non-SBD Internal Doors 7. Panel Fire Doors
JCK Doors	8. Primary Range 9. Heritage Range 10. Modern Range 11. Traditional Range 12. Innovation Range
Sliding Doors	13. Sliding Folding Doors
Certain Quotes Doors	14. Long term projects configurator
Windows	15. Widows Configurator
Miscellaneous Items	16. Miscellaneous configurator

When splitting the main configurator to the 7 different ones, it was important to look at each different type of door and split them accordingly, this is also reflected on the website of the industrial sponsor as it made it easier to put the same headers for customers so when they call and ask for a quote the estimator will follow the customer's request by the names, for example a customer quote can be: "I need a Pattern 10 door from the Primary range in the JCK doors", see Figure 11. This helped the estimator to reply to the quote quicker while the customer is still on the phone.

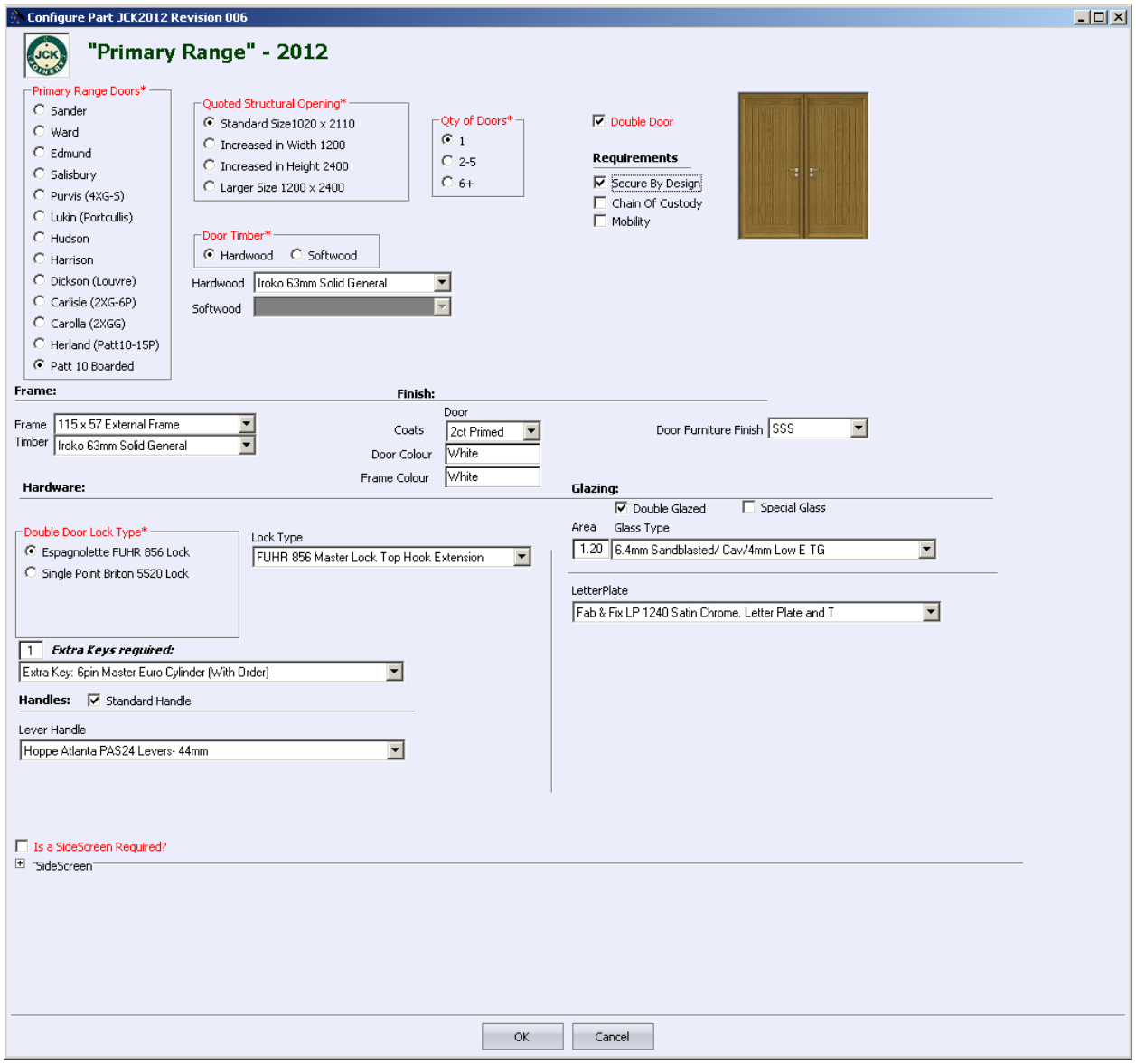


Figure 11: Configurator Sample

4.3.1.1 Programming the configurators

Programming the configurators took over two years of work at the company as it is the main most important function, since information in the Purchase Management module was being used and all the data required was already in. The Estimating Quoting module needed implementation as once the customers place the order, all the information can be automatically pulled from it.

The ERP system consists of two sides, a client side where the employees at the industrial sponsor use it, and server side software where the researcher can develop it using Design studio and SQL, VB script programming languages. Outlook add in software was also developed with the system to send direct emails from M1 to customers either in Word, Excel or PDF format.

The first issue faced while programming the configurators was getting the right information from the estimators, as one of them was at a top management level it was hard to get the time to obtain all the information required and it was difficult to get them to have the time to look at results and test it, which led to delays. This is a common problem at SMEs due to the number of employees and lack of replacements for them, as this takes them away from their day to day work (Snider et al, 2008). The configurator module was built using training sessions and other documents provided by B&G. When the top management provided the information needed for building the

configurators, they provided many different Excel sheets for each type of configurator with certain requirements, and as it is a door building company, the details had to be very accurate with regard to timber quantities not just for the door, but also for frames, and windows, desks, stair cases and it was decided that in some cases instead of putting fixed sizes, there will be 4 different standards depending on the way they had purchased the timber. Then the ironmongery that goes with each type depending on what the customer asks for, this differs from hinges to locks, handles and letter plates, then the type of paint and adding side screens to doors. The next important detail to add after was the rules for what specification can be used to match the certification of each door, like secure by design doors and fire doors.

Interface Design

After making sure that the configurator functionality was working as required by the estimators it was important to work on the layout and make sure that it is consistent through all the other required configurators to make it easier for the estimators to follow. It was also important to work on the layout of the report sent to the customer, the Crystal report. For this reason the estimator took a Crystal report workshop and was able to customise different types of reports which were able to include a number of images of the doors, single and double, and also different types of ironmongery when requested, which was shown on the customer's quote. At every point and after finishing every configurator the estimators asked for a new different one before even using the ones made already, which made it harder to see errors and issues and after making the 16 different configurators the estimators decided to add more functions and prices to it, which was even harder to go back and edit, and it was noticed that the fear of using the system was what was delaying the use of it.

Change

At this stage some change management techniques were needed to help employees not only learning something new but also unlearning, as it is necessary to change unhelpful attitudes of employees into useful attitudes that help sharing knowledge. In order to change the work environment there must be a motivation, which can be accomplished through explaining the benefits to employees. Hutchinson (1991) suggested that enterprises should try to affect key members in each department, which will lead to a successful transition to ERP helping with negotiating change. For this reason, the researcher decided to train a new employee and get them trained to use the ERP system first before trying the manual system. This employee started at the company as a receptionist and held A levels. After a 2 months training period, it was noticed that when another employee asks for help from this employee through the manual system, they find it hard to work on the manual system and found that the number of errors there could lead to losing customers. Talking about the errors and making the same quotes on the ERP system and showing estimators the difference made them notice how easier things can be with no mistakes, especially when it comes to building standards which can affect the credibility of their work. So at that point estimators needed to verify the results of the Estimating Quoting module by testing it on some old quotes, which will be explained in the next testing phase section 4.3.2. After the configurators, it was important to involve other employees in the customisation of the other modules, like the sales orders and job management which feeds back directly to the shop floor employees where they can scan jobs and make it easier to track.

Discussing the work processes at sales order made it necessary to make changes to the default M1 screens to what suits the industrial sponsor. It was noticed that involving employees with the change made them more enthusiastic about using it, especially when they see how fast they can finish every order and how they can track the status of jobs. For example placing a customer order no longer needs to go and find a file, then create another Excel sheet where they need to rewrite the information, create emails of confirmation of orders, with using the ERP, they only need to find the quote sent to the customer through the system by searching for the number or the

customer name or even address and turn it into an order, which will pull all the information of the customer, order, dates, specification sheets and prices. This also creates an automatic job file and alerts CAD of the upcoming order to design.
The next implementation phase was at the shop floor level, where it was important to create Job Tracking sheets with bar codes for employees to scan at every stage. The first step was with creating a detailed job tracker that includes the following processes shown in Table 8 that they use and write jobs and time next to:

Table 8: Work Processes

Process
CNC
Machining
Lari lari
Sanding
Mortising
Assembly
Paint
Final Assembly
Palletising
Shipment

Having too many barcodes to scan at every step made shop floor workers stop using it, as they mentioned that some work takes only a few minutes, which is less than the time it takes to go and scan the bar code from the main machine, for this the solution was to reduce the work processes to only the main ones to track the job, and ended up with the report looking like Figure 12:

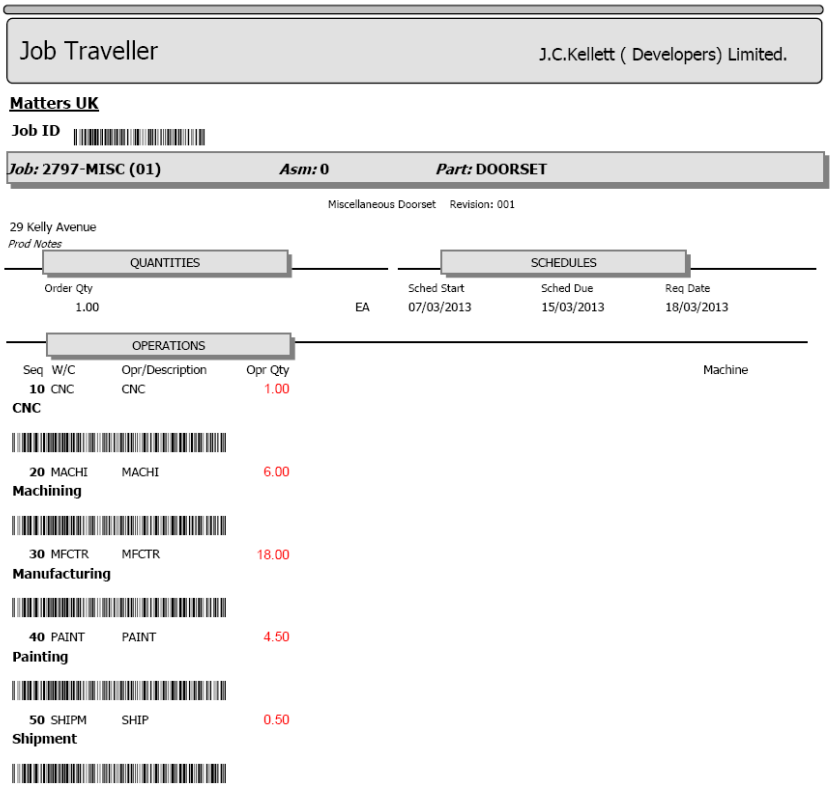
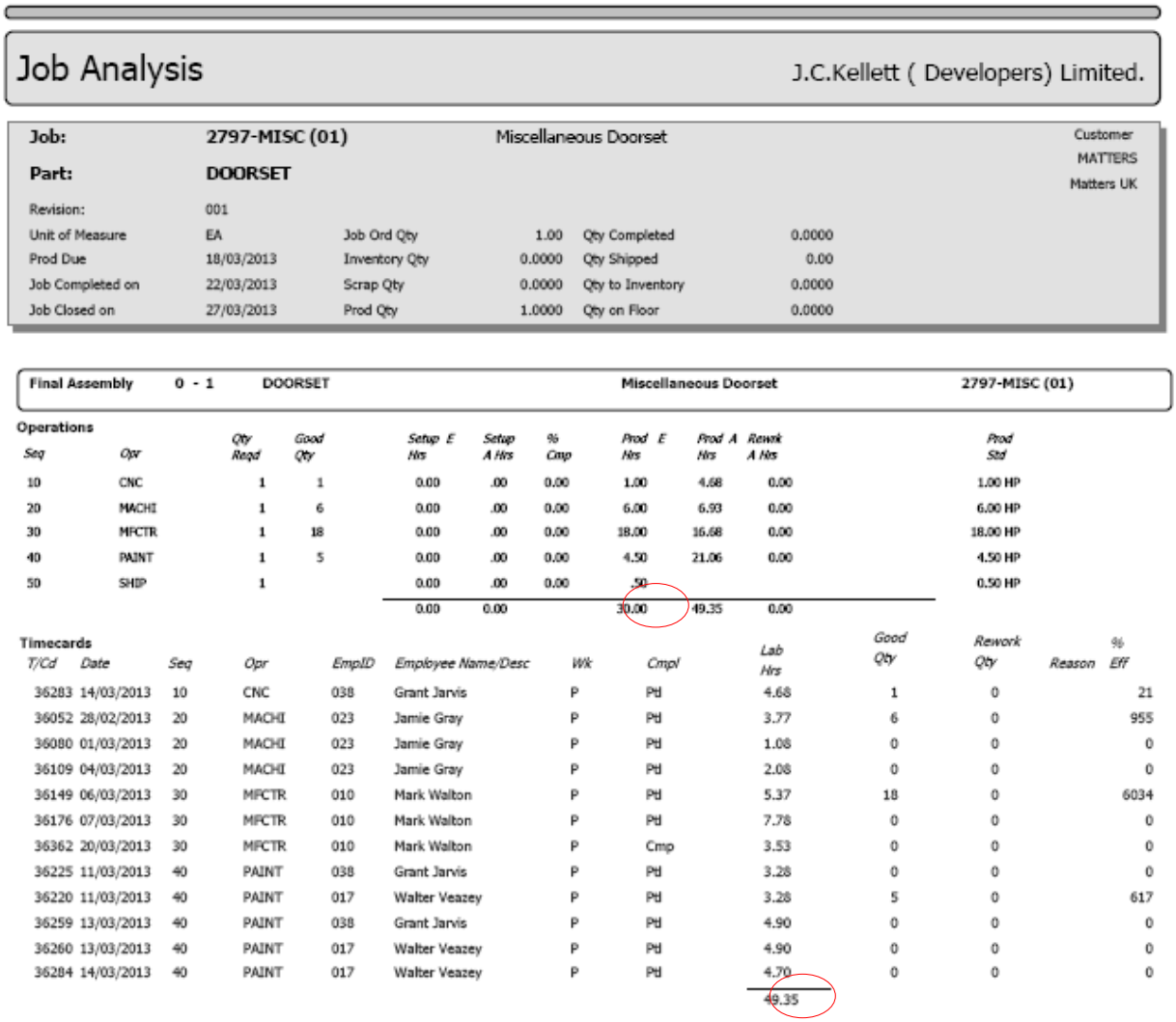


Figure 12: Job Traveller at industrial sponsor

This process took around two months to complete, as shop floor employees weren't convinced with the importance of the tracking, for this reason it was important to explain to them in detail why they need to do this, and tracking one of the jobs and comparing the estimated hours and the actual hours and showing that to them made them realise that estimators do not actually know how long it takes them to do the work, and they're underestimating the hours for customers. Looking at the job analysis report in Figure 13 below, shop floor employees were able to see the difference between the estimated hours and the production actual hours which helped them realise the importance of clocking into the system, this led the production manager to push others to use it to be able to adjust estimated hours accordingly.



Job Analysis — J.C.Kellett (Developers) Limited.

Job:	**2797-MISC (01)**	Miscellaneous Doorset			Customer MATTERS Matters UK
Part:	**DOORSET**				
Revision:	001				
Unit of Measure	EA	Job Ord Qty	1.00	Qty Completed	0.0000
Prod Due	18/03/2013	Inventory Qty	0.0000	Qty Shipped	0.00
Job Completed on	22/03/2013	Scrap Qty	0.0000	Qty to Inventory	0.0000
Job Closed on	27/03/2013	Prod Qty	1.0000	Qty on Floor	0.0000

Final Assembly 0 - 1 DOORSET — Miscellaneous Doorset — 2797-MISC (01)

Operations

Seq	Opr	Qty Reqd	Good Qty	Setup E Hrs	Setup A Hrs	% Cmp	Prod E Hrs	Prod A Hrs	Rework A Hrs	Prod Std
10	CNC	1	1	0.00	.00	0.00	1.00	4.68	0.00	1.00 HP
20	MACHI	1	6	0.00	.00	0.00	6.00	6.93	0.00	6.00 HP
30	MFCTR	1	18	0.00	.00	0.00	18.00	16.68	0.00	18.00 HP
40	PAINT	1	5	0.00	.00	0.00	4.50	21.06	0.00	4.50 HP
50	SHIP	1		0.00	.00	0.00	.50			0.50 HP
				0.00	0.00		30.00	49.35	0.00	

Timecards

T/Cd	Date	Seq	Opr	EmpID	Employee Name/Desc	Wk	Cmpl	Lab Hrs	Good Qty	Rework Qty	Reason	% Eff
36283	14/03/2013	10	CNC	038	Grant Jarvis	P	Ptl	4.68	1	0		21
36052	28/02/2013	20	MACHI	023	Jamie Gray	P	Ptl	3.77	6	0		955
36080	01/03/2013	20	MACHI	023	Jamie Gray	P	Ptl	1.08	0	0		0
36109	04/03/2013	20	MACHI	023	Jamie Gray	P	Ptl	2.08	0	0		0
36149	06/03/2013	30	MFCTR	010	Mark Walton	P	Ptl	5.37	18	0		6034
36176	07/03/2013	30	MFCTR	010	Mark Walton	P	Ptl	7.78	0	0		0
36362	20/03/2013	30	MFCTR	010	Mark Walton	P	Cmp	3.53	0	0		0
36225	11/03/2013	40	PAINT	038	Grant Jarvis	P	Ptl	3.28	0	0		0
36220	11/03/2013	40	PAINT	017	Walter Veazey	P	Ptl	3.28	5	0		617
36259	13/03/2013	40	PAINT	038	Grant Jarvis	P	Ptl	4.90	0	0		0
36260	13/03/2013	40	PAINT	017	Walter Veazey	P	Ptl	4.90	0	0		0
36284	14/03/2013	40	PAINT	017	Walter Veazey	P	Ptl	4.70	0	0		0
								49.35				

Figure 13: Job Analysis report

The programming phase kept going until the end of the project and through the testing phase and will continue as this is a company for bespoke products; a key member at the company was trained how to make changes to screens and add fields when needed.

4.3.2 TESTING

During this stage, the ERP system was tested twice. The first time was during the implementation and customisation of the software by involving users in the process and the second time was after it was run live and employees started using it. The testing phase was different from one module to another and it included running a one year (2011) quotes into the ERP system, it would've been helpful to run the further modules at this stage, but as Sales Orders And Job Management needed live feedback it was hard to run them at the first initial phase and they will be discussed at the live testing phase.

4.3.2.1 Module Testing

At this stage the module testing involved users from different departments trying the screens they will be using and trying to test processes to see how they feel about the interface and the information they get, users complained about having fields they will never use and it will confuse them while running live so they were hidden (not deleted) as it was found after a while that users asked for these fields again under different names. All modules were tested by the end of the project but some of the modules, like the Estimating Quoting and Shop Floor entry modules were the main focus as they feed all the important information to the rest of the modules. The main module that was tested was the **Estimating Quoting module** and the process was as follows:
It was found that in 2011 the estimator sent 645 quotes to customers around UK and Europe, the industrial sponsor has won 266 (39.87%) quotes and lost 379 (60.13%) quotes, after contacting all customers for lost quotes for feedback on the reason they didn't make their order it was found that out of the (60.13%) 2011 lost quotes (31%) from them are lost due to **prices**, (3%) for long **lead times** and (3%) for necessarily changed **specifications**, (20%) due to high **delivery** charges and the other (43%) were lost due to **other** reasons, like customers changing their minds, some for needing a third party to do all the measurements, or for fittings, and sometimes just because they lost a site contract or other reason. Analysing the lost quotes, it was found that in money terms, they had won £1,210,698.84 worth of quotes this year and lost £6,443,682.82 worth of quotes, £1,438,105.66 of them due to inaccurate pricing, which were taken by competitors. Analysing the lost quotes due to prices, and redoing them again through the ERP system, a number of errors were found, but most importantly out of 82 quotes lost due to prices, 56 were estimated with lower prices than those the estimator sent to the customer, 17 were underestimated due to not tracking the price changes, and 9 quotes files were not found or quoted wrongly. A sample of the lost due to prices quote can be found in table 9 below, for the full list of all lost quotes see appendix G, section 1.

Table 9: Lost Quotes due to price

Quote number	Customer	Date	Reason	Details	Manual Price	ERP system Price
Q3079-11	Retail	28/01/2011	Closed Lost Price	The reason we did not use your company was mainly the cost but it did not help that there was such a long lead time. I would like to once again like to thank you for your	£638.00	£459.00

				time and effort. Regards, Jane		
SP3376-11 Laya	Retail	18/05/2011	Closed Lost Price	We have not yet purchased our chosen door, but to be honest found your pricing too high. Regards, Mr G Goodrum	£1,756.00	£1,425.00
Q3049-11	Retail	20/01/2011	Closed Lost Price	-	£3,056.00	£2,722.00
Q2583-10 Grosvenor Waterside Health Club	J A Stott	17/03/2011	Closed Lost Price	Regarding the Grosvenor Health Club we did win that. I have asked the QS responsible, Benn Wilson, to advise you of the latest on that job. Regards, Nick Green		one off Door, bespoke (no info available)
Q2248-10revA Campbell Close	Mansell	26/04/2011	Closed Lost Price	Unfortunately you were unsuccessful with this quotation. The order was placed with Midland Building Products - reason was price. Regards, Aron Jackson	£48,988.00	£28,699.78
Q3767-11	European Doors	19/09/2011	Closed Lost Price	Unfortunately on this occasion your price was not competitive, therefore it wasn't put forward to my client. I will bear you in mind for future opportunities of similar specification. Regards, Steve Fairham	£132,727.00	£121,449.45

Q3715-11 Kilmuir House	Frencon Construction Ltd	22/07/2011	Closed Lost Price	Many thanks for quote, we have put it to our client but they have deemed it too expensive. Regards, John Beglane	£104,794.00	£98,016.60
Q2556-10	Heterarchy	05/01/2011	Closed Lost Price	With regards to your quotation, in the end for our prototype we made it in house. We are still in the process of marketing the product, if and when we start selling them we will come back to you to discuss this further - the quote for the main components was ok, but the costs for the smaller items was too much, so would want to discuss more cost effective ways of sourcing these components. Will be in touch if the need arises. Best Regards, Tony		Wrong Quote, cannot be made as it doesn't match standard certifications.

No patterns were found for the results because of the un-systematic approach the estimators use, and asking the estimator about the results, we found that some of the quotes were raised in price to make a balance in some other lost jobs or mistakes done in jobs, this unsystematic approach has been causing the company a huge loss in both the quotes stage and job stage of the company work process. More information can be found in Paper 4, Appendix D.

The other analysis was at the **Job Management module** and it was made at the live testing phase, to track jobs at shop floor and compare the estimated hours with the real working hours, this test examined 39 jobs, and results were as follows in Table 10. Results shows that 58% of the jobs were underestimated and took longer time when in production, this affects scheduling jobs as it delays jobs and also affects the tracking system.

Table 10: Jobs

39 tracked jobs
14 of them took less than the estimated time
2 were not clocked into
23 were underestimated and took more time on shop floor

It was felt that estimators and top management are somehow disconnected from what is going in other departments in the company and the estimation process use to be done by guessing how many hours a door can take instead of using real life hours, see appendix G section 2 for full details of the estimated hours and actual hours.

4.3.2.2 System Testing

During this stage, it was decided to test the system as a whole combining all different modules together and go through a whole production process from quotes to shipment. Testing the system as a whole has led to great results and satisfaction from employees at the industrial sponsor, as they found it really easy to pull information from the quotes and just read the information to make sure they're all correct, the system fills in customer information, product and materials with prices and taxes, any extra charges without having to go through the process of writing anything again, just emailing the customer the confirmation of order and also the final payment receipts to finalise production.

During the testing phase, a few errors were found in calculations of standard prices, other in the flow of information between different modules, some fields needed adding and some were not pulling prices from one module to another, but as employees reported these errors to the researcher it was fixed quickly and they could see how easily their problems can be sorted, some employees asked for a few changes in layout of reports to standardize what they send to customers and add more fields or remove unnecessary information.

This phase of the research was able to make a comparison between before and after the ERP system, and show a cost model of what the company can gain and lose in terms of money. Key outcomes of this phase of the research are:

- Inadequate project resources and wrong information that are not updated regularly can cause duplications, errors, financial loss.
- Resistance to change can be overcome by focusing on key member of every group.
- Education level is not a barrier to the ERP implementation, as the key member that started the work had A levels and was able to use the system and then learn how to help with the implementation process.
- Lack of knowledge (awareness) about the implementation process, makes the implementation slower and there is only the ERP system to blame, involving employees in the implementation process is very important for overcoming the fear and resistance towards the ERP system.

4.4 EVALUATION AND SPECIFYING LEARNING PHASE (SYSTEM EVALUATION STAGE)

As stated in section 3.4, this phase involved evaluating the system that was implemented during the Action taking phase against the requirements defined in diagnostic and Action planning phase.

4.4.1 RESEARCH EVALUATION

The evaluation of the system implementation was an integral part of this research, as it provides evidence of user's acceptance of the ERP system in the industrial sponsor and techniques to a successful implementation process handling challenges and using change management techniques, details of the findings of this evaluation are in chapter 5 and documented in paper 6, appendix F.

4.4.2 SYSTEM EVALUATION: EMPLOYEES EVALUATION

The employee's evaluation of the system was through a questionnaire where they were asked to assess how well they could use the ERP software, and how well the system matched their needs to finish their work processes. Employees were given full training on the ERP system and were testing the system for over 6 months to see results. This questionnaire was taken as a part of a post study for the research to see the performance of the ERP at the industrial sponsor. The questionnaire took two forms, an overall system evaluation and then an evaluation for each module of the ERP system with specific users. The first part asked employees to give general information about themselves (age, number of working years at industrial sponsor). Then it was followed with questions about their overall satisfaction of the system and then next part about each module they work on. The questions focused on the barriers found at the two different stages of the research project, the diagnostic and analysis stage and the implementation stage. For example questions were to see if they overcame the resistance to change barrier and are actually using the system, which were the first 3 questions of each module questionnaire to see whether they use the ERP system and had stopped using the manual system. Other questions were to see if they can trust the prices and results from the system and send it directly to customers. The questionnaire results are outlined below and discussed in detail in the evaluation findings in chapter 5.

The results found indicated an overall positive feedback of the use of M1. It was felt that the ERP system had the ability to help to ease the work processes and reduce the number of errors. Comments on the overall use of the system were:

- **I think system is good. It would've been nice if created a nice way that easier on eye & have units within to make easier to connect to address been details. (Employee works for 9M at JCK).**
- **M1 is easier to use and wish I could have used it years ago.**

Employees at industrial sponsor were happy about using the system and when they were forced to use the manual system they found it hard to go back to it and found that mistakes there can affect the work. It was felt that using the system made it easier to communicate and share information between employees, they were able to call and give an order number to each other and open it on their screens and talk about it without having to find paper files and go to each other's desks to talk about it. Information was consistent and the system could alert users for missing information and others would fill them to make the file of the customers complete. Comments from the quotation module are discussed below and further details will be discussed in the finding (See section 5.4.1):

- **Although there are still minor problems with M1, such as some of the configurators not be 100% correct or not finished yet, I think once everything is sorted we will eventually eliminate the manual system as M1 is a lot faster and easy to use (employee works for 3Y at JCK).**

- **Would like a 'How to' manual for help when stuck as more likely to refer to that than if I have to ask someone I will just not do it. Basically a 'User Guide' folder (employee works for 7Y at JCK).**
- **As I don't quote or generate purchase/Sales orders, my involvement in M1 hasn't been obsessive. However I can see the benefits (employee works for 10Y at JCK).**

Employees who used the quotation module were able to see the difference when sending the customer's quotes, it was also noticed that regular customers could see the change, their comments were that they like how they get quick replies for their quotes, the layout of the quotes are the same, they can track the information easily, the quotes are consistent and the breakdown of the prices can make them more comfortable when making orders as they do not need to keep calling the estimator asking questions. Other modules were also analysed, like sales orders and purchase management and were discussed in the findings section 5.4, please refer to Appendix G, section 3 for details about the questionnaires. Shop floor employee's questionnaire can also be found there.
The key objective of the evaluation was to find if the barriers found during this research and defined in objective 1, were overcome. It was felt that employees were able to use the system and see the benefits and changes in the work outcome and had more confident when it comes to sending customers enquiries, placing orders and making purchases.

4.5 SUMMARY

This chapter discussed the research undertaken and the different stages it went through to meet the aims and objectives specified in chapter 1. A description of how to involve users in the ERP implementation phases and what to expect from users and top managements was summarised with the example from the company, and how change should be taken as a multistage cycle with all stages planned and negotiated, as forcing change will only lead to problems; change is not only rational management but also emotional management. The key findings of the research, as well as the detailed evaluation are explained in chapter 5.

5 FINDINGS & IMPLICATIONS

5.1 INTRODUCTION

This chapter presents the key research findings of the project. To avoid repetition, the findings of the different stages in chapter four are detailed below. This is followed by the findings from the user evaluation of the system and the economic benefits.

This research aim was set out as **within the context of the industrial sponsor to implement a structured approach to overcome the implementation barriers of an ERP system focusing on how the management of information through ERP can be an effective tool in a SME.** This was achieved by reviewing current literature in the identified area; identifying the problems and barriers to the use of the enterprise resource planning system; designing and mapping the business processes to improve information access at the company; implementing the dormant system with the industrial sponsor; implementing solutions defined during the research period with the industrial sponsor. Based on these solutions being developed, implemented and tested in the industrial sponsor, key research findings are presented in this chapter and the impact of this research on the industrial sponsor and the wider society is also discussed. Recommendations to academics and industry are made before a final review and conclusion of the thesis.

The findings of this research project adds to the academic body of knowledge and shows immediate gains for the industrial sponsor by showing financial improvements and changes to the overall processes and design, most importantly showing immediate results of combining the literature process into a live industrial context.

5.2 DIAGNOSTIC AND ACTION PLANNING PHASE (CONCEPT DEVELOPMENT) FINDGINGS

This phase of the research has explored ERP implementation through examining literature and the situation at the industrial sponsor and found that the **problems** that make it necessary to use ERP systems in SME can be summarised from literature and what was found at the industrial sponsor:

5.2.1 PROBLEMS AT THE INDUSTRIAL SPONSOR

Results from the informal interviews at the company shows that ERP is needed because of the loss of information, as not all of the documents are filed and there is a lot of paper work flowing throughout the organisation, which makes it easy to mislay or lose important documentation; new sales enquiries are not tracked through any system, so when it comes to finding a job employees need to track them manually, which impacts upon their time; staff retirement or attrition - when employees leave or are off on holiday, it becomes nearly impossible for employees to take over their work as there is no system in place to show what is left to do; When a customer enquires about a new job all the pricing and product details are calculated manually, which takes a long time, especially if it is a big order for hundreds of doors for a new building site; As everything is entered manually into Excel sheets, the risk of information being entered incorrectly increases (no field validation); accounting problems - if an invoice is lost, this leads to long-term funding problems, which lead to financial risk. These problems were discovered during the implementation of the project. See section 4.2.1.1 for details why the manual system failed/ Results were published Bani-Hani et al. 2010 a (Appendix a, section 4).

5.2.2 BARRIERS TO ERP IMPLEMENTATION

The barriers found that affected the implementation process at the industrial sponsor started by the lack of interest from the top management, as they were discouraged from using the system after the two previous trials (see section 4.2.1.2 for details) which led to lack of motivation for employees to endorse the new system. Other factors that effected the system implementation were lack of training due to financial costs and lack of time, as it removes an employee away from their 'day-job'.

Lack of process mapping was also an important barrier to the ERP implementation at this phase of the research project – a map should define every activity at the organisation. It should include a step-by-step process for every information flow, but as this takes time to develop, it could be argued that this needs to be conducted by an outside expert; they are less disciplined about process definition and improving practices, this would lead to big number of customizations that will take the entire project budget. Lack of knowledge (awareness) about the implementation process, which makes the implementation slower; inadequate project resources; resistance to change from employees; unrealistic expectations; lack of project planning; fear of losing authority/ job insecurity; and lack of transaction time and cost during implementation of ERP. Results were published Bani-Hani et al. 2010 b. More details about these barriers are explained in the next section 5.3.

5.3 ACTION TAKING PHASE (SYSTEM BUILDING) FINDINGS

This phase of the research was to start implementing the ERP system, by customising the different types of system modules and testing them with employees, it was important to use change management techniques to solve the problems found and convince employees to use it. Results from this phase have shown a number of new barriers to the implementation process and were clustered into four main barriers and they were supported with examples from the company, overcoming the barrier recommendation and reflection on the industrial sponsor. The types of issues addressed have involved implementing different modules for different departments in the industrial sponsor. The results are in Appendix F, Paper 6 (Paper to be published).

Table 11: Barriers of the Action Taking Phase

Barriers	Example from case study	Solutions	Reflection
Process mapping Following a certain communication protocol at the work environment is a key to success; this applies to the ERP system, it is important that employees follow a certain protocol with work processes. Umble et al 2003 mentioned poor planning/ poor management as a main cause for IT system failure in enterprises in general. At the company the problem occurring showed there are no established protocols for processing information which means everyone requests a different set-up, Which was the case when the first student started at the company, they started customisation without changing work processes which led to duplications and errors. *Quote:*	**Controversy (No agreed process)** **When I do a quote and it turns into an order the person in charge keep asking me what I mean with specifications and parts as they were set differently from what I use at the quoting module.** When employee in charge of purchasing glass took leave and another employee took over, conflict occurred. The already customized ERP screens for purchasing were not convenient for the other employee; failing to convince them to work the same way, and asked to do changes.	*Advanced Planning & Scheduling* As many SMEs lack defined and documented processes, it is important to make use of any "best practice" process flows to put into the software application, manuals, help documentation. Unwillingness to re-engineer their processes means success is unlikely. There is a need to ensure that employees understand the importance of mapping processes and are willing to commit to generating documented procedures protocols. (Bani-Hani, 2010), listed a number of barriers to a successful implementation; one barrier was the lack of process mapping. This helps in learning about the processes in different departments, including: Re-engineer business processes. Change controls and standards to	*Quotes:* "I found it hard at the beginning to adjust to the system and change my work processes to fit, but now that I did and with training it is much easier as my screen looks exactly the same as the sales orders one and jobs, purchasing, which means when someone is not around I can go and look at their work and take their place when needed. Plus, other colleagues can simply read my quotes and print outs as they all look similar." Trevor, Estimator.

I can't connect my work at the estimation department with sales and jobs; they look different and do not connect with each other. "Trevor, estimator".		improve efficiency. Monitor business decisions. Define expected outcomes. *Change the processes not the system* Employees at SMEs want the ERP system to be adapted according to their way of working instead of changing work processes to fit into the system. Even though it is slow, change management techniques apply here (Hutchinson, 1991). *Customisation* Customisation of screens was necessary at the company as employees needed more fields added to fit their work, more graphics and hiding unnecessary fields, However, it is important to limit this, and apply the minimum customisation as it is time consuming (Raymond et al., 2006). Involving employees while implementing is crucial; enquiring about the best layout will help them get their work done faster and build their trust and confidence. Change the looks not the processes behind the screen as this may fall under changing processes.	
Resistance to Change Change is necessary for ERP implementation; change in work processes, employee's attitudes and in work habits. Employees prefer to work manually, even when faced with errors and mistakes. As mentioned by (Ondrej and Bjorn 2012) one major reason for ERP customisation failure in SME prior to running live is resistance to change. *Quote:* "We have used the system before and I believe it will not work now, every time I try to make a purchase order on the system I have to go back and redo it on the manual system as it makes more sense to me". Andy, Purchases	**Stocks** One employee refused to use the system, making excuses, asking for more customisations, discouraging others from using it and trying to prove that the ERP system made mistakes. The purchasing and stock manager requested a stock control solution. The system offers a bar code and scanner solution, where the information is fed to the system and prints out a bar code. This bar code is put on the shelf and during taking stock for jobs the shelf is scanned with feedback into the ERP. This solution did not suit him so a book was requested containing all the bar codes in the ERP system, a barcode scanner in his office and after taking stocks he wrote down a list, which was then scanned off the book. This was only done once, and now the book and scanner are shelved.	*Change* Changing employee's attitude toward the system is important. An approach to dealing with change is needed at the implementation stage; it needs to be systematic, both at an organisational and individual level, meaning that new values and behaviours need to be introduced to the organisation to support overcoming resistance to change in each department. *Who's involved?* It is equally important to choose carefully the team members in each department as they would help in negotiating the change. Hutchinson (1991) mentioned that affecting key members in each department is very effective at SMEs. Establish a key user group that has the experience and authority to decide on workflows and processes in each department. Keeping in mind that workflows and processes in one department can have a profound effect on others. Change should be taken as a multistage cycle and all stages must be planned and negotiated.	*Quote:* "I still find it hard to issue materials from the ERP system, but I believe it is more accurate when it comes to stock takes and stock counts at the end of month. The ERP system is time consuming as it used to take days to finish stock counts end of the month, and other employees use to take materials without me knowing, now I get alerts to when order certain materials." Paul, purchases.
Lack of Knowledge Lack of knowledge about ERP System	**Inconsistency** One problem was the inconsistency in quotes due	*Why is an ERP needed?* The strategic goals of using the ERP system.	The sales orders employee was exposed to the system at an early stage but due to lack of training

often causes errors. The greater the knowledge users have about ERP, the more likely they are to address the objections and trust the system Implementation involves validating resources, accurate information and maintaining an up to date database. For the user who has been using tacit knowledge, it is hard to communicate with a system that will give them ready information to send to customers. If employees lack the knowledge of how to use the system and where the information is coming from, it will be difficult to trust the results they get from it, and they become reluctant to use it. Trusting the ERP system and its results aids in exchanging information; distrusting the ERP system leads to other problems *Quote:* "Do not like scanning on & off jobs every 5 mins (Do feel that all money spent on these systems could have been used better things like machine, as I don't see the benefit of it" John, Manufacturing	to different ways of quoting, manual and the ERP system. For example, company "A" asked for a quote for one of their own customers. A manual quote of £2120 was made and sent to company "A" who sent it to their customer "B". Customer "B" called and requested the same product, another estimator using the ERP system made a new quote to the customer "B" of £1837 and sent it to them. Customer "B" accused customer "A" of lying to them and overcharging. Customer "A" requested an explanation. An explanation and apology was written to both customers and discounts were offered. **Duplication** Since the purchase orders are controlled by stock quantities, it is very important that the system knows the materials in stock to give an alert when purchase is required. As data entry into the system was not structured, employees were entering parts into the system as they needed them, and because a part could have different names duplication occurred. Eventually it was found that there were around 2217 parts on the system, 973 parts are actually used, and others were duplicates with different names.	Since SMEs have fewer layers of management the managers do not invest in software analysis (Egbu 2001); even after the customisation process the system is judged unsuitable for the company and fails. The lack of knowledge about the problem itself and the ERP as a whole causes failure. The recognition for the need to change and a structured approach presents a chance of a successful implementation. (McCartan-Quinn and Carson 2003) mentioned that one important success factor of ERP implementation is the support of top management. *Data entry* Companies need to take care of risks like data duplication, Upadhyay (2010), which was very common at the company. This means that a poor system management, lack of knowledge and training can lead to duplicating information, and it was often difficult to determine which version was accurate, a very simple training period at the start can amend this. *Choosing the system* It is important to know about the problem, what kind of ERP system is needed and how much money the company can afford, it is also key to: Think who will use the system, what are their skills? Make the employees aware of the company's needs in advance to facilitate allocation of resources. This way the company will avoid falling into the lack of knowledge trap and have all the problems mentioned before. In the company the management chose the system without designing a clear plan, spent a couple of years implementing it, after failing to use it employees became demotivated.	failed to understand it. A new employee with the same skills trained to understand the work processes of the ERP system found it difficult to return to manual procedures. Exposing this employee to the system made them explain to others how easily they can enter their information and then find it from any company computer. *Quote*: "When I saw others using it, I asked them to train me, and as they know the system and what I exactly need to use it for, I found it easy and it became more of a challenge to me to use and get more training, how come new employees can and I can't!" Laura, sales. "If filters were chosen correctly it is very easy to find information through the system, I wish I knew this earlier" Anthony, Manager. "The feedback we get from the shop floor hours gives a better idea of whether we are achieving the estimated hours or whether there is a need to increase or decrease the hours which make the prices more accurate in the future. It also tell us who is working on each job and gives an idea of each employees skills" John, Manufacturing
Trust Another reason for refusing the ERP system was lack of trust, validation was needed at every stage, but users were not convinced *Quote:* I can't see how these prices are coming from the purchases, and how can they be right, they're very different from the one's I use in my manual quotations, some are higher and some are much lower which would affect my quote to the customers and make them vary, not sure I can verify these prices. "Anthony, Estimator/ Laura, sales.	***More without trying*** A simple example was an extra configurator where material prices would be entered manually and fed to the system to override original price; this was similar to Excel sheets. This configurator is the most used because estimators were having a hard time trusting the prices coming from purchases and inventory. **Lack of trust** The manager wanted to use the system, or at least test it by one of the employees at	*Testing* Test each entire workflow, as the system is implemented, ensuring there are no errors that employees would have to fix afterwards as this will discourage them from using it and inhibit their trust. *Show intermediate results* Employees need to see results to be able to trust the system: While the system is being customised, take some of their work and process it on the system to demonstrate how easy, fast and accurate the ERP system is. They would want to use it if they trust the results.	*Quote:* "Accuracy of the quote made me feel that I can send them with confident, as I can examine detailed quotes with the material prices from recent invoices. I needed to see the change in prices from what I thought prices were, and see the effect of this change on the company, as this didn't only affect the quoting side of the process but also had an effect on other departments as all information were registered on the system" Emma, Estimator.

	the company. In order to do that and be able to send them directly to customers, he increased the labour hours by 6-8 hours at £42 rate to make it cover any wrong prices, which means each door is about £294 more.		

It is important to recognise that some people in the company simply refuse change and tough decisions may be necessary. However after applying these steps it is time to run live, and to add features and functions after the initial goals have been achieved to improve their experience. SMEs are usually different from one another with regard to employees and bespoke products, and it is believed that each one is in a different situation with respect to ERP, but these steps summarise and cover most situations in SMEs as they are taken from literature and case studies along with this research.

5.3.1 BENEFITS

From this phase of the research a number of findings in regards of the benefits of the system were found, Bocij et al. (2006, p605) stated that the benefits of ERP systems are often harder to quantify as they are often intangible, like improving customer services, management of information, internal and external communication in the company. It also supports core business functions and improves product quality. However the quantifiable benefit is the reduction in costs. Lozinsky (1998) stated that operating costs will be reduced leading to increased return on investment. Bendoly and Schoenherr (2005) have also stated that benefits of implementing an ERP would include the elimination of unnecessary processes to improve resource allocation and system wide standardisations. Nevertheless, the inability to fund long-term and risky programmes and weaknesses in technological competencies, make it hard to utilise information and knowledge (Egbu, 2001). Results were published in Bani-Hani et al 2012, Appendix D.
In 2011, 266 (41.2%) quotes with a total value of £1,2m were won, and 379 (58.7%) with a value total of £6.4m lost. A survey of customers showed that out of the 379 lost in 2011:

- (21.6 %) £1,438,105.66, due to overpricing.
- (3%) long lead times.
- (3%) changing specifications.
- (30%) high delivery charges.
- (43%) due to customers changing their minds, some for needing a third party to conduct measurements, or for fittings, and also losing a contract.

Analysing the lost manual quotes due to prices, a number of errors were found. Importantly out of 82 quotes lost, 56 were overestimated and 17 were underestimated due to not tracking the price changes, 9 files were lost. Re-estimating the lost due to price quotes on the ERP system and contacting customer with the new prices, 68% of these customers said they would have accepted these quotes if they got these quote prices. No pattern was found for the results because of the un-systematic manual approach, and it was found that some of the quotes were inflated to recover money lost in other jobs, for example: “I was quoting a customer’s quote and I received a phone call telling me that a door at a customer site started bending meaning we have to remake the door from scratch, for this reason and to make it up for the loss I’ve added around £200 to this quote”, Company estimator. This unsystematic approach has been causing the company losses in both the

quotes and job stages. This indicates that if the ERP system was used they could have won some of the quotes lost due to prices, with a total value of around £1.4m.
Other examples are with big quotes as they are the hardest to do, it takes more time to enter data manually for each product, it takes the estimator from doing all the other quotes for retail customers and also the chance of winning them is very low so it is important to find an easier way to do them. The ERP system has 12 configurators that take each range and analyses them with only the applicable materials. To show the accuracy and efficiency of the system, a quote of around 70 doors was made by both the estimator and the ERP developer. The ERP system finished in 3 hours, manual estimating finished the next day with major differences. Checking both quotes, errors were found in the manual quotes, some leading to impossible specifications.
Another comparison included 20 live quotes. A quote for one door was made with the manual and the ERP system; the manual took around 10-20 minutes whereas the ERP system took 3-5 minutes for the same door, more accurately. This analysis encouraged employees to use the system without having to quote twice but validating the quote before sending it to customers. As mentioned earlier, benefits are often harder to quantify as they are intangible (Bocij 2006); however there are few questions to be asked in order to verify the results of the implementation:

- Has productivity improved after the implementation?
- Do things seem simpler?
- Can the budget and stocks now be controlled adequately?
- Have any of the in house or the customer's production lines been stopped because of material shortage due to changed planning system?
- Are there tangible financial benefits?

By answering these questions, these following benefits were found at the company:

1. Reducing errors.
2. Achieving effective communication between departments.
3. No duplications and better structure.
4. Time-saving, e.g. “What used to take 30 minutes from me now only takes 4-5 minutes max”, and through some analysis for a week of work it was found that with the old system an estimator was able to do up to 25 quote lines a week, but with the ERP system an estimator can do up to 122 quote lines a week, a massive difference with more accurate and up-to-date prices.

The implementation at the company has developed well and despite the problems faced, the system is working, employees at the company are using it and information is being transferred effectively.

5.4 EVALUATION AND SPECIFYING LEARNING STAGE (SYSTEM EVALUATION) FINDINGS

This section provides an overview of the ERP system implementation evaluation study conducted at the industrial sponsor. The study consisted of questionnaires and informal interviews with employees at the company which was a pre-study to implementing the system which was at the beginning of the research and led to the understanding of all the problems and barriers employees suffered from prior to implementing the ERP and was discussed earlier in the concept development findings (See section 5.2).

5.4.1 EVALUATION FROM USERS

After four years of implementation and using the system and overcoming most of the barriers some positive responses from the post research questionnaire indicated that:

- The ERP system (M1) is preferable to using the Old manual system (100%), yet still (37%) of employees at industrial sponsor still use the manual system for some processes.
- The ERP system (M1) is simple to use (88%).
- The ERP system (M1) clock in system is much easier than writing down times and more accurate (100%).
- The ERP system is similar to the process we have defined at the beginning of the research which makes it easy to follow the track of work (83%).
- It is easier to send accurate quotes to customers through M1 as the ERP system is more trustable than the old way of quoting (75%).
- The task of finding information on the system is easy and gives accurate prices (75%) (50%).
- The ERP system (M1) fits the jobs based on the hours already planned in the system without having to work it all out manually (100%).
- The more complex the configurator the more liable malfunctions. It is better to have more configurators that are reliable instead of having one complicated one (100%).
- The number of configurators for the door is justifiable as it is a bespoke company; the variety covers all options (100%).

Although most feedback was positive, there was a number of neutral answers among the questionnaire, some were employees do not use this area or were they still don't have the confidence of using this part of the module as it is been recently implemented. Some participants were not pleased with using the system and thinks it is a waste of money and that this money could have been implemented in buying new manufacturing machines. Others complained about being far from the machines and having to walk all the way there to clock in for a job is a waste of time and this needs to be sorted. Some good comments and feedback was asking for a better looking system, easier on the eye & have units clearer, others needed more training especially on using computer in general rather than just the ERP system.

Comments: From the comments section in the questionnaire, employees expressed general satisfaction with the ERP system with such comments as:

"It is good but difficult in the spray department as we are usually doing multiple jobs at once".

"M1 is faster and easy to use".

"The M1 traveller is the same as a time sheet, which will give nearer true time on jobs".

"M1 is the way forward but I need more training on how it works so I can understand it more. (I need more training on all areas of the computer)".

"If filters were chosen correctly it's very easy to find information through M1".

"I still use the manual system sometimes for reference of certain parts not on M1".

"The prices on M1 can be historic sometimes if no purchase order were raised for a while so need to be careful when doing that".

"The feedback we get from the shop floor hours gives a better idea of whether we are achieving the estimated hours or whether there is a need to increase or decrease the hours which make the prices more accurate in the future".

"Labour hours are critical, also the understanding of why jobs take longer than estimated, e.g. lack of tooling".

The overall feedback from employees at the industrial sponsor shows that they're currently using the system after refusing to use it or test it at certain stages of the research. It was felt from employees that the ERP system had a good impact on their daily work processes, it is faster, and it gives more accurate prices and more accurate information about the products.

5.5 CONTRIBUTION TO KNOWLEDGE

Despite the ongoing attempts at finding a solution for ERP implementation failure, the research into ERP implementation in low tech SMEs today suffers from many shortcomings. It is important to take a step by step deep investigation of the implementation process. The researcher has contributed to overall ERP knowledge by publishing the findings of this research in academic research and by meeting the objectives as discussed in section 5.10. This research will add to the body of knowledge available by addressing the shortcomings:

- A more substantial list of barriers for ERP implementation in Low tech SMEs has been identified.
- Experiments have identified the reason for failed implementations, managed to change the idea of how a lack of education can lead to failed implementation and shown how resistance to change can lead to it. This provides valuable feedback into the validity of previous suggested barriers.
- It was shown that SMEs suffers from subtle resistance (We want this but not really want it) especially by top management resisting using ERP systems.
- The ERP system has been implemented, and tested, managed to merge different departments together, defined the tangible benefits that could be achieved from ERP implementation in SMEs. The financial benefits of ERP were justified through a model of cost of implementation.
- Focusing on individuals in SMEs rather than groups has proven to be the best approach when it comes to the implementation.

5.6 THE IMPLICATIONS/ IMPACT ON THE SPONSOR

JCK Joinery's main objective of sponsoring this research was to successfully implement an ERP system within the organisation. The intention of this was to help employees to find information, reduce errors and make work processes faster and clearer to employees. The EngD research has made a positive contribution to the industrial sponsor, as after struggling with the implementation and not finding reasons to the failure of the implementation, the industrial sponsor has learned what the ERP implementation barriers are and how ERP can make a difference to the company systemically and financially. They have also found that resistance to change has limited users from using systems like M1 and they were able to overcome those issues by using steps described in the findings chapter 5 sections 5.3.5. The research findings suggest that the four issues identified in the system building stage were sorted and employees were happy to contribute to the success of sharing knowledge through the ERP system and contribute to increasing productivity which will turn to a higher profit for the company. Additionally, it was noticed that productivity improved after the implementation, by monitoring the work going on the shop floor and tracking jobs. It was also noticed by employees that doing work seems simpler, budget, stocks, can now be controlled adequately, and few customer's production lines been stopped because of material shortage due to changed planning system and also due to monitoring customer requests and what can't be done in production.

5.7 THE IMPLICATIONS/ IMPACT ON SMES IN GENERAL

The wider industry will benefit from the implementation of the ERP system in ways similar to the industrial sponsor. ERP system is a tool that helps people effectively and efficiently use

information and locate its resources, it also helps with saving expertise that wasn't accessed before and only saved as tacit knowledge to useful information that other employees can benefit from. Small to medium enterprises are usually reluctant when it comes to purchasing or using an ERP system because of the failure stories they hear and the difficulty of having enough funds for consultants to help with the implementation. They also find it difficult to overcome the barriers of the implementation and change user's attitudes towards new technology and systems. For this reason, the research findings can help the wider community making implementing an ERP system easier if followed correctly without the need of having to spend money on external consultants.
The research findings address the different development stages, problems that could be faced and the steps for a successful implementation and all positive and negative feedback to expect after the implementation. It also addresses all the barriers faced in the industrial sponsor and literature and how to overcome those barriers. Employees at the industrial sponsor have shown great interest in sharing knowledge and this will result in a better use of information, fewer errors, less time spent on finding information and this will help other companies in appreciating the use of ERP in SMEs.

5.8 CRITICAL EVALUATION OF THE RESEARCH

The aim of this research was to implement a structured approach to overcome the implementation barriers of an ERP system focusing on how the management of information through ERP can be an effective tool in a SME. In particular how an ERP system can enhance access to information, how to overcome barriers to the implementation and what are the benefits of having an ERP system in a SME. As this is a very challenging task, some limitation of the research are addressed below followed by some recommendations for further research in this field.

- **Sample size:** The results in this research are limited to the company and literature and lack generality and require further investigation on different types of low tech SMEs. However, this was not possible due to the time constraints and nature of the project.
- **Sponsoring company:** The industrial sponsor was a little concerned when other companies working in the same field were in touch and were considered for questionnaires about barriers, as they consider them competitors and refused to give information about problems at the company.

5.9 RECOMMENDATION FOR THE WIDER INDUSTRY/ FUTURE RESEARCH

In spite of the extensive research through the past four years of this project at the industrial sponsor, there remain a number of issues that require further research to solve. When it comes to implementing ERP it is very important to do deep research at the company itself of what they need to achieve from having an ERP system specially with tangible benefits, they need to understand the importance of the knowledge that's hidden in places like stocks and job tracking and the benefits they can utilise from this knowledge. Top management issues are not yet sorted at the industrial sponsor, especially when top management are the owner of the company and their decision doesn't go through a hierarchical tree to be made. This needs further investigation and a solution, as even though they're using the system at the industrial sponsor, they're yet not satisfied and cannot trust results and try to find a way of not using the ERP system by blaming the system for any mistake happening at company. As it is important to raise awareness of the benefits of ERP system, it is also important to raise awareness of the steps and how long would this take, as change cannot happen overnight and this needs analysis and change in process mapping. A senior management comment at the industrial sponsor was "*It would've been great if*

we knew how long the implementation would take and what to expect in advance". For further work, the research needs to generalise the findings and apply them on other companies and check the company's productivity within a few years with more cost-benefit analyses.

5.10 OVERALL CONCLUSION OF THE THESIS

The main findings of this research have been published in five peer reviewed academic papers, grouped under the following 4 headings:

1. Demonstrating the barriers to KM in SMEs, the work identifies and analyses the processes involved in getting a small low tech business ready for an information system. It establishes and discusses the barriers to installing a knowledge information system and highlights the main challenges for business i.e. why they need a knowledge information management system and how it benefits the work flow, Bani-Hani et al 2010 (Appendix A).
2. The knowledge validation techniques in SMEs and the consequences of not having an identified process for implementing the ERP system, the work analyses the main problem of validating information between different departments of the company as it can be inconsistent between one part and another, Bani-Hani et al 2010 (Appendix B).
3. The sharing of knowledge and the effect of staff redundancy in SMEs, the work analyses some examples of lack of knowledge sharing and its effects for the company, Bani-Hani et al 2011 (Appendix C).
4. A summary of the economic benefits of having an ERP system in SMEs, the work identifies the costs and benefits of the ERP system and the positive difference it can make to the financial status of the company. In fact the improvement in accuracy plays a major part in convincing the management of the value of the system, Bani-Hani et al 2012/2013 (Appendix D, E). The last paper identifies the barriers and suggests ways to overcome those barriers for implementing ERP. It includes a definition of barriers to explain variation between successful and unsuccessful implementations followed by a framework of how to overcome those barriers focusing on top management Bani-Hani et al (Appendix F, to be published).

The aim of this research project as stated in chapter 1 is to within the context of the industrial sponsor to implement a structured approach to overcome the implementation barriers of an ERP system focusing on how the management of information through ERP can be an effective tool in a SME. In order to achieve this aim, eight specific objectives were defined:

- Objective 1: To critically review literature in the identified area, this objective was met as detailed in chapter 2 and published in Bani-Hani at al 2010, Appendix A;
- Objective 2: To identify, in collaboration with the industrial sponsor's top management, the problems and barriers to the use of the enterprise resource planning system, this objective was met as detailed in chapter 5 and published in Bani-Hani at al 2013, Appendix E.
- Objective 3: To design and map the business processes to improve information access at the company, this objective was met as detailed in chapter 4 and published in Bani-Hani et al 2010, Appendix B. (See section 4.2.1.4).
- Objective 4: To implement the dormant system with the industrial sponsor, this objective was met as detailed in chapter 4 and published in Bani-Hani et al 2012, Appendix D.
- Objective 5: To justify the implementation of the dormant system, this objective was met as detailed in chapter 4.

- Objective 6: To implement solutions defined during the research period within the industrial sponsor; this objective was met as detailed in chapter 5 and to be published in a journal paper, Appendix F.
- Objective 7: To evaluate the impact of these solutions on the industrial sponsor and overall industry, this objective was met as detailed in chapter 5 and to be published in a journal paper, Appendix F.
- Objective 8: To test the research results through publication, this objective was met by publishing four different conference papers and one journal paper.

The research achieved all stated objectives as can be shown throughout the thesis and achieved the overall aim of the research by implementing the ERP system at the industrial sponsor and overcoming the barriers and has shown how ERP can be an effective tool in SMEs financially and in improving the work processes.

5.11 SUMMARY

This chapter has focused on the results obtained from each stage of the implementation. The findings and results of evaluation can be concluded in the use of the system and how users can now manage their work load differently. ERP systems such as M1 were found to provide a solution for SMEs to adopt a different method into work practice and avoid long term problems as the found occurring in the industrial sponsor due to the inconsistent work and errors. Moreover, this research has shown that SMEs and ERP developers can follow an implementation and customisation process which will avoid the loss of money and time for all. The research findings suggest that once the user is involved with the system from the beginning they would be happy to contribute by sharing their knowledge and experience gained with others where applicable.

6 REFERENCES

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APPENDIX A … (BARRIERS TO KNOWLEDGE MANAGEMENT IN SMALL LOW TECH ENTERPRISES)

Full Reference

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., "Barriers to Knowledge Management in Small Low Tech Enterprises", Software Quality Management XVIII, Dawson, R., Ross M. and Staples G., Southampton Solent University, Southampton, Software Quality Management XVIII, BCS London, April 2010, pp. 41-52, ISBN: 978-0-9557300-8-5.

Abstract

Due to the fast changing business world and the economic challenges, knowledge management (KM) has become an essential part in any enterprise that needs to keep up with market trends. Research has shown that installing knowledge management systems in both large and small to medium enterprises has been a difficult challenge for organisations throughout the years. This paper identifies and analyses the processes involved in getting a small low tech business ready for an information system. It establishes and discusses the barriers to installing a knowledge information system and highlights the main challenges for business, why they need a knowledge information management system, and how it could benefit the work flow. The paper concludes by discussing how the major barriers to knowledge management could be overcome in a small to medium low tech enterprise.

Keywords – Barriers, SMEs, KM

Paper type – Conference paper

1.0 Introduction

Over the last few years knowledge management has received a lot of attention from researchers in order to find a way to capture, transfer and use knowledge effectively within organisations. With increasing competitiveness between organisations it is very important to keep track of information as knowledge resides in many different places such as, databases, knowledge bases, filing cabinets and employees heads [2]. Trying to install a system that will manage knowledge and information is a complex process. Not only do the technical issues have to be overcome, but also changing business processes and cultures need to be addressed. Added to these complexities is the size of the organisation that requires the new system. Previous literature has indicated that employees searching for information would rather consult other people than use on or offline manuals [2]. Allen found that engineers and scientists were close to five times more likely to consult individuals rather than impersonal sources such as databases or file-cabinets for information [3]. Even with advancements in information retrieval, computing and communications the tendency to use people still exists. People remain the most valued and used source for knowledge [9]. Therefore simply implementing an information system to aid flows of knowledge and information is unlikely to work unless the cultural issues are addressed first.

In knowledge intensive businesses, facilitating the sharing of knowledge between and organisation's employees has been attributed to improving competitive advantage [10]. More purposeful and improved sharing of knowledge will bring with it increased learning and innovation at the individual, group and organisational levels. This increased learning and innovation will in turn bring about the development of better products and ideas that can be brought to market both more effectively and more efficiently. However, what is unclear from the literature is the value of a knowledge system in a low tech small to medium enterprise [1]. It could be argued that regardless of the size of the organisation, increasing the sharing of knowledge, through the medium of information will make more relevant information available both within direct communications and through any potential system used by employees. The quality of information across the organisation will be higher and employees will be able to share information without the fear of how it might affect them. Within any organisation any investment made must be able to show a return, but it is difficult to measure the success of knowledge sharing [11]. However, it may be possible to determine the barriers that exist within a small to medium organisation. If the barriers towards a knowledge sharing environment can be determined it would have a unique effect upon an organisation, and it could provide an indication of the potential return on investment if they could be overcome [12].

This paper firstly reviews the literature on knowledge management within SMEs. It then introduces the case study on JCK Joinery, a small company based in the East Midlands in the UK. The paper goes on to identify the knowledge management issues within JCK and what the expected benefits could be if a KM system was implemented. The paper concludes by discussing the wider implications of identifying KM barriers and the need for KM within SMEs.

2.0 What is Knowledge Management?

Defining KM is itself a detailed problem and one that may never be truly answered as perspectives and opinions on what Knowledge Management denotes are wide and varied. What is clear is that Knowledge Management may be viewed from a multitude of perspectives. Either as a high level strategy, a practical IT based approach or one that attempts to view knowledge from an employee's perspective. Ultimately each perspective supports the research aim, and seeks to enhance the use, creation and the exploitation of knowledge within the workplace. Newman & Conrad [14] define Knowledge Management as:

"A discipline that seeks to improve the performance of individuals and organizations by maintaining and leveraging the present and future value of knowledge assets".

Newman & Conrad [14] acknowledge that Knowledge Management is not a new approach but an integration of many disciplines that are linked by the guiding principle of deriving value from managing organisational knowledge. The advent of Knowledge Management has introduced a wide range of strategies and methodologies, all of which proclaim to be the definitive answer to knowledge sharing and creation within the business environment. Academic literature widely

acknowledges that Knowledge Management creates value from the exploitation of the organisations knowledge and intangible assets [15]. Although how an organisation may achieve this and what constitutes an intangible or tangible asset, is often far from clear. It is also fair to say that Knowledge Management is in a state of continuous flux. As it has undergone a transition from the management of technology to the management of the social aspects of the organisation, where the focus upon what employees do with their knowledge has taken precedent over the provision of tools to capture the employee's knowledge [16]. Knowledge Management aspires to address and exploit the knowledge within an organisation, yet there is considerable ambiguity over the definitions surrounding knowledge. The present state of confusion persists through the poor definition of knowledge. In accordance with Polanyi [20] and Davenport & Prusak [17] knowledge is said to be constructed of both tacit and explicit knowledge.

In an attempt to overcome this confusion for the purpose of this research, knowledge management could be viewed as the process of communicating, creating and sharing knowledge in a business environment to enable employees to work more efficiently and effectively. Explicit knowledge is what can be captured and shared through a written medium. The most common forms of explicit knowledge are manuals, documents and procedures. Whilst tacit knowledge is the hidden information which cannot be represented via documentation, and for it to be useful, it needs to be transferred into explicit knowledge. Tacit knowledge is knowledge that is difficult to transfer to another person by means of writing it down and it is usually someone's experience which is held within their brain. In the field of knowledge management, the concept of tacit knowledge refers to a knowledge which is only known by an individual and that is difficult to communicate to the rest of an organisation. The process of transforming tacit knowledge into explicit knowledge is known as codification or articulation. Some of the best ways of transferring tacit knowledge to explicit knowledge can be:

- Interviewing people with work experience
    - For example, interviewing employees who have recently completed a successful project, or a project that went spectacularly wrong so lessons can be learnt.
- Learning by observation.
- Learning by meetings and documenting.

Knowledge management has been considered a key factor for increasing organisations performance under the competitive market as reported by Nonaka and Takeuchi [8]. If organisations managed resources effectively, like spreading strategies, new services, and processes then it will help in creating a competitive advantage in the business environment. Some of the current challenges businesses face are:

- Providing quality customer service
- The rate of innovation, due to the competitive market.
- Up to date information systems to enable real time decisions.

Knowledge management can also been seen as the management of information within an organisation. This is achieved by influencing the three organisational building blocks, which are Strategy, Culture and Systems as described by Rasheed [5]. Rasheed has explained in his paper that every organisation has a wealth of knowledge which is present in the employees and papers consisting of policies, documents, and experience. To make the most of it, and to make it easier to transfer with time, there should be a knowledge management system that aids the successful use of the information [8]. However, many KM systems have been implemented within large organisations and many research case studies have been written surrounding their implementation, but relatively little has been written on introducing a KM system into a low tech SME. The next section reviews the literature regarding KM within SMEs.

2.1 Knowledge Management in SMEs

The majority of the workforce in the UK is employed by SMEs. Statistics for 2007 published by the BIS (previously BERR) Small Business Service (SBS) Statistics Unit show that out of 4.7 million businesses in the UK, 99.3% were small firms with

fewer than 50 employees, and 0.6% were medium sized firms with 50-249 employees [13]. With so many employees working for SMEs it is quite surprising the limited amount of research that has been undertaken into KM within SMEs. By reviewing the advantages and disadvantages of SMEs the case for KM is less clear. There are many benefits to a SME over a large organisation when it comes to KM and information flows, such as:

- Less formal strategies increase the communication of knowledge, speed of decision making and improve information flows.
- Less formal communication improves employee commitment and their receptiveness to knowledge management changes.
- Increased ability to react faster to market changes to satisfy market needs.

Some of the weaknesses that SMEs have been described by Egbu [2] are:

- Inability to fund long-term and risky knowledge management programmes.
- Weaknesses in specialised technological competencies, which make use of knowledge hard, as it needs an IT system to spread knowledge easier, faster, and more cost effectively.
- Weakness in giving training and education to employees.

Another weakness that has been identified by Rothwell & Dodgson [6] is that "SMEs has a little management experience". This is usually because the manager of an SME is the owner of the organisation which can make decision making less formal and professional which is the case at JCK Joinery. Although less formal strategies increase the communication of knowledge, they also have a downside. Being able to access colleagues work is difficult as much of the information is not transferred from one employee to another through an organised system. For example, the knowledge of a pending sale, that could make a massive difference to the organisation if certain employees had knowledge of it. If a system was in place then this information could be viewed by employees within the organisation.

Therefore supporting the deployment of a knowledge management system and strategy is an intricate balancing act of tangible costs weighed up with the intangibility of perceived benefits, especially within an SME. Establishing a measurable return on a knowledge management investment has had, or can have, on a business area, is often essential to sway the opinions of staff that the scheme is having a positive benefit and is worth persevering with (Milis & Mercken [18]; Wilcocks & Lester [19]). Having a measureable return is critical yet difficult to calculate, but without it an SME will not have the ability to fund long-term and potentially risky knowledge management programmes without the knowledge that it will aid their business processes in the long run.

3.0 Methodology

This research is based on a case study approach and uses JCK Joinery as the data source. JCK is a joinery firm based in the East Midlands and has more than 170 years of experience. It was the first to manufacture timber secured by design door sets. They pride themselves on producing high quality products through using the best materials available on the market. All their products are certified for Secured by Design, Fire Rating and Chain of Custody, which is FSC (Forest Stewardship Council) and PEFC (Programme for the Endorsement of Forestry Certification) approved. JCK Joinery has around 29 employees, ten of them work on designing, planning and administration, and the other nineteen are based on the shop floor building the doors. Their customer base includes a wide range of organisations like banks, building societies, local authorities, housing associations, government departments, retails, commercial and industrial clients, and of course individual customers

The research started by undertaking business process analysis of the JCK Joinery business processes. This would provide an insight into the information flows within the organisation. This was completed by conducting informal interviews and reviewing official and unofficial documentation within the organisation with groups and individuals. Following the business analysis a number of informal interviews were conducted to determine the potential knowledge management issues within

JCK. The managing director of JCK, the general manager, the marketing offer, the production manager and many of the workers on shop floor were all interviewed. The informal interviews lasted between 10 minutes to over an hour and in some cases a number of repeat informal interviews were conducted. The results from the informal interviews were analysed and grouped together in themes in order to identify common issues and potential benefits to JCK Joinery by implementing a KM system. A more formal interviewing and questionnaire approach was considered, but it was decided that the informal approach would elicit more detailed and richer information given the size of the organisation.

4.0 Results: Identifying the Knowledge Management Issues at JCK Joinery

The initial objective, in order to identify the knowledge management issues at JCK Joinery, was to understand the business processes. This required a business analysis of the JCK Joinery processes. The analysis reviewed the processes from Sales through to Production. The process starts by JCK receiving a customer order by email or by the phone. A quote is then created using a MS Excel spread sheet and is then sent back to the customer. The customer is then asked to verify that the details of the product requested are correct. If the quote is verified by the customer, a pricing list is produced for the customer enquiry and then sent back to customer with the final quoted price to see if it matches their budget. The design and quote are then changed if they do not match the customer's budget. If the quote and design is agreed it is then sent to the NCAD team to draw a detailed design and then that is sent back to customer to sign order off the order. Once the signed copy has been received this is then passed on to the shop floor for production. An overview of the business Sales to Production process can be seen in Figure 1.

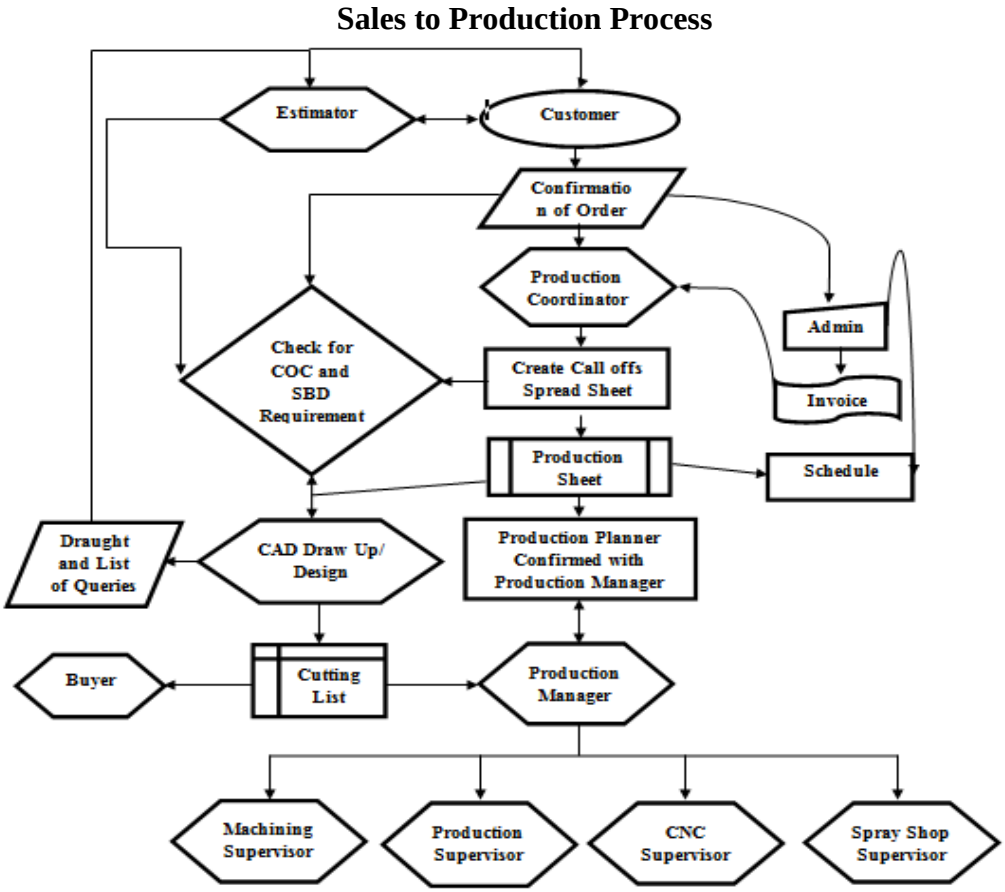

Figure 1 – A flowchart of the Sales to Production business processes

After reviewing the business processes and writing up the notes from the interviews and then analysing them, it was possible to identity areas for concern and which business processes could be improved within JCK Joinery.

- Loss of information, as not all of the documents are filed away and there is a lot of paper work flowing throughout the organisation, which makes it easy to mislay or lose important documentation.
- New sales enquiries are not tracked through any system, so finding a job needs be tracked manually, which impacts upon emoployees time.
- Staff retirement or attrition - when employees leave or are off on holiday, it becomes nearly impossible for employees to take over their work as there is no system in place to show what is left to do.
- Due to lack of an information system, when a customer enquires about a new job all the pricing and product details are calculated manually, which takes a long time, especially if it is a big order for hundreds of doors for a new building site.
- Everything is entered manually into Excel sheets, which increases the risk of information being entered incorrectly (no field validation).
- Accounting problems - if an invoice is lost, this leads to long-term funding problems, and puts JCK Joinery at financial risk.

To overcome these issues, one solution would be to implement a knowledge management information system, such as an Enterprise Resource Planning (ERP) system. The system could track documents from Sales through to Production (including payment of invoicing).

4.1 Five Barriers to Implementing a KM System within a Low Tech SME

JCK Joinery have tried to implement an ERP system called Rent-IT, and went as far as renting the software and buying a server to run the application. However, the ERP system never got up and running and JCK Joinery still relied on the manual paper based system. Why was the knowledge management information system not installed and what were the barriers? Through interviewing key personnel at JCK Joinery five barriers for installing a knowledge management information system were uncovered and they are:

1. Low tech SMEs usually attract people with low educational skills, as educated people usually prefer to go to bigger organisations or high tech SMEs where salaries are higher and they have a more stable work situation.
2. Unskilled employees, especially IT illiterate employees, make it difficult to implement an ERP system, as it requires many hours of training to bring them up to just a basic level of IT understanding.
3. Lack of motivation for employees to endorse the new system.
4. Lack of training due to financial costs and lack of time, as it removes an employee away from their ‘day-job’.
5. Lack of process mapping – a map should define every activity at the organisation. It should include a step-by-step process for every information flow, but this takes time to develop and it could be argued needs to be conducted by an outside expert.

Reige’s work undertaken in 2005 [11] identified three-dozen knowledge-sharing barriers managers must consider. His work did take account of technology and implementation, but on reflection it mainly focused on large organisations. The results of this study have shown that Reige’s work would need to be adapted if it was to be of use to SMEs. However, the replication of this study would be inherently different as the informal interview approach did not have a repeatable structure. The next stage was to review the potential benefits of a KM information system if the barriers could be overcome.

4.2 Potential Benefits of Implement a KM Information System at JCK Joinery

If a suitable KM Information system could be successfully installed into JCK Joinery it could provide a number of benefits to the organisation. It will enable easier integration between departments, as everything will be automated and there be no need

for spread sheets, physical paperwork, and to print out door designs from NCAD. In the past the lack of an audit trail and lots bits of paper have cost the organisation financially.

The Estimator would be able to enter customer's queries directly into the system which would enable automatic quotes to be generated according to the customer requirements. This would significantly reduce the amount of time spent on quoting, as currently the Estimator has to look through various documents to cost every part of the door, and then determine the time for making the door.

Putting everything into an ERP system at JCK Joinery will reduce the number of errors, and it will also speed up the business processes which will make JCK Joinery more efficient and cost effective in their very competitive market. In summary it will:

- Make integration with other departments easier;
- Automatically provide a quote given a door design;
- Reduce the time required to find files, file paperwork, and estimate orders;
- Reduce the number of errors and duplication of work;
- Increase efficiency;
- Improve the speed of the business processes.

5.0 Conclusion

Knowledge management is a very important aspect to any successful organisation, and to enable it to happen, support is required by employees. The paper has identified and analysed the processes involved in getting a small low tech business ready for an information system. In particular the research has shown that in a low tech SME, employees tend to be less experienced and at best only have basic IT skills. Therefore there is a greater initial investment to bring the employees up to the required standard to implement any new IT systems. However, the bigger barrier is convincing employees with limited or no IT skills, that a new system will actually be more effective and efficient for the organisation. Strong resistance to a new system is likely to cause major problems and unless addressed early on in the implementation plan of the system, the new system will never be successful.

It is a complex quandary that many low tech SMEs find themselves in. If they do not invest in new technology they will no longer be competitive and could face closure. If they do invest in new technology it could be costly in terms of the amount of time taken to win over the employees with limited or no IT expertise, the cost of training, the cost of downtime due to learning the new system. However, by identifying the potential barriers and potential benefits a low tech organization can make a more educated decision on the route they should take.

The next phase of this research is to install an ERP system into JCK Joinery to improve business performance. Further research will be undertaken to identify the most effective way of successfully implementing the system into the low tech organisation. The initial barriers and benefits that have been identified in this paper will undergo further validated and amend accordingly to enable other low-tech SMEs to benefit from the JCK Joinery experience.

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APPENDIX B … (KNOWLEDGE VALIDATION IN SMES)

Full Reference

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., "Knowledge Validation in SMES", Proceedings of KMIS 2010, Filipe, J. & Kacprzyk, J., SciTePress, KMIS 2010, Valencia, Spain, October 2010, pp.354-357, ISBN:978-989-8425-30-0.

Abstract

Knowledge Validation is a challenge in Small to Medium Sized Enterprises, SMEs, as most of the available information is held in people's minds as tacit knowledge, or saved on each employees PC without sharing or common validation. This case study is based on a company in Leicester after installing an enterprise resource planning (ERP) system. The underlying reasons for these problems were due to the distributed and tacitly held knowledge where the assumptions in one part of the company were inconsistent with other parts. The paper analyses the main problem of validating knowledge in more detail and has identified the consequences of failing to do this. Challenges are discussed and highlighted in the paper, which concludes with the importance of Knowledge Validation and identifies some solutions.

Keywords – Knowledge validation, SMEs, Barriers

Paper type – Conference paper

1 INTRODUCTION

Implementation of an ERP system has always been difficult, where communication between employees, the system, and the change management is a very complicated process. The difficulties in transferring the tacit and explicit knowledge into the ERP system, the validation of this knowledge and the process of putting all of this together into a knowledge management (KM) system has been a challenge due to the barriers of installing a KM in an SME which will be described in this paper. This study was done as a case study at JCK Joinery, an enterprise based in Leicester specializing in designing different kinds of door sets and windows. JCK has 29 employees, 10 of whom work on designing, planning and administration, and the others actually build the doors. Their customer base includes a wide range of organisations. Section 2 is a literature review of ERP systems and KM. Section 3 describes how the research is to be conducted. Section 4 describes how things are being done without the ERP system. Section 5 gives a description of the JCK ERP system and Section 6 describes the barriers to implementation and the expected changes and benefits of using this system. The results are then discussed, followed by a conclusion and future work.

2 LITERATURE REVIEW

Enterprise Resource Planning, or ERP, is a complex process in practice. In theory ERP could solve a lot of problems, by centralising the knowledge into a database (Leknes, 2006). The difficulties in transferring this knowledge between the different departments and actors have shown an interest in how Knowledge Management may be supported by an ERP system (Haines and Goodhue, 2003). KM is defined according to the Knowledge Board in 2004 as planned activities and processes for managing knowledge to enhance the competitiveness through better use and creation of individual and collective knowledge resources (Sedera et al., 2004). KM often relies on the information technology available which relies on capturing employee's knowledge and filtering it according to the job needs. After this and after gathering all of this tacit and explicit knowledge it is transferred to the database of the system,

Here comes the importance of the knowledge validation process! Without this (Probst et al., 2000) validation process, ERP system loses its credibility with employees and this is one of the things that happened in JCK Joinery, where employees no longer believed in the importance of the system. Failure of the knowledge validation process, not understanding what is happening with the system and not contributing in the work usually leads to rejection of the system from employees. According to Durikova and Gray (Durikova and Gray, 2009) an ERP System must be implemented with care in order to encourage contributors to go for this challenge and provide valuable points to get the desired results from a knowledge management system. They have also noted in their hypothesis that contributing to the implementation can enhance an employee's perception of knowledge quality and their faith in the system. According to one paper (Leknes, 2006), it was found that some of the barriers to knowledge validation and knowledge transfer between different work departments is caused by system unreliability and lack of training as well as the information overload and change management, and how this might be solved by following a knowledge management communication process between the implementer and the people involved in the system. The role of knowledge management is very important in a business environment as it increases the interaction and share of knowledge between people which enhances the organization's overall knowledge base. An ERP system integrates work between all functional departments from purchasing, employee's management, scheduling, inventory management, production to shipping, and payroll management. Then if ERP systems can be this helpful to organizations, and if it can solve problems in organizations, why does it have many negative reports! What are the barriers to using it?

3 METHODOLOGY

This research in JCK Joinery started by undertaking business process analysis of the JCK Joinery business processes then interviews, formal and informal was done with management, administration employees and with shop floor workers; and reviewing official and unofficial documents within JCK. Interviews were repeated from time to time, and lasted between 10 minutes to an hour with different employees. All information were gathered together, studied and a working plan was set in order. This research also went through a study of different ERP systems and why JCK Joinery had chosen this product for solving their business problems. Many factors have affected JCK Joinery when choosing the product and one of the main factors was the financial issues along with the requirements of the business. Further study was done about how the processes in JCK are done, the orders, purchases, certification, door making, and how all of these are done manually by employees and how it can be customised into the ERP system.

4 HOW THINGS ARE BEING DONE AT THE MOMENT?

Work process flow: One of the main processes in JCK Joinery has been studied which is the production process of a door, and here is a brief description of how things are being done:

1. A customer makes an order by email or by the phone.
2. A quote is created by the estimator using spreadsheet and sent back to customer.
3. The customer is asked to verify that the details are correct.
4. If the quote is verified a pricing list is produced using another spread sheet and then sent back to the customer for approval.
5. The design and quote are then changed if they are unacceptable.
6. If the quote and design are agreed a detailed design is made.
7. The design is then sent back to customer to sign off the order.
8. Once the signed copy has been received this is then passed on to the floor for production.

This process takes days to complete in JCK, and if the order is a big one, for a new building with different kind of doors, indoors, outdoors, security doors, mobility doors, then this would take longer. When a door is ordered a pricing spread sheet is used to calculate the price of the door. With time the estimator memorised the prices in it, and it has been found that these have not been revised for the last two years and not updated according to the purchasing orders, which led to losing money.
This is one of JCK's problems which is happening due to manual processes, and the errors occurring because it is huge. For that the Configurator was proposed, in order to be able to reduce the number of hours this is taking, number of errors as all information will be pulled from a database, plus that every quote will be saved into the system, no need for paper work.

5 WHAT THE NEW SYSTEM WILL PROVIDE FOR THIS PROBLEM (CONFIGURATOR)

Work on a Configurator took a few months, and there were a lot of challenges in customising it, some of these were related to the barriers mentioned below, which were caused of lack of employees knowledge in IT basic tools, and some others were due to the lack of encouragement of using the ERP system. Employees no longer had faith, and didn't believe in the change it would make. One of the mistakes when doing the Configurator, was its complexity as it was two pages, with more than 100 boxes to fill and pick, and that was confusing to employees not knowing much about computers, they refused to use it, as it was complicated and not user friendly. So with interviews and tests including employees in the steps, boxes have been eliminated and it has been made simpler. In the Configurator, which is an aid to design and produce doors, one for an FD30 door, a standard door for 30 minutes fire rating, was changed about 4 times. The first one didn't have all requirements for the door, and the second was too complicated for employees, with showing and hiding fields facilities, and then after sitting with the estimator and discussing things thoroughly the only requirements for the FD30 door were found unless there was special cases which we did not go through at this stage of the implementation. After showing this to everyone in JCK it was discussed that going through this might take a longer time than that available and the best idea would be defaults for making this door can be set. Once opened, all defaults for an FD30 door are present and then these are just checked and any changes required are made, this minimised the number of errors and reduce the time required for making any quote. Defaults were all set, and the final Configurator for this door was ready to be used. In this Configurator there were some requirements to choose from first, things like Mobility, Secure by design, Chain of Custody, fire rating and location. Then the structural opening, which will be allocating the height and width, and finishing with the glass and hardware attached to the door. All of these boxes are attached to the database, where all parts used in JCK are listed, and connected to purchasing orders to be able to pull prices and to calculate the door price when doing the quote.
Another problem was faced which was with validating the knowledge in the Configurator. Employees were saving prices differently into their Excel sheets, using what they have which wasn't up to date and prices were very different.
Receipts were gathered, talking to the employee doing all the purchasing, and trying to verify prices, and do all the mathematical equations to get the right door price, and while going through this process, another problem was found which was with the different names of the parts used in the door making. Employees know different ways of naming the products and were refusing to change to the new names which were required by the ERP system, and which are used when purchasing. Some were saying how hard it is to use this format of names, for that we had to find a way to write them differently where everybody can work on the system. All part names were printed out from the ERP system, and there was around 3000 parts available there, and have decided on one person who would take the time to do this job, remove unused parts which were added two years ago, rename the parts and go through the prices, trying to verify them with the purchasing order. Some were

named with the manufacturer first, others with the kind of hardware, some depended on the height and width of the door. Rules had to be set for the name and how to deal with them in the Configurator. Working on this along with the ERP system Provider and the Company verification of prices had been done and the testing process was in progress.
Hypothesis (1):
Configurator may work, solving all the validation problems in JCK Joinery and will eliminate all kind of errors that was happening earlier!
Hypothesis (2):
Configurator may work faster than the Excel sheets used in the quotes orders.
Hypothesis (3):
When Configurator works properly this will affect the quality of work positively and make the business flow easier.

6 PROBLEMS AND BARRIERS

According to previous research in JCK, problems that led to the need of an ERP system, barriers to installing and using it have been listed as follows:

Problems:
• Loss of information, documents are not filed and a lot of paper work flows through the organisation, which makes it easy to mislay or lose.
• Sales enquiries are not tracked, so finding a job needs to be done manually, which takes time.
• Staff retirement or attrition - when employees leave or are off on holiday, it becomes nearly impossible for employees to take over their work.
• When a customer enquires about a new job pricing and product details are calculated manually, taking long time, especially for big orders.
• Data is entered manually into spread sheets, which increases the risk of incorrect information.
• Accounting problems - if an invoice is lost, long term funding problems occur.

Barriers:
1. Low tech SMEs attract people with low educational skills, as educated people prefer larger organisations where salaries are higher and work situations are more stable.
2. Unskilled employees make it difficult to implement an ERP system, as they require many hours of training.
3. No motivation for employees to use the new system.
4. Lack of training due to financial costs and lack of time.
5. Lack of process mapping, a map should define every activity at the organisation. It must include a step-by-step process for information flow.

In JCK this system had been installed, two years ago and until now had not been used properly, employees still use spread sheets to make orders, customer quotes, and even when printing orders, they use a customised template in a Word document where everything is written manually.
Due to the barriers listed earlier, JCK was not able to make the system work, employees with low skills, and lack of training, financial problems have led to this failure.

7 CONCLUSIONS

Knowledge Validation is an important aspect to any organization and this case study has presented the problems at JCK, what solutions were presented and what were the barriers to these solutions. This paper has identified and analysed problems and barriers, in particular resistance to change. Some limited conclusions may be drawn, first is that even though the user gives a thorough specification there is a mismatch between what the user claims to want and what they actually want? Secondly, there is an internal resistance to change evidenced by the number of Configurators offered to the user and the persistent complaint that they were too complex. The system of spread sheets used by JCK was no more complex than the Configurators offered but it was familiar. The newest Configurator has many of the properties of the old Configurators but is becoming accepted. A great deal of training is required. The next phase of this research would be to prove changes the Configurator would make to JCK and identify effective ways for improving the business. The barriers and problems have been identified and will go through a validation process to make the change to JCK and be able to help other SMEs like JCK solve their business problems.

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APPENDIX C … (KNOWLEDGE MANAGEMENT, SHARING AND ERP SYSTEMS IN A SMALL COMPANY)

Full Reference

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., "Knowledge Management, Sharing and ERP Systems in a Small Company", Proceedings of International Conference on Information & Communication Systems, Wail Mardini, Faculty of Computer & Information Technology, Jordan University of Science & Technology, International Conference on Information & Communication Systems, Irbid, Jordan, June 2011, pp.24-27, ISBN:978-1-4507-8208-1.

Abstract

Knowledge sharing, tacit knowledge and knowledge management have always been very important subjects in today's business, as companies are very keen to keep information. Staff redundancy, and employees moving to other companies because of the recession, has made loss of information more frequent. This paper describes some examples of lack of knowledge sharing and what effect it has caused for the company studied. It starts by examining the literature, and then discussing the case study in detail, ending with potential solution, currently being tested, and conclusions.

Keywords – ERP, Sharing, SMEs

Paper type – Conference paper

Introduction

The difficulties in transferring the tacit and explicit knowledge into the Enterprise Resource Planning (ERP) system, validating this knowledge and the process of putting all of this together into a knowledge management (KM) system has been a challenge for Small to Medium Sized Enterprises (SME)s in the UK.

This case study was done at a joinery enterprise based in the UK, this SME specializes in woodwork, designing different kinds of door sets and windows. It has around 29 employees, ten of them work on designing, planning and administration, and the other nineteen are based on the shop floor building the doors. Their customer base includes a wide range of organizations like banks, building societies, local authorities, housing associations, government departments, retailers, commercial and industrial clients, and of course individual customers.

It is a manufacturing company, which has been in the business dating back to the 1830s; they do very high quality work using first rate materials and invest in trained operatives and comprehensive research and development.

It was the first to do secure by design door sets, and all of their products types can be produced from PEFC (Programme for the Endorsement of Forestry Certification) & FSC (Forest Stewardship Council) or independently verified sustainable source materials, with chain of custody.

This paper will present a literature review of ERP systems, SMEs, knowledge sharing, followed by a description of the ERP system implementation in the SME, what problems were found, focusing on the knowledge sharing issues, brief description of the results and expected outcomes of using this system.

At the end of the paper conclusions and future work are drawn.

Literature review

SMEs use knowledge to manage their daily work. It may be explicit and held in documents, an information system, ERP, or tacit and held in employee's minds. When an ERP system is adopted by SMEs, it tends to be simple. Most SMEs consider cost when thinking about an ERP system, and are reluctant to invest after start-up. However, some SMEs take into consideration the changes an ERP system can do to their business, mainly those looking for future development and growth.

ERP is a system made to manage all information and functions in a company from many departments and data stores, it is very important to use ERP system in a company where information is being shared easily, and securely.

Research has shown ERP systems are very complicated processes in practice. In theory an ERP has to solve a lot of business problems, and should transfer all of the knowledge in a business environment efficiently into a database where everything can be connected together (Leknes 2006).

As implementing ERP would lead to changes within the organization, there is a possibility that some employees will be made redundant due to various reasons. Haines and Goodhue (2003) stated that the difficulties in transferring this knowledge between the different departments, and actors like employees, and customers have shown an interest in how KM may support ERP system.

KM is defined according to the Knowledge Board in 2004 as planned activities and processes for managing knowledge in order to enhance the competitiveness through better use and creation of individual and collective knowledge resources (Sedera et al., 2004). KM often relies on the information technology available, which relies on capturing employee's knowledge and filtering it according to what the job needs. Gathering all of this important tacit and explicit knowledge and transferring it into the

database of the system needs working on the knowledge management techniques, and doing this successfully will lead to the next phase of the KM process of knowledge validation. Without this sharing and validation process, Probst (2000) said that ERP system loses its credibility with employees and this is one of the things that happened in the SME (Case Study), where employees no longer believed in the importance of the system.

Metaxiotis (2009) stated that in today's business, the success of an organization depends on how they manage their knowledge. Therefore, different scholars and researchers have found several different steps and tools in order to achieve successful knowledge management within the organization. Dieng et al. (1999) suggested that each firm should have their own corporate memory, which will include non-computational, document-based; knowledge based case-based and distributed corporate memory. Dougherty (1999) argues that knowledge management can use Information Technology (IT) as a tool of assistance.

Ghobadian and Gallear (1997) stated that in a small enterprise with a small number of people are usually united together under the same values and thinking, which implies that it is easier for smaller organizations to change and implement knowledge management. It is usually easier to create a knowledge sharing environment in smaller organizations than in larger ones.

Wong (2004) said that in smaller organizations the cultural values and beliefs of the employees can be influenced by the owners. This can be a problem if the owner doesn't trust his employees or doesn't encourage the sharing and transferring knowledge environment. In this case, the owner can obstruct the development of knowledge rather than develop it.

In the SME under study it is reversed, the employees don't trust the owner with transferring the knowledge, and that's due to some serious decisions that were taken earlier that led to business failure.

Failure of the knowledge sharing and validation process, not understanding what is happening with the system and not contributing in the work usually leads to rejection of the system from employees. According to Durikova and Gray (2009) ERP System must be implemented with care in order to encourage contributors to go for this challenge and provide valuable points to get the desired results from the knowledge management system. They have also noted in their hypothesis that contributing in the implementation can enhance employee's perception of knowledge quality and their faith in the system.

Leknes (2006) found that some of the barriers of knowledge validation and knowledge sharing between different work departments are caused by the system unreliability and lack of training as well as the information overload and change management, and how this might be solved by following a knowledge management communication process between the implementer and the people involved in the system.

The role of knowledge management is very important in a business environment as it increase the interaction and share of knowledge between people, which enhances the organization's information overflow.

Methodology of research

As the SME under study is a high quality industrial company they have invested in training operatives and comprehensive research and development, and for that they have allocated some funding for the implementation of ERP system to minimize the number of hours spent in work duplication.

The research started by undertaking business process analysis of the SME business processes by interviews, formal and informal which was done with management, administration employees and with shop floor workers and by also reviewing official and unofficial documents within the company.

Interviews were repeated from time to time, and lasted between 10 minutes to an hour with different employees, and all information was gathered studied and a working plan was set in order.

Informal interviews proved to be better, as employees were more comfortable sharing their knowledge, views about the ERP system, and also their work problems.

Analysis

According to previous research done on the same case study (Bani-Hani 2010), the SME faced a lot of problems that led to the need for an ERP system, problems that occurred because of the current manual processes, these problems are listed briefly below followed by the barriers to implementing and using the ERP system:

Problems:

- Information loss, as paper work is not filed properly, which makes it easy to mislay or lose important documentation.
- Sales enquiries are not tracked, so finding a job manually impacts upon their time.
- Staff retirement, when employees leave or off on holiday, it is almost impossible to take over their work as there is no system in place to show what is left to do.
- Due to lack of information system, pricing jobs and products are calculated manually, which takes time, especially with big order for a new building site.
- Information is entered manually into Excel sheets, which increases the risk of incorrect information (no field validation).
- Accounting problems - if an invoice is lost, long-term funding problems may occur, and lead to financial risk.

Barriers found while implementing the ERP system:

6. Low educational skills.
7. Unskilled employees, especially IT illiterate employees, make it difficult to implement an ERP system, and this requires training.
8. Lack of training due to financial costs and lack of time.
9. Lack of motivation for employees to endorse the new system.
10. A map should define every activity at the organisation. It should include a step-by-step process for every information flow, but this is missing in most SMEs as it needs time to develop and usually need outside experts which is almost impossible due to financial problems.

In the SME an ERP system was installed two years ago, and until now, this system had not been used properly, as employees were still using Excel sheets for the work. Making purchasing orders, customer quotes, and even when it comes to printing any of these orders, they use a customised template in a Word document where they have to write everything manually.

Due to the barriers listed earlier in this paper, the SME was not able to make the system work, employees with low skills, and lack of training, financial problems and many others have led to this failure.

The work process in the SME starts from a customer call for quoting, and if this quote is won it then goes through sales order, job management, scheduling, AutoCAD drawing, sending it to the purchasing department and shop floor, and when the door is ready its then sent to delivery and shipped to the customer.

Now through this long process a lot of problems occur that lead to serious trouble and also have led to delays in implementing the ERP system in the SME, in this section these problems will be analyzed and discussed in details.

The three main problems that happen in the SME are; at the stages between quoting, AutoCAD and purchases. In the first problem, we mainly found that parts are named differently.

Employees use different ways for naming the products, each department of those uses a different naming system.
For example a door lock can be named "Access control" in a quoting stage, and then when sent for drawing the AutoCAD drawers will call it "AC803F30" (Access Control number 803 used for Fire resistant door for 30 minutes) and when it sent to Purchasing it will be called "Almd AC80330FD" (company called Almand Access Control number 803, 30 minutes fire resistant), and this would affect the ERP system, since everyone is refusing to change to one naming format which was required by the ERP system, and which was used when purchasing the products from suppliers. Some were saying how hard it is to use this format of names, since they're familiar with the current one for years, and so a way had to be found to write them differently were everybody can work on the system.
Sorting this problem, will avoid duplication of parts on the system, and will help with consistency of quotes since it pulls parts directly from the latest up to date ones which will lead to less errors and money loss.
Hypothesis (1): Parts named in one format succeed, no duplication on the system, errors will be eliminated.
The second problem that was found through following the work processes, were with the purchasing orders, when an employee does a purchase order they fill the order with some tacit information, not up to date prices, and send it to suppliers. When they check the prices on the purchase order, they make the call to the employee; let them know about price changes. The employee is supposed to update the price somewhere to keep a reminder but they don't update the price or save it into any system, which leads to differences between purchase orders and invoices they get from suppliers and this cause trouble for the finance department where they need to verify this with the purchase orders employee every time, which is time consuming since they do around 350 purchase orders every month.
Hypothesis (2): the purchase order employee, enters latest prices into the ERP system, so purchase orders are up to date, avoid finance calls, supplier calls, and be able to compare prices between different suppliers which will help with taking better decisions of where to buy from.

The third problem found was with stock control, when the final drawing is sent to the shop floor, they check what is in stock and send purchase orders department for missing parts, so they either buy the missing part or sometimes send different parts from the ones written in the drawing according to availability, and here the problem starts as they don't inform any other colleagues of this change, when a customer calls later on for a spare part or damaged one, looking at the files, they would send the one written there which then doesn't match the one on the door, and this causes problems with customers.
Hypothesis (3): full work process is entered into the ERP system, and from quotes to shipment, will help track any changes if a different part is pulled from stock for that certain job, and will keep the record for future enquiries from customers.
One last problem occurred was with accounting – the accountant had some personal problems so he needed to leave the SME, and since there was no system for tracking invoices, some were lost, and the new accountant made some assumptions about the financial situation in the company according to the papers he had, the manager made some major steps and decided to add a new line to the company which cost a lot of money, after signing the contracts it was found that the situation was not as described earlier, and this led to long-term funding problems, and put the SME at financial risk.
After that serious steps had to be taken, mainly staff redundancy, major cuts in other employee's wages, and also having to cancel many jobs coming to the company, due to the financial exposure and lack of working cash flow.

Hypothesis (4): all invoices are saved into an ERP system, employee retirement or redundancy would not affect the company as everything would be saved and can be found, financial problems would be reduced.

Conclusion

Knowledge sharing and validation are important aspects to SMEs and these are the right stages that lead to knowledge management.
This paper has presented the problems and barriers at the case study, and has identified what is mainly holding the ERP system implementation from progressing, which is in particular the resistance to change.
Limited conclusions can be drawn from this paper as work is still in progress. There was internal resistance to change evidenced by the years this is taking to work and the persistent complaint that ERP systems were too complex.
The system of spread sheets used was no more complex than the ERP offered but it was familiar. A great deal of training is required. The next phase of this research is to prove changes the ERP system would make to the SME and identify effective ways for improving the business. The barriers and problems identified are currently going through a validation process to help this and other SMEs to solve their business problems.

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APPENDIX D … (ECONOMIC BENEFITS OF AN ERP SYSTEM TO A LOW TECH SME)

Full Reference

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., "Economic Benefits of an ERP System to a Low Tech SME", Proceedings of the International Conference on Knowledge Management and Information Sharing, ISBN: 978-989-8565-31, KMIS 2012, Barcelona, Spain.

Abstract

This case study describes the potential economic benefits for installing an enterprise resource planning system in small to medium enterprises, using a study of a small enterprise in the UK. The motivation for the research is to investigate the claim of ERP vendors that their ERP solutions increase the performance of their customers, increase profitability and efficiency of work processes. The case study goes through three years of ERP implementation and this paper discusses what effects the system has had on the company's overall performance, what the benefits up until now are, and where there could be an enhancement to SMEs from the ERP system. The major benefits accrue from the more accurate estimates the system is able to provide and the resulting improvement in quotes.

Keywords – ERP, Barriers, Cost benefits

Paper type – Conference paper

1 Introduction

A study in 1998 by the IDC looked at the growth of ERP systems, expected it to grow at a rate equal to or greater than the software industry for which it caters. AMR Inc., which was then the leading industry and market analysis organisation specialising in enterprise enabling technologies, predicted that the ERP software market would grow annually at a rate of 37% of the next five years. Over 10 years later many large organisations have implemented an ERP system and research studies during that time have shown the difficulties they have faced (Esteves and Pastor 1999). However, the uptake of ERP systems in low-tech, small to medium enterprises has been low and very few research studies have investigated the barriers these enterprises face in trying to implement an ERP system ((Sahran et al. 2010) (Esteves and Pastor 1999) (Laukkanen, Sarpole 2005)).
The most important benefit that ERP would bring to the organization is the improvement in internal communications and the increase in efficiency of the information flow. Law & Ngai (2007) stated that ERP "allows seamless integration of information flows and business process across functional areas within a company", which is an extension of the benefits listed by Bocij. The view was further extended by Lozinsky (2008) on "As ERP improved on access of information, it will make possible more agile decision making for better negotiating with customers and suppliers".
The transitions from paper work and Excel sheets to an ERP system has been causing a lot of issues to employees in SMEs and have been causing delays to companies when they start to use ERP. This research discuses a case study, that has adopted an ERP system after two previous trials with different software, and has overcome the barriers of implementing ERP in Small to medium enterprises (SMEs) using some successfully modified methods (Bani-Hani, 2010). This research starts by describing the advantages and disadvantages of SMEs in terms of culture, human resources, employees and the acceptance of the system. Describing the Common mistakes SMEs do when installing the system, barriers and what are the steps applied in this case study to overcome them. Followed by the potential economic benefits the system would bring to the case study used in the research.
Findings and a summary are drawn at the end.

2 SMEs Advantage & disadvantages

The definition of an SME used by the South West Ventures Fund (nCipher, 2011), is a business or company that has fewer than 250 employees; with annual turnover not exceeding £24 million. Small to medium enterprises usually have a few numbers of employees between 20-250, and usually in most of the organisations in UK SMEs are companies that have around 50 employees and this has its advantages where it will be much easier to spread knowledge between employees. This is due to the less formal strategies, which increase communication of knowledge, speed of decision making and improve informality, which improve employee's commitment and their receptiveness of knowledge management changes. This will also increase the ability to react faster to the market changes requirements and knowledge changing to satisfy the market needs (Rothwell and Dodgson, 1994).
SMEs have fewer layers of management, which means that decision making takes less time but at the same time it means less thinking, less searching and less use of knowledge management strategies. Ghobadian et al (1996) has mentioned that SMEs have a structural advantage over other enterprises, as they are less complex, which makes the ability to change much easier than larger organizations, and also increases cross-functional exchange, which makes decision making more efficient, SMEs also tend to have a more flexible culture than other organisations, small numbers of people with the same beliefs and values, which makes it easier for smaller organisations to change and spread knowledge management, but SMEs have a problem with human resources as they attract less skilled people, as highly skilled employees tend to go to larger organisations, where they will have higher salaries, insurance, more stable situation and bonuses (Bani-Hani, 2010). Achanga et al (2006) said that SMEs usually have a small number of staff which makes training almost impossible and longer as training means stopping daily work activities, and training individuals is very expensive for SMEs and usually cannot afford it. Large enterprises usually have more funds than small enterprises so they can afford a better ERP system, hardware and give employees more training which helps in the implementation phase of the ERP system.
As for IT, Large enterprises have an IT department that is dedicated mainly for ERP implementation and training. SMEs on the other hand usually have part time IT person who is responsible for IT support along with the ERP installation, implementation, maintenance, training and everything, which can lead to project delays, or sometimes abandoning the system in case of IT person leaving the company as it will be hard to find a replacement (Snider et al. 2008), which was illustrated at the case study when replacing two different ERP systems with the change of the developer working on them.

However, SMEs also has some disadvantages that make it difficult to use computer based knowledge management systems, Egbu has discussed the disadvantages are the inability to fund long-term and risky knowledge management programmes, weaknesses in technological competencies, which make use of knowledge difficult, as it needs an IT system to spread knowledge easier, faster, and more cost effectively, and a weakness in giving training and education to employees (Egbu 2001).
One more disadvantage that has been identified by Rothwell & Dodgson (1994) is that "SMEs have little management experience", and that applies because usually the manager of an SME is the owner of the organisation which makes decision making less formal and less professional.
A problem that employees at SMEs have is being unable to refer to each other's work, if information was transferred effectively from one employee to another through an organized system, then problems would be solved easier, and learning would be in a better place in the organisation. Most of this work is tacit knowledge; knowledge that has been gained from project experience that needs to be transferred from one employee to another and here is where the conversion techniques need to be used, as this problem is sorted in bigger organizations and needs to be converted to suit smaller ones, for that studies have been undertaken to investigate the correlation between ERP and the size of the organization.
The following section will talk about the barriers found at the case study and how the size of the enterprise would affect ERP implementation process.

3 Barriers of the ERP implementation found at case study

Barriers found at case study from were as follows:

1. Low tech SMEs usually attract people with low educational skills, as educated people usually prefer to go to bigger organisations or high tech SMEs where salaries are higher and they have a more stable work situation.
2. Unskilled employees, especially IT illiterate employees, make it difficult to implement an ERP system, as it requires many hours of training to bring them up to just a basic level of IT understanding.
3. Lack of motivation for employees to endorse the new system.
4. Lack of training due to financial costs and lack of time, as it removes an employee away from their 'day-job'.
5. Lack of process mapping – a map should define every activity at the organisation. It should include a step-by-step process for every information flow, but this takes time to develop and it could be argued, needs to be conducted by an outside expert.
6. Lack of knowledge (awareness) about the implementation process, which makes the implementation slower and there is only the ERP system to blame.
7. Lack of interest from the Top Management.
8. Inadequate project resources, as information are not updated regularly the resources were information comes from is inadequate.
9. Resistance to change.
10. Unrealistic expectations.
11. Lack of project planning.
12. Fear of losing an authority/ job insecurity.
13. Lack of transaction time and cost during implementation of ERP.
14. SMEs are less disciplined when it comes to process definition and improving practices, this would lead to big number of customizations that will take the entire project budget.

Those barriers have been overcome through applying change management techniques to employees at the case study (Bani-Hani 2010), and action research, but what are the benefits of ERP and what are the economic benefits found at case study.

5 Benefits of an ERP system

Bocij et al (2006, p605) stated that the benefits an information system brings to the company are often harder to quantify as these benefits are often intangible in nature, like improving customer services, improving management of information, internal and external communication in the company. It will also support core business function and improve product quality. However the quantifiable benefit is the reduction in cost. Lozinsky (1998) stated that operating cost will be reduced which

will lead to the increase of return on investment. Bendoly and Schoenherr (2005) have also stated the benefits from implementing an ERP would include the elimination of redundant or unnecessary processes to improve resources allocation and system wide standardizations.
Poston and Grabski (2001) andMatolcsy et al. (2007) indicated that the adoption of ERP will reduce the number of employees needed for manual processes as the ERP system will help manage these processes automatically, which will reduce the cost for each year following the ERP implementation.

4 Potential Benefits of implementing ERP system in SMEs

The MD of the company's main concern is the financial status of the company, how much they gain, lose, Return On Investment (ROI). For that a study of the financial benefit of ERP to assure the MD was needed in order to prove how the system is more accurate than the manual estimates.
For this reason some comparisons were needed, such as:
The number of hours actually quoted for a door (Job tracker), recording hours to the system through the ERP from the shop floor work, live hours were collected, and the results were gathered after a test phase that lasted for more than a year. It was found that out of 60 jobs tracked, 41 were quoted wrongly, underestimating how long it actually takes on the shop floor to be made. Products have been taking more time in manufacturing than the charge to customers.

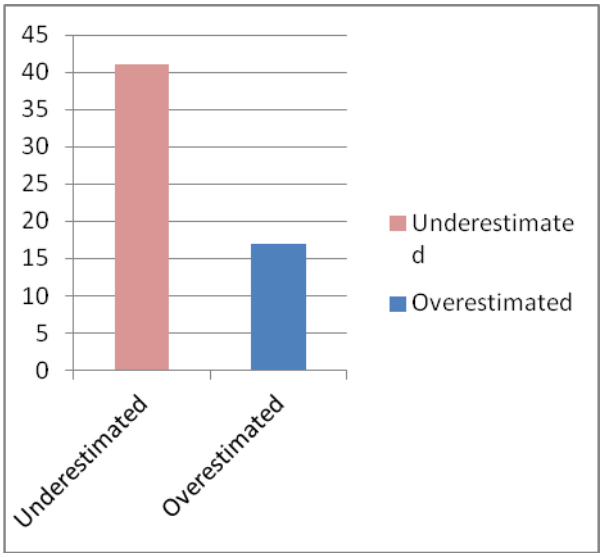

Figure 1. 41 jobs, 70.6% of the tracked jobs were underestimated at the quote stage. 16 or 29,4% of the jobs were overestimated at the quote stage.

					Actual Hours recorded though the ERP system					Estimated Time from Tacit information					
2	Job Number	Cus tom	Door Type	Quantity	CNC	Mach Total	Assembly Total	Spraying	Total Hours	Mach Quote inc CNC	A'bly Quote	Spray Quote	Total	Diff Hours	Time / Door
3	2098-SPIR B		Solar	7.00	13.50	15.00	39.25	17.50	85.25	21.00	42.00	14.00	77.00	-8.25	12.18
4	2144-SPIR		Timka + sic	1.00	0.00	10.50	20.25	2.50	33.25	5.50	11.00	2.00	18.50	-14.75	33.25
5	2136-MISC		Rosette st	1.00	0.00	11.50	19.00	2.50	33.00	4.67	9.33	2.00	16.00	-17.00	33.00
6	2141-MISC A		1VP Comb	6.00	10.50	16.00	46.00	13.00	85.50	28.00	56.00	12.00	96.00	10.50	14.25
7	2175-SBD		3XGGG (x3	4.00	3.00	18.50	22.50	3.00	47.00	18.00	36.00	3.50	57.50	10.50	11.75
8	2176-SBD		Solid core	7.00	8.50	7.00	2.00	3.00	20.50	32.00	66.00	7.00	105.00	84.50	2.93
9	2153-MISC		Vairous	4.00	0.00	63.00	96.75	16.50	176.25	27.00	55.00	5.00	87.00	-89.25	44.06
10	2141-MISC B		S-C 1VP	9.00	12.50	24.50	139.50	17.00	193.50	36.00	74.00	9.00	119.00	-74.50	21.50
11	2172 MISC		57mm 4XG	1.00	0.00	9.50	24.00	1.50	35.00	5.00	10.00	2.00	17.00	-18.00	35.00
12	2163 SBD		9 4XG, 1D4	12.00	0.00	37.00	120.50	8.00	165.50	47.00	95.00	16.50	158.50	-7.00	13.79
13	2174 SPIR		Mock Zara	7.00	0.00	14.50	48.75	13.25	76.50	25.00	57.00	14.00	96.00	19.50	10.93
14	2188 SBD		FD30 6 par	4.00	1.00	3.00	25.00	2.00	31.00	8.00	12.00	4.00	24.00	-7.00	7.75
15	2166 MISC		D12RF 12 p	1.00	0.00	4.00	23.00	3.00	30.00	7.00	14.00	4.00	25.00	-5.00	30.00
16	2157 SBD		Flat entrar	47.00	14.50	22.00	174.50	4.00	215.00	117.50	164.50	47.00	329.00	114.00	4.57
17	2170 MISC		2XGG	3.00	0.00	8.50	10.00	3.50	22.00	5.00	10.00	4.00	19.00	-3.00	7.33
18	2169 MISC		2XGG	2.00	0.00	3.50	21.25	3.50	28.25	11.00	27.00	4.00	42.00	13.75	14.13
19	2164 SBD		3XG-H Arcl	1.00	0.00	4.75	12.25	1.50	18.50	3.00	8.00	2.00	13.00	-5.50	18.50
20	2146 SBD		FD30 5VP	5.00	2.00	3.00	17.00	2.00	24.00	7.50	15.00	2.50	25.00	1.00	4.80
21	2120 SDB		FD30 5VPC	3.00	1.00	5.50	15.25	0.75	22.50	5.00	10.00	1.50	16.50	-6.00	7.50
22	2177 SPIR		Dina + Slav	1.00	0.00	12.00	12.50	1.00	25.50	6.00	12.00	2.00	20.00	-5.50	25.50
23	2192 SPIR		Satini	6.00	0.00	14.50	81.00	7.00	102.50	30.00	60.00	12.00	102.00	-0.50	17.08
24	2186 DBS		Patt 10	1.00	0.00	2.50	5.50	0.50	8.50	2.00	4.00	1.00	7.00	-1.50	8.50

Figure 2: Job tracker comparison between ERP recorded hours and estimated hours

Material updates (Purchase orders), as the MD uses prices from his own tacit knowledge, the company lost money on some jobs because they were using old prices, or losing customers because they were overpricing a number of quotes due to incorrect estimation.

Some of the results found were at the quotation stage, the ones sent to the customer, and it was found that in 2011 the case study had won 266 (39.87%) quotes and lost 379 (60.13%) quotes, 82 of them were due to overpriced products.

Out of the (60.13%) 2011 lost quotes (31%) from them were lost due to prices, (3%) for long lead times and (3%) for changing needed specifications, (20%) due to high delivery charges and the other (43%) were lost due to customers changing their minds some for needing a third party to do all measurements, or for fittings, and sometimes just because they lost a site contract or other reason.

In money terms, they had won £1,210,698.84 worth of quotes this year and lost £6,443,682.82 worth of quotes, £1,438,105.66 of them due to inaccurate pricing, which were taken over by our competitors'.

Analysing the lost quotes due to prices, and redoing them again through the ERP system, a number of errors were found, but most importantly out of 82 quotes lost due to prices, 56 were estimated with lower prices from what the estimator sent to customer, 17 were underestimated due to un tracking the price changes, and 9 quotes files were lost.

No patterns were found for the results because of the un-systematic approach the estimator uses, and asking the estimator about the results, it was found that some of the quotes were raised in price to make a balance in some other lost jobs or mistakes done in jobs, the exact example was:

"I was quoting a customer's quote and I received a phone call telling me that a door at a customer site started bending meaning we have to remake the door from scratch, for this reason and to make it up for the loss I've added around £200 to this quote", Company MD. This unsystematic approach has been causing the company a huge loss in both quotes stage and job stage of the company work process.

6 Findings from case study

There are few questions to be asked in order to verify the results of the implementation:

Can you observe productivity in your planning area a few months later after ERP implementation? Do things which have been assumed as complex before implementation seem very simple after implementation? Can you now control your budget and stocks? Have you not stopped your and your customer's production lines because of material shortage due to better planning system? Can you feel the financial benefit or the ERP system?

A successful ERP implementation in any case study needs to answer these questions. At the case study, live prices are used for quotes, which if accepted are then turned into the sales orders, transferring them easily into a job that can automatically alert the purchasing department of what needs to be purchased for this jobs, updating quantities, scheduling a job for the shop floor, tracking it through the work, being able to determine job stages and update customers, has been accomplished, and made creating a job file much easier than previously as each file use to be typed manually into Excel sheets, paper work.

The case study was able to overcome a number of barriers to the implementation and can feel a financial difference in the quotes sent to customers, which help in losing fewer customers and with increasing the productivity of the company.

7 Conclusions and Future Work

A successful ERP implementation is based on the understanding and clarity of the processes and work flow through the various departments in the organization. It also depends on the support employees get when using the system, especially from top management.

There were many barriers to successful implementation, many of which were not predicted. Bani-Hani et al. described these focusing on the difficulty of persuading many of the employees that the ERP system could make their job easier and more successful.

This paper was able to identify the costs and benefits from the ERP system, and what difference it can make to the financial status of the company if used properly. In fact the improvement in accuracy played a major part in convincing the management of the value of the system. It was also clear that there is a critical mass of support that is necessary to persuade management to adopt the improved procedures.

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APPENDIX E … (THE ECONOMIC BENEFITS OF KNOWLEDGE VALIDATION OF ERP TO LOW TECH SMES)

Full Reference

Bani-Hani, A.I., Jackson, T.W. and Hinde, C.J., "The Economic Benefits of knowledge validation of an ERP System to a Low Tech SME", International Journal of Information Technology and Business Management, 2013, Vol. 13, PP. 100-107.

Abstract

Knowledge Validation is a challenge in Small to Medium Sized Enterprises (SMEs), as most of the available information is held in people's minds as tacit knowledge, or saved on each employee's PC without sharing or common validation. This case study is based on a company in Leicester who installed an enterprise resource planning (ERP) system after two previous failed trials with different type of software. The underlying reasons for the problems were due to the distributed and tacitly held knowledge where the assumptions in one part of the company were inconsistent with other parts. The research goes through three years of ERP implementation and analyses the main problem of validating knowledge in more detail and identifies the consequences of failing to do this. It also describes the potential economic benefits for installing enterprise resource planning system in SMEs and investigates the claim of ERP vendors that their ERP solutions increase the performance of their customers, increase profitability and efficiency of work processes. It discusses the effects of ERP on the company's overall performance, what the benefits are, and where there could be an enhancement to SMEs from the ERP system. The major benefits accrue from the more accurate estimates the system is able to provide and the resulting improvement in quotes. Challenges are discussed and highlighted in the paper, which concludes at the end the importance of Knowledge Validation and identifies benefits of doing it.

Keywords – ERP, Barriers, Cost benefits

Paper type – Journal paper

Introduction

Implementation of an ERP system has always been difficult, where communication between employees and the system is a very complicated process. The difficulties in transferring the tacit and explicit knowledge into the ERP system, the validation of this knowledge and the process of putting all of this together into a knowledge management (KM) system has been a challenge due to the barriers of installing KM in SMEs.

The transitions from paper work and Excel sheets to an ERP system had been causing a lot of issues to employees in SMEs and had been causing delays to companies when they started to use ERP. The most important benefit that ERP would bring to the organization is the improvement in internal communications and the increase in efficiency of the information flow. ERP "allows seamless integration of information flows and business process across functional areas within a company" [1], which is an extension of the benefits listed by Bocij [2]. The view was further extended [3] "As ERP improved on access of information, it will make possible more agile decision making for better negotiating with customers and suppliers".

This research discusses a case study, which has adopted an ERP system after two previous trials with different software, it starts by describing the advantages and disadvantages of SMEs in terms of culture, human resources, employees and the acceptance of the system. Describing the common mistakes SMEs do when installing the system, focusing on the knowledge validation process, barriers and what are the steps applied in this case study to overcome them. Followed by the potential economic benefits the system would bring to the case study used in the research. Findings and a summary are drawn at the end.

Literature review

SMEs

Small to medium enterprises usually have a small number of employees between 20-250, and usually in most of the organisations in UK SMEs are companies that have around 50 employees and this has its advantages where it will be much easier to spread knowledge between employees [4]. This is due to the less formal strategies, which increase communication of knowledge, speed of decision making and improved informality, which improve the employee's commitment and their receptiveness of knowledge management changes. This also increases the ability to react faster to the market changes requirements and knowledge changing to satisfy the market needs [5].

SMEs have fewer layers of management, which means that decision making takes less time but at the same time it means less thinking, less searching and less use of knowledge management strategies. SMEs have a structural advantage over other enterprises [6], as they are less complex, which makes the ability to change much easier than larger organizations, and also increase cross-functional exchange, which makes decision making more efficient, SMEs also tend to have a more flexible culture than other organisations, small numbers of people with the same beliefs and values, which makes it easier for smaller organisations to change and spread knowledge management. SMEs have a small number of staff [7] which makes training almost impossible and longer as training means stopping daily work activities, and training individuals is very expensive for SMEs and they usually cannot afford it. Large enterprises usually have more funds than small enterprises so they can afford a better ERP system, hardware and give employees more training which helps in the implementation phase of the ERP system.

SMEs usually only have a part time IT person who is responsible for IT support along with the ERP installation, implementation, maintenance, training and everything, which can lead to project delays, or sometimes abandoning the system in case of the IT person leaving the company as it will be hard to find a replacement [8] which was illustrated at the case study when replacing two different ERP systems with the change of the developer working on them.

However, SMEs also have some disadvantages that make it difficult to use computer based knowledge management systems, Egbu has states that the disadvantages are the inability to fund long-term and risky knowledge management programmes, weaknesses in technological competencies, which make use of knowledge difficult, as it needs an IT system to spread knowledge easier, faster, and more cost effectively, and a weakness in giving training and education to employees [9].

One more disadvantage that has been identified by [5] is that "SMEs have little management experience", and that applies because usually the manager of an SME is the owner of the organisation, this was also described in a study [10], were their study on 30 different SMEs indicates that more than half of them were managed by owners, founders or close relative, which makes decision making less formal and less professional.

One of the problems employees at SMEs have is being unable to refer to each other's work, if information was transferred effectively from one employee to another through an organized system, then problems would be solved easier, and learning will be in a better place in the organisation. Most of this work is tacit knowledge; knowledge that has been gained from project experience that needs to be transferred from one employee to another and here is where the conversion techniques need to be used, as this problem is sorted in bigger organization and need to be converted to suit smaller ones, and it is important to investigate the correlation between ERP and the size of the organization.

ERP

Enterprise Resource Planning, or ERP Systems, is a complex process in practice. In theory ERP could solve a lot of problems, by centralising the knowledge into a database [11]. The difficulties in transferring this knowledge between the different departments and actors have shown an interest in how KM may support an ERP system [12]. KM is defined according to the Knowledge Board in 2004 as planned activities and processes for managing knowledge to enhance the competitiveness through better use and

creation of individual and collective knowledge resources. KM often relies on the information technology available which relies on capturing employee's knowledge and filtering it according to the job needs.
After this and after gathering all of this tacit and explicit knowledge and transferring it to the database of the system, comes the importance of the knowledge validation process. Without the validation process [13], ERP system loses its credibility with employees and this is one of the things that happened at the case study, where employees no longer believed in the importance of the system. Failure of the knowledge validation process, not understanding what is happening with the system and not contributing in the work usually leads to rejection of the system from employees.
According to other research [14], ERP system must be implemented with care in order to encourage contributors to go for this challenge and provide valuable points to get the desired results from knowledge management system. They have also noted in their hypothesis that contributing in the implementation can enhance employee's perception of knowledge quality and their faith in the system. It was found [11] that some of the barriers to knowledge validation and knowledge transfer between different work departments are caused by system unreliability and lack of training as well as the information overload, and how this might be solved by following a knowledge management communication process between the implementer and the people involved in the system. The role of knowledge management is very important in a business environment as it increases the interaction and share of knowledge between people which enhances the organization's overall knowledge base. ERP system integrates work between all functional departments from purchasing, employee's management, scheduling, inventory management, production to shipping, and payroll management.

Methodology

This research at the case study started by undertaking business process analysis then interviews, formal and informal was done with management, administration employees and with shop floor workers, reviewing official and unofficial documents as well. Interviews were repeated from time to time, and lasted between 10 minutes to an hour with different employees, and all information was gathered studied and a working plan was produced. This research also went through a study of different ERP systems and why the case study had chosen this product for solving their business problems. Many factors have affected the choosing of the product and one of the main factors was the financial issues along with the requirements of the business. Further study was done about how the processes in the case study are done, the orders, purchases, certification, door making, and how all of these are done manually by employees and how it can be customised into the ERP system.
According to previous research on the same case study, problems that led to the need of an ERP system, barriers to installing and using it have been listed as follows:

- Losses of information, documents are not filed and a lot of paper work flows through the organisation, which makes it easy to mislay or lose.
- Sales enquiries are not tracked, so finding a job needs to be done manually, which takes time.
- Staff retirement or attrition - when employees leave or are off on holiday, it becomes nearly impossible for employees to take over their work.
- When a customer enquires about a new job pricing and product details are calculated manually, taking long time, especially for big orders.
- Data is entered manually into spread sheets, which increases the risk of incorrect information.
- Accounting problems - if an invoice is lost, long term funding problems occur.

Barriers:

- Unskilled employees make it difficult to implement an ERP system, as they require many hours of training.
- No motivation for employees to use the new system.
- Lack of training due to financial costs and lack of time.
- Lack of process mapping, a map should define every activity at the organisation. It must include a step-by-step process for information flow.

At the case study this system had been installed, three years ago, and until now had not been used properly, employees still use spread sheets to make orders, customer quotes, and even when printing orders, they use a customised template in a Word document where everything was written manually.
Work process flow: One of the main processes that was studied was the Production process of a door, and here is a brief description of how things were being done:

- A customer makes an order by email or by the phone.
- A quote is created by the estimator using spread sheet and sent back to customer.
- The customer is asked to verify that the details are correct.
- If the quote is verified a pricing list is produced using another spread sheet and then sent back to the customer for approval.
- The design and quote are then changed if they are unacceptable.
- If the quote and design are agreed it goes a detailed design is made.

- The design is then sent back to customer to sign off the order.
- Once the signed copy has been received this is then passed on to the floor for production.

This process takes days to complete at the case study, and if the order is a big one, for a new building with different kind of doors, inside doors, outside doors, security doors, mobility doors, then this would take longer. When a door is ordered a pricing spread sheet is used to calculate the price of the door. With time the estimator memorised the prices in it, and it has been found that these have not been revised for the last two years and not updated according to the purchasing orders, which led to losing money.
This is one of the main problems which are happening due to manual processes, and the errors occurring because of it is huge. For that the Configurator was proposed, in order to be able to reduce the number of hours this was taking, number of errors as all information will be pulled from a database, plus that every quote will be saved into the system, no need for paper work.

WHAT THE NEW SYSTEM WILL PROVIDE FOR THIS PROBLEM (CONFIGURATOR)

For the past few months working on a Configurator, there were a lot of challenges in customising it, some of these are related to the barriers mentioned below, which was caused of lack of employees knowledge in IT basic tools, and some others were due to the lack of encouragement of using the ERP system. Employees no longer have faith, and don't believe in the change it would make. One of the mistakes when doing the Configurator was its complexity as it was two pages, with more than 100 boxes to fill and pick, and that was confusing to employees not knowing much about computers, they refused to use it, as it was complicated and not user friendly. So with interviews and tests including employees in the steps, boxes were eliminated and the Configurator made simpler. In the Configurator, which is an aid to design and produce doors, one for an FD30 door, a standard door for 30 minutes fire rating, was changed about 4 times. The first one didn't have all requirements for the door, and the second was too complicated for employees, with showing and hiding fields facilities, and then after sitting with the estimator and discussing things thoroughly the default requirements for the FD30 door were found unless there was special cases which we will not go through at this stage of the implementation. After showing this to employees at the case study it was discussed that going through this might take a longer time than required and the best idea if we can set defaults for making this door. Once opened, there are all the defaults for an FD30 door which are just checked and any changes required are made, this minimised the number of errors and reduced the time required for making any quote. Defaults were all set, and the final Configurator for this door was ready to be used. In this Configurator there were some requirements to choose from first, things like Mobility, Secure by design, Chain of Custody, fire rating and location. Then the structural opening, which will be allocating the height and width, and finishing with the glass and hardware attached to the door. All of these boxes are attached to the database, where all parts used in Configurators are listed, and connected to purchasing orders to be able to pull prices and to calculate the door price when doing the quote. Another problem was with validating the knowledge in the Configurator. Employees were saving prices differently into their Excel sheets, using what they have or memorise which wasn't up to date and prices were very different from what they purchased from suppliers.
For this, receipts were gathered, the employee doing the purchasing was questioned, prices verified, the mathematics to get the right door prices, and while going through this process, another problem was found which was with the different names of the parts used in the door making. Employees know different ways of naming the products and were refusing to change to the new names which were required by the ERP system, and which were used when purchasing. Some were saying how hard it was to use this format of names, for that it was crucial to find a way to write them differently were employees could use them on the system. All part names were printed out from the ERP system, and there was around 3000 parts available there, and have decided on one person who would take the time to do this job, remove un used parts which were added two years ago, rename the parts with the help of the researcher and go through the prices, and trying to verify them with the purchasing order. Some were named with the manufacturer first, others with the kind of hardware, some was depending on the height and width of the door. Rules had to be set for the name and how to deal with them in the Configurator. Working on this along with the ERP system provider and Company, verification of prices were done and the testing process was in progress.

Hypothesis (1):
Configurator may work, solving all the validation problems in case study and will eliminate errors.

Hypothesis (2):
Configurator may work faster than the Excel sheets used in the quotes orders.

Hypothesis (3):
When Configurator works properly this will affect the quality of work positively and make the business flow easier.
SMEs are less disciplined when it comes to process definition and improving practices, this would lead to big number of customizations that will take the entire project budget.
Benefits of ERP and what are the economic benefits found at case study are discussed in the next section.

Benefits of an ERP system

[2], stated that the benefits an information system brings to the company are often harder to quantify as these benefits are often intangible in nature, like improving customer services, improving management of information, internal and external communication in the company. It will also support core business function and improve product quality. However the quantifiable benefit is the reduction in cost. Operating cost will be reduced [3], which will lead to the increase of return on

investment. [15], have also stated the benefits from implementing an ERP would include the elimination of redundant or unnecessary processes to improve resources allocation and system wide standardizations.
Other research, [16], [17] indicated that the adoption of ERP will reduce the number of employees needed for manual administrative processes as the ERP system will help manage these processes automatically, which will reduce the cost for each year following the ERP implementation.

Potential Benefits of implementing ERP system in SMEs

The MD of the company's main concern is the financial status of the company, how much they gain, lose and Return On Investment (ROI). For that a study of the financial benefit of ERP to assure the MD was needed in order to prove how the system is more accurate than the manual estimates.
For this reason some comparisons were needed to take place, such as:
The number of hours actually quoted for a door (Job tracker), recording hours to the system through the ERP from the shop floor work live hours were collected, and the results were gathered after a test phase that lasted for more than a year. It was found that out of 60 jobs tracked, 41 were quoted wrongly, underestimating how long it actually takes on the shop floor to be made. Products have been taking more time in manufacturing than the charge to customers.

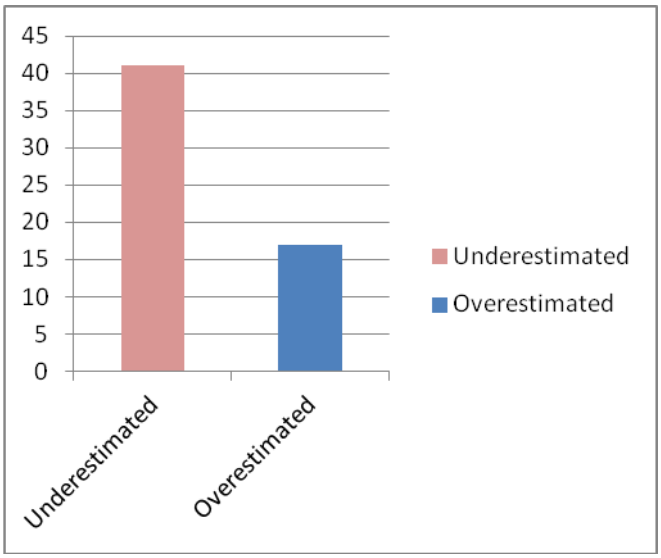

Figure 1: 41 jobs, 70.6% of the tracked jobs were underestimated at the quote stage. 16 or 29, 4% of the jobs were overestimated at the quote stage.

				Actual Hours recorded though the ERP system					Estimated Time from Tacit information					
Job Number	Cus tom	Door Type	Quantity	CNC	Mach Total	Assembly Total	Spraying	Total Hours	Mach Quote inc CNC	A'bly Quote	Spray Quote	Total	Diff Hours	Time / Door
2098-SPIR B		Solar	7.00	13.50	15.00	39.25	17.50	85.25	21.00	42.00	14.00	77.00	-8.25	12.18
2144-SPIR		Timka + sic	1.00	0.00	10.50	20.25	2.50	33.25	5.50	11.00	2.00	18.50	-14.75	33.25
2136-MISC		Rosette st	1.00	0.00	11.50	19.00	2.50	33.00	4.67	9.33	2.00	16.00	-17.00	33.00
2141-MISC A		1VP Comb	6.00	10.50	16.00	46.00	13.00	85.50	28.00	56.00	12.00	96.00	10.50	14.25
2175-SBD		3XGGG (x3	4.00	3.00	18.50	22.50	3.00	47.00	18.00	36.00	3.50	57.50	10.50	11.75
2176-SBD		Solid core	7.00	8.50	7.00	2.00	3.00	20.50	32.00	66.00	7.00	105.00	84.50	2.93
2153-MISC		Vairous	4.00	0.00	63.00	96.75	16.50	176.25	27.00	55.00	5.00	87.00	-89.25	44.06
2141-MISC B		S-C 1VP	9.00	12.50	24.50	139.50	17.00	193.50	36.00	74.00	9.00	119.00	-74.50	21.50
2172 MISC		57mm 4XG	1.00	0.00	9.50	24.00	1.50	35.00	5.00	10.00	2.00	17.00	-18.00	35.00
2163 SBD		9 4XG, 1D4	12.00	0.00	37.00	120.50	8.00	165.50	47.00	95.00	16.50	158.50	-7.00	13.79
2174 SPIR		Mock Zara	7.00	0.00	14.50	48.75	13.25	76.50	25.00	57.00	14.00	96.00	19.50	10.93
2188 SBD		FD30 6 par	4.00	1.00	3.00	25.00	2.00	31.00	8.00	12.00	4.00	24.00	-7.00	7.75
2166 MISC		D12RF 12 p	1.00	0.00	4.00	23.00	3.00	30.00	7.00	14.00	4.00	25.00	-5.00	30.00
2157 SBD		Flat entrar	47.00	14.50	22.00	174.50	4.00	215.00	117.50	164.50	47.00	329.00	114.00	4.57
2170 MISC		2XGG	3.00	0.00	8.50	10.00	3.50	22.00	5.00	10.00	4.00	19.00	-3.00	7.33
2169 MISC		2XGG	2.00	0.00	3.50	21.25	3.50	28.25	11.00	27.00	4.00	42.00	13.75	14.13
2164 SBD		3XG-H Arcl	1.00	0.00	4.75	12.25	1.50	18.50	3.00	8.00	2.00	13.00	-5.50	18.50
2146 SBD		FD30 5VP	5.00	2.00	3.00	17.00	2.00	24.00	7.50	15.00	2.50	25.00	1.00	4.80
2120 SDB		FD30 5VPC	3.00	1.00	5.50	15.25	0.75	22.50	5.00	10.00	1.50	16.50	-6.00	7.50
2177 SPIR		Dina + Slav	1.00	0.00	12.00	12.50	1.00	25.50	6.00	12.00	2.00	20.00	-5.50	25.50
2192 SPIR		Satini	6.00	0.00	14.50	81.00	7.00	102.50	30.00	60.00	12.00	102.00	-0.50	17.08
2186 DBS		Patt 10	1.00	0.00	2.50	5.50	0.50	8.50	2.00	4.00	1.00	7.00	-1.50	8.50

Figure 2: Job tracker comparison between ERP recorded hours and estimated hours

Material updates (Purchase orders), as the MD uses prices from his own tacit knowledge, the company lost money on some jobs because they were using old prices, or losing customers because they were overpricing a number of quotes due to incorrect estimation.
Some of the results found were at the quotation stage, the ones sent to the customer, and it was found that in 2011 the case study had won 266 (39.87%) quotes and lost 379 (60.13%) quotes, 82 of them were due to overpriced products.
Out of the (60.13%) 2011 lost quotes (31%) from them are lost due to prices, (3%) for long lead times and (3%) for changing needed specifications, (20%) due to high delivery charges and the other (43%) were lost due to customers changing their minds, some for needing a third party to do all measurements, or for fittings, and sometimes just because they lost a site contract or other reason.
In money terms, they have won £1,210,698.84 worth of quotes this year and lost £6,443,682.82 worth of quotes, £1,438,105.66 of them due to inaccurate pricing, which were taken over by our competitors'.
Analysing the lost quotes due to prices, and redoing them again through the ERP system, a number of errors were found, but most importantly out of 82 quotes lost due to prices, 56 were estimated with lower prices on the ERP system from what the estimator sent to the customer, 17 were underestimated due to untracking the price changes, and 9 quotes files were lost.
No patterns were found for the results because of the un-systematic approach the estimator uses, and asking the estimator about the results, we found that some of the quotes were raised in price to make a balance in some other lost jobs or mistakes done in jobs, the exact example is:
"I was quoting a customer's quote and I received a phone call telling me that a door at a customer site started bending meaning we have to remake the door from scratch, for this reason and to make it up for the loss I've added around £200 to this quote", Company MD. This unsystematic approach has been causing the company a huge loss in both quotes stage and job stage of the company work process.

Findings from case study

There are few questions to be asked in order to verify the results of the implementation:
Can you observe productivity in your planning area a few months later after ERP implementation? Do things which have been assumed as complex before implementation seem very simple after implementation? Can you now control your budget, stocks? Have you not stopped your and customer's production lines because of material shortage due to better planning system? Can you feel the financial benefit or the ERP system?
A successful ERP implementation in any case study needs to fulfil these arguments. At the case study, live prices are used for quotes, which if accepted are then turned into the sales orders, transferring them easily into a job that can automatically alert the purchasing department of what needs to be purchased for these jobs, updating quantities, scheduling a job for the shop floor, tracking it through the work, being able to determine job stages and update customers, has been accomplished, and made creating a job file much easier than previously as each file use to be typed manually into Excel sheets, paper work.
The case study was able to overcome a number of barriers to the implementation and can feel a financial difference in the quotes sent to customers, which help in losing fewer customers and with increasing the productivity of the company.

Conclusion

Knowledge Validation is an important aspect to any organization and this case study has presented the problems, solutions and barriers to these solutions. This paper has identified and analysed problems and barriers, in particular resistance to change. Some limited conclusions may be drawn, first is that even though the user gives a thorough specification there is a mismatch between what the user claims to want and what they actually want? Secondly, there is an internal resistance to change evidenced by the number of Configurators offered to the user and the persistent complaint that they were too complex. The system of spread sheets used at the case study was no more complex than the Configurators offered but it was familiar. The newest Configurator has many of the properties of the old Configurators but is becoming accepted. A great deal of training is required. This research's next step was to prove the changes made to the Configurator would identify effective ways for improving the business. The barriers and problems have been identified and went through a validation process, many of which were not predicted. Bani-Hani et al. (2010) described these focusing on the difficulty of persuading many of the employees that the ERP system could make their job easier and more successful.
This paper was able to identify the costs and benefits from the ERP system, and what difference it can make to the financial status of the company if used properly. In fact the improvement in accuracy played a major part in convincing the management of the value of the system. It was also clear that there is a critical mass of support that is necessary to persuade management to adopt the improved procedures.

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APPENDIX F … (IDENTIFYING AND OVERCOMING BARRIERS TO IMPLEMENTING ERP IN SMES)

Full Reference

Awaiting publication

Abstract

Purpose-To investigate the barriers to ERP software system implementation in SMEs and identify the steps to overcoming them, and to demonstrate they have been overcome with tangible benefits.

Design/methodology/approach- An 18 month study which used a combination of methods, including change management, un-structured interviews, negotiation strategy, a mix of action research method and problem solving technique.

Findings- The findings include a definition of barriers to explain variation between successful and unsuccessful implementations, followed by a framework of how to overcome those barriers, focusing on top management.

Research limitations/implications- The focus is on the case study, but draws on relevant literature. This study improves the overall knowledge of ERP implementation in SMEs by embedding the case study in that body of knowledge.

Practical implications- SMEs wishing to implement an ERP system can utilise the findings.

Originality/value- Providing original structured steps for overcoming ERP barriers in SMEs.

Keywords: SMEs, ERP software system, Barriers.

Paper Type: Case study

Keywords – ERP, Barriers, Cost benefits

Paper type – Journal paper

Introduction

Enterprise resource planning systems capabilities to manage data effectively and efficiently has convinced companies of the importance of integrating different departments together in large and small to medium enterprises (Lozinsky, 1999). It offers a management tool that according to successful implemented companies is lifesaving software that changed their work forever (Huin, 2004).

A study by the UK Department of Trade and Industry stated that SMEs will be the job creation source for new graduates (Thoburn ET al.1999). The small to medium enterprises eases the spread of knowledge between employees due to less formal strategies, which increases communication and decision making, and improves employee's commitment and receptiveness to knowledge management changes, which increases the ability to react faster to market changes (Rothwell and Dodgson, 1994). Unfortunately, in 1998, a survey made by the society of practitioners of insolvency in the UK, related the failure of SMEs to the lack of information sharing being the most important factor (SPI, 1998). The uptake of ERP systems in low-tech SMEs has been low and little research has investigated the barriers these enterprises face in implementing one (Sahran, Goni et al., 2010; Esteves-Souza et al., 1999; Laukkanen, et al., 2005).

Why SMEs needs ERP

Bhattacharyya (2011) lists some conditions that force an organisation to change:

- Dramatic crisis, like recession.
- Leadership turnover;,
- Changes to increase profit,
- Age of the organisation,
- Size or strength of the current culture, potentially causing resistance to change.

These reasons to change the work environment involve not only learning something new but also unlearning, as it is necessary to change unhelpful attitudes of employees into useful attitudes that help sharing knowledge. In order to change the work environment there must be motivation, which can be accomplished through explaining the benefits to employees.

Why this is an important topic

Rothwell and Dodgson stated that "SMEs have little management experience", because usually the manager of an SME is the owner, which makes decision-making less formal and less professional (Rothwell and Dodgson 1994). Other problems employees at SMEs face is their inability to share each other's work; if information was transferred effectively between employees through an organized system, then problems would be more easily solved, and learning would be more effective but most of the work at SMEs is tacit knowledge; knowledge that has been gained from project experience that needs to be transferred amongst employees and made available for sharing and to transmit into a logical manner (Lee and Lee, 2000, Nonaka, 1994), or explicit knowledge. Explicit knowledge can be articulated and captured in the form of texts, tables, diagrams, websites, intranets, databases, organisational business records and so on. The features of explicit knowledge are as follows: it is easily expressed and shared; it can also be stored, codified and transferred easily (Serban and Luan, 2002). In contrast, tacit knowledge is embedded in people and cannot be easily articulated. It covers informal business processes and communications, personal experiences and understanding; it is, in effect, individual knowledge and is considered as the property of the knower; it can be difficult to formalise and capture (Dalkir, 2005; Serban and Luan, 2002).

Previous research based on the case study (Bani-Hani et al.2010) found that SMEs have a number of problems that needs a software system to sort like:

- Loss of information. Important documentation being mislaid,
- New sales enquiries are not tracked systematically,
- Staff retirement or attrition - when employees are absent, it is difficult for colleagues to take over,
- Due to lack of an information system, all the pricing and product details calculated manually,
- Everything is entered manually into Excel sheets, which risks errors,
- Accounting problems – a lost invoice carries financial risks.

For these reasons and in order to help with the growth of enterprises, software like an ERP that offers a knowledge management tool to help with the enterprise resources is important (Huin 2004).

Studies about ERP

ERP is a system made to manage all information and functions in a company from many departments and data stores, it is very important to use ERP system in a company where information needs to be shared easily, and securely.

Research has shown ERP systems are very complicated processes in practice. In theory an ERP has to solve a lot of business problems, and should transfer all of the knowledge in a business environment efficiently into a database where everything can be connected together (Leknes 2006), but it is not that simple, as implementing ERP would lead to changes within the organization there is a possibility that some employees will be made redundant. Haines and Goodhue (2003) stated that the

difficulties in transferring this knowledge between the different departments, and actors like employees, and customers have shown an interest in how KM may support ERP system.

A study by Buonanno 2005 stated that the factors effecting ERP adoption in SMEs are more depending on the structure of the work and lacking the understanding of it can lead to failure of the implementation, as well as the process of choosing the ERP system which doesn't depend on the work process but rather on other constraints unlike bigger organisation that are more interested in mapping the processes and the data when it comes to the adoption and implementation of ERP.

Another study in Canada (Snider et al. 2008), discusses the difficulties in implementing ERP specially in SMEs and concluded the barriers to the successful implementation in 5 SMEs, as follows: SMEs usually dedicate only part of their time to working with the ERP which gives less time for implementation causing delays and frustration; they also mentioned that most SMEs try to keep communication informal as employees tend to speak their minds informally, but their research suggests that formal communication is useful, enforcing firmness and dedication, this was supported by Sahran (2010) who listed lack of internal cooperation and communication as one of the causes of ERP failure; another barrier identified is that SMEs adopt some of the processes of the ERP system rather than the system as a whole, and they tend to modify the system significantly to fit their way of thinking, leading to continuous software modification as employees change; this usually slows down the ERP project and could affect the sustainability of the software as mentioned by Buonanno et al 2005, but at the same time the good advantage of it is less changes in the work process that employees are used to, which means less training on the new process if it is changed to fit the software.

Sahran (2010) also mentioned other barriers like, no dedicated IT staff, insufficient educational levels, bad data quality, and top management not wanting to learn from experience, expensive ERP systems. Huin, 2004 mentioned that SMEs are different from large enterprises as they do not function as a collection of formal structured departments. In their study on 30 different SMEs, they state that top management involvement impacts on how the ERP system is managed at SMEs; this means that lack of top management support, strong committed knowledgeable leadership or involvement can be a barrier to the successful ERP implementation (Sarker and Lee 2002, Snider et al. 2008, Sahran, 2010, Huin, 2004).

Other factors or barriers that could affect the implementation process as mentioned by Buonanno et al 2005 is data inconsistency, limited support for the decision, high cost of data distribution and lack of flexibility of the ERP system; other factors were also mentioned but were more related to larger enterprises.
One other issue is the lack of departmental walls as mentioned by Huin 2004; stating that one employee can be in charge of more than one department at the same time, so their main work can be accounting but they can do purchasing or quoting at the same time which can affect the individual roles when it comes to the implementation. Other factors which are very common in manufacturing companies is bespoke work, as they have to change their monthly planned forecast, change their orders and change their lead times depending on orders which can delay the ERP implementation process and put it into difficulty at certain times (Huin 2004).

Barriers to solving these problems in SMEs can be summarised in table 1

Table 12: Barriers identified in literature

Focus of the study	*Research by*	*Summary of barriers in SMEs*
To explore the challenges of ERP system implementation in order to deepen the knowledge on ERP system implementation in SMEs	*Sahran, 2010*	*Insufficient educational level.* *Lack of internal cooperation and communication.* *No Recruitment of IT Staff.* *Bad Data quality.* *Top management doesn't want to learn from experience.* *ERP system over budget.*
To explore the critical success factors (CSFs) of enterprise resource planning (ERP) system implementation in small and medium-sized enterprises (SMEs).	*Poti et al,, 2011* *Hutchinson, 1991* *Snider at al., 2008* *Thurley and Wirdenius, 1973*	*Part time dedication to implementing the ERP system* *Lack of formal Communication.* *Software modification.* *Lack of top management support.*

To explore the barriers of enterprise resource planning (ERP) system implementation in small and medium-sized enterprises (SMEs).	*Esteves-Souza et al., 1999.* *Holland and Davis, 1998.* *Bani-Hani et al., 2010*	*Lack of motivation to endorse the system.* *Lack of training.* *Lack of process mapping.* *Lack of knowledge (awareness) about the implementation process.* *Lack of interest from the Top Management.* *Inadequate project resources.* *Resistance to change.* *Unrealistic expectations.* *Lack of project planning.* *Fear of losing an authority/ job insecurity.* *Lack of transaction time and cost during implementation of ERP.* *SMEs are less disciplined when it comes to process definition and improving practices.*

Why this research is different

This study focuses on the barriers to implementing ERP, particularly in low tech SMEs by answering the following research questions:

1. What is the impact of the barriers (Lack of knowledge, process mapping and trust) on the implementation process?
2. What is the impact of top management support?
3. What is the impact of focusing on individuals rather than departments and does it work in SMEs?
4. What impact does education level of employees at SMEs have on the overall implementation process?
5. Could action research and problem-solving techniques and approaches be mixed to overcome the ERP implementation barriers?
6. Could resistance to change from employee's effect SMEs?

By answering these questions a number of structured steps of overcoming the barriers were suggested followed by a discussion of the financial and economic benefits of ERP implementation.

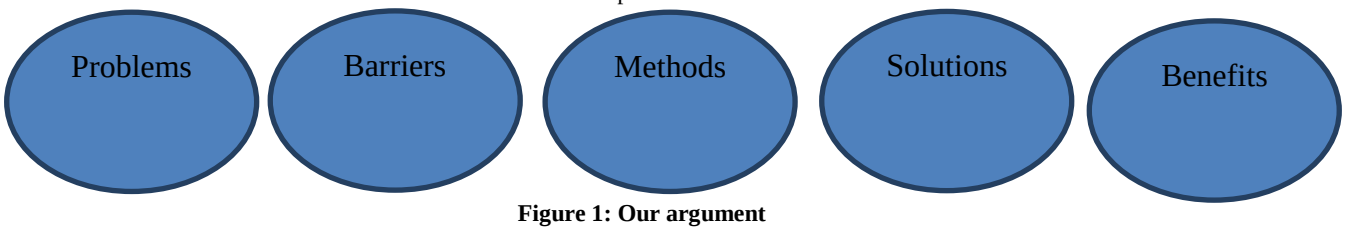

Figure 1: Our argument

This research represents the next phase of the investigation of ERP implementation barriers in SME (Bani-Hani et al 2009 – 2012). The argument is structured as follows. In section 2, the theoretical background for this study is reviewed, barriers mentioned, different approaches suggested in SMEs to solve ERP implementation problems and what case studies say about it. The research design is discussed in section 3 and the case study context that derived this research and methods that guided our analysis of the case study. Section 4 covers how these approaches are mixed based on our analysis at the case study and how these approaches help with solving problems. A model is derived that includes barriers, methods, solutions and quotes from the ERP system users. Section 6 provides the implications for future research.

Methodology

In order to frame the research questions and advance practice in this research, it is important to build on theory and how this research benefits from it and how can it contribute and add to the theory. Specifically, the approaches that were used in solving the problems of the research discussed.

- **Could action research and problem-solving techniques and approaches be mixed to overcome the ERP implementation barriers?**

Several scholars proposed different theories about ERP implementation (Sahran 2010, Esteves-Souza et al., 1999, Holland and Davis, 1998, Sarker 2003). A review of literature reveals that the use of action research and other mixed approaches and techniques in parallel could lead to an easier ERP implementation (Chiasson et al 2008) as action research solves a certain problem while enhancing theoretical knowledge at the same time. Sahran 2010 used action research cycles to implement ERP in SMEs in Malaysia and discusses the complexities that occur practically. He broke it down into five steps, starting with diagnosing, action planning, and action taking, evaluating, and specifying learning which was a model by Susman & Evered (1978) that is called the canonical model. It has been validated in Malaysia by Sahran (2010), and has been identified as a successful method for implementing ERP. The success factors in this method were; the focus on top management

commitment, teamwork, effective project management, clear understanding of ERP and its uses and goals, changes in management programme culture, data accuracy, suitability of software and hardware, IT support, educational level of employees, and user involvement; however in the case of lack of management support or any of the mentioned factors above this breaking down of the action research method wouldn't work and would lead to a failure of the implementation process.

(Chiasson et al 2008) stated in their research that action research can take different forms when it comes to information system, and focused on the importance of the balance in action research as sometimes it leans more toward the practical side which leads to lack of generalisation of knowledge which doesn't contribute to theory and conversely can have little practical effect. For this reason it is important in action research to make a balance between both by putting more attention on the problem and learning specific skills and mixing it with other research activities and approaches in order to produce knowledge to implement information systems in general.

For the purpose of this research action research was mixed with problem solving techniques like change management and also a number of approaches like interviews and semi structured interviews to be able to analyse the problems at the case study that's causing the failure of the implementation.

(Chiasson et al 2008) also mentioned that the approaches can be used either sequentially, in parallel, dominant, multi methodology or in a multi-level way. With action research it was important to verify the changes along with the implementation of the system, so research methods, techniques and approaches were executed at the same time starting with management of change which can help dealing with the problem in a systematic way, both at an organizational and individual level. It is the activities involved in defining the new values and behaviours into the organisation to support overcoming resistance to change, and planning, testing the transition from one structure to another in each department within the organization.

The purpose of management of change (MOC) is to verify that changes made to facilities, documentation, personnel, or operations are evaluated and managed to ensure they meets requirements and all risks and problems arising from it are controlled, but before starting to use it, there are three critical best practices to do identified by SunMicro systems (mentioned in the PRINCE2 Managing successful book (OGC, 2009)), and listed as follow:

- **Scope**: It is very important to select the scope of changes that will affect the change management process, and this should be specified according to the size of the organization, budget, and type of change.
- **Project management**: Almost all of the change management is about good project management. One very common methodology is the Prince2 methodology, which cuts the work process into stages that helps identify the work plan.
- **Communication**: It is very important through the change process to get employees on board with how the change management process works, and what projects will be affected and why is it very important to the organization.

These three practices are very important when starting to change to any new system, as they ensure that every individual in the organization can understand the benefits occurring from this change. Hutchinson (1991) suggested that enterprises should try to affect key members in each department, which will lead to a successful transition to ERP helping with negotiating change. Change should be taken as a multistage cycle with all stages planned and negotiated, as forcing change will only lead to problems; change is not only rational management but also emotional management.

(Thurley and Wirdenius 1973) have defined five approaches to change, which are:

- Directive strategies: a very quick approach to change, which means that managers have the authority to apply change with no involvement of other people, which is good in implementing the new system quickly but the disadvantage of it that it doesn't take into consideration users involvement and views and might lead a huge system resistance and failure.
- Expert Strategies: Experts plays a major role in the solution as they implement a quick way of involving a small number of users.
- Negotiation Strategies: this approach says that those affected by the change have the right to say how change would be implemented and what the expected outcomes are. The good thing about this strategy is that individuals can feel involved in the change and would be more supportive. The disadvantage is taking a very long time for the change to take effect.
- Educative Strategies: is the approach that works on changing people's value and beliefs by winning their minds, and take full support, this will be a mixture of training, education, consultation and persuasion, but again the disadvantage of this approach is the time it takes.
- Participative strategies: the approach of this strategy is the full involvement of all participants in every little detail of the process, and this will cause delays, unexpected outcomes, and also longer payments of consultants and experts, but at the same time, change will be supported and individuals will be more committed to success of the system.

These five strategies described by Thurley and Wirdenius (1973) are used independently, testing which one is more effective to change depending on the type of organizations.

In order to get the change right, there must be a sequence in implementing the work, starting with planning, mapping processes, understanding the problems and barriers, monitoring, dealing with consequence of change and these can be achieved through different approaches to help the research.

Approaches used in this study were interviews and semi structured interviews, which were the main data collection points that helped with learning user requirements which was followed by observation and documentation analysis of paper work.

Interviews in general are an important tool for capturing information from employees or participants. Informal interviews are considered as conversations or chats that leads to important information as the research can draw a full analysis of the participants thought without having fixed questions that might make them uncomfortable.
Informal interviews were the key method for capturing information as it made it easier to get participants thoughts about the ERP system and their fears of using it without the influence of other employees and without being worried about others judgement as described by employees at the sponsoring company.

Informal interviews provided a deeper understanding of the work processes, which led to a better evaluation of the current situation of the ERP system.

Action research as described by Chiasson et al (2008) is a methodology that can help researchers with a variety of options depending on the context of the study; they summarised that often researchers mix action research with other research methods in order to evolve their research programs. For this reason, the research used a solution to the practical problem at the case study that links theory and practice in order to solve the problems of the failed implementation.

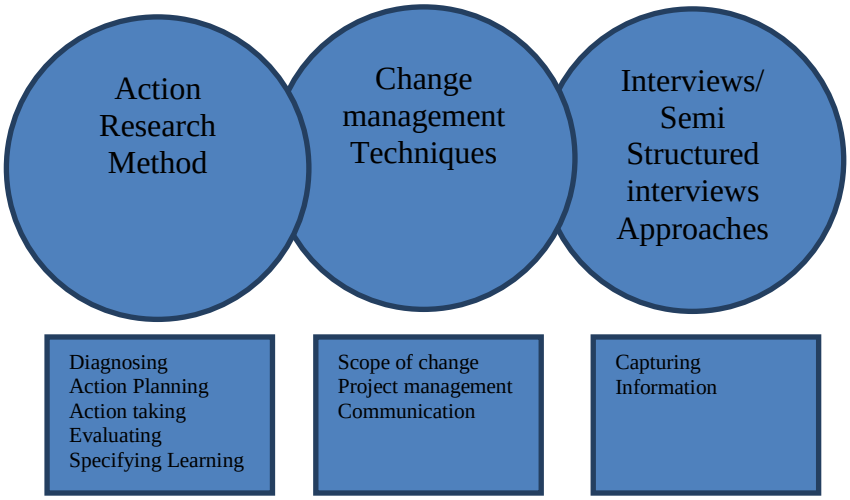

Figure 2: Action research mixed with problem solving Techniques &Approaches

Research Design & Testing the methodology in the case study

Action research methodology was used mixed with a number of problems solving techniques as suggested by (Chiasson et al. 2008). This started by interviews with employees, a key method for capturing all the necessary information from different departments who would be using the system, as one of the researchers was based in the company they could talk to colleagues and explain how the system would support them. Formal interviews were conducted twice but it was found that employees were uncomfortable with it. One employee said, "I won't say anything with everyone around they just make me feel stupid".

The interviews were conducted in stages, first at the diagnosing stage of the action research in order to understand the problems at the case study, how they got the system and what were the main barriers to implementation. It was with the 9 office employees, then followed by the 19 shop floor employees, who only deal with the system for clocking in and out. The difficulty of getting information from them led the researcher to work with them for over two months to gain their trust and start getting information about their needs, as they would be the main system users at the implementation phase so it was essential to discuss their fears about using the system.

The second phase of informal interviews was at the scope change management phase and it included conversations, working with employees while doing their daily jobs and asking them questions, telephone interviews and emails. Useful information was also gathered by analysing documentation, ERP system manuals, and observation of work processes on the shop floor.

For a better understanding of the case study it was important to understand the history of the case study and the ERP system. The study is based on a UK SME specialising in woodwork. It has around 28 employees, 9 designing, planning and administration, and 19 based on the shop floor. Their customer base is wide-ranging such as local authorities, housing associations, government departments, and retailers.

For many years, employees have used a paper based system and Excel sheets. Some orders are large, e.g., for building sites, and others for retail customers. The process was basic and employees were coping with the workload, but with an increased customer base the changes in marketing, website launching and other technologies made it very hard to keep track. Due to the increased level of orders, mistakes occurred. The lack of a formal system meant that a quote could vary depending on who prepared it. Accordingly a customer could receive two different quotes for the same item.

As employees were saving much of their experience in their heads (Tacit Knowledge), other employees could not get that information. This was exacerbated when employees were on holiday, and so a way of recording information in one place was needed. Therefore, all Excel sheets were saved on one server but as the file numbers grew this became infeasible. For this reason the director (and owner) decided to purchase an off the shelf system to help with the problem, failing to adjust this system to the bespoke work needs and lack of training and convincing employees to use led to a failure of using it. The current ERP system was purchased in 2006 with the help of Loughborough University, and a student was placed at the case study to help with the installation and implementation process. Showing employees the demonstration of the system, employees thought it would improve everything without any changes to their work processes which was the first barrier built toward the ERP implementation process as mentioned by Holland and Davis, 1998, Bani-Hani et al., 2010 which is the unrealistic expectations of the ERP system.

The current ERP system is manufacturing software that can be customised for bespoke work and used for small to medium enterprises. The reason for choosing this software by the case study was their need to find something that will handle their business processes. Additionally, all standard reports can be customized and new reports created to fit. When the customisation process began the student started with customising the purchasing module system and inventory management module, these two modules were handled along with the purchasing manager and they agreed to change the ERP system to fit the work processes without analysis of the current processes which is according to Hong & Kim, 2001 one reason for ERP failure as it always recommended to change organisation processes to fit the ERP system rather than the other way around. So, after 7 months of implementing and customising the system they introduced these modules to employees and they were discouraged by results. Using these two modules without changing the work process led to too much duplication and when it came to the other modules it was almost impossible to integrate them together. They also found that the system is confusing and nothing like what they use and refused to use it. After several attempts with using the system the student left the job and the system was left unused for two years until one other researcher took place to find what the problems were.

Reports from employees about the problem were basically complaints about how hard the system is to use and how they didn't have any training to use it. Esteves-Souza et al., 1999 mentioned in their research that barriers to ERP implementation can be lack of motivation to endorse the system and lack of training, and due to the delay of using the ERP system and the long time for implementation employees were demotivated to even look at using it.

Mapping processes at the case study was one of the main contingencies to start with the ERP system. A number of figures were produced e.g. Figure 3 to draw the different processes. To be able to map the processes at the case study the researcher was involved in the building processes and how each job is made from a customer's call to the shipments of the product. This also included analysing shop floor loads, the hours needed for each product, who worked on the job (an experienced employee or an apprentice), to build a skills matrix for employees, and also helped in clarifying the scheduling approaches. B&G, the providers of the ERP system, provided the history of the system, training and an idea of how they deal with other companies implementing an ERP. Showing these to employees and describing to them how the ERP system would work and getting them on board was essential to get the job done. This was split into two phases; the first one was mapping the general processes with all employees from different departments and the second phase was mapping individual processes to each department to identify how the job was done. A number of in-depth interviews were conducted with individual employees to explain what change they would notice in their daily job and how change would benefit and eliminate their work errors.

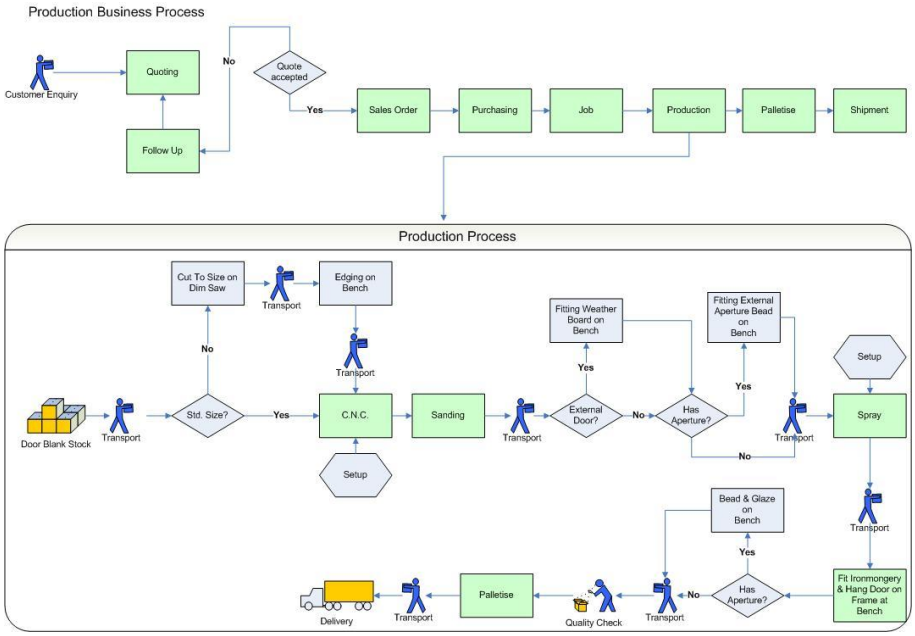

Figure 3: Main poduction process at case study

- **Impact of top management support**

The main problem found as the implementation process started was that top management and other employees were always asking for more even after the processes were approved, and they refused to use or try the system before everything was finished saying we would like to be trained at once and not in phases, which was a failure before, for this reason some techniques were needed to apply the change, some employees refused the system mentioning that top management is not using it so why would we.

- **Could resistance to change from employee's effect SMEs?**

(Thurley and Wirdenius 1973) listed five strategies as mentioned earlier in the literature. At the case study negotiation strategy was adopted and was keen to involve employees at every stage of the implementation to help motivate them to use the system again. Although this technique takes more time, it is important to use it in SMEs due to the small number of groups that get involved. It was important to focus on what employees said rather than what should be done (Sarker & Lee 2002). Plus, SMEs are smaller in size and in the case study each department had one employee only that does the job, and trying to do training takes them away from their work as they only dedicate part of their time to the implementation process (Snider et al 2008), which made training harder and needed to focus on individuals to help with the process.

Reviewing all employees CVs ascertained their level of education, as some employees complained about the difficulty of the understanding of the system even after training and linked it to their low educational levels which could be a barrier as mentioned by Sahran 2010. But after looking at the table of roles (Table 2), education and their use of ERP it was found that their education levels doesn't seem to be a problem, as employees who started using the system first were the ones with A levels and the ones causing the difficulty were the ones holding BSc in engineering.

- **What impact does education level of employees at SMEs have on the overall implementation process?**

Table 2 – The roles of employees at the case study organisation

Role At Case Study	Level of Education	Time at the case study in Years	Use of the ERP system
Company Director	BSc in Engineering	40	Search for item only
Production Manager	MSc in Engineering and Management	1	Job management
General Manager	Advanced craft Joinery from West Notts College	2 Months	Scheduling and Job management
Purchasing Manager	ONC HNC CIOB	38	Do purchase order.
Sales Manager	Business administration NVQ Level II RSA I & II – Word Processing Core text processing	6	Create all sales order, Glass purchase orders.
Estimator, Marketing	MSc in digital marketing	10	Create quotes.

Estimator	City & Guilds Carpentry & Joinery	7	Creating quotes
Estimator	A Levels	1	Quoting, Sales order, purchases, attachments, scheduling
Administration	NVQ Business Administration Level 3	8	Purchase orders and receipting.
CAD	BSC in Furniture design	5	Search for items only
CAD	N/A	9	Search for items only
Machining Foreman	City and Guilds Carpentry and Joinery (Wood Machining)	10	Time sheets/ Job travellers
Machining Worker (2 employees)	City and Guilds Carpentry and Joinery - NVQ-3	Avg of 9.5	Time sheets/ Job travellers
CNC	None	7	Time sheets/ Job travellers
Assembly Foreman (2 employees)	NVQ-3 Advanced	Avg of 10	Time sheets/ Job travellers
Assembly (5 employees)	City & Guilds Carpentry & Joinery - NVQ-3	Avg of 8.6	Time sheets/ Job travellers
Assembly (2 employees)	Apprentice	Avg of 3	Time sheets/ Job travellers
Spraying (2 employees)	NVQ-2	Avg of 9	Time sheets/ Job travellers

Table 2 shows that the education level was not a problem as mentioned by Sahran; it appeared that employees that used the ERP system were the ones who were not exposed to the manual system and had not been in the company for long, so it was concluded that the longer they worked at the company the more they resisted change.

Findings

From collecting and analysing the data over an 18 month period it was possible to cluster issues. The types of problem faced with implementing the ERP system are outlined below with examples from the case study and solutions that worked with the case study.

The prime objective of a business case is to convince a company to invest money and to invest in an ERP system to help the company improve.

Table 13: Findings

Barriers	Example from case study	Solutions	Reflection
Protocol Following a certain communication protocol at the work environment is a key to success; this applies to the ERP system, it is important that employees follow a certain protocol with work processes. Umble et al 2003 mentioned poor planning/ poor management as a main cause for IT system failure in enterprises in general. At the case study the problem occurring showed there are no established protocols for processing information which means everyone requests a different set-up, Which was the case when the first student started at the company, they started customisation without changing work processes which led to duplications and errors. *Quote:* I can't connect my work at the estimation department with sales and jobs; they look different and do not	**Controversy (No agreed process)** **When I do a quote and it turns into an order the person in charge keep asking me what I mean with specifications and parts as they were set differently from what I use at the quoting module.** When employee in charge of purchasing glass took leave and another employee took over, conflict occurred. The already customized ERP screens for purchasing were not convenient for the other employee; failing to convince them to work the same way, and asked to do changes.	*Advanced Planning & Scheduling* As many SMEs lack defined and documented processes, it is important to make use of any "best practice" process flows to put into the software application, manuals, help documentation. Unwillingness to re-engineer their processes means success is unlikely. There is a need to ensure that employees understand the importance of mapping processes and are willing to commit to generating documented procedures protocols. (Bani-Hani, 2010), listed a number of barriers to a successful implementation; one barrier was the lack of process mapping. This helps in learning about the processes in different departments, including: Re-engineer business processes. Change controls and standards to improve efficiency. Monitor business decisions.	*Quotes:* "I found it hard at the beginning to adjust to the system and change my work processes to fit, but now that I did and with training it is much easier as my screen looks exactly the same as the sales orders one and jobs, purchasing, which means when someone is not around I can go and look at their work and take their place when needed. Plus, other colleagues can simply read my quotes and print outs as they all look similar." Trevor, Estimator.

connect with each other. "Trevor, estimator".		Define expected outcomes. *Change the processes not the system* Employees at SMEs want the ERP system to be adapted according to their way of working instead of changing work processes to fit into the system. Even though it is slow, change management techniques apply here (Hutchinson, 1991). *Customisation* Customisation of screens was necessary at the case study as employees needed more fields added to fit their work, more graphics and hiding unnecessary fields, but it is important to limit this, and apply the minimum customisation as it is time consuming (Raymond et al., 2006). Involving employees while implementing is crucial; enquiring about the best layout will help them get their work done faster and build their trust and confidence. Be careful though; change the looks not the processes behind the screen as this may fall under changing protocols.	
Resistance to Change Change is necessary for ERP implementation; change in work processes, employee's attitudes and in work habits. Employees prefer to work manually, even when faced with errors and mistakes. As mentioned by (Ondrej and Bjorn 2012) one major reason for ERP customisation failure in SME prior to running live is resistance to change. *Quote:* "We have used the system before and I believe it will not work now, every time I try to make a purchase order on the system I have to go back and redo it on the manual system as it makes more sense to me". Andy, Purchases	**Stocks** One employee refused to use the system, making excuses, asking for more customisations, discouraging others from using it and trying to prove that the ERP system made mistakes. The purchasing and stock manager requested a stock control solution. The system offers a bar code and scanner solution, where the information is fed to the system and prints out a bar code. This bar code is put on the shelf and during taking stock for jobs the shelf is scanned with feedback into the ERP. This solution did not suit him so a book was requested containing all the bar codes in the ERP system, a barcode scanner in his office and after taking stocks he wrote down a list, which was then scanned off the book. This was only done once, and now the book and scanner are shelved.	*Change* Changing employee's attitude toward the system is important. An approach to dealing with change is needed at the implementation stage; it needs to be systematic, both at an organisational and individual level, meaning that new values and behaviours need to be introduced to the organisation to support overcoming resistance to change in each department. *Who's involved?* It is equally important to choose carefully the team members in each department as they would help in negotiating the change. Hutchinson (1991) mentioned that affecting key members in each department is very effective at SMEs. Establish a key user group that has the experience and authority to decide on workflows and processes in each department. Keeping in mind that workflows and processes in one department can have a profound effect on others. Change should be taken as a multistage cycle and all stages must be planned and negotiated.	*Quote:* "I still find it hard to issue materials from the ERP system, but I believe it is more accurate when it comes to stock takes and stock counts at the end of month. The ERP system is time consuming as it used to take days to finish stock counts end of the month, and other employees use to take materials without me knowing, now I get alerts to when order certain materials." Paul, purchases.
Lack of Knowledge Lack of knowledge about ERP System often causes errors. The	**Inconsistency** One problem was the inconsistency in quotes due to different ways of	*Why is an ERP needed?* The strategic goals of using the ERP system. Since SMEs have fewer layers of	The sales orders employee was exposed to the system at an early stage but due to lack of training failed to understand it. A new

greater the knowledge users have about ERP, the more likely they are to address the objections and trust the system Implementation involves validating resources, accurate information and maintaining an up to date database. For the user who has been using tacit knowledge, it is hard to communicate with a system that will give them ready information to send to customers. If employees lack the knowledge of how to use the system and where the information is coming from, it will be difficult to trust the results they get from it, and they become reluctant to use it. Trusting the ERP system and its results aids in exchanging information; distrusting the ERP system leads to other problems *Quote:* "Do not like scanning on & off jobs every 5 mins (Do feel that all money spent on these systems could have been used better things like machine, as I don't see the benefit of it" John, Manufacturing	quoting, manual and the ERP system. For example, company "A" asked for a quote for one of their own customers. A manual quote of £2120 was made and sent to company "A" who sent it to their customer "B". Customer "B" called and requested the same product, another estimator using the ERP system made a new quote to the customer "B" of £1837 and sent it to them. Customer "B" accused customer "A" of lying to them and overcharging. Customer "A" requested an explanation. An explanation and apology was written to both customers and discounts were offered. **Duplication** Since the purchase orders are controlled by stock quantities, it is very important that the system knows the materials in stock to give an alert when purchase is required. As data entry into the system was not structured, employees were entering parts into the system as they needed them, and because a part could have different names duplication occurred. Eventually it was found that there were around 2217 parts on the system, 973 parts are actually used, and others were duplicates with different names.	management the managers do not invest in software analysis (Egbu 2001); even after the customisation process the system is judged unsuitable for the company and fails. The lack of knowledge about the problem itself and the ERP as a whole causes failure. The recognition for the need to change and a structured approach presents a chance of a successful implementation. (McCartan-Quinn and Carson 2003) mentioned that one important success factor of ERP implementation is the support of top management. *Data entry* Companies need to take care of risks like data duplication, Upadhyay (2010), which was very common at the case study. This means that a poor system management, lack of knowledge and training can lead to duplicating information, and it was often difficult to determine which version was accurate, a very simple training period at the start can amend this. *Choosing the system* It is important to know about the problem, what kind of ERP system is needed and how much money the company can afford, it is also key to: Think who will use the system, what are their skills? Make the employees aware of the company's needs in advance to facilitate allocation of resources. This way the company will avoid falling into the lack of knowledge trap and have all the problems mentioned before. In the case study the management chose the system without designing a clear plan, spent a couple of years implementing it, after failing to use it employees became demotivated.	employee with the same skills trained to understand the work processes of the ERP system found it difficult to return to manual procedures. Exposing this employee to the system made them explain to others how easily they can enter their information and then find it from any company computer. *Quote*: "When I saw others using it, I asked them to train me, and as they know the system and what I exactly need to use it for, I found it easy and it became more of a challenge to me to use and get more training, how come new employees can and I can't!" Laura, sales. "If filters were chosen correctly it is very easy to find information through the system, I wish I knew this earlier" Anthony, Manager. "The feedback we get from the shop floor hours gives a better idea of whether we are achieving the estimated hours or whether there is a need to increase or decrease the hours which make the prices more accurate in the future. It also tell us who is working on each job and gives an idea of each employees skills" John, Manufacturing
Trust Another reason for refusing the ERP system was lack of trust, validation was needed at every stage, but users were not convinced *Quote:* I can't see how these prices are coming from the purchases, and how can they be right, they're very different from the one's I use in my manual quotations, some are higher and some are much lower which would affect my quote to the customers and make them vary, not sure I can verify these prices. "Anthony, Estimator/ Laura, sales.	***More without trying*** A simple example was an extra configurator where material prices would be entered manually and fed to the system to override original price; this was similar to Excel sheets. This configurator is the most used because estimators were having a hard time trusting the prices coming from purchases and inventory. **Lack of trust** The manager wanted to use the system, or at least test it by one of the	*Testing* Test each entire workflow, as the system is implemented, ensuring there are no errors that employees would have to fix afterwards as this will discourage them from using it and inhibit their trust. *Show intermediate results* Employees need to see results to be able to trust the system: While the system is being customised, take some of their work and process it on the system to demonstrate how easy, fast and accurate the ERP system is. They would want to use it if they trust the results.	*Quote:* "Accuracy of the quote made me feel that I can send them with confident, as I can examine detailed quotes with the material prices from recent invoices. I needed to see the change in prices from what I thought prices were, and see the effect of this change on the company, as this didn't only affect the quoting side of the process but also had an effect on other departments as all information were registered on the system" Emma, Estimator.

	employees at the company. In order to do that and be able to send them directly to customers, he increased the labour hours by 6-8 hours at £42 rate to make it cover any wrong prices, which means each door is about £294 more.		

Evaluation from users

The next step in the action research method was evaluating, which usually means what are the consequences of taking this action. This shows in the evaluation below and the benefits show from using the system, so, after four years of implementation and recently using the system at the case study, a questionnaire was distributed to get some evaluation from users at case study, some responses indicated that:

- The ERP system is more preferable than using the Old manual system (100%), yet still (37%) of employees at industrial sponsor still use the manual system for some processes.
- The ERP system is simple to use (88%).
- The ERP system clock in in system is much easier than writing down times and more accurate (100%).
- It is easier to send accurate quotes to customers through the ERP system (75%).
- The task of finding information on the system is easy (75%) and gives accurate prices (50%).
- The ERP system fits the jobs based on the hours already planned in the system without having to work it all out manually (100%).
- The more complex the configurator the more liable malfunctions. It is better to have more configurators that are reliable instead of having one complicated one (100%).
- The number of configurators for the door is justifiable as it is a bespoke company; the variety covers all options (100%).

Although most feedback was positive, there were a number of neutral answers in the questionnaire, some were that employees do not use this area or were they still don't have the confidence of using this part of the module as it is been recently implemented and training is still in progress. Some participants were not pleased with using the system and thought it was a waste of money and that this money could have been used to buy new manufacturing machines. Others complained about being far from the machines and having to walk all the way there to clock in for a job is a waste of time and this needs to be sorted. Some good comments and feedback were asking for a better looking system, easier on the eye and have units clearer, others needed more training especially on using a computer in general rather than just the ERP system.

Depending on the stage of the ERP adaptation/ implementation process benefits can be as follow

Bocij et al. (2006, p605) stated that the benefits of ERP systems are often harder to quantify as they are often intangible, like improving customer services, management of information, internal and external communication in the company. It also supports core business functions and improves product quality. However the quantifiable benefit is the reduction in costs. Lozinsky (1998) stated that operating costs will be reduced leading to increased return on investment. (Bendoly and Schoenherr, 2005) have also stated that benefits of implementing an ERP would include the elimination of unnecessary processes to improve resource allocation and system wide standardisations. Nevertheless, the inability to fund long-term and risky programmes and weaknesses in technological competencies, make it hard to utilise information and knowledge (Egbu, 2001).

In 2011, 266 (39.87%) quotes with a total value of £1,2m were won, and 379 (60.13%) with a value total of £6.4m lost. A survey of customers showed that out of the 379 lost in 2011:

- (31%) £1,438,105.66, due to overpricing,
- (3%) long lead times,
- (3%) changing specifications,
- (20%) high delivery charges,
- (43%) due to customers changing their minds, some for needing a third party to conduct measurements, or for fittings, and also losing a contract.

Analysing the lost manual quotes due to prices, a number of errors were found. Importantly out of 82 quotes lost, 56 were overestimated and 17 were underestimated due to not tracking the price changes, 9 files were lost. Re-estimating the lost due to price quotes on the ERP system and contacting customer with the new prices, 68% of these customers said they would have accepted these quotes if they got these quote prices. No pattern was found for the results because of the un-systematic manual approach, and it was found that some of the quotes were inflated to recover money lost in other jobs, for example:

"I was quoting a customer's quote and I received a phone call telling me that a door at a customer site started bending meaning we have to remake the door from scratch, for this reason and to make it up for the loss I've added around £200 to this quote", Company estimator. This unsystematic approach has been causing the company losses in both the quotes and job stages.

This indicates that if the ERP system was used they could have won some of the quotes lost due to prices, with a total value of around £1.4m.

Other examples are with big quotes being the hardest to do, as it takes more time to enter data manually for each product, it takes the estimator from doing all the other quotes for retail customers and also the chance of winning them is very low so it is important to find an easier way to do them.

The ERP system has 12 configurators that take each range and analyses them with only the applicable materials. To show the accuracy and efficiency of the system, a quote of around 70 doors was made by both the estimator and the ERP developer. The ERP system finished in 3 hours, manual estimating finished the next day with major differences. Checking both quotes, errors were found in the manual quotes, some leading to impossible specifications.

Another comparison included 20 live quotes. A quote for one door was made with the manual and the ERP system; the manual took around 10-20 minutes whereas the ERP system took 3-5 minutes for the same door, more accurately. This analysis encouraged employees to use the system without having to quote twice but validating the quote before sending it to customers.

As mentioned earlier, benefits are often harder to quantify as they are intangible (Bocij 2006); however there are few questions to be asked in order to verify the results of the implementation:

- Has productivity improved after the implementation?
- Do things seem simpler?
- Can the budget, stocks now be controlled adequately?
- Have any of the in house or the customer's production lines been stopped because of material shortage due to changed planning system?
- Are there tangible financial benefits?

By answering these questions; these following benefits were found at case study: reducing errors, achieving effective communication between departments, no duplications and better structure, time-saving, e.g. "What used to take 30 minutes from me now only takes 4-5 minutes max", and through some analysis for a week of work it was found that with the old system an estimator was able to do up to 25 quote lines a week, but with the ERP system an estimator can do up to 122 quote lines a week, a massive difference with more accurate and up-to-date prices.

The implementation at the case study has developed well and despite the problems faced, the system is working, employees at the company are using it and information is being transferred effectively.

Conclusions and Limitations

Although this study was based on one case study, it provides important contributions to the ERP implementation studies.

The lessons learned (Specifying learning) from this study are that the barriers identified earlier (Lack of knowledge, protocol and trust) can impact the implementation process and lead to a failure of the ERP system if not sorted and this study suggested a number of solutions in Table 3 to solve these barriers. Top management support is essential when it comes to the implementation process as suggested from different literature (Sahran (2010), *Poti et al,* (2011), Hutchinson (1991), Snider et al. (2008)) but at the case it was found that focusing on other individuals in the company can benefit the implementation process even if there was resistance from top management, which couldn't be the case in larger companies. At the case study employees were able to work on the system and show results to top management which forced them after to use the system which means that focusing on individual's roles rather than departments does work in SMEs.

One other finding in this study, is unlike what Sahran (2010) said in his paper that low education level of employees at SMEs has a negative impact on the overall implementation process, it was found in our case study that higher education of employees didn't help the implementation process as individuals with lowers education levels like A levels and high school used the system quicker than the ones holding BSc and MSc, and it was found that it had more to do with the years they have been working in the company and how long they've been exposed to the manual system. Employees who were able to use it quicker and gave positive feedback were new employees who were introduced to the ERP system before the manual.

The action research and problem-solving techniques and approaches mixing to overcome the ERP implementation barriers was successful in our case as it helped with getting employees on board and with exposing them to the system at all the implementation stages, interviews and change management was very important to help employees adapt to the change.

Improving the quality of knowledge transferred led to a number of benefits; i.e. financial benefits, fewer errors, reducing time, increasing productivity, controlling invoices and budget, and the ability to track jobs and provide better customer services. Employees seem to like working with the system, as it provided more consistent quotes and better job tracking.

The research achieved all stated objectives as can be shown through the research.
The main contributions of the research are:

- Experiments have identified the reason for failed implementations, managed to change the idea of how lack of education can lead to failed implementation and proved how resistance to change can lead to it.
- It was proven that SMEs suffers from subtle resistance (We want this but not really want it) especially by top management resisting using ERP systems.
- The financial benefits of ERP were justified through a model of cost of implementation.
- Focusing on individuals in SMEs rather than teams has proven to be the best approach when it comes to the implementation.

The practical implications are that SMEs who are preparing to engage in ERP system should be able to utilise the findings and follow the steps, potentially leading to a faster and more efficient implementation. This SME is small with minimal computer usage before implementation. These factors indicate that companies with as few as 30 employees can use ERP.

The limitation of this study is its strong link to the case study although it draws on relevant literature covered in the body of the research. A further limitation, and strength, is the size of the company. Overall, the study has shown the benefits of the ERP system to SMEs.

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APPENDIX G … SUPPORTING DOCUMENTS

1. Customers Quotes Lost Quotes Analysis

Quotations Name	Account Name	Closing Date	Stage	Description	Quoted Price	M1 Price
Q2590-10	Alexander Carpets	26/04/2011	Closed Lost Delivery (Lead time)	8 Week Lead Time too long		
Q3208-11 Beresford Road	CBS	23/02/2011	Closed Lost Delivery (Lead time)	Emma, I did get the quote, when I spoke with Trevor yesterday I was concerned that the lead times may not fit with our timeline. We have decided much to my better judgement to line and hang the doors on site to meet our project deadline. I'll be in touch next time we need doorests. Many thanks Robert 23/02		
Q3379-11Bournbrook Road	Thomas Vale	04/04/2011	Closed Lost Delivery (Lead time)	Your price was okay but unfortunately not the 7 weeks delivery period, but thank you for quoting so quickly Regards Alan		
Q3237-11	Breyer	27/04/2011	Closed Lost Delivery (Lead time)	Order placed elsewhere with considerably quicker lead time Regards, Tom Mercer		
Q3836-11 218-228 Crow Lane	Durkan	21/09/2011	Closed Lost Delivery (Lead time)	The client chose a door from Securidor on Franklands Drive. Your lead-in time was too long for Crow Lane. I will be sending you another enquiry for 10 Corsica Street, London N15 shortly. Regards Rob Mimms		
Q4184-11	Taylor Wimpey Homes	23/11/2011	Closed Lost Delivery (Lead time)	Received thank you but we have ordered elsewhere due to long lead time and payment terms		
Q2656-10	Lion Industries	17/03/2011	Closed Lost Delivery (Lead time)	Your lead time of 8 weeks was a bit long, so we placed the order with a local firm who supplied in just over 2 weeks and their doors look very good with quality oak. Regards, David Dundas		
Q3723-11	The Kitchen Store	27/07/2011	Closed Lost Delivery (Lead time)	Due to time scale we had to buy from elsewhere. Thanks for all your help. Kind regards Jan Hunsballe Sales Manager		
Q3471-11 Sackleton Court	Phibbs Carpentry Contractors	19/09/2011	Closed Lost Delivery (Lead time)	Unfortunately we could not place that particular order 3471 with your company as your manufacture/ delivery date was too long (8weeks) It does look good on Quote no. 3922 as the client has given me a verbal agreement on Friday and I am awaiting their official order. Kind regards Bernard Mulqueen		
Q3026-11	EWB Solutions	12/01/2011	Closed Lost Delivery (Lead time)	lead times		
Q2232-10revD	The BSS Group Plc Trading as UGS	21/02/2011	Closed Lost Other	Unfortunately our client did not secure the tendered job though it was mentioned that the rates provided were reasonably competitive compared to the other prices he acquired. So I hope we can secure further work together in the foreseeable future on new projects.		
Q3166-11 Coppice Avenue	Hill Partnerships	18/05/2011	Closed Lost Other	We ended up placing an order for a 44mm front door elsewhere in the end. Regards		
Q2157-10 Shenley Lane	Kier	27/04/2011	Closed Lost Other	We did provide all external doors for this project but they weren't listed against this quote reference		
Q3564-11 Moston Close	Hill Partnerships	30/08/2011	Closed Lost Other	Good morning Emma Unfortunately you were unsuccessful on this occasion and an order has been placed with John Russell Joinery. Regards Robert Gibbard		

Q3549-11 WR4 0LX	Retail	22/09/2011	Closed Lost Other	Many thanks for the quote, however we have purchased the door from another supplier. Regards, Steve Bury		
Q2660-10	W H Martin	18/03/2011	Closed Lost Other	Hi, I have heard nothing more from my client after giving him the price, so I assume that I will not be needing the items. Thanks Steve Martin		
Q2204-10	Scarlet Fields	18/05/2011	Closed Lost Other	Q2204-10		
Q2589-10 Tovara, Midenhead	CSK Architects	18/07/2011	Closed Lost Other	Thank you for your interest in Tovara; personally I found you extremely helpful to deal with and was impressed with your quotation. We supplied the contractors on this project with a suppliers and finishes schedule that named yourselves and one other door manufacturer as our preferred suppliers. I am not sure whether they have chosen a supplier or are not yet at that stage- all I can suggest is that you contact the contractor to ask who they are considering giving the doors sub-contract to. The contractor is: RJ Clyde (Builders) Ltd. Venlaw Peters Lane Holyport, Maidenhead Berkshire SL6 2HW 01628 673534 r.j.clyde_builders_ltd@btopenworld.com I hope this helps, Many thanks, Nicholas Drofiak		
Q2528-10 SE22 9AX	Retail	14/10/2011	Closed Lost Other	Thanks for the email. We have changed our plans and no longer require the doors.		
Q3768-11 Glasgow	Westpoint Construction Company (Scotland) Ltd	19/09/2011	Closed Lost Other + Closed Lost Price	We elected to place the order with another supplier, thanks. Evan		
Q2628-10revB Jaysam Contracts	Original Door Company	17/03/2011	Closed Lost Other	-		
SP1148-10	Studio Amita Vikrant	20/07/2011	Closed Lost Other	Thanks for your emal. Our project is now completed. Hope if you can stop sending us the email for the same. Many thanks Amita		
SP3329-11 Satini/Dina	Retail	18/05/2011	Closed Lost Other	thank you for the quotation, but in the end we decided for a different type of door. Best regards, Lars Kreckel		
SP1194-10 Zara	Retail	26/04/2011	Closed Lost Other	Thanks for the email, we commissioned a local bespoke joinery company to replace our front door. we liked your designs but felt more comfortable hang a discussion with local person on site David Woods		
Q3844-11 Hornchurch Essex	Houston Cox	19/09/2011	Closed Lost Other	This door was not required in the end. However thank you for your quotation. Regards Andy		
SP3216-11 Solar	Retail	16/05/2011	Closed Lost Other	-		
Q3437-11 Stretham High Road	Willmott Dixon	18/07/2011	Closed Lost Other	Tenders Streatham Hub and Stoke on Trent we unfortunatley did not get, although you may want to contact Vinci about Streatham Hub The site at Waring Court - you were unsuccessful Kind Regards Ken		
Q2582-10	K Griffin and Sons	17/03/2011	Closed Lost Other	Hi Emma, i will not need you to make these doors for me , the funding for the project has been withdrawn for the present time , but thank you for your help kevin griffin		
Q3896-11	W H Martin	20/09/2011	Closed Lost Other	Thank you for the quote, unfortunately my customer has told me that he is not at this time going ahead with the work, he said that if he decides to go further he will contact me in the future, if he does I will be in touch with you. Steve Martin		
Q3005-11	MSN Display	27/04/2011	Closed Lost Other	Sorry we haven't got this one. Regards Mark		
Q2499-10	Neilcott Construction	28/10/2011	Closed Lost Other	I regrettably advise that we were not successful with the tender		

Q3652-11	Capital Garage Doors	25/08/2011	Closed Lost Other	Thank you for your email, unfortunately our customer has decided to purchase the door from the company fitting the windows for this property. Best Regards Donna Compton		
Q2400-10 Day care centre Belper street	T Denman & Sons	20/06/2011	Closed Lost Other	Just to let you know that we have not been successful with either of these two schemes. Regards Roman Rozycki		
Q3179-11 St Peter Street	Graefe	18/08/2011	Closed Lost Other	Please see below – we lost the job. Regards,		
Q2390-10 Chawton Road	Willmott Dixon	17/02/2011	Closed Lost Other	Thanks for the quote but in the end we did not go down this route and was therefore not required Many Thanks Ken 17/02		
Q3261-11 Cheeriton Road	Coombs (Canterbury) Ltd	19/07/2011	Closed Lost Other	We did not secure this contract we understand isg jackson may have Regards Richard		
Q2538/10 NO SITE SBD PATT20	Blairs - IN ADMINISTRATION	06/01/2011	Closed Lost Other	Q2538-10 - client in administration		
Q2401-10 STowford Rise Community Centre	Mansell	21/03/2011	Closed Lost Other	Many thanks for the quote, unfortunately we were unsuccessful with the project. However, I will keep sending the enquiries ! Regards Mark Porter		
Q3282-11 Peckham Road London	Optimum Surveying Services	22/03/2011	Closed Lost Other	Thank you, I've received the email from you guys. Unfortunately my client, ABR Woodcraft, are not going to tender on this project anymore for now. So for now I would not be needing any more assistance on this project. Kind Regards, Steph Kleynhans		
Q3197-11 OMCO UK Ltd	Ashcroft Construction	26/04/2011	Closed Lost Other	We had a spare slot in our workshop so our own joiners have made these. Regards Gareth		
Q2586-10 Turves Green Birmingham	Willmott Dixon	21/03/2011	Closed Lost Other	Not sure to what this quote referred but Turves Green is now completed. You did supply the progressive security doorsets from memory. Many thanks Jim Noble		
Q2627-10	Habco	18/05/2011	Closed Lost Other	-		
Q3831-11 Durand Estate	Rydon	19/09/2011	Closed Lost Other	Sadly you were not successful this time.		
Q3724-11 Wembley	Atlantic Contracts	28/07/2011	Closed Lost Other	Thank you for the quotation These doors have not been ordered as the client decided they were not required Regards Ryan		
Q3435-11 St Lukes School	Priory Gate Ltd	18/07/2011	Closed Lost Other	Sadly we were unsuccessful with the project on this occasion. Regards Regards James Ahearne		
Q3413-11revA Barking	Pro Care	18/08/2011	Closed Lost Other	Unfortunately the main contractor purchased these directly from another joinery company, we lost it. Regards Gary Proctor		
Q3151-11 Grand View	Brennan Group	18/05/2011	Closed Lost Other	Unfortunately we have been unsuccessful with these contracts.		
Q3165-11revA Clapham One	Alloway Timber	20/06/2011	Closed Lost Other	unfortunately, our customer did not secure the contract. Gavin M North.		
Q2775-10 Coppice Avenue	Hill Partnerships	18/05/2011	Closed Lost Other	We ended up placing an order for a 44mm front door elsewhere in the end. Regards		
Q3224-11 Waring Court	Willmott Dixon	18/07/2011	Closed Lost Other	Tenders Streatham Hub and Stoke on Trent we unfortunatley did not get, although you may want to contact Vinci about Streatham Hub The site at Waring Court - you were unsuccessful Kind Regards Ken		

Q3001-11revB Boumbrook Road, Birmingham	Thomas Vale	17/03/2011	Closed Lost Other	Emma, unfortunately the order has been placed elsewhere. We all thought that what you quoted for was absolutely ideal but the Architect for whatever reason went for something else. Thank your team for their efforts and co-operation Regards Alan		
Q2436-10 Dee Park	Willmott Dixon	26/04/2011	Closed Lost Other	In response to your email below regarding communal doors to Dee Park, unfortunately we decided not to pursue this type of door as requested by the Client so it's now not worth JCK pricing because the doors will be a basic off the shelf item that our builder merchants can supply. Thanks for pricing again, Don		
Q3045-11 External Louvre Doorsets for Bin Store	Mansell	17/03/2011	Closed Lost Other	I have no idea about this. We did think that we had ordered a small louvered door but JCK could not find any order from us. If you require any more info please do not hesistate to contact me. Regards Cliff.		
Q2642-10 Restrop Farm	Retail	28/10/2011	Closed Lost Other	29/11 Hi Emma, sorry for my delay in replying to you. Thank you for your quote which we considered very closeley. However, we have decided to go with a local firm close to us. Thank you, Leila Moseley		
SP3100-11	Retail	31/01/2011	Closed Lost Other	All sorted, system in, i will contact you on the next one, thanks for the follow up Regards Kevin Delaney 31/01		
Q3315-11 Franklands Drive	Durkan	21/09/2011	Closed Lost Other (Lead time)	The client chose a door from Securidor on Franklands Drive. Your lead-in time was too long for Crow Lane. I will be sending you another enquiry for 10 Corsica Street, London N15 shortly. Regards Rob Mimms		
Q2386-10	Retail	07/01/2011	Closed Lost Other	The job has already been done, it took you a long time to give me the initial quote I had already found someone else for the job. Regards Jo 07/01		
Q2509-10	Charnick Contracts	17/03/2011	Closed Lost Other	Unfortunately the contract went to someone else. Kind regards, Rod _____		
Q3586-11 AL5 3LE	Retail	18/08/2011	Closed Lost Other	We ended up sourcing our front door from the company who is also making our windows. Many thanks for your quote. Kind regards Lynne		
SP3228-11	Retail	27/04/2011	Closed Lost Other	We have decided to go with a local supplier, thanks for the quote though		
2205-SPIR SP3416-11revA	Retail	23/09/2011	Closed Lost Other	CANCELLED 23/09/11		
Q3207-11 Castle Street	Boothville Roofing	18/08/2011	Closed Lost Other	This project has now been completed. Kind regards, Roger Pennifold		
Q2479-10 Goswell Road	John Paul Construction	06/01/2011	Closed Lost Other	thank you for your tender but we have not heard who has been awarded this project. Sorry about this. Regards Maureen 06/01		
Q3819-11 Limpsfield Road Warlingham	Riverside Developments	19/09/2011	Closed Lost Other	Please accept my sincere apologies. I have no record of receiving your quotation. We will send you further enquiries and will keep your name on our database. Riverdale Developments appreciates the effort you put into the submission and wishes you all the best in the future For your information, the order was placed with Benlowe £6,645.41 Kind Regards, Rob Smith		
Q3439-11 Birmingham	Forest Environmental	07/09/2011	Closed Lost Other	-		
2305-DRS Q3624-11	Retail	09/11/2011	Closed Lost Other	CANCELLED		

Q3226-11 High Street	KDS Associates	19/09/2011	Closed Lost Other	We forwarded the information JCK provided to them as an option, however we are not informed by our client of their final commercial decisions in most cases. I am sorry we are unable to provide anymore feedback than this, though would like to thank you for your help once again. Regards JONATHAN WILLIAMS		
Q2385/10	Retail	28/02/2011	Closed Lost Other (Lead time)	I did not recieve the original quote, and have found a door elsewhere.		
Q2825-10 Bt Building	Living well Joinery	18/03/2011	Closed Lost Other	I am afraid that we have not heard back from Bowmer & Kirkland about this project however I think it has been put on the back burner I am afraid. If I hear any more I will be back in contact. Thanks for your help. Regards Alasdair Belton		
Q2731-10 Cumnor Hill and Grassingham	Rectory Homes	18/03/2011	Closed Lost Other	This was a back-up plan if the original manufacturers reneged on their agreement to supply replacements. They did supply so you can put this to bed. Regards, Tony Wrench		
Q2773-10 Shoeburyness Hotel Site SS3 9AJ	Hollybrook Homes	18/05/2011	Closed Lost Other	I'm sorry John no longer works for Hollybrook but I understand from the Project Surveyor, you were unsuccessful. I will see what I can dig out re: feedback. If we have any other joinery packages, we will forward to you for pricing. Regards, Keith Moran		
Q2162-10 London	Houston Cox	26/04/2011	Closed Lost Other + Closed Lost Price	You were not successful with this quotation. Regards Andy		
Q3320-11 Cambridge	Kestrel Joinery	18/08/2011	Closed Lost Other	-		
Q2763-10 Bruckner Street	Soundcraft	22/06/2011	Closed Lost Other	Q2763 – lost		
Q3458-11revA St Giles	Astec Windows	18/07/2011	Closed Lost Other	Unfortunately they went with an onsite supplier who was working on this project in A similar capacity Your price was competitive and we would have mo hesitation in quoting with yourselves Again Kind regards Lance Clarry		
Q2343-10 4 London Road	L K Architects	05/01/2011	Closed Lost Other	thanks for your mail, but we have now gone ahead with another contractor.We will keep you in mind for the next job that we have. Best regards Lisette 05/01		
Q3161-11 Victoria Road	Horohoe Construction	18/07/2011	Closed Lost Other	-		
Q2631-10 Unit 3 Kiln Road	Prop Studios	18/05/2011	Closed Lost Other	This was just one fire door, which our builder ending up sourcing for us in the end. Kind regards Sarah Sarah Townsend		
SP3462-11	Retail	20/06/2011	Closed Lost Other	Thanks for the massage. We are using a local joinery company who are making a door bespoke to our own design, who have been recommended by our builder. Regards Sharon		
Q2650-10	Retail	17/06/2011	Closed Lost Other	FYI we have now purchased another door. Many thanks Kate		
Q2384/10	Retail	17/03/2011	Closed Lost Other	Thanks for the info -- I decided on an alternative product Regards Barry		
Q3234-11 Signature Senior Living	Soundcraft	18/08/2011	Closed Lost Other	CUSTOMER LOST		
Q3088-11 Quarry Street, Hamilton	CCG	17/03/2011	Closed Lost Other	We will be manufacturing these doors ourselves. regards		
Q2671-10	Euro-par Interiors	02/05/2011	Closed Lost Other	We were not Successful on this project, many thanks for helping us tender for it. Danny		

Q2774-10 Blk E5 Six Acres Finsbury Park London N4	Houston Cox	27/04/2011	Closed Lost Other	You were not successful with this quotation. Regards Andy		
Q2690-10 Eaton Mews North London	Soundcraft	18/03/2011	Closed Lost Other	Q2690 – No news		
Q3657-11	Humphrey & Stretton	18/08/2011	Closed Lost Other	Unfortunately the Secure By Design Doors on this project were downgraded and the SBD requirement was removed from the doors. This has meant we were able to manufacture all of the doors ourselves. We were very happy with the quotation provided at the time and the competitive rates you offered us enabled us to engage in negotiations with the client which eventually secured us the job. We will no doubt be in touch with future projects. Regards Chris Roullier		
Q2477/10 Middlesex house	Breyer	17/03/2011	Closed Lost Other (Lead time)	Unfortunately you were unsuccessful on this occasion due to the lack of time we had to procure these doors from another supplier. Kind Regards Marie Backhurst		
Q2434-10	Leonard Builders	26/04/2011	Closed Lost Other	I cannot recall specific job , We may have sourced elswhere. Best wishes and regards Graham		
Q2457-10	Gunfire	17/02/2011	Closed Lost Other	Q2457-10		
Q3217-11	Leadbitter	26/04/2011	Closed Lost Other	The client is going for a grp door. Regards Ian		
Q2364-10revA 6 Home Farm	Smith Building Contractors	18/05/2011	Closed Lost Other	Unfortunately we were not awarded this contract, thankyou for your quotation anyway. Best Regards Chloe		
Q2827-10 St Johns Street	Brooks and Wood	18/03/2011	Closed Lost Other	Unfortunately, it appears that we were unsuccessful on that Project. Regards Keith Kennell		
Q3235-11 Hill Partnership Plashet Grove	Soundcraft	27/04/2011	Closed Lost Other	lost to unknown		
Q3490-11 Mark Street London	Essential Designs	18/07/2011	Closed Lost Other	Unfortunately we were not successful in securing this project. Best Regards Felicity Parke		
Q2163-10	Adams Carpentry Contractors	01/10/2011	Closed Lost Other	Q2163-10		
Q2484-10	Brian J Waters	18/05/2011	Closed Lost Other	As I informed you in a previous reply we did not get the contract to do the job. Julie		
Q3321-11 857 Lea Bridge	Soundcraft	22/06/2011	Closed Lost Other	Q3321 – lost		
Q2458-10	Ellmer Construction	05/01/2011	Closed Lost Other	Our bid for this project was unsuccessful. Unfortunately we do not know who the successful contractor was - apologies. Regards Sally 05/01		
Q2784-10 Canterbury City Council	DCB (Kent) Ltd	06/12/2011	Closed Lost Other	we were unsuccessful in securing this project. Regards Paul Baker		
Q2445-10revA Cassland	Albany	18/03/2011	Closed Lost Other	Q2445-10		
SP3071-11	Retail	18/08/2011	Closed Lost Price	It would appear that we were not successful on this occasion with this quotation . Thank you for the time taken to prepare our quotation. Kind Regards John Vecchio		
SP3313-11 solar	Retail	18/05/2011	Closed Lost Other	We have ordered via an alternative supplier.		
Q2681-10 Stoke on Trent	Willmott Dixon	18/07/2011	Closed Lost Other	Tenders Streatham Hub and Stoke on Trent we unfortunatley did not get, although you may want to contact Vinci about Streatham Hub The site at Waring Court - you were unsuccessful Kind Regards Ken		
Q2754-10 Cork	Solid Wooden Doors	21/03/2011	Closed Lost Other	This one's not going ahead. Many Thanks Mark		

Q2356-10revA Windmill Estate	Willmott Dixon	22/03/2011	Closed Lost Other	I'm sorry but we didn't win this contract. Regards Tracie		
SP1197-10 Solar Doorset	Retail	17/03/2011	Closed Lost Other	I do realise you are merely following up a possible sale but I'll have to ask you to close this lead down. I have recently lost my job and having a new front door is the least of my worries. In fact keeping the whole house is now a worry. If things change I will let you know. Regards, Ross Horwich		
SP3551-11	Retail	20/07/2011	Closed Lost Other	I've decided to go with a different door so I won't be progressing with your quote. Kind regards, Sally		
Q2539-10 Cassland	Albany	18/03/2011	Closed Lost Other	Q2539-10		
Q3191-11 Travel Lodge	John Sisk & Son	26/04/2011	Closed Lost Other	-		
Q2635-10 Pinner Road	Dorplan	18/05/2011	Closed Lost Other	We have lost this order We will send other enquiries over as and when they arise Best Regards Russell Evershed		
Q2432-10	J A Stott	17/06/2011	Closed Lost Other	We lost this job Best Regards, Manoj Rajani		
Q2757-10 110 Brent Street	Modern Doors	17/03/2011	Closed Lost Other	-		
Q2245-10revA	The BSS Group Plc Trading as UGS	21/02/2011	Closed Lost Other	Unfortunately our client did not secure the tendered job though it was mentioned that the rates provided were reasonably competitive compared to the other prices he acquired. So I hope we can secure further work together in the foreseeable future on new projects.		
Q3853-11	Horohoe Construction	15/09/2011	Closed Lost Other	-		
Q3323-11 BT Exchange	All sash Solutions	17/06/2011	Closed Lost Other	We put our price into Ibex Interiors who did not win the job. They don't know who did win it. Sorry. regards, Allan		
Q3494-11revA Franklands Drive	Durkan	21/09/2011	Closed Lost Other (Lead time)	The client chose a door from Securidor on Franklands Drive. Your lead-in time was too long for Crow Lane. I will be sending you another enquiry for 10 Corsica Street, London N15 shortly. Regards Rob Mimms		
Q3601-11 Warburton Close	Original Door Company	16/08/2011	Closed Lost Other	-		
Q2606-10 SW19 5AW	Retail	18/05/2011	Closed Lost Other	Thank you, but we have had our door made with another supplier. Warm regards, Rebeccca		
Q2497-10 Beavers Lane	Soundcraft	22/06/2011	Closed Lost Other	Q2497 – lost		
Q2306-10	Retail	12/10/2011	Closed Lost Other	Q2306-10		
SP3631-11	Retail	20/09/2011	Closed Lost Other	thank you for follow up but I will not be placing the order with you. regards Stuart Thorne		
Q2777-10 Fiveways	Leadbitter	17/03/2011	Closed Lost Other	-		
Q2643-10 8 Storey Gate	Euro-par Interiors	02/05/2011	Closed Lost Other	-		
Q3184-11 Charing Cross Hospital	Logan Construction	27/04/2011	Closed Lost Other	Unfortunately you were unsuccessful on this contract; I was not involved at tender stage but we had to use a nominated supplier for the IPS panels on the 7th floor. We will continue to issue further enquiries in due course. Regards, Nick		
Q3682-11 Lodge Lane	Horohoe Construction	19/08/2011	Closed Lost Other	We were not successful in either of the first two jobs im afraid and the 3rd job , im afraid you will have to tell me the name of the job as im not able to find the quotation nimber.. Regards John Glennon.		
Q2271-10 NO SITE SBD EXTERNAL	Blairs - IN ADMINISTRATION	06/01/2011	Closed Lost Other	Q2271-10 - client in administration		

Q4189-11	Soundcraft	23/11/2011	Closed Lost Other	Yes we received the quote but unfortunately you had also quoted our end client directly as well so I believe they are placing it directly with yourselves Kind regards Rob Thomson		
Q2721-10	Bridgman IBC Ltd	17/03/2011	Closed Lost Other	-		
Q2474-10 Nazareth House	Finesse Architectural Systems	17/03/2011	Closed Lost Other	Contractor ordered joinery dire3ct on this occasion . Sorry Yours Sincerely Fred West		
Q2729-10 Barnsbury Youth Hub	Kier	06/01/2011	Closed Lost Other	At present we are undergoing discussions with another supplier regarding these works. Should these discussions prove successful we may be likely to proceed with them however should these discussions prove less successful we may continue discussions with others. Although this package is not lost, we wish to thank you for your interest and efforts with the Barnsbury Youth Hub Project. Kind Regards, Michael Snook 06/01		
SP1205-10	Retail	27/01/2011	Closed Lost Other	Changed to a JCK Job		
SP1165-10revA	Retail	17/03/2011	Closed Lost Other	Thank you Emma for following up; unfortunately, we have made other arrangements for our front door. Kind regards Rakesh		
SP3582-11 Timka	Retail	19/09/2011	Closed Lost Other	I have ordered a door from another supplier please delete my email from your correspondence many thanks suzi lumbard		
Q3019-11 Benenden Street	Quinn London	17/03/2011	Closed Lost Other	In regards to the below project thank you very much for your quotation however we was unsuccessful on this occasion I will keep you in mind for further enquiries. Kind Regards Rebecca		
Q2758-10 Parson Close	Hobson and Porter	17/03/2011	Closed Lost Other	We were not successful with the Parson Cross, Sheffield Tender. Regards Ben Thorn Estimating Assistant		
Q3354-11	Brown and Carroll	17/06/2011	Closed Lost Other	Sadly we did not secure this Project regards Peter Guiton		
Q2778-10 Victoria Road Hendon	Horohoe Construction	18/07/2011	Closed Lost Other	On the quotes below if we have not placed orders by now, these are no longer required Cheers Allan O' Sullivan		
Q2214-10 witney	Thomas Vale	18/03/2011	Closed Lost Other	Unfortunately the Witney project is almost complete! I will however keep you in mind for all future joinery requirements, I will also pass your details to my colleagues within the estimating departments. Thanks, Matt		
SP3911-11	Retail	01/09/2011	Closed Lost Other + Closed Lost delivery	thank you for your quote, I have agreed a sale nearer home, to save on delivery charges. kind regards stacey	£1,577.00	£1,590.10
Q2610-10 Macclesfield Hospital	HB Joinery	17/03/2011	Closed Lost Other	Unfortunately I presume the project reference number you quoted is yours and does not mean anything to me. However, I can update you as per the attached letter, that a decision has been taken to close HB Traditional Joinery once we have completed our current orders. I will pass your details on to the Buyer within Baggaley Construction (Ali Clapham) for future opportunities. Regards,Matthew		

Q3372-11	Reinhold Conservations	30/06/2011	Closed Lost Other	Thank you very much for the trouble you have taken to quote for a new door for our cottage. Your help and advice has been most appreciated. I am sorry that it has taken so long for a decision to be made. I have been otherwise engaged for the past couple of months. There have been various other changes too ! I regret that on this occasion I will not be awarding the contract to you. You did impress with your excellent follow ups by your very pleasant staff. Your products and the ability to make bespoke quality joinery has been noted and your courtesy and approach to the job really appreciated. You will remain on my "contractors list" and be assured that I will contact you if any of my clients have need of your services. Yours sincerely Michael Reinhold		
Q2680-10 Cardinal House	Leadbitter	03/11/2011	Closed Lost Other	You were, I'm afraid, unsuccessful on this occasion and an order has been placed elsewhere, we will however forward you any future enquiries that we get Regards Ian Moran		
Q2620-10	HB Joinery	03/05/2011	Closed Lost Other	Unfortunately I presume the project reference number you quoted is yours and does not mean anything to me. However, I can update you as per the attached letter, that a decision has been taken to close HB Traditional Joinery once we have completed our current orders. I will pass your details on to the Buyer within Baggaley Construction (Ali Clapham) for future opportunities. Regards, Matthew		
Q3186-11	Doors Direct	18/05/2011	Closed Lost Other	Thank you for providing me your qoutation. My customer has has shopped elsewhere and gone for something different. I appreciate your time and effort and maybe we can do business in the future. Regards Darren		
Q2722-10 Lea Bridge Road	DCB (Kent) Ltd	18/11/2011	Closed Lost Other	Unfortunately we were unsuccessful on this occasion. Regards Paul Baker		
Q2446-10	Morris Homes	05/01/2011	Closed Lost Other	Apologies Emma, unfortunately you were unsuccessful on this occasion, we will retain your details and contact you should a further opportunity arise, Regards		
Q2179-10 Chesterfield Way	Soundcraft	18/03/2011	Closed Lost Other	Q2179-10		
SP3164-11	Retail	02/05/2011	Closed Lost Other	We're trying to see if a more local sourcing of the door we want is easier. We would like a visit & measurement by the manufacturer before we part with payment & go to effort of having the door & sidelight made. It is best if this is done by same company supplying not by third party. I think your company suggested we have this done either by yourselves at considerable cost or by third party. Regards Elizabeth Lazell		
Q2769-10 Alvanley Gardens	Woodteam	19/07/2011	Closed Lost Other	We haven't had any feedback from our client regarding this project. I am guessing that this is not going to happen as we quoted this back in early December last year. I know this doesn't help you but thanks for your quote. Regards Graham		
Q2658-10 Rayners Lane	Willmott Dixon	26/04/2011	Closed Lost Other	We were able to find an alternative supplier at a more competitive rate on this occasion.		
Q3690-11 London Road	Doorset Technology	18/08/2011	Closed Lost Other	You took this one direct from our customer CBC of Glasgow. They also sent you the enquiry direct against which you quoted them a cheaper price than ourselves. We were intending to take this up with Anthony but have not had a chance to date, perhaps you can relate this to him and provide us with some feedback. Regards Frank. Frank.		
Q3558-11 Woodbury Grove	Horohoe Construction	19/08/2011	Closed Lost Other	We were not successful in either of the first two jobs im afraid and the 3rd job , im afraid you will have to tell me the name of the job as im not able to find the quotation nimber.. Regards John Glennon.		
Q3149-11	Retail	17/02/2011	Closed Lost Other	I did receive but due to delay in response have bought/ordered from elsewhere.		

Q3696-11 Woodlands Road Lambeth London	Rydon	19/09/2011	Closed Lost Other	sadly you were not successful this time.		
Q2760-10 40 Pont Street London SW1	Original Door Company	21/03/2011	Closed Lost Other	Unfortunately there was no reply from the customer when I tried to get in contact earlier today. I would hazard a guess that this one is probably dead. Apologies for the belated response, I will inform you should this status change. Regards Jamie Sharkey		
Q2740-10revA Warren PH2	Soundcraft	06/01/2011	Closed Lost Other	We lost out to Vicaima who supplied the previous phase Kind Regards Rob Thomson 06/01		
Q2634-10 Rayners Lane	Willmott Dixon	26/04/2011	Closed Lost Other + Closed Lost Price	We were able to find an alternative supplier at a more competitive rate on this occasion.	£24,721.00	£22,165.20
SPIR138 SP1185-10	Retail	03/02/2011	Closed Lost Other	Unable to match paint finish		
Q2161-10revA Northern City Plaza	BBJ Northern	18/05/2011	Closed Lost Other	Unfortunately we haven't won this project. Regards, Lee Mason		
SP1199-10	Retail	26/04/2011	Closed Lost Other	Emma, I thought I had replied previously. This has been sourced from another supplier but thank you for your follow up and quotation. Regards, kevin henderson		
SP1141-10	Roi Projects	07/01/2011	Closed Lost Other	Thank you for your email, I am sorry for not getting back to you sooner but in this instance your quote was not successful, but I do hope that we might be able to give you the opportunity to quote for us again in the future. Kind regards Amanda Roundhill 07/01		
Q3058-11	RSBC Ltd	18/08/2011	Closed Lost Other	My apologies for not responding earlier. Sadly we did not secure the wok and for that reason we will not be progressing with this enquiry. However I would thank you for your service piovided and will contact you if required in the future. Best regards Richard Skitch		
SP4186-11	Modern Doors	23/11/2011	Closed Lost Other	We have received everything we needed but this quote was unsuccessful I'm afraid. Thanks Best regards		
Q3645-11 Kerridge Court	STV Building Services Ltd	19/09/2011	Closed Lost Other	Unfortunately we were unsuccessful with the project but I thank you for your assistance Regards Mason		
Q2219-10	Leadbitter	17/03/2011	Closed Lost Other	Q2219-10		
Q3104-11 Daventry Fire Station	Art Contracts	19/07/2011	Closed Lost Other	Unfortunately we were unsuccessful with our tenders for the Emberton School and Knowle Park. Daventry is a project we are working on at the moment, I believe the QS dealing with the Project (Dave Keys) has already placed joinery orders with a local company. But I can't tell you anymore than that I'm afraid. Thank you for your assistance and if we have any future requirements we will send the details through to yourselves. Kind Regards Stuart Elbourn		
SP3162-11 Flagship Housing Group	Brooks and Wood	26/04/2011	Closed Lost Other	I do not believe that we were the successful contractor on this development, however I am not aware who was. Thank you for your assistance in preparing our tender and we will be in contact in the future over future developments. Regards, Justyn French		
Q3745-11	Saturn Projects Limited	19/08/2011	Closed Lost Other	The client has yet to make a decision, but I do know that they are in talks with one of the other suppliers, so I think it unlikely that this work will be coming your way. Many thanks for your time and we will keep you on our records for future works that may be of interest to you. Kind regards Mike Fish		
Q3691-11 Rendlesham	Elliston Steady & Hawes	19/09/2011	Closed Lost Other	Unfortunately you have been unsuccessful on this particular project, this was down to the u-values you can achieve not being low enough. Thank you for taking time to price this scheme and we look forward to working together in the near future. Kind Regards. Martin Currie		

SP3017-11	sally Dawes	20/07/2011	Closed Lost Other	Thank you for your quote and subsequent emails. Although we are very keen on a couple of the designs, due to more immediate work required on the house, we will have to shelve our 'door project' for now. Regards Sally Morris		
Q2447-10 Flooks Jewellers	Kingfisher	07/01/2011	Closed Lost Other	Faxed to say that they were unsuccessful and are not sure whether or not it has been started 07/01		
Q2604-10	Retail	20/06/2011	Closed Lost Other	I've been working on the fire door project and have come to the conclusion that we are just going to have to replace all our doors with off the peg firedoors. Our door linings are unsuitable for firedoors in any case, so since they will need altering, we may as well use standard sized doors. Thank you for your interest Fiona Martin		
Q3295-11 Peckham Road London	Quinn London	18/07/2011	Closed Lost Other	I'm afraid we didn't win that contract and we are not sure who did. We appreciate your time and effort in providing us with a quote and we will send you more enquiries in the future. Regards		
Q2500-10	Gunfire	17/02/2011	Closed Lost Other	Q2500-10		
Q2380-10	Pro Care	17/03/2011	Closed Lost Other	-		
SP4106-11	Retail	07/11/2011	Closed Lost Other	Thanks Emma, I've chosen something from a local joiner. Thanks,		
Q2770-10 Canterbury	City Construction	26/04/2011	Closed Lost Other	Have not received any news relating to this contract, assume another contractor has been successful Thanks Jim Cornish		
Q2327-10revA Langley Boys School	Leadbitter	06/01/2011	Closed Lost Other	Thank you for your email unfortunately in this instance this order has been placed elsewhere. Regards Allan. 06/01		
Q2430-10 Webber Street	Allenbuild	18/07/2011	Closed Lost Other	I'm afraid the order was won by another supplier. We will of course be in touch over future projects. Kind Regards Jon Bowles		
Q2636-10	MSN Display	27/04/2011	Closed Lost Other	Sorry we haven't got this one. Regards Mark		
Q2272-10 Wolverhampton	T & D Group	26/04/2011	Closed Lost Other	-		
Q2328-10 Cross Estate	Soundcraft	26/04/2011	Closed Lost Other	We have heard that we were not successful with our quotes. Regards, Chas Williams		
Q2346-10	Rydon	17/03/2011	Closed Lost Other	We have lost this one!		
Q3364-11 Hampton and Hilton	Horohoe Construction	20/06/2011	Closed Lost Other	Hampton by Hilton was being procured by Bowen construction, who are after going bust not too long ago.		
Q3671-11	Euro-par Interiors	19/09/2011	Closed Lost Other	We have not been successful on this project, many thanks for quoting for the project. Danny		
Q2741-10	Johnston's Aluminium & Glass	18/07/2011	Closed Lost Other	Thank you for the quote, but we were unsuccessfull on this occasion. Kind regards, Mark		
Q2579-10 147-149 East India Dock Road	Soundcraft	26/04/2011	Closed Lost Other	We have heard that we were not successful with our quotes. Regards, Chas Williams		
Q2375-10 Clara National School	Complete Interior Solution	23/05/2011	Closed Lost Other	We never got that project		
Q3119-11 Lavender Court	D Geal Contractors	26/04/2011	Closed Lost Other	Unfortunately we were not successful on this one. Kathy		
Q3294-11 Sydenham Road Croyden	J A Stott	18/08/2011	Closed Lost Other	We didn't secure this contract Best Regards, Manoj Rajani		
SP3173-11	Retail	26/04/2011	Closed Lost Other	Thank you for your email. We decided not to proceed with the order as we required a site visit to make sure our measurements and requirements were accurate. We understand your company manufacture to the clients' own measurements and don't visit site to measure up. We didn't want to risk getting it wrong. Also, we felt the delivery charges were quite high. Lovely products though! Regards Helen Beaumont		

Q3336-11 Wembley	J A Stott	18/05/2011	Closed Lost Other	I think this was for the residential Block, It was awarded to another carpentry contractor. We are also pricing the Hilton, but don't think there is anything of that description in there Paul		
Q2473-10 Knowle Park Primary School	Art Contracts	19/07/2011	Closed Lost Other	Unfortunately we were unsuccessful with our tenders for the Emberton School and Knowle Park. Daventry is a project we are working on at the moment, I believe the QS dealing with the Project (Dave Keys) has already placed joinery orders with a local company. But I can't tell you anymore than that I'm afraid. Thank you for your assistance and if we have any future requirements we will send the details through to yourselves. Kind Regards Stuart Elbourn		
Q2622-10 Hackney	Archer Hoblin	17/03/2011	Closed Lost Other	We are using your doors , although they are through our sub contractor Woodlands Plant Hire Regards Paul		
Q2649-10 Canterbury	Kirk Brown Ltd	06/01/2011	Closed Lost Other	your company and product details were used as part of wider tender document which was due to be returned to Canterbury Council in early December. Canterbury are running the scheme themselves and I do not know which tender they chose. Sorry I can't be any for help. Regards cliff Kirk-Brown 06/01		
Q3110-11 Hollingdean Road	Soundcraft	22/06/2011	Closed Lost Other	Q3110 - lost		
Q2744-10 Burns Close Middlesex	Hill Partnerships	17/03/2011	Closed Lost Other	Unfortunately both site enquiries didn't go any further. Please take off your records Thanks Alistair Deacon		
Q3365-11	Essential Designs	18/05/2011	Closed Lost Other	We have not been successful in this project. Best Regards Felicity Parke		
Q3427-11 Dee Park	Willmott Dixon	18/07/2011	Closed Lost Other	I'm not sure what the below quotation reference actually refers to in terms of material you may have priced. It is unlikely you have been successful if an order is not in place by now. It may be that we actually changed the design or spec of materials too. The last order I placed was reference Dee Park but it was Q3533-1. Thanks, Don		
Q2743-10 Milton Keynes	Hill Partnerships	17/03/2011	Closed Lost Other	Unfortunately both site enquiries didn't go any further. Please take off your records Thanks Alistair Deacon		
Q3170-11 3-9 Canal Walk	Clovertone Ltd	27/04/2011	Closed Lost Other	Although your price was very competitive we gave the work to a supplier who could do all aspects of the job entailed i.e. supplying and fitting the door and all the electrical work for the entry system. Regards, Steve		
Q2791-10 Military Road Canterbruy	Soundcraft	18/03/2011	Closed Lost Other	-		
Q2349-10 Ryhall Primary School	Newlife Regeneration Construction	17/03/2011	Closed Lost Other	Q2349-10		
Q2550-10 Lower Green Road	Parkinson and Bryant Construction	27/01/2011	Closed Lost Other	They Lost The Tender		
Q2266-10 Beaumont Walk Estate London	Diamond Build	19/07/2011	Closed Lost Other	that job has finished as far as I am aware regards Stewart Jackson		
Q3296-11	J A Stott	18/08/2011	Closed Lost Other	We didn't secure this contract Best Regards, Manoj Rajani		
Q2413-10	John Rowan & Partners LLP	17/02/2011	Closed Lost Other	Sorry for not get back to you earlier. The clients have decided to use composite door and contract was awarding to Mulalley (main contractor). Thanks for your helps on the matter. 17/02		
Q2609-10	Soundcraft	26/04/2011	Closed Lost Other	We have heard that we were not successful with our quotes. Regards, Chas Williams		
Q2689-10	Retail	16/11/2011	Closed Lost Other	24/11 Thank you very much for your quotation. However,I have decided to source with a local joiner. I appreciate your efforts. Regards Phil Applin		

Q3248-11 Packham Road London	8 Build	18/05/2011	Closed Lost Other	We did not win that job unfortunately. Not sure who did Regards Chong Hwa		
SP3264-11	Retail	18/08/2011	Closed Lost Other	THE ORDER WAS PLACED LOCALLY		
Q3475-11 Waring Court	Willmott Dixon	18/07/2011	Closed Lost Other	Tenders Streatham Hub and Stoke on Trent we unfortunatley did not get, although you may want to contact Vinci about Streatham Hub The site at Waring Court - you were unsuccessful Kind Regards Ken		
Q2738-10 Cliffton College Nottingham	Doorset Technology	17/03/2011	Closed Lost Other	Thought Frank has discussed this contract with Anthony at the time, we lost it. We were not quoting like for like as our competitor was half the price! Regards Robert McPherson		
SP3904-11	Retail	06/10/2011	Closed Lost Other	Order placed through Martindales. Quote Q3989-11		
Q3016-11 Chalfront Pavilion Rading	Art Contracts	27/04/2011	Closed Lost Other	Our company has secured this project but unfortunately I was told that your quotation didn't go ahead and subcontract order was placed with somebody else. I do not have many dealing once the contracts get secured therefore I can not tell you more to why you weren't successful. If you wish to discuss it further please do not hesitate to contact Steven Cooke on the number at the bottom of this email. Kind Regards Jurgita Moyses		
Q2426-10 Blenheim Park Tangmere	Barratt David Wilson	26/04/2011	Closed Lost Other	Thank you for the quotations mentioned below, unfortunately on this occasion you have been unsuccessful. If we have a need for doors sets of a similar nature I will contact you immediately. Kind regards Adrian Wallace		
SP1162-10 Laya	Retail	19/07/2011	Closed Lost Other	We no longer require your services. Kindly remove my email address from your list. Kind regards, Mitul Mehta		
Q3515-11 Eberton School	Art Contracts	19/07/2011	Closed Lost Other	Unfortunately we were unsuccessful with our tenders for the Emberton School and Knowle Park. Daventry is a project we are working on at the moment, I believe the QS dealing with the Project (Dave Keys) has already placed joinery orders with a local company. But I can't tell you anymore than that I'm afraid. Thank you for your assistance and if we have any future requirements we will send the details through to yourselves. Kind Regards Stuart Elbourn		
Q2407-10 Finsbury Square	John Sisk & Son	18/05/2011	Closed Lost Other	Q2407-10		
Q2630-10revA 165 Garden Avenue	Retail	17/06/2011	Closed Lost Other	The customer decided on other doors from another supplier.		
2227-SBD 3712-11 Station Road	Highwood	23/11/2011	Closed Lost Other	CANCELLED		
Q2467-10 Duke Street	Calanpoint	17/06/2011	Closed Lost Other	The main contractor we priced for were unsuccessful. Faithdean won the project if you want to follow it up. Kind regards Alan 17/06		
Q2787-10 Westbury Health Centre	Mansell	17/03/2011	Closed Lost Other	Unfortunately we lost this project. Kind Regards Karen Broom		
Q3665-11 Wigmore Street and Picton Street	Calanpoint	18/08/2011	Closed Lost Other	Haven't heard anything back from the contractors regarding Wigmore Street/Picton Place, which means either the architect is making amendments or the contractor completely forgot to tell us we didn't win. It's been nearly two months since we priced that project so I'd probably go with the contractor forgetting. Hope all's well in Leicester! Paul		
Q3452-11	Liquid Global	18/07/2011	Closed Lost Other	Thank you for your email, however we are not currently presuing this project but i will contact yourself if i need further assistance. Kind Reagrds, Paul Breffitt		
Q2694-10	Ansell and Bailey Architects	18/07/2011	Closed Lost Other	You did provide a quote and maybe I should have notified you that I did not wish to proceed with ordering from you. I am impressed with your tenacity and suspect that this may be automated. Please accept my thanks for the quote. I will not be ordering from you. The project has been completed for several months now. Kind regards, Jason Laurence		

Q3246-11 Peckham Road London	Lakehouse Contracts Ltd	18/08/2011	Closed Other	Lost	-	
Q3444-11 Bearwood Centre	Leadbitter	17/06/2011	Closed Other	Lost	We unfortunately did not secure these works in the end. Regards James	
Q3424-11 Hall Street Lochgelly	Morris and Spottiswood	18/07/2011	Closed Other	Lost	Hello Emma sorry this is me just returning your email today, I have just returned from a 2 week break. With regards to the Lochgelly job we never heard anything back, still may come back but I think it could be unlikely. With regards to your price it was very competitive. Kind Regards, Lynsay Thomson	
Q3114-11	Mansell	18/08/2011	Closed Other	Lost	-	
Q2483-10	Robert Price	05/09/2011	Closed Other	Lost	Sorry for the delay in getting back to you but I have just returned from Maternity Leave. The enquiry is no longer a live one. Kind regards, Janet	
Q2736-10revA 103-105 Sehlford Road Cambridge	Cocksedge	18/07/2011	Closed Other	Lost	Regretfully we were unsuccessful with this tender, however, we thank you for your time and interest and will certainly bear you in mind for future projects. Regards Diane	
Q3406-11	Beard Construction	18/07/2011	Closed Other	Lost	Firstly, thank you for your quotation. We did use your price in our tender submission. However, unfortunately we were unsuccessful on this tender bid. I am not sure who actually won the job. Many Thanks Luke	
Q3257-11 Golden Hind Place	Security Matters	10/03/2011	Closed Other	Lost	-	
Q2371-10	Gunfire	17/02/2011	Closed Other	Lost	Q2371-10	
Q2779-10 Central Street	Horohoe Construction	18/07/2011	Closed Other	Lost	On the quotes below if we have not placed orders by now, these are no longer required Cheers Allan O' Sullivan	
SP3391-11revA	Retail	19/09/2011	Closed Other	Lost	This project is now complete. Thank you for your quotation. Regards, Kate	
Q2807-10 Tovara, Midenhead	Brennan Group	18/05/2011	Closed Other	Lost	Unfortunately we have been unsuccessful with these contracts.	
SP3524-11	M and S Contractors	18/08/2011	Closed Other	Lost	No this has gone else where	
Q2465revD Leith Mansion	DML Contracting	27/04/2011	Closed Other	Lost	I am afraid that our client has chosen to run with another door manufacturer. I would like take this opportunity to thank you for your quotation. Kind regards Steven Thorpe	
Q2174/10 St Marks Surbiton	Blairs - IN ADMINISTRATION	24/01/2011	Closed Other	Lost	Q2174-10 - client in administration	
SP3656-11 Satini	All Done Design and Build	18/08/2011	Closed Other	Lost	Thank you for the email. We have decided against the purchase of this door at this stage, however I do love your products and will recommend you to our clients in the future. Many thanks Charlie	
SP3105-11 Solar	Retail	24/05/2011	Closed Other	Lost	Thanks for your email, we have placed the order with a local supplier, many thanks for your help	
Q2495-10revA Alton Site	Willmott Dixon	17/02/2011	Closed Other	Lost	Thanks for the quote but in the end we did not go down this route and was therefore not required Many Thanks Ken 17/02	
Q3466-11 Barking Park	MBM Contracts	18/08/2011	Closed Other	Lost	We were not successful with our tender for this project. Kind regards, Kris Bayford	
Q3269-11	Buildwise Construction Group	19/07/2011	Closed Other	Lost	We did not secure this contract we understand isg jackson may have Regards Richard	
Q2460-10 South Ruislip	Willmott Dixon	17/02/2011	Closed Other	Lost	No sorry we didn't win this job Regards Tracie 17/02	
Q3403-11revB	Midland Building Products	21/07/2011	Closed Other	Lost	I'm afraid we lost this to a company called PDS Manchester. Regards, Martin Smith	

Q3759-11 Silwood Estate	Horohoe Construction	15/09/2011	Closed Lost Other	Yes i recieved your quotation , thank you very much. Regards John Glennon		
SP3301-11 Timka	Guy Holloway Architects	17/06/2011	Closed Lost Other	I'm guessing that the project you refer to is the Burnt House Farm project in Smarden. If this is the case, thank you for supplying the quote, however the project has now been stopped and will not be going ahead. I asked you to quote on this as I was pleased with the doors you supplied on a previous project. If I do have further projects which require similar doors I will contact you to allow you to quote. Regards Lian Kaczykowski		
Q3357-11 Burleigh Way	Astec Windows	18/05/2011	Closed Lost Other	Thanks for the email unfortunately looks like the job is going to Russell Joinery not us. Ziggy Boban		
Q2298-10 Chatel France	Step Property	17/03/2011	Closed Lost Other	Thanks for following up – however the project was awarded to Halspan. Kind regards Katie		
Q2829-10 6 Acres Wansworth	Soundcraft	27/04/2011	Closed Lost Other	LOST TO WOODLANDS		
SP3270-11 Timka	Retail	18/05/2011	Closed Lost Other	Hi Emma, I have already provided feedback. I now have a new door so no longer need anything. Thanks, Chantal.		
Q2707-10 Narwal	Modern Doors	18/10/2011	Closed Lost Other	-		
SP1144-10	Modern Doors	18/07/2011	Closed Lost Other	unfortunately you were not able to do this for me. Thanks James		
Q2676-10 Lansbury Estate	Breyer	18/05/2011	Closed Lost Other	Thanks for your quotation as I recall it being of interest, however, our client has decided they want all doors to be steel clad and has advised us to use their specified contractor so this package will be going to that contractor. Thanks again for your quote and I will certainly send you enquires of any future projects which may be of interest to you. Regards Mike Tobin		
Q3528-11 St Paul's House London	Mansell	18/07/2011	Closed Lost Other	Emma, thank you for your quotation & interest. Unfortunately we were close, but not close enough and this project will not be coming our way. Regards Alan		
Q2591-10	John Porter Doors	18/05/2011	Closed Lost Other	I believe we were unsuccessful on that project. Many Thanks. Simon		
Q2587-10 Douglas Hotel Arran	Doorset Technology	19/07/2011	Closed Lost Other	Unfortunately we didn't get the order. The contractor has manufactured the doors in his own workshop. Regards Tony O'Reilly		
Q3404-11	Stanton Williams	17/06/2011	Closed Lost Other	Yes thank you for your quotation. I'm afraid I went elsewhere as they were more local and very good at answering my technical queries. Many thanks		
Q2691-10	Original Door Company	17/03/2011	Closed Lost Other	-		
Q3708-11 Sidcup Kent	Soundcraft	18/08/2011	Closed Lost Other	-		
Q3580-11 Stevenage	Retail	19/09/2011	Closed Lost Other	We won't be going ahead with it, Emma. Thanks, Adrian.		
Q2410-10 Evington Valley Primary School	G F Tomlinson Building Ltd	17/02/2011	Closed Lost Other	Q2410-10		
Q2772-10revB Westbourne Terrace	Mulalley & Co	17/03/2011	Closed Lost Other	We were not successful with our bid on this project. Suggest you try 'Cosmur Ltd'. They are the only opposition we know about. Many thanks for your quote. Regards Gary		
Q3394-11 Frys Court Nightingale Avenue Oxford	J T Ward Joinery	18/08/2011	Closed Lost Other	Heard nothing. You could check if you have made them for anyone else as you were nominnated supplier. Regards Martin Believed to be Q3408-11 Princebuild		
Q3707-11 Sheppard Close Devizes	Quadrigy Ltd	18/08/2011	Closed Lost Other	Unfortunately we didn't win this project. Thanks for your help with pricing. Regards, Andy Ormston		
Q3276-11 Wilton Way	Horohoe Construction	20/06/2011	Closed Lost Other	Wilton way is well is a few weeks into the job.		

Q3450-11 St Luke's School	Quinn London	17/06/2011	Closed Lost Other	Thank you for your quotation however we were unfortunately unsuccessful on this occasion, I will be sure to contact you with regards to future projects. Kind Regards Rebecca		
Q3138-11 Malvern Road	Rydon	27/04/2011	Closed Lost Other	We went to another supplier on this project based upon a commercial decision. Thanks Stuart		
SP3222-11	Retail	18/05/2011	Closed Lost Other	Not required thankyou		
Q3337-11	Distinction Contract	05/04/2011	Closed Lost Other	Thank you for sending the quote but unfortunately we did not get the job. I appreciate your help and time.		
Q3050-11	Retail	19/07/2011	Closed Lost Other	Please remove me from any and all future mailings. Regards, Sam		
Q2785-10 Cedars Farm	T Denman & Sons	20/06/2011	Closed Lost Other	Just to let you know that we have not been successful with either of these two schemes. Regards Roman Rozycki		
Q3367-11 Auday	Solid Wooden Doors	17/06/2011	Closed Lost Other	Auday is lost, Will find out about the other one. Many Thanks Mark Lambourne		
Q3137-11 Kirtlington Oxon	Rectory Homes	27/04/2011	Closed Lost Other	Sorry, unsuccessful on this occasion. Regards, Tony Wrench		
Q3306-11 Marjorie Whimster Twerton Bath	Leadbitter	22/03/2011	Closed Lost Other	Received but no longer required Thanks for your help Regards Adam Sturgeon		
Q2711-10 Lillies Hill Felpham Blakes Mead West Sussex	Barratt David Wilson	18/11/2011	Closed Lost Other	Thank you for the quotations mentioned below, unfortunately on this occasion you have been unsuccessful. If we have a need for doors sets of a similar nature I will contact you immediately. Kind regards Adrian Wallace		
Q3526-11revA Southampton University	The Hub Ltd	18/08/2011	Closed Lost Other	Unfortunately we were unsuccessful on that project. Thanks Rob		
SP3325-11 Satini	Retail	19/05/2011	Closed Lost Other	Thanks for your interest but have sourced a door locally. Regards Phil		
Q2803-10 25 Knightsbridge	Mulalley & Co	17/03/2011	Closed Lost Other	We were not successful with our bid on this project. Suggest you try 'Cosmur Ltd'. They are the only opposition we know about. Many thanks for your quote. Regards Gary		
SP3213-11	Retail	19/09/2011	Closed Lost Other	Thanks for your follow up. We went, in the end, with another provider - Kloeber. We found the design and spec that we needed there. We appreciate this contact, however. Yours, Pam Stocker		
Q3283-11 Mote Park Maidstone	UPM Tilhill	19/08/2011	Closed Lost Other	I am afraid we lost that tender; not sure yet who to. Thanks for all your efforts. Regards, Jason Loughran		
Q3079-11	Retail	28/01/2011	Closed Lost Price	The reason we did not use your company was mainly the cost but it did not help that there was such a long lead time. I would like to once again like to thank you for you time and effort. Regards Jane	£638.00	£459.00
SP3376-11 Laya	Retail	18/05/2011	Closed Lost Price	We have not yet purchased our chosen door, but to be honest found your pricing too high. Regards Mr G Goodrum	£1,756.00	£1,425.00
Q3049-11	Retail	20/01/2011	Closed Lost Price	-	£3,056.00	£2,722.00
Q3124-11	Smart Handyman	18/05/2011	Closed Lost Price	I'm sorry unfortunately, our client did not want to pay so much for the door and the appointment did not go ahead. Regards Louise	£486.00	£434.00
SP3920-11	Retail	14/10/2011	Closed Lost Price	Thanks very much for your quote in September. I'm afraid we've decided to go with another supplier on the basis of price but thank you for taking the time to send a quote. Best regards, Matt Rymell	£1,879.00	£1,613.87

SP3399-11 Geddis	Retail	19/07/2011	Closed Price	Lost	I decided not to proceed with the door you quoted me for purely because of cost. This was my only project and is now complete. Tatenda	£1,903.00	£1,550.00
Q3606-11 Laelia House	Warwick Avenue Group	26/09/2011	Closed Price	Lost	Thank you for the email Unfortunately the package was placed along with all other doors and windows which offered a much more efficient price. Thank you for providing the tender and I will consider your services for future projects. Kind Regards Oliver Garfoot BSc (Hons)	£7,416.00	£7,449.00
Q2824-10 Dee Park Reading	Willmott Dixon	21/02/2011	Closed Price	Lost	Unfortunately you were unsuccessful on quotation ref: Q2436-10 Dee Park. The price submitted was on this occasion too high.	£3,872.00	£4,312.00
Q2583-10 Grosvenor Waterside Health Club	J A Stott	17/03/2011	Closed Price	Lost	Regarding the Grosvenor Health Club we did win that. I have asked the QS responsible, Benn Wilson, to advise you of the latest on that job. Regards Nick Green		one off Door, bespoke (no info available)
Q4011-11	Nordica	30/09/2011	Closed Price	Lost	Lost this one as the door was too expensive for the client. Kind regards Jarmo Lahti	£903.00	£930.00
Q2569-10 Stoke Bardolph	Leawood Builders	05/01/2011	Closed Price	Lost	Hi , this contract is now complete, thanks for your quote but this time we used a cheaper option. Regards greg. 05/01		Windows
SP3352-11 Solar	Retail	10/06/2011	Closed Price	Lost	Thank you for your quote. Unfortunately the cost of the door is above our budget. Best regards Katia	£1,796.00	£1,686.00
Q3123-11 Stanbridge Farm	GD Projects	18/05/2011	Closed Price	Lost	Thank you for your quotation On this occasion you were unsuccessful. Whilst your quotation was not the dearest, it was £14,000 more than the lowest and my client has chosen to go with that supplier. regards Giles Dixon		Quote not found
Q2248-10revA Campbell Close	Mansell	26/04/2011	Closed Price	Lost	Unfortunately you were unsuccessful with this quotation. The order was placed with Midland Building Products - reason was price. Regards. Aron Jackson	£48,988.00	£28,699.78
SP1159/10 Satini	Retail	17/03/2011	Closed Price	Lost	Thanks for your quote, unfortunately it was out of our budget and have since opted for another manufacturer! Best Regards Claire	£2,716.00	£2,624.00
q3919-11	Breyer	12/09/2011	Closed Price	Lost	Regrettably you were not competitive on this occasion. Regards, Tom Mercer	£4,503.00	£4,273.95
Q3198-11 Packington Estate Islington	Rydon	26/04/2011	Closed Price	Lost	Way too expensive thanks Julian	£109,447.00	£89,940.41
Q3634-11 Stoneham Doors	Drew Smith	18/08/2011	Closed Price	Lost	This project went elsewhere due to price Kind regards Abi	£5,292.00	£4,220.51
SP3086-11	Retail	17/06/2011	Closed Price	Lost	Gone else where Too expensive Thanks	£1,645.00	£1,114.00
Q3242-11revB New Kings Road	Forcia Ltd	18/05/2011	Closed Price	Lost	Sorry you were not successful with this one. I don't think that there was anything uncompetitive about your price but we were only to provide the cheapest doors possible. Thanks Gareth Hunt	£61,104.00	£60,810.34
SP3751-11	Retail	29/07/2011	Closed Price	Lost	Thank you for email I have received the quoatation but I feel it is too high price . Thank you J.A.Mann		Bespoke (Half Moon Door, not availble)
Q2748-10 New Park Road Clapham London SW2 4ET	Rydon	27/01/2011	Closed Price	Lost	29k job but we were 4k out 27/01	£29,615.00	£32,760.93
Q2507-10 Herberr Road	Indecon	06/01/2011	Closed Price	Lost	This is not actually the job i am currently looking after, however i may have done that enquiry so that's probably why my name was on it. However, i have spoken with my colleague in our office who is Contract Managing this development and he has explained to me that unfortunately your quotation on this occasion was unsuccessful. Your quotation was competitive however just not competitive enough. I realise this is a brief reply with regards to feedback, however in my position this is the only information i can currently give you . Regards Lewis White Indecon Building 06/01	£8,088.00	£9,479.22

Q3579-11 Bourton on the Water	Leadbitter	18/08/2011	Closed Price	Lost	Order placed elsewhere based on price. Regards Ian	£97,212.00	£84,405.78
SP3156-11 Laya Door	Retail	21/06/2011	Closed Price	Lost	Many thanks for the quotation and apologies for not coming back to you sooner. Whilst there is no doubt that your product was of excellent quality and very close to the design concept we had in mind, I am sad to say that the quote was a little too rich for our budget and we were forced to source elsewhere. Very grateful for your time and assistance, Best, Brett Regan.	£2,066.00	£1,817.97
Q3905-11	Lagan Homes	19/09/2011	Closed Price	Lost	Further to your earlier email, unfortunately this order has been placed elsewhere as your price was uncompetitive. Kind Regards Nicola Rowland	£39,402.00	£23,937.21
Q3371-11 Bulford Barracks	Drew Smith	18/05/2011	Closed Price	Lost	King George is too high, as Stoneham and Bulford Barracks as well. I think the rates needs addressing as they all come in too high. Abi	£732.00	£664.39
SP3041-11 Solar	Retail	18/03/2011	Closed Price	Lost	Unfortunately your pricing was far in excess of other quotes. Regards Marc	£2,039.00	£1,822.00
Q2673-10 King George Allotments	Drew Smith	18/05/2011	Closed Price	Lost	King George is too high, as Stoneham and Bulford Barracks as well. I think the rates needs addressing as they all come in too high. Abi	£12,903.00	£10,435.00
SP3897-11	Retail	31/08/2011	Closed Price	Lost	Yes, I have received the quote on the lovely Lucent door. Factoring in shipping costs it seems to be a bit above my budget. I thank you for you time and promptness.	£1,657.00	£1,562.00
SP3846-11	Timka	15/08/2011	Closed Price	Lost	Many thanks for the detailed quotation. Unfortunately it is more than we are considering and have opted for a less expensive option. Thank you very much for your assistance. Best regards Adrian Roberts	£2,293.00	£2,165.00
SP3438-11	Retail	19/07/2011	Closed Price	Lost	Thanks for following up. Your quote was way above every other quote we had, so we are going with our alternative choice. Kind regards Jane	£4,449.64	£3,623.00
Q2719-10 St Olaves Bury St Edmunds	Elliston Steady & Hawes	17/03/2011	Closed Price	Lost	You were not successful with this project, both in terms of price and delivery times. Kind regards, Mick.	£5,759.00	£5,024.21
Q2674-10 London	Saxon Bs	26/04/2011	Closed Price	Lost	THANK YOU FOR YOUR EMAIL. We went ahead with another quote, which was a lot cheaper. We have kept your details on record. Regards Jackie	£31,330.00	£33,391.02
SP1028-10	Retail	17/03/2011	Closed Price	Lost	we had to go for a cheaper solution in the end because of the cost of the door and delivery. We went to Emerald Doors.	£2,095.00	£2,390.00
Q2429-10 Hampshire	Dual Architectural Aluminium Systems	05/01/2011	Closed Price	Lost	Project was shelved due to cost. Regards Alan Akerman 05/01	£2,300.00	£2,005.62
Q3097-11 Bourton On the Water	Leadbitter	17/03/2011	Closed Price	Lost	Recieved but not checked	£22,620.00	
SP1201-10 Naturelle Range	Retail	26/04/2011	Closed Price	Lost	Due to spiralling costs we have had to make several cut backs on our design, we decided to install a cheaper front door supplied by a builders merchant and installed by a local joiner. Thanks for your quotation Regards Matt	£4,178.00	£4,726.50
SP3311-11 Bromley	Retail	22/03/2011	Closed Price	Lost	Thanks but this is beyond my budget esp when you add in the fitting cost.	£2,733.00	£2,717.61
Q3901-11	G F Tomlinson Building Ltd	19/09/2011	Closed Price	Lost	Quoted prices: £6,651 £7,019 (JCK) £5,229 (manufacturer named on drawings for reference purposes but not specified) Additionally, the companies other than JCK were able to offer the windows. The order has now been placed elsewhere. May I thank JCK for quoting and for the prompt turnaround of the quotation. I am sorry we could not turn it into an order. JCK remain on our list of quality joinery companies, particularly for external doors & windows. Kind Regards, Terry Milton Supply Chain Manager		Quote not found

SP1179/10 Satini	Retail	16/11/2011	Closed Price	Lost	Thank you , I have received the quote, but unfortunately it is beyond our budget.	£2,830.00	£3,324.38
SP3158-11	Retail	17/02/2011	Closed Price	Lost	Thanks, yes I received the quotation however the Client has decided to go for another option – due to cost. 17/02		Quote not found
Q3559-11	Leadbitter	18/08/2011	Closed Price	Lost	Order placed elsewhere based on price. Regards Ian	£5,916.00	£5,072.00
Q3890-11	Breyer	19/09/2011	Closed Price	Lost	Uncompetitive on this occasion Emma Regards, Tom Mercer	£20,311.00	£19,125.06
SP3008-11	Retail	27/04/2011	Closed Price	Lost	The work is now completed, I bought a hardwood door from Kay Bee and had a hardwood frame made locally, total cost inc VAT = £1,300.00 Thanks for your quote and will be in touch if I require any other joinery work pricing Regards John	£1,773.00	£1,320.00
SP3467-11	Retail	17/06/2011	Closed Price	Lost	I thought I had emailled you the day after - but maybe not..... sorry - the price was higher than we had anticipated, and we could not go ahead at that price, thanks though. Paula KNOTT	£3,002.32	£2,296.00
Q3578-11revA	Retail	18/07/2011	Closed Price	Lost	Hi Emma, thanks for your email. I am afraid your quote was much higher than expected so we do not plan to proceed at this stage. Many thanks, Amanda	£2,030.32	£1,804.00
SP3344-11	Retail	22/07/2011	Closed Price	Lost	Thank you for your quote the quotation is too high I was not expecting it to be so much. thank you J A Mann	£2,243.00	£1,989.00
SP3160-11	Retail	18/05/2011	Closed Price	Lost	Thank you for your email. I can confirm that your fee quotation was far higher than some of the other quotes we obtained. Kind regards Andrew	£3,853.00	£3,234.00
Q3747-11	Morris Homes	22/07/2011	Closed Price	Lost	Yes thank you Unfortunately it was the most expensive quote I received so have had to order elsewhere. Kind Regards, Phil Shaw	£729.00	£497.78
Q3055-11 Bicester Care Home	Leadbitter	17/03/2011	Closed Price	Lost	-		Quote not found
SP3339-11	Retail	19/05/2011	Closed Price	Lost	We thank you very much for your quotation and appreciate the time taken to put this together. We decided not to proceed with the order as it was more than our budget would allow for. Regards Helen	£2,702.32	£2,488.13
Q3694-11 Mole Hill Reigate Road Dorking	Shanley Homes	18/08/2011	Closed Price	Lost	I placed this at a more competitive rate with another joinery company. Kind regards Andrew Howard	£16,171.00	£13,531.00
Sp4104-11	Retail	08/11/2011	Closed Price	Lost	All recieved thankyou but im afraid you are a long way out on my budget. regards Dustin	£2,222.20	£2,483.00
Q3787-11 Lewisham Road	Rydon	19/09/2011	Closed Price	Lost	order placed with PDS (approx £100/doorset cheaper!) regards	£54,924.00	£51,907.32
SP3278-11 Satini with a Lucent Vison Panel	Retail	19/07/2011	Closed Price	Lost	I felt the price was a bit too much but we haven't started the project yet. Kind regards John	£3,550.00	£2,916.99
Q2666-10 Surrey School	J A Stott	17/03/2011	Closed Price	Lost	-	£9,059.00	£8,863.18
Q3120-11	Advertising Works	07/02/2011	Closed Price	Lost	Received a much lower price locally.	£1,505.00	£1,497.00
Q3358-11 Birmingham City Housing	Vinci Facilities	18/05/2011	Closed Price	Lost	The doors have been made and fitted by another company for around £2,500 which was the best price we found and are very pleased with the product. Thanks Lee	£3,206.00	£3,150.18
Q3767-11	European Doors	19/09/2011	Closed Price	Lost	Unfortunately on this occasion your price was not competitive, therefore it wasn't put forward to my client. I will bear you in mind for future opportunities of similar specification. Regards Steve Fairham	£132,727.00	£121,449.45
Q3400-11 Rothley Leicester	Delta Properties	19/07/2011	Closed Price	Lost	Thanks for your email. Your price was not competitive so I have place the order elsewhere.	£2,906.00	£2,673.22

SP3272-11 Timka	Retail	08/03/2011	Closed Lost Price	Many thanks for your quotation. I am afraid your price was actually beyond our budget and we have decided to keep looking. Thank you again, Regards, Martin	£2,102.00	£1,858.08
Q2417-10 St Andrews	M L Hart Builders	05/01/2011	Closed Lost Price	Thank you for providing a quote for this project. Unfortunately I obtained a cheaper price and have placed an order with an alternative supplier. Best Regards Michelle 05/01	£11,062.00	£12,232.00
SP3244-11	Retail	18/05/2011	Closed Lost Price	I seem to remember that the price for the door was more than we could afford. Thanks for your time Kind regards Sabine	£1,545.00	£1,767.43
SP3225-11 Dina	Retail	22/06/2011	Closed Lost Price	I can't find the quote on email, so I can only imagine it was sent by post. If you weren't selected to supply the external doors, it must have been down to cost as I am sure it wasn't an aesthetic or design issue. Thanks, Andy	£7,041.00	£6,147.00
Q3715-11 Kilmuir House	Frencon Construction Ltd	22/07/2011	Closed Lost Price	Many thanks for quote , we have put it to our client but they have deemed it to expensive . Regards, John Beglane	£104,794.00	£98,016.60
Q2615-10	Retail	17/10/2011	Closed Lost Price	23/11 Many thanks for your mail In this case my client decided to proceed with another supplier due to cost reasons Many thanks for your attention and we will not hesitate to contact you in the future Regards K Konu	£1,380.00	£1,460.00
Q3646-11 1 Highmore	Original Door Company	21/06/2011	Closed Lost Price	My customer placed the order with a company called Stairways and paid £850.00! Not caused a problem as is a close acquaintance of mine so will give us a shot next time. Regards Tim	£2,354.00	£1,080.00
SP4118-11	Retail	07/11/2011	Closed Lost Price	Than kyou for the quotation, but the price is out of our budget. Regards Greg Goodrum	£1,364.00	£1,280.00
Q2556-10	Heterarchy	05/01/2011	Closed Lost Price	With regards to your quotation, in the end for our prototype we made it in house. We are still in the process of marketing the product, if and when we start selling them we will come back to you to discuss this further - the quote for the main components was ok, but the costs for the smaller items was too much, so would want to discuss more cost effective ways of sourcing these components. Will be in touch if the need arises. Best Regards Tony		Wrong Quote!!
SP1087/10	Retail	18/03/2011	Closed Lost Price	Q1087/10	£2,100.00	£2,237.00
Q2831-10 Stoneham Cemetery Road	Drew Smith	18/05/2011	Closed Lost Price	King George is too high, as Stoneham and Bulford Barracks as well. I think the rates needs addressing as they all come in too high. Abi	£9,251.00	£1,021.00
Q2369-10 Covent Garden	M S Pubs	17/02/2011	Closed Lost Price	Q2369-10	£1,068.00	£835.00
Q2708-10 Wateringbury Stables	Original Door Company	18/11/2011	Closed Lost Price	This contract is lost, it was awarded to another due to price. Regards Lu Thach		Quote Thrown Away !!
SP3828-11	Retail	15/08/2011	Closed Lost Price	Thanks, got the email, however the client is looking for a cheaper option, thanks anyway !	£3,295.00	£2,629.00
Q3289-11 West Sussex	Amiri Construction	18/05/2011	Closed Lost Price	unfortunately you were a little more expensive – around £150. Thanks. Adrian Harvey	£2,436.00	£2,177.56
SP3699-11	Retail	18/08/2011	Closed Lost Price	Thanks for your email. I'm afraid we decided to go with another firm, mostly on cost grounds. Regards, Dane Dane Rogers	£2,835.00	£2,638.00
Q3705-11 Beeches Manor	Willmott Dixon	18/08/2011	Closed Lost Price	I'm afraid you were overpriced on this one.	£17,429.00	£16,899.21
Q3122-11	MSN Display	07/02/2011	Closed Lost Price	Unfortunately we were a little expensive and it has been placed else were I have informed Trevor by way of an E-mail Kind Regards, Mark. 07/02	£9,984.00	£8,443.00
Q3218-11 Huntley Wharf	Rooff	18/05/2011	Closed Lost Price	You was expensive	£9,085.00	£9,660.00
Q3147-11 Swindon Canopies	Willmott Dixon	20/06/2011	Closed Lost Specification	We experienced various design changes with regards to these canopies. We ended up going for a fully steel option but are greatful for your quote/help during the pricing/design process. Regards, Simon		

Q2440-10 HMP Featherstone	Milford Contracts	28/10/2011	Closed Lost Specification	-		
Q3011-11 Dee Park Reading	Willmott Dixon	21/03/2011	Closed Lost Specification	Unfortunately these doors had to be procured elsewhere due to the specification. Thanks, Don		
Q2685-10 Narwal	Modern Doors	18/10/2011	Closed Lost Specification	-		
SP3505-11 Solar	Retail	19/07/2011	Closed Lost Specification	Thank you for your follow-up. We have decided to order an aluminium door. Kind regards Piers		
Q3094-11 St Johns	Studio 4 architecture	23/05/2011	Closed Lost Specification	Further to your message below, thanks very much for providing, a while ago, a quotation for the fire rated window we had specified. I'm afraid the requirements for the room in which this window was located, altered considerably (and the project has just completed). Sorry not to be able to use your product for this project. We hope to be able to do so on a future occasion. Regards Laura Livesey		
SP3852-11	Property Wide	20/09/2011	Closed Lost Specification	No joy because doors are too thick. Thanks		
SP3167-11	Retail	09/05/2011	Closed Lost Specification	We have the quote and hope to be in touch soon Thanks Mike		
Q2027-10revA	Breyer	17/06/2011	Closed Lost Specification	Apologies for the delay in getting back to you. Unfortunately the client steered us away from timber doors and insisted (after a lot of groundwork from both yourselves and ourselves) the doors were manufactured in steel, therefore, this is no long a lead for you guys. No doubt we will speak again. Regards Mike Tobin		
Q3420-11	HGT Construction	20/06/2011	Closed Lost Specification	The PAS door was not required by client in the end which allowed me to source a standard door. Many thanks for your assistance Regards John Sayers		
SP4181-11	Retail	25/11/2011	Closed Lost Specification	Thank you for your quotation. Unfortunately we have decided to go with a different type of entrance and so will not require your doors. Thank you for your help. Yours sincerely Keith Hooper		
SP1167/10	Retail	22/06/2011	Closed Lost Specification	I decided to go with a composite door from force 8 and I am very happy with the result		

2. Jobs analysis reports

JOB ID	Type	QTY	Estimated hours	Production Hours	Difference
2815-JCK	SBD Door	2	17.5	17.38	0.12
2874-0003-001	SBD Vision/Solar Doorset in Moralt Klima	18	250.5	256.23	-5.73
2882 Rev A-0004-001	Halspan Door with Four Plain Panels	11	74.25	69.23	5.02
2882 Rev A-0005-001	Halspan Door with Four Plain Panels	5	46.25	9.9	36.35
2882 Rev A-0006-001	Halspan Door with Two Plain Panels	1	8.75	5.24	3.51
2884-0001-001	Zara Soorset in Idigbo	1	42	67.35	-25.35
2888-0001-001 A	SBD FD30 Internal Solid Core Door	42	84	158.73	-74.73
2889-0001-001	Chelsea Pair Doorset in Euro Oak	1	67.2	47.32	19.88
2890-0001-001	Naturelle Vision/Timka Doorset in Moralt Klima	1	13	23.06	-10.06
2891-0001-001	FD30 Door in Halspan Optima	1	5.25	13.05	-7.8
2894-0001-001	SBD COC Carolla Doorset (2XGG)	4	57	73.87	-16.87
2894-0002-001	SBD COC Carolla Doorset (2XGG)	1	10.25		10.25
2895-0001-001	SBD Mobility Loackland Pair Doorset	1	35	44.7	-9.7
2896-0001-001	Jacob Door Only	8	36.4	34.47	1.93
2896-0002-001	Kitk Door Only	4	15	10.98	4.02
2897-0001-001	Carolla Doorset (2XGG) in Sapele	2	47	58.81	-11.81
2899-JCK	Non-SBD Internal Fire Door	1	7.25	15.74	-8.49
2900-JCK	Non-SBD Internal Fire Door	2	14.5	18.82	-4.32
2901-0001-001	Hudson Doorset in Euro Oak	1	8.5	42.81	-34.31
2901-0002-001	Hudson Doorset in Euro Oak	1	8.5	0.83	7.67
2901-0003-001	Hudson Doorset in Euro Oak	1	8.5	0.82	7.68

2901-0004-001	Hudson Pair Doorset in Euro Oak	1	15	1.36	13.64
2904-0001-002	Non-SBD NFR Internal Solid core	1	5	4.27	0.73
2906	Non-SBD Internal Solid core	1	4.5	5.84	-1.34
2910-0001-001	Satini Solid Core Doorset	1	19.5	22.26	-2.76
2912-0001-001	Dina Solid Core Doorset	1	23	20.82	2.18
2914-0001-001	Chelsea Doorset in Iroko	1	38	38.68	-0.68
2915-0001-001	Patt 10 Boarded in Iroko	1	37	55.57	-18.57
2916-0001-001	Satini Doorset in Iroko	1	40	45.59	-5.59
2918- JCK	Non- SBD Internal Fire Doors	1	4	6.55	-2.55
2919-0001-001	SBD FD30 Internal Solid Core door	3	12.75	17.17	-4.42
2921-0001-001	SBD FD30 Internal Solid Core Pair door	2	14	24.47	-10.47
2922-0001-001	Non- SBD NFR Internal Solid core Pair Doors	2	12.5	12.87	-0.37
2928-0001-001	SBD Mobility COC 1VPC 3P Solid Core	1	5.25	19.91	-14.66
2928-0002-001	SBD 44mm Flush Solid Core Doorset	1	4.25		4.25
2937-0001-001	SBD FD30 Internal Solid core door	1	4.55	11.66	-7.11
2939 JCK	Miscellaneous Timber Parts	2	3	1.33	1.67
2945-0001-001	Non-SBD NFR External Solid Core Door	1	7.2	15.56	-8.36
2945-0002-001	Non-SBD NFR External Solid Core Door	1	7.2	0.22	6.98
	39 tracked jobs				
	14 of them took less than the estimated time				
	2 were not				

	clocked into
	23 were underestimated and took more time at shop floor

3. Questionnaires

Post Study Questionnaire for office users

Dear Participant,

Thank you for participating in the ERP Implementation in SMEs in UK. At this stage, it is important to obtain your feedback about your experience of using M1 through completing this questionnaire. All responses will be treated in strict confidence. The information provided will only be used for the purposes of the research project. Individuals will not be identified in any results produced. Thank you very for your time and effort.

Overall System Evaluation
Please tick √ appropriate box:
1. Overall, I would rate the use of the M1 software system as easy □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
2. The concept of the M1 System was easy to understand. □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
3. Using M1 to clock in for the shifts is easy □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
4. M1 is faster than the manual system in general…… □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
5. I get problems I face with M1 fixed quickly …….
6. It is easy to find Information on M1 □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
7. Did you get enough training/Documentation to use the system? □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
8. Did you get enough support from top management? □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
9. M1 produce more accurate information. □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
10. The time of the implementation is justifiable □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
11. Overall I'm satisfied with the software development? □ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
12. You are aware that you can customise your own M1 screen □ Strongly □ Agree □ Neutral □ Disagree □ Strongly Disagree

Agree

13. It is easy to make amendments on M1

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

14. Is it simple to use?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

15. Is it easy to track work from one module to another, is it similar to processes predefined :

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

16. Do you think M1 reduced duplications?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

17. Searching for parts on M1 is a hard task to do?

☐ Yes ☐ No

Why?

……
……

18. Is there anything else you'd like to learn?

☐ Yes ☐ No

What?

……
……

19. Do you still use the manual system?

☐ Yes ☐ No

If Yes, what processes would you like M1 to take over?

……
……
……
……

20. Do you prefer the old manual system to the M1 system you were using?

☐ Yes ☐ No

Why?

……
……

Estimating/Quoting Module
Please tick √ appropriate box:
1. The configurator is much easier than using the manual quoting template?
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
2. Do you make quotes on M1 faster than the Manual way?
☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
3. The material prices you're getting from M1 are accurate
☐ Strongly ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly

Agree Disagree
4. It is easy to send quotes to customers ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
5. It is easy to amend quotes ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
6. It is easy to find information on M1 ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
7. Do you think the number of configurators available is justifiable? ☐ Yes ☐ No **Why?** …… …… …… ……

Sales Orders Module
Please tick √ appropriate box:
1. The sales order screen is easier than manual template? ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
2. Do you make sales orders on M1 faster than the Manual way? ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
8. The material prices you're getting from M1 are accurate ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
3. It is easy to send confirmation of orders to customers ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
4. It is easy to amend sales orders ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
5. It is easy to find information on M1 ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
6. Dispatching orders is easier on M1 ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
7. You feel comfortable searching for parts on M1 ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
8. Is it easy to schedule sales orders on M1? ☐ Yes ☐ No

Why?

……
……
……
……

Job Management Module				
Please tick √ appropriate box:				
1. Do you prefer M1 to the manual system?				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
2. Do you make Jobs on M1 faster than the Manual way?				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
3. the material prices you're getting from M1 are accurate				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
4. It is easy to track jobs on M1				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
5. It is easy to amend Jobs				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
6. It is easy to find information on M1				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
7. Scheduling on M1 easier than the Manual template you use to use				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
8. Do you think the feedback you get from shop floor job tracking is good?				
☐ Yes	☐ No			
Why?				
……				
……				
……				
……				

Purchase orders Module				
Please tick √ appropriate box:				
1. Finding parts on M1 has made your job easier?				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
2. Do you make purchase orders on M1 faster than the Manual way?				
☐ Strongly Agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly Disagree
3. The material prices you're getting from M1 are accurate				

□ Strongly Agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree
4. It is easy to send purchase orders to suppliers?				
□ Strongly Agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree
5. It is easy to amend material prices on M1?				
□ Strongly Agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree
6. It is easy to find information on M1?				
□ Strongly Agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree
7. It is easy to raise receipts on M1?				
□ Strongly Agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree
8. It is easy to raise invoices on M1?				
□ Strongly Agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree
9. Issuing materials on M1 is faster than looking at the spec sheets and raising them				
□ Strongly Agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree
10. Searching for parts or suppliers is easy				
□ Strongly Agree	□ Agree	□ Neutral	□ Disagree	□ Strongly Disagree
11. Do you think you've got all you need in the purchase orders module?				
□ Yes	□ No			
Why?				
……				
……				
……				
……				

Receipts Module
Please tick √ appropriate box:
1. Finding receipts on M1 has made your job easier? ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
2. Do you make receipts on M1 faster than the Manual way? ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
3. The material prices you're getting from M1 are accurate ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
4. It is easy to use ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
5. It is easy to amend material prices on M1? ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
6. It is easy to find information on M1? ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
7. It is easy to raise receipts on M1? ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
8. It is easy to raise invoices on M1? ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
9. Issuing materials on M1 is faster than looking at the spec sheets and raising them ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
10. Searching for parts or suppliers is easy ☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
11. Do you think you've got all you need in the receipt module? ☐ Yes ☐ No **Why?** …… …… …… ……

Are there any areas you would need more training on?

Comments

Post Study Questionnaire for Shop floor users

Dear Participant,

Thank you for participating in the ERP Implementation in SMEs in UK study. At this stage, it is important to obtain your feedback about your experience of using M1 shop floor entry for tracking jobs and clock in and out of your daily hour's shifts, through completing this questionnaire. All responses will be treated in strict confidence. The information provided will only be used for the purposes of the research project. Individuals will not be identified in any results produced. Thank you very for your time and effort.

Overall System Evaluation

Please tick appropriate box:

1. Overall, I would rate the use of the M1 software system as easy to use

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

2. The concept of the M1 System was easy to understand.

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

3. Using M1 to clock in for the shifts is easy

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

4. M1 is faster than recording times on the Job Traveller

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

5. Problems you get fixed quickly

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

6. Finding Information on M1 is easy

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

7. Did you get enough training/Documentation to use the system?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

8. Did you get enough support from top management?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

9. Looking at the Job Analysis form, it produces useful information to track difference between estimated and actual hours?

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

10. The time of the implementation is justifiable

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

11. Overall I'm satisfied with the M1 software development

☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree

12. Do you prefer the old job traveller to the bar code scanning now?

☐ Yes ☐ No

Why? …… …… …… ……

Are there any areas you would need more training on?
Comments