COMMUNICATION AND DOCUMENT CONTROL; THE WAY TO PROJECT SUCCESS

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Statement of Authorship

This dissertation was completed as part of the MSc (insert programme title) at Liverpool John Moores University. This is my own unaided work. Where the work of others has been used or drawn on, it has been fully attributed to the relevant source.

Signature.....

Date.....

Abstract

The purpose of the dissertation is to explore what is not or has not been studied before with regards to document control, to add to the existing knowledge and to suggest a way forward that would benefit the industry. In the design methodology approach, prior literature was used to identify existing studies, document control, Web Based Project Management Systems (WBPMS), Project Assisted Management Systems (P-ASM) and trains of thought within the construction industry. An interview / questionnaire was designed to gather perceptions and identify frustrations among professionals to answer how the industry can improve by avoiding conflict, reducing waste of time and to identify what is missing or not being recorded. The findings / results showed that there was a genuine frustration from most respondents with regards to communications, trust and honesty. The main finding was, there is no standard filing system, even across organisations from project to project. There appears to be the need for standardisation with regards to filing systems on site and throughout the construction industry. Research limitations Implications, given the exploratory nature of the research reported in this dissertation it is a relatively small sample of respondents. The researcher relied on personal contacts so has a limited catchment. However the respondents are from eleven different countries and thirty-one companies of varying disciplines coupled with the 35+ years' experience of the researcher, twenty-three of those years as a project manager it proves to be a trusted source of rich data gathering. Practical implications, originality value and conclusion - The emergence of Web based Project Management Systems (WPMS) and Project Assisted Management Systems (P-ASM) along with the industry could embrace a standard filing system which could be taught in universities and colleges nationally and globally. A standard filing system could be used from the smallest project, for example a sole proprietor building an extension to a mega project lasting years employing thousands and costing £billions. The exploratory research in this dissertation focuses on the personal perception and frustrations of the professional within their organisation with regards to communications and trust throughout the supply chain. It attempts to draw out comments of desire for support by recording of the frustrations and longing for a system or standard way of document control and procedure which would include a recording of lessons learned.

Keywords: Communication, Records, Management System, Document and Document Control.

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List of Tables and Diagrams

Glossary of Terms

BS British Standard

KPI Key Performance Indicators

PM-ASP Project Management System-Application Service Provider

PMI Project Management Institute.

PMBOK project management Body of Knowledge

PMO Project Management Office

SME Small Medium Enterprise

TQM Total quality Management

WPMS Web-based Project Management System

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CHAPTER ONE

INTRODUCTION

1.1 Research background, setting the scene.

The purpose of this paper was to research how communication is applied recorded and managed in construction. Data was sought from a cross section of construction professionals in namely The United Kingdom and The Middle East, using the existing network contacts of the researcher. The intention was to research methods of recording, transferring, electronic storing and managing data, to research how relationships between the customer and the contractor are applied and or maintained and to ascertain what is best practice.

The larger organisations may use a Web based Project Management System (WPMS) conducted through an extranet, which is a private network that uses internet protocols to transmit information. It is more commonly known as a “Project Management System-Application Service Provider (PM-ASP)”, The researcher has used ACONEX which is a Web Based Project Management System, WPMS. The ACONEX system gave certain level of management clearance to view various information for example it would not be security conscious to enable all actors to access and view the cash flow or confidential matters therefore only the Senior Project Management and Commercial Manager had access to these particular virtual accounts

The researcher having more than 35 years’ experience in the industry, 23 of those years as a Project Manager, having used ACONEX and experienced what is not added to the virtual extranet, further stated it is not something that he would say was the answer to all communication problems, as records and confidential files are in practice kept away from the extranet and only files, letters, information and reports were added that the opposing actors considered would not incur cost or harm to the business case or project if it should be relied on later in court, or in a claim situation.

1.2 Research aim and objectives

- To find out what studies are available of communication, document control systems, procedure and most used in the construction industry and to

separate theory or assumption from reality, to combine theory or assumption with reality? Communication of the true position on site

- To investigate recording keeping filing and communication.
- Research most used Project communication methods.
- Investigate and pick out information not recorded or measured. For example the speed information actually gets on to the shop floor from the customer.
- Investigate organisations strategy to avoid an adversarial project and avoid conflict.

1.3 Research methodology

It was intended that communication and document control on projects within the construction industry will be defined and Best Practice will be identified. It was the intention to obtain primary data by conducting a survey and research of Best Practice and problems incurred by a series of face to face interviews including the use of Skype for overseas interviewees. An interview will provide information which may not be collected via internet search or data bases. They will provide a collection of opinions and assumptions from individual professionals who may be more willing to discuss factors and influences affecting project performance and communication problems within the industry.

A questionnaire was administered via email and via the professional networking site LinkedIn to Professionals within the industry to gather data which will be analysed by qualitative means. Care was taken that the questions are put in such a way so as not to lead the reader.

The purpose was to investigate various factors and influences communication and document control has on project performance, what best organisational procedure is, including measuring of how quickly information gets to the shop floor.

Secondary Data was obtained via the use and search of online journals which measure performance. A qualitative approach shall be used collating the interview responses and concerns of the professionals from director level to shop floor management.

A research of the role of the gatekeeper, or document controller within an organisation, be it in the office or on site is a key to performance. They may be an individual whose sole responsibility is to control the transfer of information and keep records of information transfer. Such an individual or series of individuals are the 'linking mechanism between an organisation and their external environments'. Tushman, M. L. Kaltz R. (1980) abstract.

The initial proposal was to develop a questionnaire such as that used by Mawdesley, M. J. and Al-Jibouri Saad (2009, 23) and include procurement, cash flow, speed of communication transfer to the shop floor / site in the event of change, perceived satisfaction of the customer, perceived satisfaction of the partaking professional, subcontractor procurement, material procurement, statutory service delivery. However after compilation of the questionnaire and use of a pilot or trial it was found that the questionnaire took an hour to complete, there were many repeats of the questions and a possible 576 questions and answers i.e. 24 x 24 = 576. This lead to an assumption that the original data collected may have been rushed or embellished and a professional during a busy working day would not have given such a time consuming questionnaire the attention or indeed the time required to complete it. There were many answers with no effect and to say there is no effect, surely cannot be true as all actions have an effect. As in the words of the great Albert Einstein 'For every force there is an equal an opposite effect.' E = mc2

After careful consideration a pilot / trial and possible configurations of a questionnaire it was decided that this was not the only approach with which to gather useful data therefore the questionnaire and a qualitative approach using a combination of interviews and emailed response was applied in this paper.

The proposal, after collating the data, was to come up with a suggested strategy and or methodology to guide and assist the project team not just the Project manager so then together as one they can achieve the milestones, mitigate delay, enhance performance and achieve the project goal by suggesting a standard system that can be used throughout the industry by all actors that is the customer their agent and the contractor. However after collating the data it became apparent that there was no standard filing system used throughout the industry.

Microsoft Project, Primavera, Power Project to name but a few are a sample of software that can measure performance and is used daily within the construction industry however a Gant chart will not tell the whole story. If the project is on schedule and meeting its milestones there would be an assumption all is well and not to look too deeply into any underlying factors. Only when a project is slipping will there be an investigation or even after project completion will there be an attempt to analyse what went wrong. It is then when an investigation into communication, record keeping, diaries and all correspondence is fully undertaken. The organisations operations and procedures will be critical in evaluating and proving guilt or innocence or apportioning the consequences of cost incurred.

1.4 Main research findings

A Document Controller (Gate keeper) at project level as an individual responsible for that sole purpose has not been found in SME's. The larger companies especially in the Middle East namely Saudi Arabia, Bahrain, Qatar and Dubai do have a Document Controller at project level on site, in the office or both. It has been found that SME's consider the document control as included in the duties of the project manager and expect that duty to be done.

There appears to be no standard filing system within the industry. There appears to be no study undertaken of what filing systems are used within the industry

1.5 Research limitations

The interview questions were posted on the web based forum linked-in on three sites i.e. groups-noreply@linkedin.com and they were 'The Project Manager Network group, membership 209,000+, the Construction Professionals Forum group, membership 22,000+ and the Contract Risks Management group membership 4000+. That has a total catchment of more than 235,000 people of which only 3 replies had been received as of 3rd Sep 2011, only one of which actually took part. It was found that the professionals are either reluctant, too busy or are not interested in replying to the request for participation. It was also noticed that once the request for participation in the survey was posted on the web, there appeared to be a number of other surveys following suit perhaps initiating an overkill of choice.

To overcome the problem, the researcher used his contacts in the industry and via email and LinkedIn and found a total of 43 respondents willing to take part however only 31 actually did participate which equates to 72%.

As the interview questionnaire has a number of open questions it required some thought and appeared to put respondents off, as emails received from original respondents who said they would take part, expressed they were too busy and would try to fit it in. It appears a simple tick questionnaire from the likes of Bristol Online Surveys of yes and no answers would have provided a bigger response.

Interviewees of which there were only two, were reluctant to be recorded and so asked after completion of each question, was this a fair transcript of what they had said? In both cases added further information i.e. minor comments after reading, then the quote was amended accordingly.

1.6 Research significance

The importance of the research is to identify what is not being disclosed or considered when examining project communication and document control. Existing literature suggests and promotes the view that if a project is not successful it is the failing of, or mismanagement by the project manager. The beneficiaries' of this research will be the whole project team which includes the Project Manager, Specialist Managers, Directors, CEO's, Planners, Gate Keepers and Potential Customers. This research is original; it does not appear to have been done before except in broader terms i.e. study of organisations implementing a TQM system. There does not appear to be a study of if organisations implement a stringent document control and site filing system which includes methods of communication.
See conclusion and recommendations for in depth practical implications, page 51 – 55.

1.7 Structure of dissertation

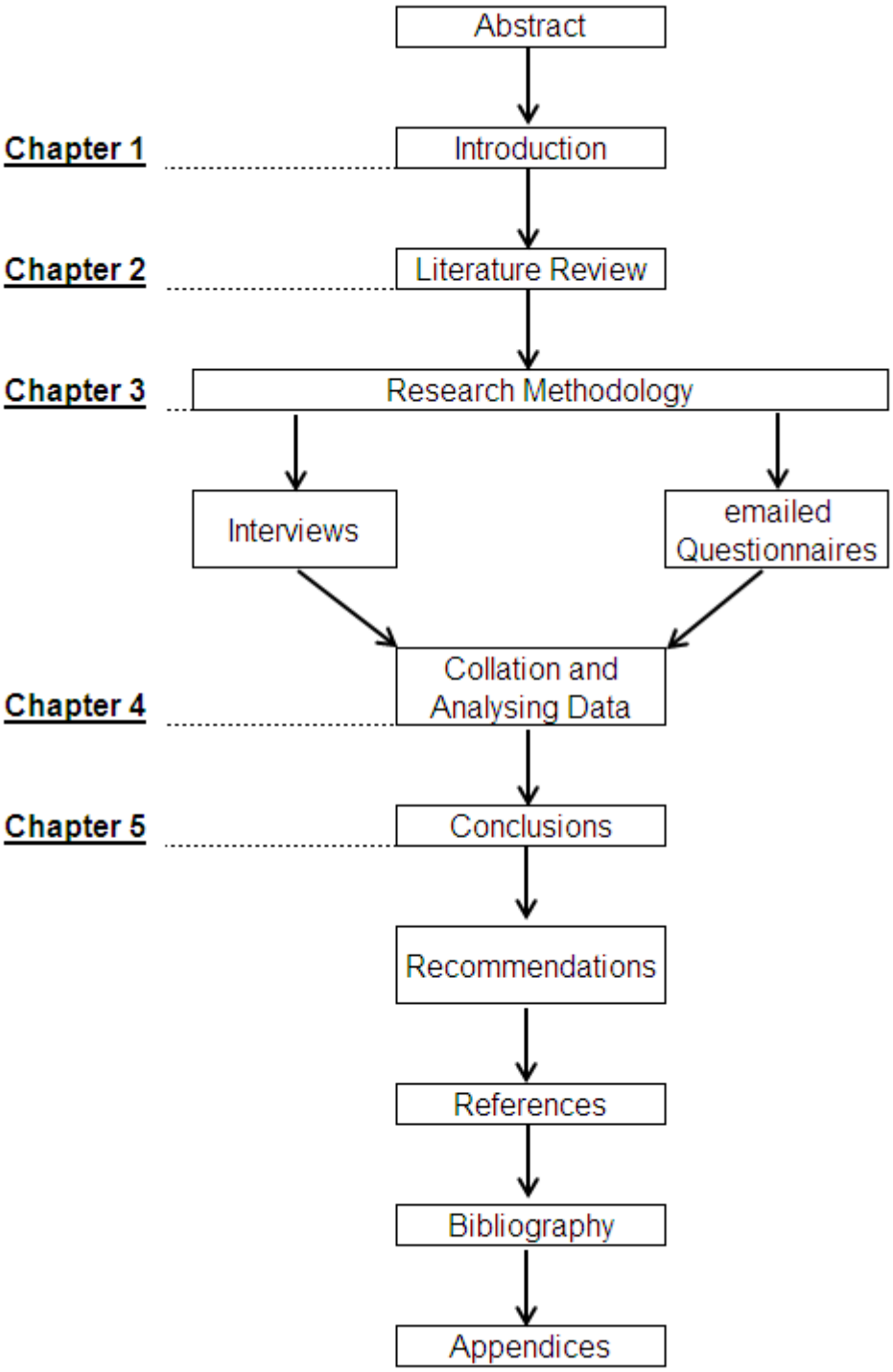

Fig 1. Flow diagram structure of dissertation

CHAPTER TWO

DOCUMENT CONTROL AND MANAGEMENT SYSTEMS

2.1 Introduction

Professor R. C. Lamming's quote in the book by Jones and Saad (2003, iii) Managing Innovation in Construction 'the UK spends more money on litigation than research and development and there was never a better time to urge managers to innovate in the industry'. This is old news now we are approaching 2012. Innovation in terms of measuring performance, new ideas on organisational behaviour and new technologies have continued to better the industry. The new thinking now is more towards Organisational Alignment as described by Kaplan. (Kaplan, BSC, 2006, 13)

In the abstract of their article Tushman, M. L. and Kaltz R. (1980, 1071), they refer to the gatekeeper being a 'boundary spanning individual who is a linking mechanism to an organisation and their external environments'. They research the role of these same individuals and infer that they are a controlling influence with the project. What needs to be stated is that this said individual could be a lesser employee who is just transferring information from director level to the shop floor or front line. These gatekeepers although may not be a decision maker, are a key mechanism that should be fully appreciated and considered. They should posses a technical knowledge of the subject matter, codes and all abbreviations.

A research of the role of the gatekeeper, or document controller within an organisation, be it in the office or on site is a key to performance. They may be an individual whose sole responsibility is to control the transfer of information and keep records of information transfer. Such an individual or series of individuals are the 'linking mechanism between an organisation and their external environments'. (Ibid, 1980, 1071).

Furthermore Tushman cited March and Simon (1958, 36) 'This local orientation and coding scheme development is a double-edged sword. For those who share in this common language and awareness, communication is remarkably efficient. Not only can large amounts of information be transmitted with relatively few specialized symbols, but through systematic selection and encoding riles, misinterpretations

between actors are minimised.' They are suggesting colour coding and symbols to identify different importance of data or document. This is a good way of dealing with communication however what about people who are colour-blind? If someone is colour-blind they cannot be an electrician or a bomb disposal expert for the obvious reasons, It would be inconceivable to include a filing clerk.

> *'Gatekeepers are most important in development projects; units whose task is locally defined yet where the technology employed is changing. For these kinds of units, a few key individuals provide the most effective linkage to external areas. This two-step process operates informally; individuals approach those who they see as technically competent and current. While this gate keeping role cannot be legislated, it can be facilitated. Managers can select technically respected individuals and systematically facilitate their internal and external linkages (e.g. through transfers, training, travel budgets, etc.)'* (Ibid, 1980, 1083)

The role of gate keeper should be elevated as the transference of information can make or break a project. It could be an instruction or new drawings, or client's wishes and should be immediate, subject to approval of cost. The construction process is such a fast moving production that waste can be avoided if the information gets to the shop floor quicker. Production is sometimes put on hold while awaiting an instruction for an impending decision although Time and Cost are the factors that may affect a decision and there are mechanisms within the contract in place to deal with this, it is the communication between the individuals to enhance the decision making process and in turn communicating it to the shop floor that needs to be addressed. Waste of time appears to be the most unconsidered value.

In his research paper Albert P.C. Chan (2004 215 - 218) states.

> *'Project success has been a recurring topic in the construction management field for many decades. The review of journals on project success reveals that cost, time and quality are the three basic and most important performance indicators in construction projects. Other measures, such as safety, functionality and satisfaction, etc., are attracting increasing attention'.*

The Key Performance Indicators (KPI's) used to measure the works are being enhanced by additional factors such as customer satisfaction, the managements perception of project success etc. There does not appear to be a consideration for effective communication although two out of three of their case studies showed the project running over schedule but still reporting a success. The assumption must be that correct communication was maintained between the contractor and the client as the case study showed the clients were satisfied with the project.

Where it is stated that the customer was accepting of the delay or in agreement with the cause, the customers' expectations may not have been met so the progress must have been timely communicated. No customer would be happy with increased cost or delay but true communication of the on-going works and progress will at least keep the customer up to date and they will not be surprised at a sudden disclosure of failing to keep to a deadline, mile stone or completion date. According to Chan's case studies, they say gathering data was more easily obtained from projects funded by Government, as private contractors were unwilling to disclose what they perceive to be confidential information. It could be perceived that the customer / client reported satisfaction so as not to highlight their own shortfall or inadequacies. If a contract spends $30million more than the original budget and is over by 87days yet still shows the customer is satisfied, it is more likely to be within the public sector than private. (Ibid, 2004; 215, 218)

The most recent The Project Management Institute PMBOK Guide (2008, 261) states 'When managing stake holders expectations it is defined as the process of working with stake holders to meet their needs and addressing issues as they occur. It involves communication activities directed towards project stake holders to influence their expectations address concerns and resolve issues such as:

- *'Actively managing the expectations of stakeholders to increase the likelihood of project acceptance by negotiating and influencing their desires to achieve and maintain the project goals.*

- *Addressing concerns that have not become issues yet, usually related to the anticipation of future problems. These concerns need to be uncovered and discussed and the risks need to be assessed.*

- *Clarifying and resolving issues that have been identified. The resolution may be result in a change request or may be resolved outside of the project, for example, postponed or postponed for another project or phase or deferred to another organisational entity'.*

- *All points' effect perception of performance and meeting the stakeholder's expectations is paramount. The meeting of a target is one thing but if the stakeholder, who may be the customer, is not happy with the progress it is a clear indication that communication is not as it should be and that customer satisfaction will not be met*.'

In their book 'Construction Management Principles and Practice' (2004, 500) Griffith and Watson state 'It is not uncommon for the client to hold a post-contract evaluation meeting to further inform the judgements made of project performance. Such meetings are attended from each contractual party – for example Client and clients lead consultant, other specialist consultants, clients financial consultant / quantity surveyor etc.' This all adds value and completes the process and should be entered into the body of knowledge as 'Lessons Learned'. The post contract review is an essential process for the modern Construction Company and the client. It is best practice and lessons learned may be invaluable on the next project if properly recorded in a knowledge library. Within their book are suggested a Clients Post Contract review form, Principal Contractors Post Contract Review Form, Clients Consultant Post contract Review Form asking various questions with a rating from 1 – 5 i.e. 1 being unacceptable and 5 being excellent. This data can be collated along with the lessons learned and would prove a great asset to any new similar project and the manager (ibid, 2004, 500)

In their recently published paper Mawdesley, M. J. and Al-Jibouri, S. (2009, 23, 34) Using a system dynamics approach they concluded the following.

> *'The model has been extensively tested and has shown that it is possible to help construction project managers to evaluate alternative strategies and consequently to determine the one to be adopted in their own particular situation. There is some evidence to suggest that the best factors on which to spend money, time and effort are planning and control. However, all the significant factors have similar effects. There is*

> *also some evidence to suggest that it is more advantageous to spread any expenditure throughout the project rather than concentrate it at the beginning. A typical contracting organisation would have to change their modus operandi to achieve these savings and it is suggested that company and project specific experimentation is required before such action is taken.'* www.emeraldinsight.com/1463-5771.htm [Accessed 8th Dec 2010]

Mardley and Al- Jibouri's paper suggests a model can be used to assist the project manager however it all depends on the company buying into the suggestion and changing their operational methods. Cash flow and procurement was not used within their questionnaire and must be two of the biggest factors in construction project performance so to not consider them tends to imply the survey is flawed. (Ibid, 2009, 34)

According to Pollaphat Nitithamyong and MirosClaw J. Skibniewski (2004: 491-506) They stated that 'many web-based construction project management systems, are available and used through the use of application service providers (ASP's) utilised by construction companies.....' 'In order for the construction industry to successfully embrace PM-ASPs, many factors such as technology, process, people, procurement, legal issues, and knowledge management must be considered equally'.

Web-based Project Management System (WPMS) Promises to enhance construction project documentation and control and to revolutionize the way in which a construction project team conducts business. WPMS is an electronic project-management system conducted through the Extranet, which is a private network that uses Internet protocols to transmit information. The system is only accessible by a project team, but team members can be located in different organizations.' Even different countries as per the example earlier described ACONEX and the Bahrain Project. There are promises and then there are actual results.

Furthermore according to Engineering News Record (ENR) cited by (Ibid, 2004)

> *'In the United States It is also estimated that the number of [Architectural and Engineering Contracting] A/E/C firms prepared to set up ''virtual'' project teams by using the WPMS concept is doubling every 6 months.*

Currently, there are three options in regard to WPMS implementation. The first option is to develop a customized WPMS in-house by hiring either a consulting company or programmers to create a system. The second is to develop a WPMS by purchasing commercial web-enabled packaged software and installing it on a company's internal server. Examples of this software include Microsoft Project 2002 from Microsoft, P3e/ck and SureTrakk from Primavera, Prologk Project Pack from Meridian Project Systemsk, WebProjectk from NovientR, and TeamflowR7 from CFM. The third is to rent/lease a completely developed WPMS from an Application Service Provider (ASP) for a usage fee, which is normally charged per project, per the amount of computer storage space required,and/or per user. Examples of WPMS developed by ASPs include Buzzsawk by Autodesk, Citadonk, Constructw@re, ProjectTalkk by Meridian ProjectSystems (MPS), PrimeContract by Primavera, Vieconk by Bentley, VISTA 2020 by Market Street Technologies, Projectmatesk by Systemates,IronSpire, Unifierk by Skire, Project- Grid.comk, BuildOnline.comR, e-Builderk, BIW Information Channelk, ProjectVillagek, etc.'(p. 492)

They go on to say that the third option i.e. The project management System-Application Service provider (PM-ASP) is becoming more popular as it is the least costly to set up and can be operated after minimal training. SME's are more likely to participate as they do not have to lay out large sums of money investing in new hardware and software and so can keep up with the latest advances in technology. It is a virtual document system management or document control hub and SME's would not have to maintain an in-house IT department. And that ASP's have claimed that their products are the only right solutions facing construction project management and that the claims are usually overestimated or unrealistic i.e. that they are being used for marketing purposes. (Ibid, 2004: p 492)

The idea of a virtual document control and all actors using it, that is the client and the contractor is a Utopian dream at this present time as not all actors are able especially the SME's. Trust is the key to participation. SME's would want to know what they get out of it. The client and his agent would prefer all actors to participate as in theory it gives instant access to records and information however the information is only as good as what you put in.

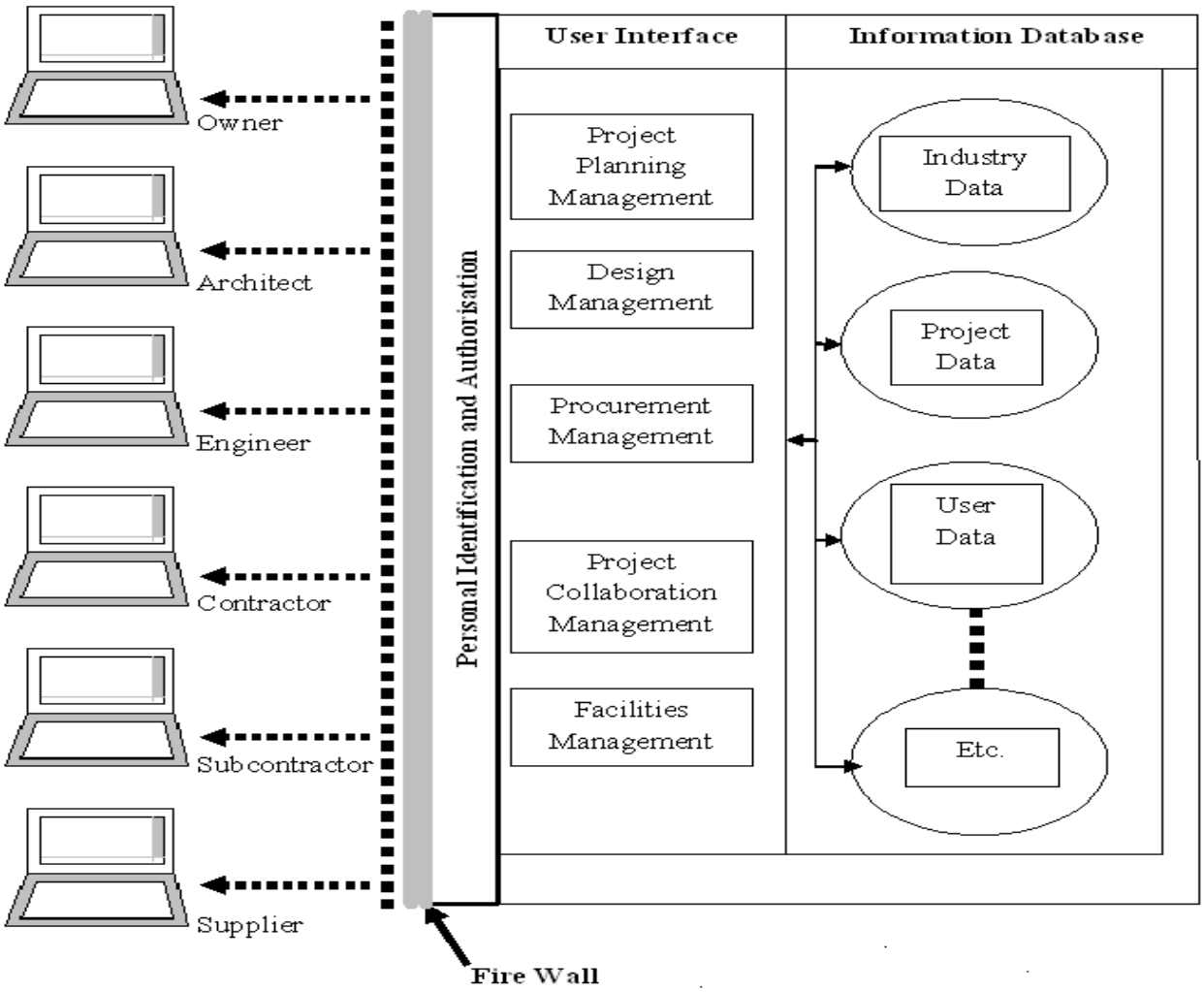

Fig 2. Functional scheme of WBPMS (ibid., 2004 p 493)

Another example of a PM – ASP is Project Management.com.

Project Manager.com boasts 'Used by 30,000 people in over 100 countries including NASA, Boeing, Volvo, United States Department of Defence, United Nations etc. They are a project management service provider, however within their list of users there did not appear to be any construction companies so it is assumed they are more suited to the computer industry. http://www.projectmanager.com/who-trusts-us.php [Accessed 06-06-11]

In his article (2011) 'Rising to the level of a record? 'Some thoughts on records and documents'. Geoffrey Yeo asks the question when is a document a record? Which is exactly the point made earlier that information is only as good as what you put in, for example a Project Managers daily diary. That is a record which is referred to often during arbitration and is used to prove the case for or against and is thought of as a true record of events. However it is a record which can also be biased towards the

customer or his agent. It can be a matter of opinion rather than actual fact although many facts would be recorded such as a visit of an inspector which may be of use if for some reason the inspector did not sign a visitor's book. Where in all of this is ACONEX or another Web based Project management system?

'The notion that documents become records when they are "declared" is problematic. Capture and declaration do not determine record status, but if capture systems are robust they allow the power of the record to be harnessed to the fullest possible extent.'(Ibid, 2009: 8)

In his very bold Article entitled "We're dragging construction into the 21st Century" Rod Sweet (2010: 14-19) Cited CEO of Living PlanIt, Steve Lewis who boasts that 'The construction industry is not ready for the onslaught of competition it's just about to get' he further states that 'You could cut 50 to 60 percent of the cost of construction without even trying' (Ibid, p14) Very bold statements it implies that we have been doing wrong for the past 4000 years or so. All bow to the new order of IT. Plug and play houses and factories in PlanIt Valley Portugal.

'Cisco, McLaren, Accenture, Siemens and hundreds of other non-construction companies are rallying behind a technology and business model that aims to revolutionise buildings, cities, the construction process and the whole property business as well**.** Rod Sweet reports.' (Ibid, 2010: p14)

He goes on to say that,

> *'There would be no need for quantity surveyors. There would certainly be no need for arbitrators or construction lawyers. Estimators and planners would be out of work. The role of the building contractor would be simplified to the point where anybody with any project management skills could do it. Wet trades would disappear. Bye-bye to bricklayers, joiners and electricians.'* (Ibid, 2010: p14)

He has at least the sense to acknowledge that you cannot excavate a foundation, lay concrete, fix reinforcement bar, lay miles of pipe works with services installed in a factory and the elite IT companies will need basic building workers who will work with the concrete, dirty their hands and may not even know how to turn on a computer,

especially in the hills and valleys of Portugal. The CIOB News (2010, 25 Nov.) stated 'Wembley City developer Quintain now on board for PlanIT Valley, Portugal's futuristic eco-city'. Further quotes from PlanIt CEO 'Lewis also said he expects to announce a deal with a major contractor active in the UK and around the world as a construction integrator for PlanIT Valley in the coming weeks.' (Ibid, 2010) De Beer B. (2010) Portugal's News on line referred to the development as 'Portugal's intelligent green city'.

PlanIt Valley is a fantastic futuristic attempt at construction using the latest technologies, innovation and really is constructing plug and play homes and factories on a hexagonal grid. The valley will be a breathing self regulating IT dream town based on a nervous system heavily reliant on a brain which is in effect a central computer system. However as before described there will be or could be depending on who gets the contract, a construction company with the same old Communication and Document control procedures of any other company unless it chooses but will most likely be required to participate in at the very least a PM-ASP. (Ibid, 2010: p 14-19)

2.2 TQM Total Quality Management

Total Quality Management is a before the event approach it is not to be confused with a Quality Management approach which is an after the event approach ensuring quality by inspection to meet a specification for example. On a construction project, if a TQM approach was used with regards to communication document control and record keeping this would be invaluable to all participators as there would be a series of early warning indicators and records of reference for all in the event of dispute or claim.

According to Bryde D.J. and Robinson L. (2007) referring to the management of stakeholders, cites Chan et al., (2003; Ng et al., 2002) that 'there is some evidence in some projects environments a particular problem is unwillingness on the part of all parties to commit to the principle in practice, due to part commercial pressure'.

The unwillingness and sometimes resistance is more so within SME's, an unwillingness to give time and or expend monies on developing a TQM which included a stakeholders management system. Within the TQM and management of the stake holders is a critical requirement for good communication so to manage, especially the customers' expectations.

2.3 Key performance Indicators

Kaplan and Norton (1992: 7-9) introduced the balanced Score Card (BSC) concept, which was a new measurement using four linked perspectives: Financial, customer, and internal business processes, and learning and growth. However Health and Safety including accidents should and is now widely used as a performance indicator. Potential customers would access such data and look for continuous improvement on the previous year.

The journal Strategic Direction (2006: 13-18) In an Interview with Kaplan and Norton discussed their BSC and their new 4th book stated 'Alignment is a distinctive competency – complete with tools and techniques – that you can learn and apply…. 'Since 2000 some 69 organisations have been inducted in the Balanced Scorecard Hall of Fame for Executing Strategy'.(Ibid, 2006: p18) The BSC has become widely respected and used as a yardstick by companies willing to conform to the modern way of thinking in construction, and that is alignment. Customer satisfaction is one of the measures used in their score card to achieve customer satisfaction communication must be paramount and a governing factor in success of the project. (Ibid, 2006, 13 -18) [Accessed 14th Dec 2010)]

Key Performance Indicators (KPI's) have relevant data and measurements of cost performance, Tender enquiries, New Tenders Enquiries, Project Values, Project Completions. It is the intention of this paper to root out what is not recorded. Do gate keepers slow projects? Are organisations aware that the flow of information to the shop floor is adequate or readily available and can it be measured?

'Any organisation needs a vision framework, comprising its guiding philosophy, core values and beliefs and purpose. The effectiveness of an organisation depends on the extent to which people perform their roles and move towards the common goals and objectives.' Oakland J. (201; 517) It is their roles as a conduit or a gatekeeper of knowledge which must be accessible for the common good or goal of the project. As Oakland points out TQM must start from the top, from the chief Executive and must be communicated down through the ranks encouraging performance and collation of lessons learned. An organisation must embrace the concept within its culture, if it does not do so already then it must adapt and undergo culture change. The customer

is the ultimate beneficiary as they receive a well-controlled and executed product. Before the execution of a project, it is the lines of communication which must be established first and that is within the organisation, including the customer, including inception phase to closing the project and aftercare. TQM articles and journals sing from the same sheet and bang the same drum however there is no mention of a workforce that moves from company to company, organisation to organisation, they assume once a project manager is in the organisation that is it. Employees no longer have a job for life and move about the industry therefore they may experience a TQM system in one company with good organisational procedures then be made redundant and find new employment with a new organisation with no TQM and are left to their own devices, especially in SME's.

2.4 Virtual meetings

Chang H.H., Chuang S-S. & Chao S.H. (201: 305-329) Talk about trust in a virtual teams performance and trust in the actual concept of virtual teams and meetings. From a TQM point of view they can be spontaneous and called at short notice and have their place so can and do add to the TQM concept. Note TQM is a philosophy not a process or methodology. 'In addition to the reliance on IT, virtual organisations and teams also depend heavily on collaborative relationships based on trust. Control structures that rely on physical proximity in traditional organisations may be replaced with trust-based relationships in virtual structures.' (Ibid, 2011:p 309)Trust is communicated and is won, it is not automatic, it cannot be bought.

Virtual meetings are being marketed by the IT industry and have a place in construction especially when long distances are involved or the possibility of encountering heavy traffic. The researcher experienced virtual meetings using Skype when participants including the client's agent were from Bahrain, Dubai, Texas USA and Jordan. The meeting saved a lot of time and money negating travel and confirmed the desired outcome. The communication was adequate and for that particular meeting was successful however it was purely to discuss a product and its capabilities, there did involve a site visit from the contractor to Bahrain who travelled from Dubai so total elimination of actual meetings by the virtual are not possible but should be considered.

According to Citrix (2010) who,

> *'recently commissioned a survey of 2,318 respondents to find out how virtual teams are utilizing audio and Web conferencing'* [They stated that] *'more than 605 of those surveyed used audio conferencing weekly, however they also stated that audio conferencing has its limitations - most notably in its inability to push projects to completion. In fact, the lack of a visual communication actually often extends the production length of projects. It is for this very reason that Web conferencing is outpacing audio conferencing in terms of growth.'* (Ibid., 2010)

Citrix then goes on and states 'virtual teams collaborate and complete projects faster', which is a contradiction of their aforementioned statement however webinar / virtual conferencing will become more common in the future due to the advancing technology and the benefits of time saved spent travelling to and from meetings. Communication will be enhanced by the process. It is easier talking to an architect or an engineer when all participators can see what's going on and what is in discussion for example a drawing or detail, instead of describing what is being looked at over the phone

2.5 Prince 2 and PMI

The OGC Prince2 (2009:14.4.4) Explains and advises of communication management strategy and what it should contain including details of how the management should send information to, and receive from, but it does not say how, it does not say what, it only gives a strategy. Prince2 presents a very good overall picture' however there are no templates within the guide, just the strategy and the rest is left up to the organisation. It is too broad for construction but can be tailored as per their suggestion. The management of all stakeholders requires excellent communication keeping all abreast of the whole project from inception, initiation, during project execution, closing and aftercare of the project.

The PMBOK Guide (2008:243-271) in chapter 10 Project communications management details 5 processes which are identifying stake holders, plan communications, distribute information, manage stakeholders expectations and report performance. Within these processes are diagrams of communication direction

between the processes, descriptions of inputs and outputs but no actual detail just a description of what should be done before the next process. There are no templates of for example Request for Information, (RFI) or a Confirmation of Instruction (COI).

One of the interesting processes in communication technology which is a question PMBOK asks the reader is, 'Are the proposed communications compatible with the experience and expertise of the participants or is there extensive learning and training required? (Ibid.254) This again leads to the point that there is no single system throughout the construction industry where a participant, as PMBOK call them, is familiar and so will require training to use the organisations particular system.

Fellows cited Van de Van (1992: 12) who identifies a process as ' .... a sequence of events that describes how things change over time'. He furthermore goes on to say that 'Construction management research tends to be process oriented (e.g. organisational culture of construction firms) or both process and product (e.g. the impact of different procurement approaches on project and project management performance)' (Ibid, 2008: 12)

Igo T.and Skitmore M. (2006:134) In their 'research of a 'large, Australian Engineering, Procurement and Construction management consultancy.....determined through an in-house electronic survey employing the Organizational Cultural Assessment Instrument (OCAI),' stated 'In applying the OCAI method, the results indicated the company to have a dominant market-oriented culture. In contrast, the most desired form according to the respondents was an employee focused culture – indicating a misalignment between what employees thought was needed and what was perceived to exist'. This is further proof of misconception of what the management wants and perceives to what actually exists and appears evident throughout construction companies. It is assumed by the management that the project manager will run his project in a professional way, the manager perceives that a system and support would exist then finding that it actually does not and the project manager is left to his own devices.

> *'.....knowledge may be tacit or explicit; it can refer to an object, a cognitive state, or a capability; it may reside in individuals, groups (i.e., social systems), documents, processes, policies, physical settings, or*

computer repositories. Thus, no single or optimum approach to organizational knowledge management and knowledge management systems can be developed. A variety of knowledge management approaches and systems needs to be employed in organizations to effectively deal with the diversity of knowledge types and attributes.'
Alavi M and Dorothy E. Leidner D.E (2001)

'No single optimum approach to organisational knowledge management and knowledge management systems can be developed.' (Ibid, 2006:134) This is not true, the researcher has experienced such a knowledge transfer and management systems as over the past 10 years and as late as the time of writing this dissertation paper. One of the respondents and participators of the interview / questionnaire demonstrated the system and the fact that it has been in operation for more than 10 years. The researcher also used this system and an example of a hybrid of this system can be found in appendices page 63, Appendix A, Site Filing Index and can be used as an example of best practice for such a system.

2.5 RIBA Royal Institute of British Architects

RIBA (1999) is a good example of management procedures it lists what should, be recorded, how its recorded and where it should be filed and how to archive. It is construction orientated so is designed specifically for the industry however for the architect not the project manager (PM). The PM could be an architect so this filing system will suffice but the contractor on the other hand is not catered for but can tailor this system to suit.

RIBA (2010) is the latest and a good example of Best Practice in many ways, incorporating classic RIBA Plan of Work 2007

'For many clients, and for public bodies in particular, the demonstration of the Architect's quality through a commitment to a quality system gives assurance that quality is of critical importance to the success of the project.' (Ibid, 196)

- *'RIBA Chartered Practice Criteria - Quality Management Systems*
  Small practices (up to 10 staff in total) are required at least to use the RIBA Project Quality Plan for Small Projects (PQPSP), or equivalent, on each project.
- *Medium practices (11 to 50 staff) are required to use the full RIBA Quality Management Toolkit (incorporating the RIBA PQPSP)' or equivalent, on all projects, and for office procedures.*
- *Large practices (51+ staff) are to have an externally certified BS EN ISO 9001:2008 quality management system in use. This could be based on an externally certified system developed from the RIBA Quality Management Toolkit or another externally certified equivalent system.'* (Ibid, 196)

In the procedures and processes they describe the management's responsibility, the document requirements and the control of documents, the implementation of these procedures, the project communications, the information management, project records and the fact that there should be a filing system that can be tailored to suit the practice, they state a Uniclass and CI / SfB can be used which is a identification method using 6 characters, indicating the functional parts for example an agent or Architect, using ISO 13567 which is a cad system of ID numbering. What it does not say is what the minimum filing requirements are on site they advise of the architects practice, there seems to be an 'us and them' attitude, they advise of keeping records in case of claim or dispute. There is a duty on all actors to keep records in the event of claim or dispute however not all actors appear to be advised of the same level of record keeping.(Ibid, 196-215)

> *'Uniclass is a classification scheme for organising library materials and for structuring product literature and project information. It incorporates both CAWS (Common Arrangement of Work Sections for building works) and EPIC (Electronic Product Information Co-operation), a new system for structuring product data and product literature'.* (1999:35)

In their section C Management they state the following C419 Records management, 1 Control of office documents, collating, filing. 2 Stationery, forms. 3 Office library management and operations.' They do not state how or what is to go within these

sections. That would imply that as long as a practice follows this initial tabulated classification scheme the compiling of the library or records have a free rein to do their own thing, i.e. it is not controlled. .(Ibid, 29-39) However it does state a later within section 'C' that construction operations on site should be filed accordingly which may include records .(Ibid, 38) This system could be incorporated on site and would enable the project management staff and the customer to find records when the need arises for clarity or in the event of a claim or dispute, however the indexing is extremely large as it is for use within a library and may be too big a system for smaller individual projects with categories that would not apply on site so the system would be difficult to follow. It is more suitable for an Architectural Practice or an organisation library.

According to Tom Smith of SITECOMS (2011) his new innovation system demonstrates communication instantly in four different formats which are as follows, one, via a virtual notice board desk top tool, two, via email, three, via the website and four via text. This communication could be of any changes to the site conditions, access, variations and or instructions. All communications are chronologically archived and are accessible. All receivers of the information are recorded without the need to respond 'as read' thus confirming all have seen the communication. A good example would be a change request on site, or a delivery or a safety hazard. It would be a good tool in any project managers' arsenal to be able to contact the workforce immediately with any updates or notices and provide records of all communications as required. Although SITECOMS can be used for simple document relaying, SITECOMS specialty is communication to the whole of the workforce immediately on the shop floor. SITECOMS is further developing there system and is at present undergoing trials with a major UK contractor.

2.6 Aconex

Aconex (2011) states they provide a secure document control that will save the company or organisation time and money by reducing the time wasted in transmitting documents and the administrational procedure. In fact they have quotes from professionals who are more than happy with the service displayed on their web site. There are brochures to download claiming to have all the information to 'Drive your project to success' (Aconex 2011: p3. Project success in construction) There is no

sample of their filing index but there are claims of having comprehensive document control, storage and archiving. Aconex appears to be set up for the larger contractor on maybe mega projects as all the examples in the brochures are mega projects in the millions of $ or £. There is no demonstration that the smaller contractor can use this system, there is however an invitation to contact them with the details of your project in order for them to give you a quote / proposal for their services for that particular project. It implies that it may be cost prohibitive to the SME's or that their costs are not set but negotiable. They are supplying a service, however a very good service which a contractor and customer may wish to use subject to affordability.

2.7 ISO9000

The ISO 9004 (2009) depicts diagrams and figures of communication flow and direction, it advises of managing for the sustained success of an organisation but it does not advise of a specific document control and filing system only that it is managed in such a way so that it can be checked by an accredited ISO 9000 practitioner and can demonstrate continuous improvement. It shows tables of learning and self-assessment which will enhance personal development however it is too broad to be specific for the construction industry although it can be tailored for use. As the British Standards Institution (BSI) (2010) States

> "ISO 9001 is suitable for any organization looking to improve the way it is operated and managed, regardless of size or sector. However, the best returns on investment come from those companies that are prepared to implement it throughout their organization rather than at particular sites, departments or divisions."

2.8 Conclusion

During this research it has not been possible to find a published standard system of project / site filing and document control for a construction project. There have been many suggestions but no evidence of an actual system. Furthermore it has not been possible to find a study of what filing systems are in place within the industry. The WBPMS offer the facility for a specific project or organisation however the actual site needs a paper / hard copy or drawings and contracts etc. It is not possible to do all that is required virtually.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The researcher investigated current journals via the internet collecting secondary data to interpret what is the perception of document control and identify trends and omissions from the current media.

Chi-squared and t-tests can be used to compare sets of data. A thematic analysis on the qualitative data is taken from the open questions, i.e. looking for themes, trends and coding them. The codes can then be used as answers and in turn use those numbers to carry out the chi-squared test between two different professions or company types etc. to see if their answers are significantly similar of significantly different. For this paper discontinuous data was collated, trends identified and grouped formed to present and illustrate the findings.

An email containing a structured survey in the form of an interview / questionnaire to gather primary data was posted on the web utilising the professional networking site LinkedIn. The option of Interview was offered to professionals in the industry across a selection of companies of differing sizes and turnover and in different countries, using Skype when not available for face to face meetings. Interviewees were asked to read the transcript of the interview prior completion, as a true account of their statements.

The questions have been structured in such a way as to avoid any possible external influences so that they may be analysed on a ‘like for like’ basis. Care was taken so as not to lead the respondents and maintain interest in the subject (Preece 1994 p 111), finalising in a short tick box requesting a high, medium and low then asking to state position held within the company.

The researcher has more than 35 years experienced in the industry, 23 of those years as a project manager so can apply primary source knowledge as well as educated presumption of meaning and intention from respondents when the replies are not clear.

It was decided that a simple yes or no answer survey would not provide as rich a data reply therefore semi structured open questions were asked as a more purposive strategy in the hope a wider even unexpected response may be the outcome. It was this approach that provided the surprising response that in turn shaped the direction of the dissertation and encouraged the researcher to investigate further if there was a standard filing system within the industry and if there had actually been a survey done previously to investigate if there was a standard filing system

The interview / questionnaire survey has 19 questions in all mostly open questions however nine of which a yes or no answer was intimated which could be taken so providing a numerical display then identifying trends if any as there is an option to add comment, five are open questions of which trends have been identified and displayed within the chapter four Data and Presentation Analysis and Discussion commencing page 31.

Table 3.1 List defining type of question

Q1	open question
Q2	open question
Q3	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q4	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q5	open question
Q6	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q7	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q8	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q9	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q10	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q11	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q12	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q13	Can interpret a Yes or No answer and identify any trend, as an option to comment is available
Q14	open question
Q15	value information question
Q16	value information question
Q17	Information only
Q18	open question
Q19	incorporating 10 numerical questions identifying three options of high, medium and low, of which trends can be identified

Q1. Reason for question: How does your company avoid adversarial relationship or conflict with your customer or their agent?

The intention was to identify trends and patterns found within the data of thought and perception, then to separate them into groups. See page 30.

Q2. Reason for question: How are changes communicated through your supply chain i.e. staff and subcontractors?
The intention was to identify shortcomings in methods of communication and document control which includes record keeping. See page 31.
Q3. Reason for question: How long does it take, from the moment of decision for your company to action changes on the shop floor, i.e. from decision to action?
The researcher wanted to expose the fact that some professionals did not know and so assumed. The results supported the theory. See Q3 page 31

Q4. Reason for question: Is the time taken from decision to commencement of action on the shop floor measured? I.e. for every decision for example recorded in a log?

The researcher is looking for a lack of knowledge across the respondents of how long it takes a decision to reach the shop floor, as many decisions throughout the course of a project are made and it is assumed by many to be the end of the matter as that decision is passed down the supply chain and action is presumed in motion. The results were further proof of assumption rather than fact. See page 32.

Q5. Reason for question: How does your company ensure that your subcontractors on the shop floor i.e. site floor are using the correct / current drawings, with the latest revisions?

What the researcher was looking for is exactly word for word as per the question. The researcher was looking for an assumption that the operatives on the shop floor had the current drawings. This was borne out by the results. It is the physical action of inspection of the drawings in use that is required, not a presumption that the subcontractors have the revised drawings. See page 32.

Q6. Reason for question: Does your company operate document control procedure and if so how is it implemented?

The intention of this question was to seek out how many companies from the respondents operate a document Control procedure and more importantly how many did not. See page 33

Q7. Reason for question: Does your company employ an individual document controller i.e. gate keeper on site or in the office or both?

The researcher was looking to see how many of the population sample did employ an individual or Document Controller i.e. gate keeper and how many did not? The researcher looked to see if there was any connection with time of decision response and or time decision took to reach the shop floor and did it have any effect on the response, was there a pattern? Did country of response differ? See page 34

Q8. Reason for question: Has your company used a shared software document control application with a customer and if so which one? For example 'Aconex - online information management solutions'

The reason for this question was to establish a percentage of the respondents who were using WBPMS's, from which country and if there was a favoured WBPMS or most used and of these progressive organisations, did they have a filing system used throughout their organisation? See page 35.

Q9. Reason for question: Do you think a paperless document control facility would be beneficial?
The researcher is looking for perceptions of a paperless DC, does the respondent welcome and embrace a paperless DC or do they reject the idea? See page 36

Q10. Reason for question: Do you think there are disadvantages to using the paperless document control?

This was a double check question to ensure that the respondents fully understood the previous Q9. Would they acknowledge that operatives on the shop floor or at the workface need hard copies of files or drawings for example? See Q10 page 37.

Q11. Reason for question: Would your company be willing to use a paperless shared document control with your customer for duration of a project, for example Aconex?

This question was more for the respondents and or companies who have never used a WBPMS or who were not familiar with the concept. The reason was to gauge the

response or suggestion of a paperless DC and also the understanding of what it actually is. To be read in conjunction with the previous questions. See Q11 page 37.

Q12. Reason for question: Do you have a site filing system that is used throughout your organization on all projects without fail or question?
The researcher was looking for a lack of DC throughout the industry or organisation the findings here were surprising as it was common to not have a filing system relating to the individuals professional discipline and or organisation, implying lack of control, Quality Assurance or lack of Risk Management. See Q12 page 38

Q13. Reason for question: Would you be willing to supply a sample of your site filing index for this survey?

The researcher wanted to prove that filing indexes are very similar. The response proved to be the case and there is no reason why it cannot be standardised. See Q13 page 39.

Q14. Reason for question: How would you or what would you recommend for improving communication between the customer and the contractor and or the whole supply chain?

This question was asked to identify any abnormalities or any new innovations among the respondents. The researcher identified eight trends, groups or differences of opinion see Q14 Page 41

Q15. Reason for question: What is the average value of a typical project that your company are involved with?
The intention was to identify any abnormalities or trends by comparing with previous and later questions. See Q15 and page 42

Q16. Reason for question: What is the approximate number of operatives on an average site including subcontractors?
The reason this question was asked was to determine if there was a connection between the numbers of operatives, to compare it with the value of the project i.e. the size of the project and how the document control was applied See Q16 page 45 - 46.

Q17. Reason for question: What is your business, i.e. Main contractor, Clients Agent or Sub Contractor?

The reason this question was asked was to identify the respondents position within the supply chain and if that position affected the response. See Q17 page 45

Q18. Reason for question: What would be your advice to achieve project success?

The intention of the researcher for this question was to identify any trends, made by gathering similar comments and grouping them together, to also identify any frustrations within the sample population and to identify the main requirement from professionals to achieve the project success. See Q18, page 47.

Q19. Reason for question: The question was put in the table as below.

Table 3.1: Q19 Blank choice of effects of low, medium and high

Please fill in the boxes with an X. For example if you think 'Weather' has a large effect on project success ' enter X (for High) in the Weather row. Note there is no weather row it is used as an example so as not to lead.				
		Low	Medium	High
1	Cash Flow			
2	Speed of Decision response			
3	Time - decision to reach the shop floor			
4	Procurement			
5	Motivation			
6	Document control			
7	Design & build-ability			
8	Change orders			
9	Communications			
10	Control of the project			

Please state your position:

E.G., Project manager =PM , Director = Dir, Quantity Surveyor = QS, Other

Position _____

The reason for the question was to simplify the previous survey by Mawsdley and Al-Jibouri Saad (2009) and add four new questions that were not included and they were Q19.1 Cash Flow, Q19: 2 Speed of decision response, Q19. 3: Time-decision to reach the shop floor and Q19.4: Procurement. These categories are of high importance and would have a significant effect on the project's success. The findings have backed up the theory which is clearly shown in the results, page 50 - 52.

See also as referred to earlier in the literature research Page 11-12 (Ibid. 2009)

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction.

The sample population is representative of the research population which has been targeted and they are from professionals within the construction industry as stated earlier in chapter 1. This chapter is organised and laid out in the form of the nineteen questions incorporating Tables and or Figures to more clearly illustrate the findings. (Roberts, C.M. (2004 p167) cited Glatthorn (1998)

4.2 Q1. How does your company avoid adversarial relationship or conflict with your customer or their agent?

Trends and patterns found within the data of thought and perception were separated into the 6 groups as below. Some respondents indicated multiple reasons which explain the total calculation of respondents and percentages being more than 100% and more than the 31 respondents.

Table 4.2.1 Q1 Avoiding adversarial relationships

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Honesty, Truth and Communication	More Meetings	PM, SC, QS, CA manages	Early Warning Pro.	Personal / Partnering attitude	Clear & Complete Client Brief
27	4	9	2	16	5
90%	13%	30%	6.60%	53%	17%

The data shows that twenty seven number that is 90%, overwhelmingly, Honesty and Truthful Communication and then secondly, sixteen number at 53%, a Personal / Partnering i.e. relationship building attitude. This backs up Egan's Rethinking Construction, The Egan Report.(1998) upon which he said we needed to rethink our way of doing things, we needed to evolve and remove adversarial relationships from the construction process. It is good to see the respondents are thinking along these lines. Note, that only four number at 13% said that more meetings were required, which supports industry thinking that sometimes meetings are for meetings sake and take up too much time. Nine respondents at 30% stated that the PM, SC, QS and CA manages the relationships i.e. avoids adversarial conflict. Only two number at 6.6% stated Early Warning Indicators i.e. Procedures, judging by the rest of their answers,

it is assumed that the Early Warning Indicators i.e. Procedures are taken care of within the communications so can be ruled out as having a low factor.

4.3 Q2. How are changes communicated through your supply chain i.e. staff and subcontractors?

The answers were as follows

Table 4.3.1 Q2 Group / trend how changes are communicated through supply chain.

Use of standard forms	WPMS	em &Tel	Verbaly	Written,signed & dated
21	3	3	1	3
67.70%	9.70%	9.70%	3.20%	9.70%

Out of a possible 31 respondents 20 number i.e. 67.7% stated the use of standard forms was how they communicated changes through the supply chain, staff and subcontractors, surprisingly 3 number that is 9.7% stated they communicated changes through a Web assisted project Management system WPMS, that was the same as via email and Telecom. The one respondent at 3.2% even though their project was of a substantial size and value, was found to be a third world country so it is assumed procedures are not as advanced on this particular respondent's project.

4.4 Q3. How long does it take, from the moment of decision for your company to action changes on the shop floor, i.e. from decision to action?

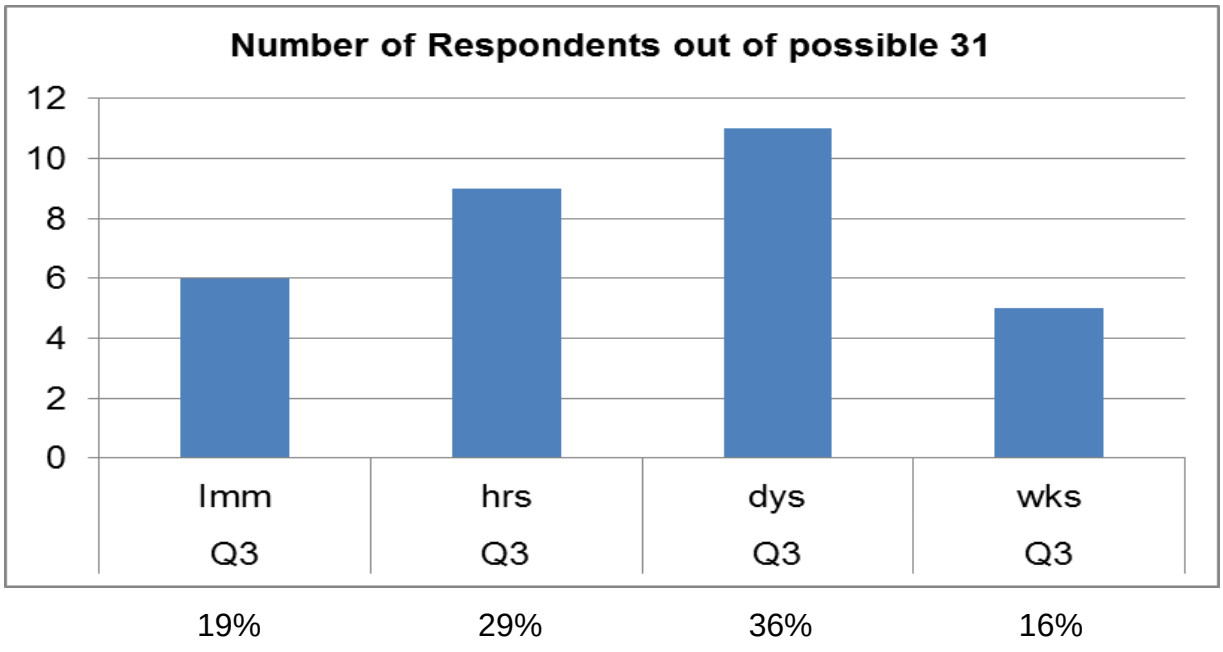

Fig 4.41: Q3 Trends of response from decision to action.

This more of a perception question, it is an open question which could have a multi answered response, depending on the change or the decision. What the researcher was looking for here was a frustration or a lack of knowledge within an organisation of how long the decision took to actual action on the shop floor? Is there a bottleneck or a gate keeper? All respondents gave a realistic reply however there were frustrations when some answered weeks one even answered weeks sometimes months or too long implying that there were gatekeepers or bottlenecks preventing quicker action to the shop floor. Eleven of the respondents at 36% stated 24hrs, one day or days, eight at 29% stated one hour or hours, six at 19% stated immediately or instantly. The remaining 5 at 16% responded a week, weeks or 2 weeks. This question is to be read in conjunction with Q19.2 and 3.

4.5 Q4. Is the time taken from decision to commencement of action on the shop floor measured? I.e. for every decision for example recorded in a log?

The researcher is looking for a lack of knowledge across the respondents of how long it takes a decision to reach the shop floor, as many decisions throughout the course of a project are made and it is assumed by many to be the end of the matter as that decision is passed down the supply chain and action is presumed in motion.
Of the 31 respondents 19 at 62% said yes it is measured and recorded however more startlingly 12 at 38% said no. This supports the researchers argument that time is wasted or not controlled by ensuring measurement and tracking the decision to the actor and on to the shop floor.

4.6 Q5. How does your company ensure that your subcontractors on the shop floor i.e. site floor are using the correct / current drawings, with the latest revisions?

See response from ID31-PM-MC-BA, see appendices page 77 – 80, It is the physical action of inspection of the drawings in use that is required, not a presumption that the subcontractors have the revised drawings.
There was a trend within the responses to purely rely on Document Control (DC) however there was one response, see ID21-QS-MC-SA page 72 - 74 that acknowledged a failure in the DC procedure as there was no system in place to ensure the drawings in use on site i.e. on the shop floor were the actual current drawings. See also the table below showing the trends.

Table 4.6.1 Q5 Group / trend methods used ensuring current drawings are in use on the shop floor

By inspection & DC	By DC	DC but aknowledges failure	N/A	DC & Meetings	BY DC WBPMS
12	13	1	2	2	1
39%	42%	3.30%	6.60%	6.60%	3.30%

4.7 Q6. Does your company operate document control procedure and if so how is it implemented?

Unsurprisingly twenty-eight at 90.3% stated they did operate a DC procedure, only 3 at 9.7% stated they did not. Of the three that did not operate a DC procedure, one was too modest as the respondent was QS in the UK who personally did the DC and that was ID12-QS-SC-UK. The second respondent stated no but the researcher believes again the respondent did their own DC and they were ID13-PM-MC-NI. The final respondent who responded 'they do not but will implement a DC when appointed to do so,' for the purpose of the survey was recorded as answering no and that was ID20-PM-CA-UK.

Therefore DC no matter company initiated or not, is in place, in some form, on all projects.

The researcher looked to see if there was any standardisation across the industry and or projects. The respondent ID01-DIR-MC-UK page 67 - 69 stated that standard templates were in place and operated a certain filing system so that if the respondent visited any site within his organisation, he knew where to find a specific subject for example records. ID06-QS-MC-OM, stated that the company had a "long standing procedure which had evolved over a period of time". ID21-QS-MC-SA stated "There is a large DC team on site'….. (Ibid, ID21). ID22-DIR-CA-BA 'implementation varies from project to project" ID27-PM-CA-BA appendices page 72 -74 stated ' An effective Document Control system is key to the success of a project.' ID28-PM-SC-KU, stated 'Yes we have developed a unified index which is a standard filing format used for the projects at hand and those in the tender process.' Only ID30-DIR-MC-UK and ID07-DIR-SC-CA stated ISO9001 procedures. ID31-PM-MC-BA appendices page 77- 80 described a filing index system set up by the respondent and implemented using the company's existing standard forms.

4.8 Q7. Does your company employ an individual document controller i.e. gate keeper on site or in the office or both?

The researcher was looking to see how many of the population sample did employ an individual or Document Controller i.e. gate keeper and how many did not?
Note, the ID's shown are in the order of response and or interview only and not for any other reason. Twenty-one at 68% stated that they did employ a DC, ten at 32% stated that they did not.

Table 4.8.1 Q7 Results of companies employing an individual DC or gate keeper

ID	Yes	No
01-DIR-MC-UK		1
02-PM-MC-UK		1
03-QS-MC-ABD	1	
04-PM-MC-UK		1
05-QS-CA-QA	1	
06-DIR-SC-UK		1
07-DIR-SC-CA	1	
08-DIR-SC-SA		1
09-DIR-MC-SA	1	
10-PM-SC-SA	1	
11-PM-SC-SA	1	
12-QS-SC-UK		1
13-PM-MC-NI		1
14-PM-MC-DU	1	
15-DM-MC-ABD	1	
16-DIR-DC-BA	1	
17-QS-MC-QA	1	
18-PM-MC-SA	1	
19-PM-MC-BA	1	
20-PM-CA-UK		1
21-QS-MC-SA	1	
22-DIR-CA-BA	1	
23-DIR-MC-CO	1	
24-PL-CA-BA	1	
25-DIR-SC-BA	1	
26-PM-CA-UK	1	
27-PM-CA-BA	1	
28-PM-SC-KU	1	
29-DIR-MC-UK		1
30-DIR-MC-UK		1
31-PM-MC-BA	1	

Note, of the ten respondents that replied and installed in the "No" column, eight are from the UK, one is from Nigeria and one is from Saudi Arabia.

The Saudi Respondent ID08-DIR-SC-SA is a Supplier of cranes to site so would not have the same tensions imposed on the organisation such as drawing revisions etc.

The Nigerian respondent, ID13-PM-MC-NI appears to fall into the same categories of the UK respondent's as the projects values and number of operatives is of a smaller scale so DC would appear to be more easily applied or individually applied.

Note, only one from the UK is in the yes column ID26-PM-CA-UK, They are a facilities provider more In the respondents discipline, the customer / CA.

Of the ten 'No' respondents, they answered Q3 The speed of decision response as follows

Three stated "Immediately."

Four stated "Hours."

Two stated "Days."

One stated "Weeks" (Implying frustration see ID02-PM-MC-UK

Re Q4 Re. is the time taken from decision to commencement of action recorded in a log, four stated yes and six stated no.

4.9 Q8. Has your company used a shared software document control application with a customer and if so which one? For example 'Aconex - online information management solutions'

The findings were as follows.

	WPMS	ID	ACONEX
	Aconex	3, 16, 17, 22, 23, 25, 31	7 no Total
UK	Business Collaborator	26	ABD 2
UK	Buzzsaw	30	Ba 3
Qa	Constructware	5	Co 1
UK	MOSS	or 26	Om 1
UK	Sitecoms	6	
Ba	SharePoint	or 22	
Ba	Primavera	24	
SA	4Projects	21	
	TOTAL	13-15 no	

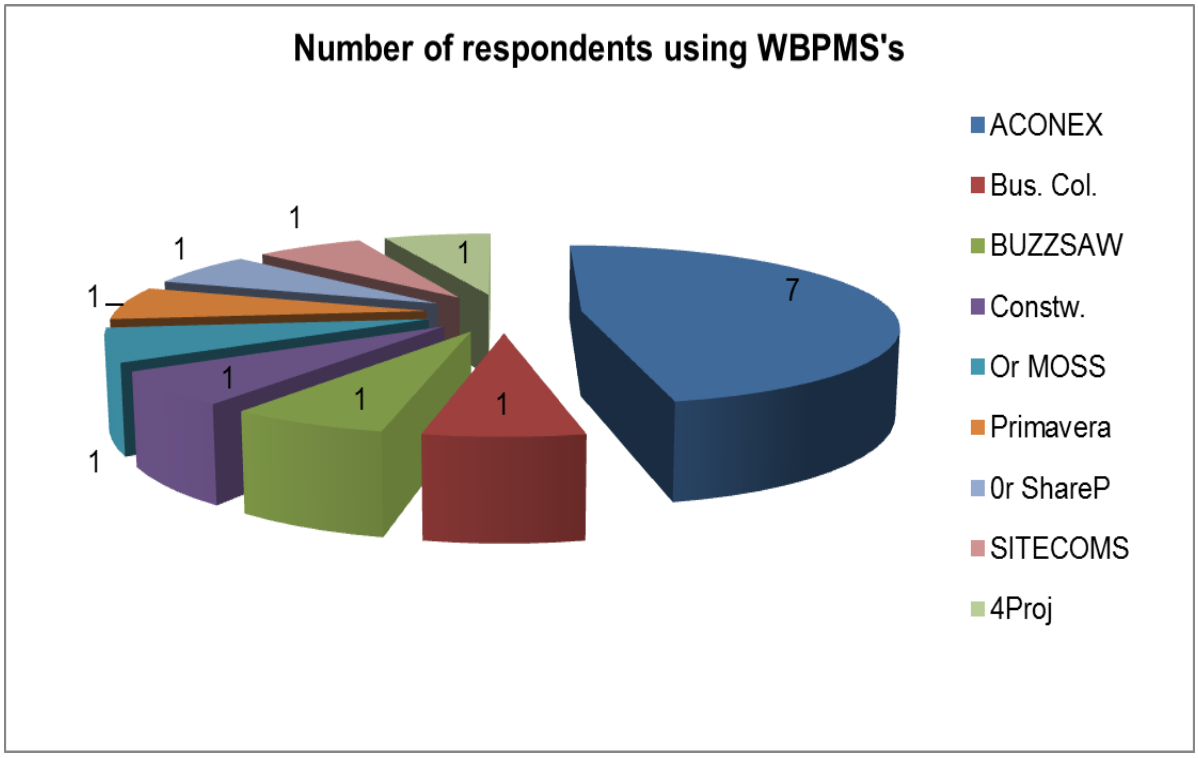

Fig 4.9.1 Q8 Number of Respondents using WBPMS's

4.10 Q9. Do you think a paperless document control facility would be beneficial?

Table 4.10.1: Q9 Results of respondents indicating benefits or not of a paperless DC.

ID	Yes	No
01-DIR-MC-UK		1
02-PM-MC-UK	1	
03-QS-MC-ABD		1
04-PM-MC-UK	1	
05-QS-CA-QA	1	
06-DIR-SC-UK	1	
07-DIR-SC-CA	1	
08-DIR-SC-SA	1	
09-DIR-MC-SA	1	
10-PM-SC-SA	1	
11-PM-SC-SA	1	
12-QS-SC-UK	1	
13-PM-MC-NI	1	
14-PM-MC-DU		1
15-DM-MC-ABD	1	
16-DIR-DC-BA	1	
17-QS-MC-QA	1	
18-PM-MC-SA		1
19-PM-MC-BA	1	
20-PM-CA-UK	1	
21-QS-MC-SA	1	
22-DIR-CA-BA	1	
23-DIR-MC-CO		1
24-PL-CA-BA	1	
25-DIR-SC-BA		1
26-PM-CA-UK	1	
27-PM-CA-BA	1	
28-PM-SC-KU	1	
29-DIR-MC-UK		1
30-DIR-MC-UK	1	
31-PM-MC-BA		1

Twenty-three at 74% stated and or intimated yes.

Eight at 26% stated or intimated no.

For a good sample of “Yes” response see Appendices’, ID04, 5, 21, and 27

The “Yes” responses are enthusiastic and sing the praises of the Computer. However of the “Yes” column 50% also state “Yes but” and explain the obvious downside.

For a good sample of “NO” response see Appendices’, ID01 and 31.

The “No” responses expressed frustration and the acknowledgement that a paperless DC is not possible in construction.

4.11 Q10. Do you think there are disadvantages to using the paperless document control?

It was good to see that all respondents that is 100% stated “Yes” there are disadvantages to the paperless Document Control.
See ID01-DIR-MC-UK, appendices page 68 – 70.

4.12 Q11. Would your company be willing to use a paperless shared document control with your customer for duration of a project, for example Aconex?

To be read in conjunction with the previous questions Q9 and 10.

Of the 31 respondents twenty-six at 84% stated “Yes”, five at 16% stated “No”

In Q8 fourteen stated they had not used a shared document control application with a customer however in Q11 the number is only five at 16% that stated their company would not be willing to use a paperless shared DC.

Of the five who stated or intimated “No”,
Two were from Saudi Arabia of the two, one ID08-DIR-SC-SA stated “No comment”
The second ID09-DIR-MC-SA “stated certainly not”
One was from Dubai, no reason just a point blank “No”
One was from Congo, ID23-DIR-MC-CO stated “Not applicable…. remote use…” [Exploratory drilling company]
One was from UK ID29-DIR-MC-UK stated “Not at this time” [Implying maybe in the future?]

4.13 Q12. Do you have a site filing system that is used throughout your organization on all projects without fail or question?

Table 4.13.1 Q12 Results of response to 'Do you have a filing system that is used throughout your organisation without fail or question?'

ID	Q12 Yes	Q12 No
01-DIR-MC-UK	1	
02-PM-MC-UK		1
03-QS-MC-ABD	1	
04-PM-MC-UK	1	
05-QS-CA-QA		**1**
06-DIR-SC-UK	1	
07-DIR-SC-CA	1	
08-DIR-SC-SA		1
09-DIR-MC-SA	1	
10-PM-SC-SA	1	
11-PM-SC-SA	1	
12-QS-SC-UK		1
13-PM-MC-NI		1
14-PM-MC-DU	1	
15-DM-MC-ABD	1	
16-DIR-DC-BA	1	
17-QS-MC-QA	1	
18-PM-MC-SA	1	
19-PM-MC-BA		1
20-PM-CA-UK	1	
21-QS-MC-SA	1	
22-DIR-CA-BA		1
23-DIR-MC-CO	1	
24-PL-CA-BA	1	
25-DIR-SC-BA	1	
26-PM-CA-UK		1
27-PM-CA-BA		1
28-PM-SC-KU	1	
29-DIR-MC-UK	1	
30-DIR-MC-UK	1	
31-PM-MC-BA		1

Of the thirty-one respondents twenty-one at 68% stated or implied "Yes", ten at 32% stated or implied "No"

Of the "No" responses there were startling revelations.

ID05-QS-CA-QA is the highest value project respondent at £3.4billion and stated, "No, it is left to the individual project manager."

ID08-DIR-SC-SA is a SC Crane supplier so would not need a filing system.

ID12-QS-SC-UK manages the DC basically on site.

ID13-PM-MC-NI manages the DC basically on site

ID19-PM-MC-BA Stated "No …designed own system which integrates with our HO admin system"

ID22-DIR-CA-BA " stated "We have a system, but not necessarily without fail."

ID26-PM-CA-UK stated "No" but operate a WPMS

ID27-PM-CA-BA as the second highest value project respondent £500million stated " No each project operate various document control systems"

ID31-PM-MC-BA stated 'No' but referred the reader to his response in Q6 upon which he set up his own system, again demonstrating acting

ID05-QS-CA-QA appendices page 70, ID27-PM-CA-BA page 75.and ID31-PM-MC-BA page 79 are supporting evidence of a gap within the system of DC which needs to be plugged. See also conclusions and recommendations, appendices page 51 -55.

4.14 Q13. Would you be willing to supply a sample of your site filing index for this survey?

Of the respondents, ten said they would be willing to supply a sample of their filing index, however only five actually did and after reviewing them, it further proves the argument that all the systems are similar, some better than others, showing the same data in differing index formats and that there is no standard system.

A sample of the filing indexes received can be viewed within the appendices page 86 Appendix I, Sample Filing system from one respondent, ID07-DIR-SC-CA Note the company names and headers have been removed for reasons of confidentiality.
However ID01-DIR-MC-UK is from WH Snow and who are happy to acknowledge and share their filing system. The researcher recommends their system as an example of “Best Practice”. A hybrid version of the same supplied by ID31-PM-MC-BA can also be seen within the appendices on page 63, Appendix A, Site Filing Index. This version demonstrates how it can be applied to the computer on site and shows a print screen of the filing system actually in use.

See also the following Table 4.15 Q 4 – 13

4.15 Q4 – 13: Collection of numerical data.

This figure and table have been included here so as not to break the rhythm and flow of reading as the questions pertaining to this diagram are not in numerical order, (i.e. missing Q5 which was an open question) but have a numerical value as shown below.

Table 4.15.1 Q4 -13 Totals and percentages to be read in conjunction with the radar chart below.

Q4	Q4	Q6	Q6	Q7	Q7	Q8	Q8	Q9	Q9	Q10	Q10	Q11	Q11	Q12	Q12	Q13	Q13
Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
19	12	28	3	21	10	17	14	23	8	31	0	25	6	21	10	14	17
%																	
61	39	90	9.7	68	32	55	45	74	26	100	0	81	19	68	32	45	55

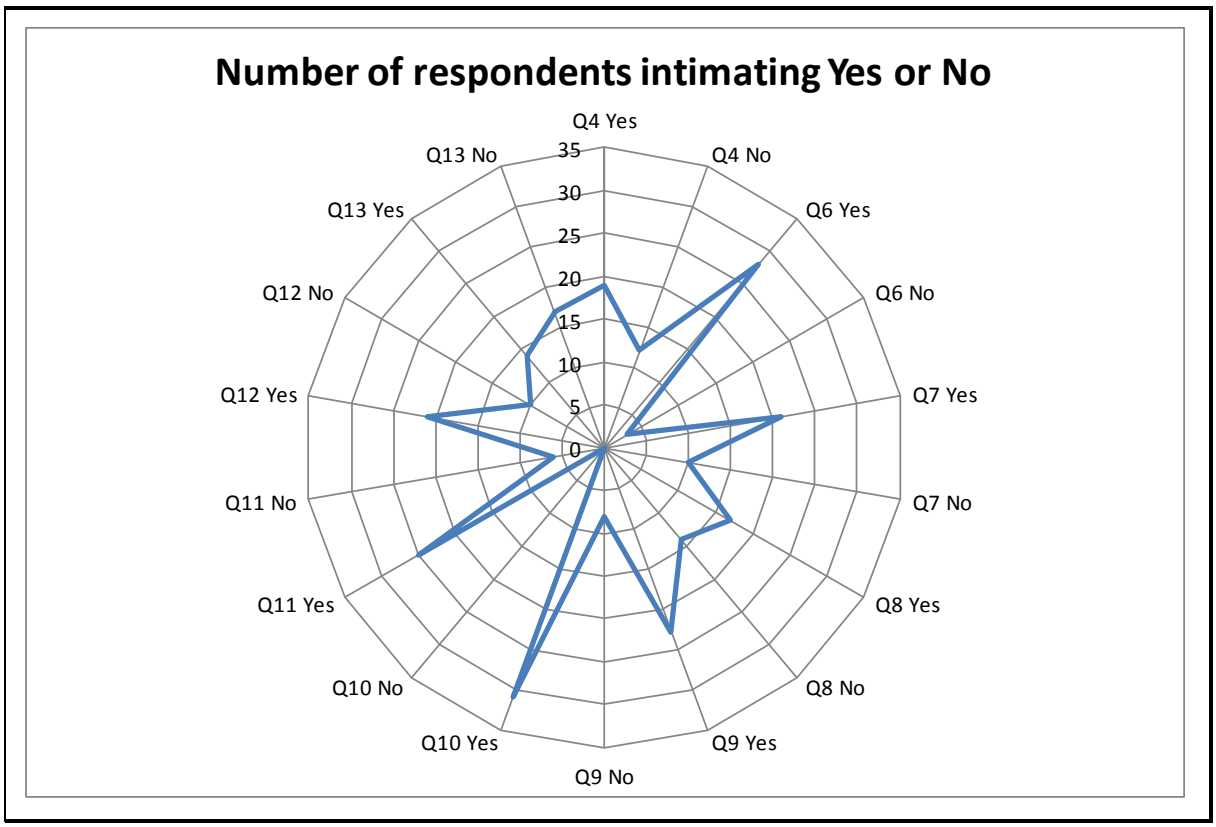

Fig 4.15.1: Q4 - 13 Radar chart demonstrating extremes and trends of response.

Extremes are as follows,

Q10 100% answered 'Yes' to 'Do you think there are disadvantages to using a paperless document control?

Q6 28% answered 'Yes' to Does your company operate a Document Control Procedure……'

4.16 Q14. How would you or what would you recommend for improving communication between the customer and the contractor and or the whole supply chain?

Table 4.16.1 Q14 Groups / trends recommendations for improving communication between the whole supply chain.

Group 1	Group 2	Group 3	Group 4
Happy as things are	Regular workshops meetings for knowledge transfer	Open relaionship, clients advising of intention changes early, a clear brief, honesty by all re dates and delivery	Integrated sofware creating transparancy open book
ID01-DIR-MC-UK	ID02-PM-MC-UK	ID07-DIR-SC-CA	ID10-PM-SC-SA
ID03-QS-MC-ABD	ID05-QS-CA-QA	ID19-PM-MC-BA	
ID04-PM-MC-UK	ID12-QS-SC-UK	ID21-QS-MC-SA	
ID06-DIR-SC-UK	ID15-DM-MC-ABD	ID22-DIR-CA-BA	
ID08-DIR-SC-SA	ID20-PM-CA-UK	ID25-DIR-SC-BA	
ID09-DIR-MC-SA	ID-24-PL-CA-BA	ID27-PM-CA-BA	
ID17-QS-MC-OM	ID29-DIR-MC-UK	ID28-PM-SC-KU	
ID18-PM-MC-SA	ID30-DIR-MC-UK	ID31-PM-MC-BA	
ID26-PM-CA-UK			
9 at 29%	8 at 25.8%	8 at 25.8%	1 at 3.3%

Group 5	Group 6	Group 7	Group 8
Weekly review mtgs, conference calls, joint inspections	Use of WPMS	Appoint team whose sole job is to measure & control all communications.	Robust Document Control
ID11-PM-SC-SA	ID13-PM-MC-NI	ID14-PM-MC-DU	ID23-DIR-MC-CO
		ID16-DIR-DC-BA	
1 at 3.3%	1 at 3.3%	2 at 6.5%	1 at 3.3%

The researcher identified eight trends, differences of opinion then put into groups as shown in the tables above.

See appendices for individual respondents' comments, page 67 - 80.

4.17 Q15. What is the average value of a typical project that your company are involved with?

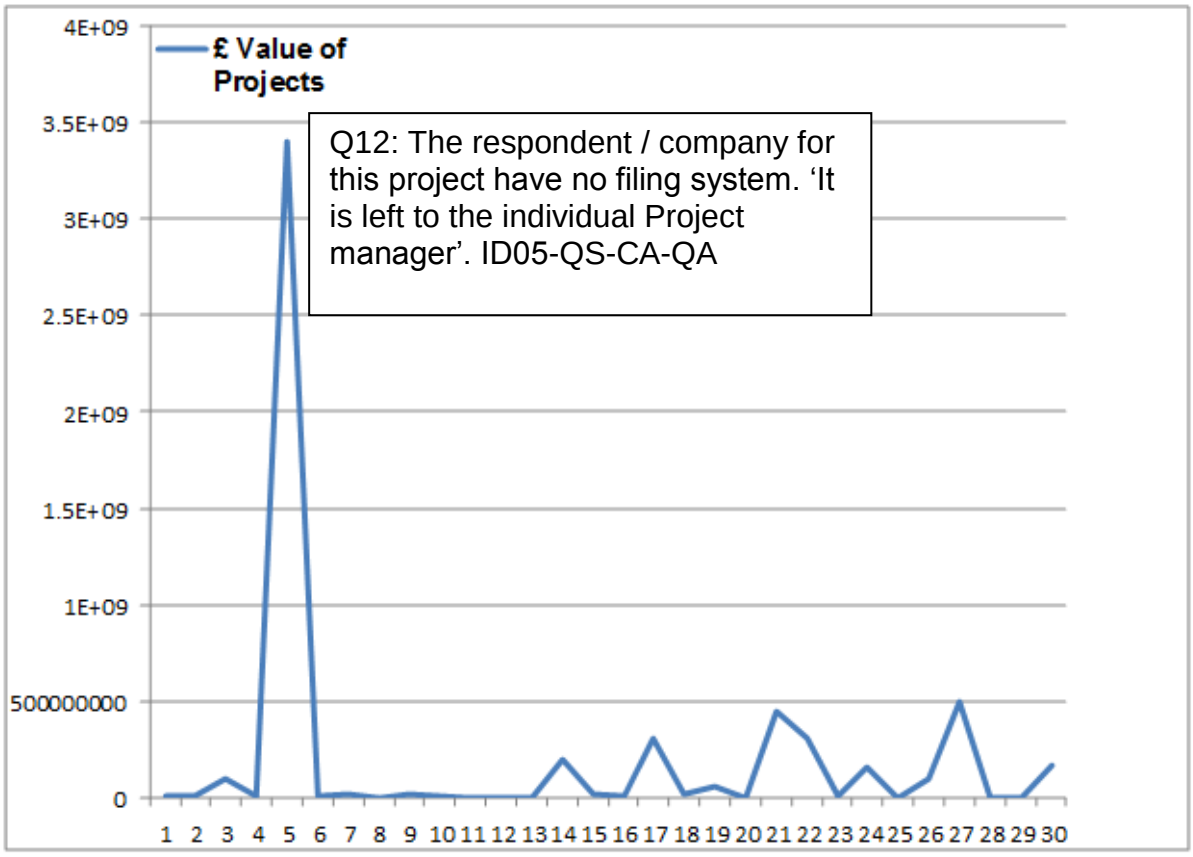

Fig 4.17.1 Q15 Graph of average project values as stated by respondents / ID.

There was a vast difference from the lowest value project being £100, 000. That's One Hundred Thousand pounds to the highest value project which was £3.4b that's Three Billion, Four Hundred Thousand Pounds. The graph cannot pick up all the data as difference is too great to show in this diagram. Note that the highest value respondent does not have a filing system but the lowest value respondent at £100k does have a filing system although both respondents are managing their own project so are doing things individually. There is no difference from the £3.4b to the £100k project. Except the lower value respondent is a sole proprietor so is answerable only to himself and the customer not senior management.

It must be stated that the researcher knows the respondent personally for the £3.4b project and that this respondent is a very experienced and capable professional which follows that the project is in good hands. However in risk analysis alone the fact that the organisation has no standard filing system for the position supports the argument for standardisation. See ID05-QS-CA-QA, appendices page 70.

4.18 Q16. What is the approximate number of operatives on an average site including subcontractors?

See the raw data for Q15 and Q16 below. The ID is easily read for example ID01-DIR-MC-UK is read as respondent ID 01, a Director, working for a Main Contractor in the United Kingdom.

Table 4.18.1: Q15 Approx. numbers of operatives on an average site including subcontractors, project value and country as per ID response.

	Q15	Q16	
ID	£	No.	Country
01-DIR-MC-UK	3,500,000	25	UK
02-PM-MC-UK	3,000,000	25	UK
03-QS-MC-ABD	100,000,000	2000	Abu Dhabi
04-PM-MC-UK	4,500,000	27	UK
05-QS-CA-QA	3,400,000,000	30000	Qatar
06-DIR-SC-UK	3,000,000	8	UK
07-DIR-SC-CA	18,400,000	1500	Cambodia
08-DIR-SC-SA	0	0	Saudi
09-DIR-MC-SA	15,300,000	200	Saudi
10-PM-SC-SA	9,000,000	1400	Saudi
11-PM-SC-SA	0	0	Saudi
12-QS-SC-UK	125,000	13	UK
13-PM-MC-NI	1,200,000	50	Nigeria
14-PM-MC-DU	200,000,000	800	Dubai
15-DM-MC-ABD	20,000,000	500	Abu Dhabi
16-DIR-DC-BA	10,000,000	60	Bahrain
17-QS-MC-QA	306,100,000	6000	Oman
18-PM-MC-SA	16,250,000	750	Saudi
19-PM-MC-BA	60,990,000	850	Bahrain
20-PM-CA-UK	1,000,000	15	UK
21-QS-MC-SA	450,000,000	3000	Saudi
22-DIR-CA-BA	311,000,000	6000	Bahrain
23-DIR-MC-CO	6,990,000	150	Congo
24-PL-CA-BA	160,400,000	650	Bahrain
25-DIR-SC-BA	1,520,000	15	Bahrain
26-PM-CA-UK	100,000,000	100	UK
27-PM-CA-BA	500,000,000	5000	Bahrain
28-PM-SC-KU	804,000	40	Kuwait
29-DIR-MC-UK	100,000	10	UK
30-DIR-MC-UK	250,000	10	UK
31-PM-MC-BA	170,000,000	3500	Bahrain
	Total value of projects		
	5,873,429,000		

It was found that inconsistent document control was evident across many organisations from the sample respondents and their projects irrespective of their value. Although the larger value projects did have a robust DC and tended to use WPMS's It did not necessarily follow that there was a filing system used throughout the organisations projects, it could differ from site to site.

See ID27-PM-CA-BA see appendices, page 75 -76.

The Total value of the project divided by the number to give the mean has not been done in this exercise as it would give a false representation because the lowest value is £100,000 and highest being £3.4billion would give an unrealistic average or mean. The same would be for the number of employees on site as an average or mean, it is vastly different in the Middle East compared with the UK as can be seen from the data.

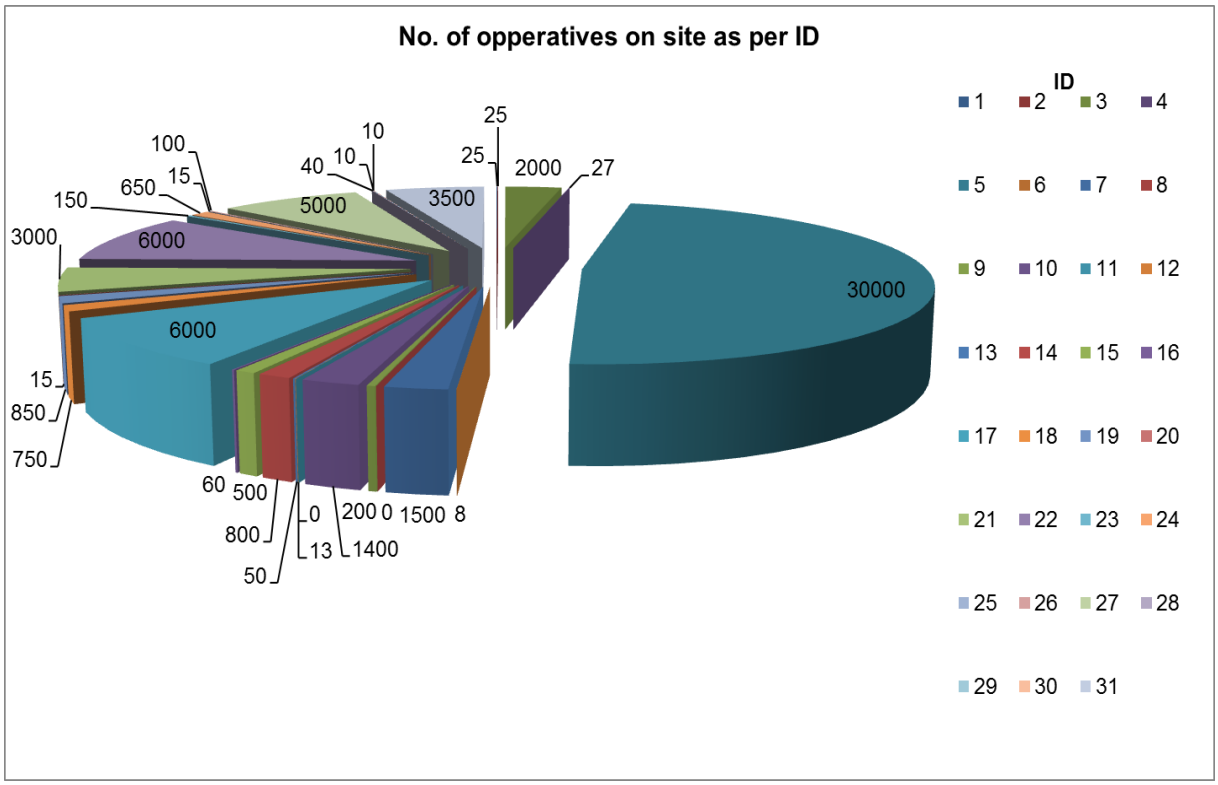

Fig 4.18.1: Q15 Exploded pie chart number of operatives on site as per ID response

4.19 Q17. What is your business, i.e. main contractor, clients agent or sub-contractor?

It was found that subcontractors were less likely to have a robust Document Control.

Table 4.19.1: Q17 Key of abbreviations re position, business and country enabling reading of figures relating to Q17.

Key: Country	**Key: Position**	**Key : Business**
ABD Abu Dhabi	PM Project Manager	MC Main Contractor
BA Bahrain	DIR Director	SC Sub Contractor
CAM Cambodia	QS Quantity Surveyor	CA Client's Agent
CON Congo	CA Client's Agent	DC Design Consultant
DU Dubai	DM Design Manager	
KU Kuwait	PL Planner	
NI Nigeria		
OM Oman		
QA Qatar		
SA Saudi Arabia		
UK United Kingdom		

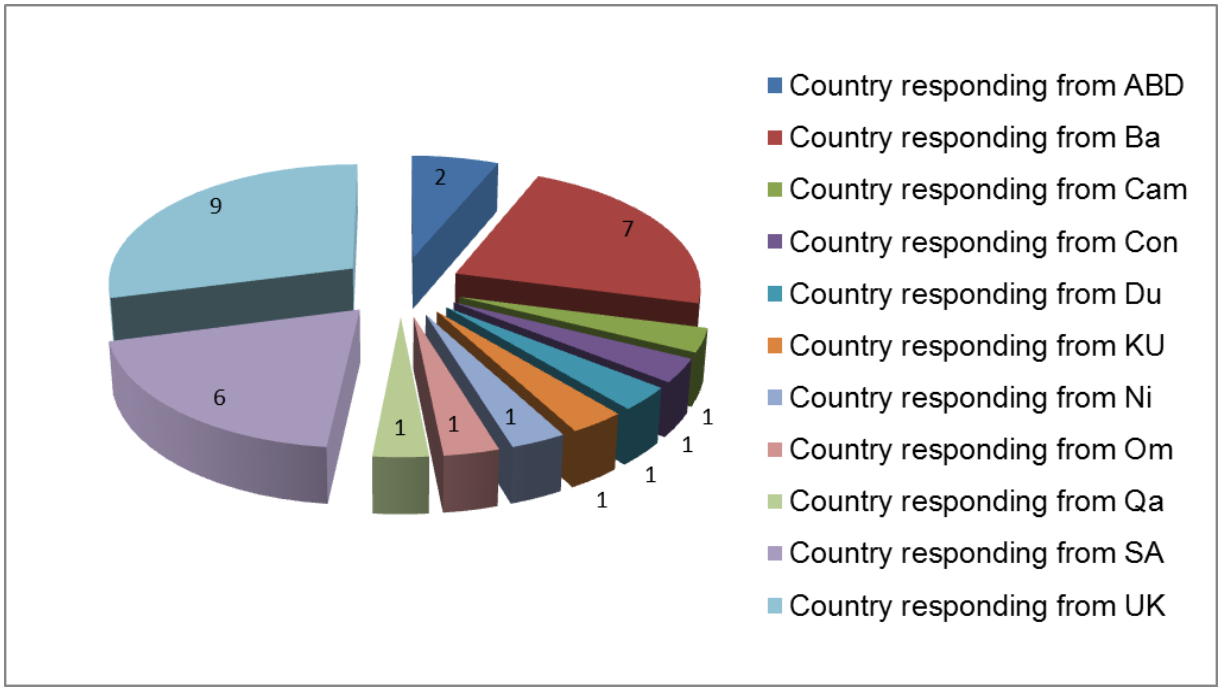

Fig 4.19.1: Q17 Exploded pie chart number of respondents from each of the eleven counties.

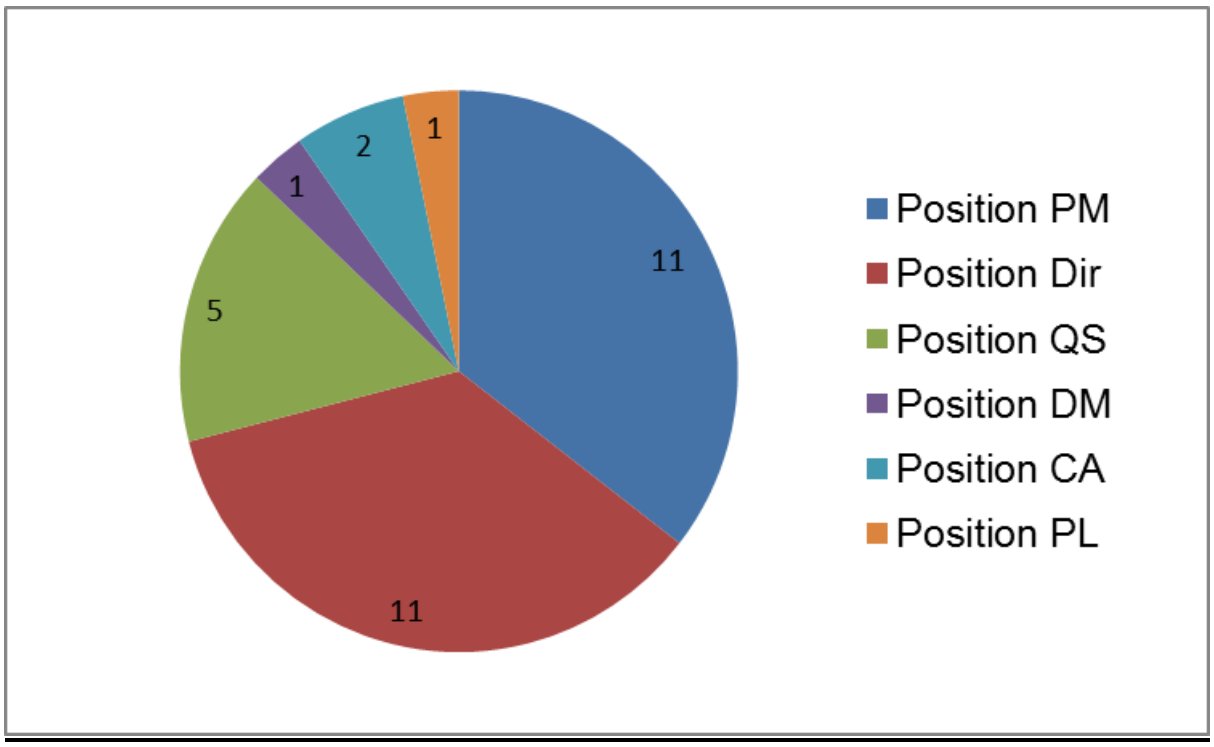

Fig 4 19.2: Q17 Pie chart number of professional positions of respondents

54% 23% 19% 3%

Fig 4.19.3: Q17 Column chart number of different business respondents.

In relating back to the individual ID responses, it was found that CA's, Design Cons., the DM and PL generally had a robust DC. The MC's needed to tighten up procedures except for the suggested Best Practice ID01-DIR-MC-UK and ID04-PM-MC-UK.

4.20: Q18. What would be your advice to achieve project success*?*

Five trends have been identified from within the sample population as shown below. Frustrations were also evident and can be seen within the responses in the appendices. The main find is a cry out for honesty, building of relationships, good timely communication, a full understanding of the clients brief and aspirations.

Table 4.20.1: Q18 Grouping of respondents' advice to achieve project success.

Q18 Trend 1	Q18 Trend 2
Achieve the trinagle of Time Cost and Quality, agree brief, agree clear realistic project goals which are measurable, adapt programme as necessary to get back on track, good teamwork and communication.	Robust communication procedure, complete client brief minimising changes, contractor must have a "Can Do" attitude and fully embrace the project goal, embrace a none adversarial project sharing gains and the risk, honesty and timely communication, early procurement, tracking all procurement and proof of product especially so in the Middle East, correct labour levels and capable manangement, cash flow must be gauranteed.
ID01-DIR-MC-UK (very good response)	ID31-PM-MC-BA (very good response)
ID02-PM-MC-UK	
ID04-PM-MC-UK	
ID10-PM-SCSA	
ID11-PM-SC-SA	
ID13-PM-MC-NI	
ID14-PM-MC-DU	
ID17-QS-MC-OM	
ID19-PM-MC-BA	
ID18-PM-MC-SA	
ID28-PM-SC-KU (very good response)	
ID29-DIR-MC-UK	
12 at 38.7%	1 at 3.3%

This was the only response that mentioned attitude, embrace of none adversarial project sharing the gains and the risk, tracking of procurement, labour levels and guaranteed cash flow so was put in its own trend.

Q18 Trend 3	Q18 Trend 4	Q18 Trend 5
Open trusting relationship, clients advising of intention re changes early, a clear brief, honesty required by all re dates and delivery, good buget control, timely and good communication, build on the understanding of shared objectives.	Full development of design and breif prior commencement on site, none changing of design, method or sequence by the client, will allow the main contractor to execute the works as priced.	Employing suitably qualified proffessionals who can communicate profficiently and effectively throughout the supplychain and carry out their roles as required.
ID06-DIR-SC-UK	ID05-QS-MC-QA	ID03-QS-MC-ABD
ID09-DIR-MC-SA	ID12-QS-SC-UK	ID07-DIR-MC-CA
ID16-DIR-DC-BA	ID24-PL-CA-BA	ID08-DIR-SC-SA
ID20-PM-CA-UK	ID26-PM-CA-UK	ID15-DM-MC-ABD
ID22-PM-CA-BA		ID21-QS-MC-SA
ID25-DIR-SC-BA		ID23-DIR-MC-CO
ID30-DIR-MC-UK		ID27-PM-CA-BA
7 at 22.5%	4 at 13%	7 at 22.5%

4.21: Q19. Respondents reply. The question was put in the table as below

Table 4. 21.1: Q19 Respondents added to the low, medium and high boxes.

Please fill in the boxes with an X. For example if you think 'Weather' has a large effect on project success ' enter X (for High) in the Weather row. Note there is no weather row it is used as an example so as not to lead.				
	The respondents answered as indicated	Low	Medium	High
1	Cash Flow	3	8	20
2	Speed of Decision response	1	8	22
3	Time - decision to reach the shop floor	0	11	20
4	Procurement	1	6	24
5	Motivation	0	13	18
6	Document control	4	15	12
7	Design & build-ability	2	10	19
8	Change orders	1	14	16
9	Communications	0	5	26
10	Control of the project	0	5	26

Please state your position:
E.G., Project manager =PM , Director = Dir, Quantity Surveyor = QS, Other

Position _____

Of the 31 respondents, the answers were as follows:

Q19. 9 & 10 i.e. Communications and Control of the project came in joint first place and scored highest at twenty-six, that is 84% followed closely in second place by Q19. 4: Procurement at twenty-four that is 77%. This backs up the researcher's criticism of the earlier paper by Mawsdley and Al-Jibouri Saad (2009) in which procurement was not considered. It is obvious control of the project and communications would come very high but it is the experience of the researcher who knew that procurement is paramount to project success so asked the question as without procurement there would be no project or it would never be successfully completed.

Q19.3: Speed of decision response came third which is twenty-two at 71% indicating a frustration within the lines communication and or a bottleneck see ID21-QS-MC-SA Q3 and ID31-PM-MC-BA, appendices, pages 72 and 31.

In joint fourth place came Q19.3 Time - decision to reach the shop floor twenty-two at 65% this supports the argument that time is the biggest waste within construction and that time only becomes a problem when it is running out. The speed of decision response to reach the shop floor is a crucial factor which in many cases is not measured. See ID31-PM-MC-BA, see appendices 31. The client, his agent and or the main contractor is sometimes oblivious to how long it takes to actually action on the shop or site floor, it could be weeks or even months. See ID21-QS-MC-SA, appendices page 72, ID22-DIR-CA-BA (not included) and ID31-PM-MC-BA question 3 In two instances there is clear frustration on the part of the respondents in the third there is at least acknowledgment of the problem and a solution / action suggested.

The findings showed that of the respondents from Saudi Arabia, cash flow was not an issue as the country is rich and payment comes easily so as not to stifle the project by inability for the contractor to pay his subcontractors or suppliers. However it still came in joint fourth place at twenty, which is 65%.

Table 21.2: Q19 Respondents who thought all choices had a high effect on project success

Respondents that thought and indicated all of the choices high.

ID04-PM-MC-UK ID06-DIR-SC-UK ID10-PM-SC-SA ID18-PM-MC-SA ID19-PM-MC-BA ID29-DIR-MC-UK ID31-PM-MC-BA	Of the list of respondents who indicated all high there does not appear to be much of a trend however there are no CA's and five of the seven are Main Contractors. Upon speaking to respondents who did not consider all high, they intimated that the reasons for a lower or medium effect in their opinion was that they had properly handled or executed their duties or had a bias if they were from the commercial profession.

Table 4.21.3: Q19 Number of responses from different countries in relation to the effect on project success.

Q19.		L	M	H
ABD	1	1		1
	2	1	1	
	3		2	
	4			2
	5		2	
	6		2	
	7		1	1
	8		1	1
	9		1	1
	10			2

Q19.		L	M	H
Ba	1		2	5
	2		2	5
	3		3	4
	4		4	3
	5		1	6
	6	1	3	3
	7		3	4
	8		3	4
	9			7
	10			7

Q19.		L	M	H
Ca	1			1
	2		1	
	3		1	
	4			1
	5			1
	6		1	
	7		1	
	8			1
	9			1
	10			1

Q19.		L	M	H
Co	1			1
	2			1
	3			1
	4			1
	5		1	
	6			1
	7		1	
	8			1
	9		1	
	10			1

Q19.		L	M	H
Du	1			1
	2		1	
	3		1	
	4			1
	5		1	
	6			1
	7			1
	8			1
	9			1
	10			1

Q19.		L	M	H
Ku	1			1
	2		1	
	3			1
	4			1
	5		1	
	6		1	
	7		1	
	8		1	
	9			1
	10			1

Q19.		L	M	H
Ni	1			1
	2		1	
	3		1	
	4			1
	5		1	
	6	1		
	7			1
	8	1		
	9			1
	10			1

Q19.		L	M	H
Om	1			1
	2			1
	3		1	
	4		1	
	5			1
	6		1	
	7			1
	8			1
	9		1	
	10		1	

Q19.		L	M	H
QA	1		1	
	2			1
	3			1
	4			1
	5		1	
	6			1
	7		1	
	8		1	
	9		1	
	10			1

Q19.		L	M	H
SA	1	1	2	3
	2		1	5
	3		1	5
	4			6
	5		2	4
	6	1	3	2
	7	1		5
	8		4	2
	9		1	5
	10		1	5

Q19.		L	M	H
UK	1	1	3	5
	2			9
	3		1	8
	4	1	1	7
	5		3	6
	6	1	4	4
	7	1	2	6
	8		4	5
	9			9
	10		3	6

100% i.e. all nine UK respondents indicated Communication and Speed of decision response as high.

100% i.e. all seven Bahrain respondents indicated Communication and Control of the Project as high.

100% i.e. all six Saudi respondents indicated procurement as high.

The remainder involving lesser respondents per country is self-evident and explanatory.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The following chapter summarises the thoughts of the professional of how to improve communication with the intent to build relationships achieve project success and identifies a shortcoming in DC by proving there is no standard filing system within the industry.

5.2 Conclusions

It appears that the majority of SME's are still lagging behind advances in document control. It further appears that most new projects of all sizes and value start as if it has never been done before especially if a new project manager has joined the company, they are left to their own devices all be it given a file with the project details, subcontractors contact details, the clients contact numbers and drawings.

It was honesty and truthful communication and the building of trusting relationships which stood out as the desired and required want of the responding professionals, note, that, it is across the board, from Clients Agents to Sub-contractors and Main Contractors. It is more than a perception, it is fact.

Cash flow should be guaranteed subject to agreement using Escrow accounts if needed to protect all parties to the contract and encourage trust and drive the project to complete on time. An Escrow account would be used in this instance as the total amount of the project, including contingency fund or provisional sums, prior to any amendment's, held by a bank which is independent of the client or customer, who shall release monies for payment as they become due and after having proof of work done, signed by the customer or their agent, CA.

Procurement which includes placing and tracking is extremely important as time wasted by assumption, all is well, as the paperwork is done, is the silent enemy of project success.

One of the most surprising findings from the survey was a certain project in the Middle East was underway, the approximate value was £3.4 billion, the estimated labour force on site including subcontractors at its peak was to be 30,000 and there was no filing system in operation for the respondents discipline, it was quote ‘left to the individual project manager.’ ID05-QS-CA-QA appendices page 70. However the project does have a WBPMS in place that is ‘Constructware’. The researcher knows the respondent personally and so can categorically state from experience that the project manager is a tried and tested individual who has brought with him a system which he has used over the years and found to be workable and manageable. He has ensured that his system is installed and utilised on site however when or if things do not go well or if he decides to leave the company for new employment and the Project manager is replaced a new manager, with his own system, will be installed and the learning curve will begin again. The risk factor alone should have picked this shortcoming up, when a mega project, lasting several years, may incur staff turnover. Procedures should be in place so as not to lose data.

ID27-PM-CA-BA at the second highest project value of £500million is a further example and support of the findings that each project even in the same company has different DC system and procedures. On each project within the organisation a DC system is probably implemented by the most senior and experienced professional who started the project, however that same professional may not finish the project so the learning curve starts again when the replacement comes along.

The make or break of a project is not the document control or filing system but it is a major factor ensuring the customer is kept properly informed, records are chronologically kept and that a director, new project manager, quantity surveyor or commercial manager when visiting a site or covering for holiday can find records and documents pertaining to the project, be they instructions, change control, labour levels, plant levels, emergency numbers, the list goes on.

There are some shining light, i.e. good examples of document control and communication namely WH Snow Contractors, see ID01-DIR-MC-UK, page 67 - 69 who are a SME, family owned company who have been operating for more than 114 years. They have a rigid document control system including a filing system which

operates throughout their organisation on all projects without fail. Recommendations described later emulate their example as Best Practice.

5.3 TARRC

- Time wasted, is the silent enemy of project success.
- Assumption is an excuse for not checking or inspecting.
- Records and filing are invaluable evidence of happenings when things go wrong or agreeing the final account.
- Relationship building and trust by truthful and timely communication from all parties to the contract is paramount to avoiding adversarial conflict.
- Communication and Document Control is the key to project success.

5.2 Research limitations

Due to low response received from the LinkedIn network site, the researcher used his own contacts who are a varied group of professionals within their own speciality. The total number of contacts was forty-three of only thirty-one replied which was 72%. The research although from a small population was across eleven countries, thirty-one companies, six professional disciplines and four business disciplines. As this dissertation was executed in the UK, perhaps the respondents would have been better all coming from the UK however there appeared very little difference to the fact that the respondents were from different countries, the failings and good examples of DC were common throughout. Furthermore the initial intention was to have a mix of interviews and emailed questionnaires hence the title Interview / Questionnaire; however there was reluctance to interview by the sample population, only two actually interviewed.

5.3 Recommendation

A nationwide further investigation of companies needs to be made to enquire do they have a company document control and filing system used on all their projects without fail? This would give support to the findings of this initial research survey.

A further investigation of wasted time only, the waiting for delivery, waiting for decision, waiting for the finished instruction containing direction be it drawings or details.

It is recommended that a site set up including a site filing system is established across all construction companies as a standard. In doing this it would mean that any project manager or director or other concerned professional from any company could visit site and know exactly where all records are kept. It would be welcomed by all professionals as the learning curve would be near enough eliminated when starting in a new company.

The customer would benefit as they too would know how and where all records are kept and could request certain information, subject to agreement of the contractor. For example if all records are kept in file no.8 the customer or the CA could ask to see file no.8, or file no 7 which would be the health & safety file. Visiting local authorities and statutory services would also benefit as they would be able to ask for specific file numbers and find details of existing services, new services planning permissions etc.

Partnering contracts would benefit especially from this setup as the whole system lends itself to open book.

A customer could request that any contractor bidding for work must comply with the system. It would guarantee a TQM of the site procedures and record keeping.
A project manager could go to any project in the country or if it was used globally anywhere in the world and find all relevant information it would be a common practice a common language.

John Egan (1998) said we must think differently we must change, in this instance the researcher recommends we think the same, we must have a common system throughout the construction industry, just as RIBA 2007 with their plan of work, or the guidelines and procedures laid down by PMI or Prince2, who do not specialise in construction, we must state the filing index and system including the record keeping which must be the same on all projects large or small. The system could be used by the smallest of projects, using only one file and expanded to suit the larger projects but still using the same index.
The aim is to standardise project document control which would include the index.

The system can be called Standard Document Control for Construction and Civil Engineering Projects, 2011. (SDCCCEP2011)

A standard filing system could be taught in the colleges and universities a graduate, trainee or apprentice could start on site and know where for example the Health and safety file is, that would be for example file 7 and where he could find emergency numbers for the client or services such as water, gas, electric or any other. The UK and Northern Ireland construction industry abiding by The health and Safety at Work Act 1974 state that welfare conditions etc. should be displayed in all canteens showing emergency numbers for police and ambulance / nearest hospital, as standard and is law. The industry could go further and standardise the filing system as a QA procedure eliminating or vastly reducing the learning curve of any new employee.

Further recommendation would be to collect sample standard forms and templates in use, select the best and submit them to a professional body for their recommendation as the Industries Standard Forms which can have a text box header for company logo's address etc. As one respondent to Q14 How would you or what would you recommend for improving communication between the customer and the contractor and or the whole supply chain? Answered: "Not applicable as systems are constantly evolving. i.e.ID17-QS-MC-OM, of which the researcher acknowledges to be true, so suggests templates can be standard but can evolve as and when required across the industry.

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Appendices

Appendix A, Site Filing Index

Appendix B, Project Site File layout for PC

Appendix C, ID01-DIR-MC-UK

Appendix D, ID05-DIR-QS-QA

Appendix E, ID21-QS-MC-SA

Appendix F, ID27-PM-CA-BA

Appendix G, ID31-PM-MC-BA

Appendix H, Sample Questionnaire

Appendix I, Sample Filing system from one respondent, ID07-DIR-SC-CA

Appendix J, Pilot Questionnaire

Appendix K, Raw Data

Appendix A, Site Filing Index

PROJECT / SITE FILING INDEX

1.0 Pre & Post Contract Commercial

1.1 Invitation to Tender / Tender Response
1.2 Contract Documents
1.3 Insurance
1.4 Bill of Quantities
1.5 Contract Budget
1.6 Specification
1.7 Variations
1.8 Day work Sheets from Contractor to Client
1.9 Day work sheets from Sub contractors as Back-Up

2.0 Correspondence

2.1 Architect / Contract Administrator / Clients Rep., or Agent, CA
2.1.1 Correspondence to each.
2.1.2 Correspondence from each.
2.1.3 Drawing Issue Cover Sheets
2.1.4 Instructions
2.1.5 Copy of COI Confirmation of Instructions
2.1.6 Copy of CVI Confirmation of Verbal Instruction- to Client / Clients Rep., CA
2.1.7 Internal Memorandum
2.1.8 Notices Issued / Received (7 day Notices, Legal Notices etc.)
2.1.9 Structural Engineer
2.1.10 Structural Engineer other

2.2 Client

2.2.1 Correspondence to
2.2.2 Correspondence from
2.2.3 Any other Records

2.3 Consultants

2.3.1 Correspondence to each Consultant
2.3.2 Correspondence from each Consultant
2.3.3 Drawing Issue Cover Sheets
2.3.4 Any other Records

2.4 Statutory / Local Authorities / Civil Defence

2.4.1 Correspondence to each.
2.4.2 Correspondence from each.
2.4.3 Applications / Licence
2.4.4 Certification / No Objection / Final Inspection / Letter of Satisfaction
2.4.4 Any other Records

3.0 Sub-Contractors (List all Sub-Contractors and their discipline / Trade, in Trade / Build Order then Alphabetically)

Sub Contract Order / Instructions
Correspondence to each Sub-contractor
Correspondence from each Sub-contractor

3.1 Test Certification all Disciplines / Trades
3.2 Sub-contractor Day work sheets

4.0 Suppliers

- **4.1** Correspondence to each supplier
- **4.2** Correspondence from each supplier
- **4.3** Materials
- **4.4** Skips
- **4.5** Material Transfer Note
- **4.6** Material Issue Note
- **4.7** Material Approval Sheet
- **4.8** Material Requisition Form

5.0 Meetings

- **5.1** Contract Review
- **5.2** Site Team Review
- **5.3** Progress meetings
- **5.4** Any other minutes

6.0 Plant & Equipment

- **6.1** Purchase Order / Requisition
- **6.2** Plant Received Sheets
- **6.3** Plant Return Sheets
- **6.4** Inspection, Test certificates

7.0 Safety

See separate file

7.1 O & M Manuals see Separate File (PM to Advise)

8.0 Records

- **8.1** Site level / Setting out Records
- **8.2** Inspection of Work Record
- **8.3** Snagging (Separate Files required)
- **8.4** Sectional / Area Inspection & Handover
- **8.5** Site Daily Diary
- **8.6** labour Levels
- **8.7** Delay Records
- **8.8** Document Transmittal Sheets or Document Issue Notices
- **8.9** **RO** Record / Observation (Include Meter Readings at Date of possession & occupation / Handover)
- **8.10** **RFI** Requests for Information
- **8.11** **COI** Confirmation or Instruction – Architect / Clients rep / CA
- **8.12** **CVI** Confirmation of Verbal Instruction- Sub Contractors
- **8.13** **NCR** Non Conformance Report
- **8.14** Fire Alarm Contractor Request Forms (working on existing systems)
- **8.15** Other misc., e.g. record of thermostat status, etc.

9.0 Programme

- **9.1** Contract Programme
- **9.2** Construction Programme
- **9.3** Short Term Programmes
- **9.4** Sub-Contractors Programmes
- **9.5** Procurement programmes
- **9.6** Procurement Schedule
- **9.7** Material Tracking Schedule
- **9.8** Risk Register

10.0 Drawings

- **10.1** Architect
- **10.1.1** Door Schedule
- **10.1.2** Ironmongery Schedule
- **10.2** Services Consultant
- **10.3** Structural Engineer
- **10.4** Sub-Contractors
- **10.5** Suppliers
- **10.6** Visuals and mock-ups

11.0 Technical

- **11.1** Technical Literature
- **11.2** Any other Records

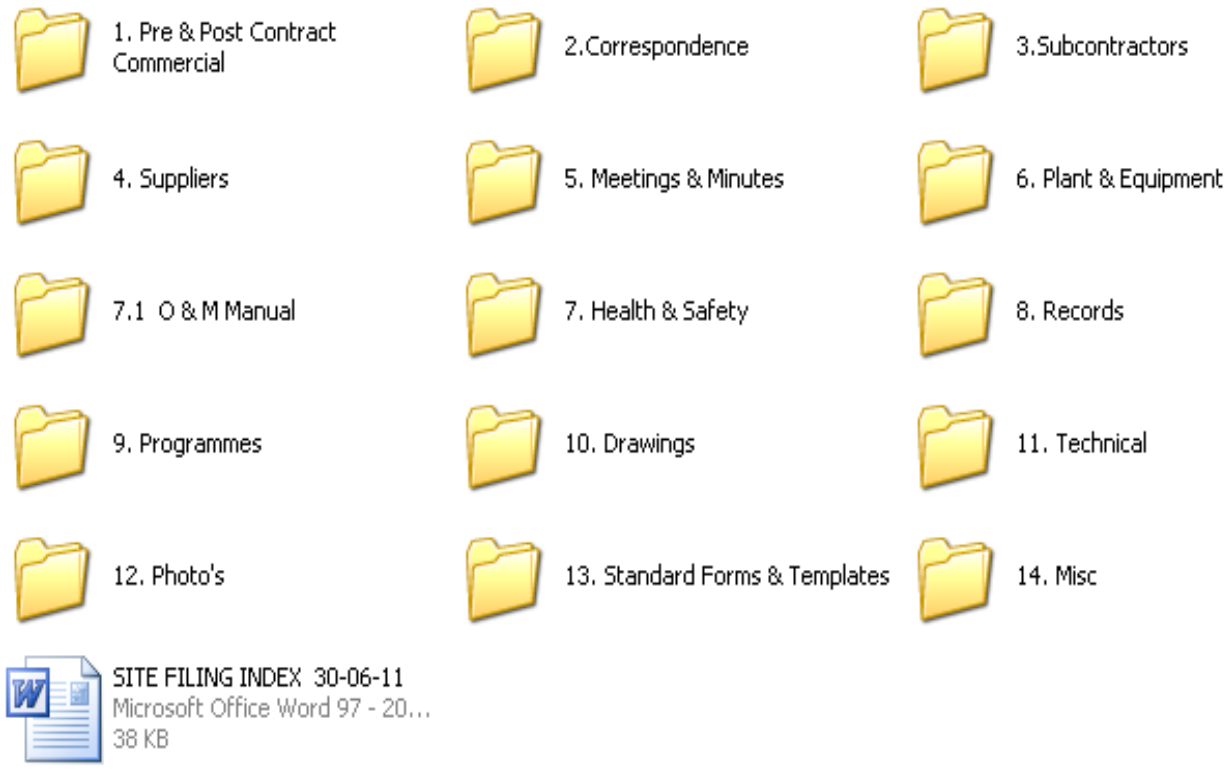
12.0 Photo's

- **12.1** Progress
- **12.2** Delap's., precondition survey etc.
- **12.3** Defects
- **12.4** Samples
- **12.5** Mock-ups
- **12.6** Staff photo's
- **12.7** Scans
- **12.8** Misc.

13.0 Standard Forms & Templates

14.0 Miscellaneous

Appendix B, Project Site File layout for PC



Print Screen PC. The folders are further subdivided as per the Site Filing Index

Appendix C, ID01-DIR-MC-UK

1. How does your company avoid adversarial relationship or conflict with your customer or their agent?

"Sometimes we don't" 'Problems should be resolved at site level. Each Director has a group of clients that he is responsible for maintaining a good relationship, to make sure that they are happy with the performance of the project and the Project Manager although it is not a formal role. We expect the Project Manager to have a good relationship with the client or his agent it is only if things start to break down we take a more hands on role on site.'

2. How are changes communicated through your supply chain i.e. staff and subcontractors?

By correspondence and use of standard forms that the company has in place. For example RFI's (requests for information) Confirmation of verbal Instruction (COVI's) Confirmation of Instruction (COI's) Record of Observation (RO's) Researcher" Why RO's ? ". Interviewee "An RO is used as a courtesy to the client and to record things as they are at that particular time. Some clients or their representatives at first considered them as an xxx covering exercise until they appreciated what they actually did when they had to refer back to that particular day or item and then they would appreciate the record." [Standard Forms]

3. How long does it take, from the moment of decision for your company to action changes on the shop floor? I.e. from decision to action?

"Immediately, Straight away" 'The PM would record the instruction and confirm it back them in writing and then on to the subcontractors using the standard forms."

4. Is the time taken from decision to commencement of action on the shop floor measured? I.e. for every decision for example recorded in a log?

"Yes within a variation register and within the programme which would show any cause and effect on the project?" "We would advise the client how long the action would take and the date or time commencement or the work would begin.

5. How does your company ensure that your subcontractors on the shop floor i.e. site floor are using the correct / current drawings? With the latest revisions?

"The Site manager manages the process; the site manager stamps and signs personally all drawings and inspects what drawings that they are using on site. If they are not stamped then they are not current.

6. Does your company operate document control procedure and if so how is it implemented?

"Yes. We have standard templates etc. We have a certain filing system and I know that if I go to site, that file number 8 holds all records so I can go to that file and pull out whatever I need for example RFI's Instructions or whatever."

7. Does your company employ an individual document controller i.e. gate keeper on site or in the office or both?

"No. All document control is carried out by the site manager" The QS has his own commercial file in the office but the site manager has a copy of all correspondence so he knows what's going on."

8. Has your company used a shared software document control application with a customer and if so which one? For example 'Aconex - online information management solutions'

"No. I have never heard of Aconex and I don't know what it is?"

9. Do you think a paperless document control facility would be beneficial?

"No! There are problems with site drawings and the subcontractors do not have that facility."
"As you know yourself Site Drawings need to be on paper so you can open them up on a table or on the site floor. Printing is just passed on to another so it is not eliminated."

10. Do you think there are disadvantages to using the paperless document control?

"Yes just as I said before, not everyone has computers and you can't drag a laptop around on site with you." You need paper copies of drawings so you can spread them out and gather around them."

11. Would your company be willing to use a paperless shared document control with your customer for duration of a project, for example Aconex?

''Yes, we would do whatever the client wanted. ''
'' If the client requested it then the cost incurred would be included in our price.''

12. Do you have a site filing system that is used throughout your organization on all projects without fail or question?

''Yes, the .....company system. As I said earlier all sites are the same, if ever a director goes to site the filing system is the same and he can find whatever he wanted as he would know exactly where to look. ''

Researcher '' So what you're saying is even if the site manager is off ill or on holiday it would be easy for another company guy to step in as all the systems are there and it minimises the learning curve?

Interviewee, '' Correct.''

Appendix D, ID05-DIR-QS-QA

9. Do you think a paperless document control facility would be beneficial?

Constructware is electronic and then left to the individual to print any document [Yes]

10. Do you think there are disadvantages to using the paperless document control?

Not really. So long as the individual has the option to print the documents they require. [For the purpose of the survey, if the individual does not have the option or the

11. Would your company be willing to use a paperless shared document control with your customer for duration of a project, for example Aconex?

Yes it is doing

12. Do you have a site filing system that is used throughout your organization on all projects without fail or question?

No, it is left to the individual project manager. [Where is the Risk Strategy? Imagine the possible claims situations here if the Project Manager does not record changes, communications, time waiting for decisions vigorously and unless the Project Manager is very experienced there could be potential dispute, a very adversarial project and even substantial loss. Furthermore there could be a different project Manager on another project all working for the same company doing it their own way? Note the researcher knows the respondent personally and can state that the individual is a very experienced professional who is more than capable however cannot vouch for other PM's on other projects within this organisation.]

13. Would you be willing to supply a sample of your site filing index for this survey?

It doesn't really exist. So no

14. How would you or what would you recommend for improving communication between the customer and the contractor and or the whole supply chain?

I think this is best done by meetings, where each side will concentrate on the issues important to them. I do not think there is anyway of improving written or electronic correspondence.
Some project managers do not consider more meetings productive and may not be in favour of this.

15. What is the average value of a typical project that your company are involved with?

Don't know – haven't been here long enough. The project we are on now is the only job they've ever had in Qatar and its equiv to BD2 Billion. I think they'll be up to 30,000 on site at a peak. [BD2 Billion is approx £3.4 Billion]

16. What is the approximate number of operatives on an average site including subcontractors?

Sorry don't know, but I think they'll be up to 30,000 on site at a peak.
its ridiculous, but haven't got anything else to put to you

17. What is your business? I.e. Main contractor, Clients Agent or Sub Contractor?

PQS consultancy [For the client / developer]

18. What would be your advice to achieve project success?

Good old fashioned development of design before striking a blow on site.
Not changing design or method or sequence will allow the contractor to carry out his plan as he priced. [Trend 4]

Appendix E, ID21-QS-MC-SA

1. How does your company avoid adversarial relationship or conflict with your customer or their agent?

We form our relationships with our Clients on a long term basis with a view to winning future work from the Client and then keeping the Senior Key members of the construction team working with the same Client over a number of Projects. We believe that this by taking this attitude towards our Clients we build good working relationships on a personal level and the knowledge learnt on one Project will be carried forward onto the next Project to enable the construction process to run more efficiently. By taking a long term approach to working with our Clients the relationship between us and our Clients becomes naturally less adversarial and more one of working together

2. How are changes communicated through your supply chain i.e. staff and subcontractors?

Internally all changes with regards to Subcontract Quantities and Specifications have to be added to the PMA Permanent Material Authorisation Report so that the Subcontract Value is constantly revised and updated. [Standard forms]
All Subcontractors require their Subcontract Order to be amended in line with their revised scope of work to include design or specification changes prior to commencing any additional works

3. How long does it take, from the moment of decision for your company to action changes on the shop floor? I.e. from decision to action?

This can be a lengthy process. Changing a PMA as described above and getting it signed off by a number of senior staff can take 2 weeks to 2 months which slows up work on site a great deal

4. Is the time taken from decision to commencement of action on the shop floor measured? I.e. for every decision for example recorded in a log?

Yes the dates are recorded in a monthly report when the change was first requested right through to the PMA being signed off by Senior Management, the Subcontract Amended and the Subcontractor/Supplier commencing the works on Site

5. How does your company ensure that your subcontractors on the shop floor i.e. site floor are using the correct / current drawings? With the latest revisions?

Drawings are stamped for construction before they are issued to the Construction team but once those drawings are superceded there is no system in place to ensure that they are not worked to and that the new revision is used.

The system is open to failure as it relies on communication between the design Engineers and the Construction team to ensure that when the Engineers issue the latest revision of a drawing that only this issue is worked to and the old issue is archived

6. Does your company operate document control procedure and if so how is it implemented?

There is a large document control team on site. Every single piece of paper on the site, both incoming and outgoing must go through document control.

All incoming mail to document control is then issued to the Senior Project Director who after the document is stamped by Document Control is then distributed to the relevant people for their information and further action

7. Does your company employ an individual document controller i.e. gate keeper on site or in the office or both?

We employ a Senior Document Controller on site with a team of 6 assistants due to the large volume of documentation that passes through the office everyday

8. Has your company used a shared software document control application with a customer and if so which one? For example ‘Aconex - online information management solutions’

We use 4 Projects

13 Would you be willing to supply a sample of your site filing index for this survey?

[XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXX] [No]

14 How would you or what would you recommend for improving communication between the customer and the contractor and or the whole supply chain?

The Client needs to better understand the implications of the late and sometimes huge changes that he makes. The Client cannot see that making one change can have a huge knock effect in the design of the project, the procurement of the correct materials and the possible additional/ remedial works that might have to be carried out on site to accommodate his late changes. To resolve this you have to build a good working relationship with a Client of a period of time and over a number of Projects to gain his trust so that you can explain fully to him the implications that his actions have on the Project in an effort to better the Clients aspirations which are sometimes unrealistic

15 What is the average value of a typical project that your company are involved with?

GBP300 to 600 million [Say £450m]

16 What is the approximate number of operatives on an average site including subcontractors?

3,000

17 What is your business? I.e. Main contractor, Clients Agent or Sub Contractor?

Main Contractor

Appendix F, ID27-PM-CA-BA

9. Do you think a paperless document control facility would be beneficial?

In an ideal world, a paperless document control system would be beneficial to the costs and sustainability targets of the company, however my personal experience is that it is essential to have hard copies of particular correspondence, such as detailed design drawings etc. [Yes]

10. Do you think there are disadvantages to using the paperless document control?

Following on from above, it largely depends on the industry. Very often it is difficult to view large documents in electronic format. I would note however that the advantages of a paperless DT control system may outweigh any disadvantages. [Yes]

11. Would your company be willing to use a paperless shared document control with your customer for duration of a project, for example Aconex?

Our company would be willing to take part in any trial which may ultimately improve to service we provide to our customer and benefit the company in terms of sustainability and cost. [Yes]

12. Do you have a site filing system that is used throughout your organization on all projects without fail or question?

No, each project operate various document control systems. [This is exactly what the survey is looking for, proof that each project, even in the same company has different DC systems and procedures. It is probably implemented by the most senior / experienced professional who started the project. However that same individual may not be the one who finishes the project. What happens then, is the new PM or team have to sift and filter through what has gone before, find records, documents, correspondence etc. the learning curve can be greatly reduced if a standard system existed.]

13. Would you be willing to supply a sample of your site filing index for this survey?

Yes

14. How would you or what would you recommend for improving communication between the customer and the contractor and or the whole supply chain?

Happy with the document control system, however towards the end of this particular project, we have identified that more effective communication during the construction period and change management process, would have prevented various misunderstandings and disputes during the commercial close out process.

[The comment re identifying more effective communications etc. needs to be added to the lessons learned log and distributed throughout the company]

15. What is the average value of a typical project that your company are involved with?

Depends on location – Middle East £500 Million.

16. What is the approximate number of operatives on an average site including subcontractors?

5000 +

17. What is your business? I.e. Main contractor, Clients Agent or Sub Contractor?

Project Manager/ Engineer – Client's Representative

Appendix G, ID31-PM-MC-BA

1. How does your company avoid adversarial relationship or conflict with your customer or their agent?

- By being honest and open and correctly communicating the true position on site with reference to progress.
- By timely communication to the customer
- By use of early warning indicators advising of any possible risk to the project aims and goals be it time, cost or quality not forgetting environmental and social effects.

2. How are changes communicated through your supply chain i.e. staff and subcontractors?

By DIN (Document Issue Notice) or DTN (Document Transfer Notice) within the notice will be a list of communicated documents which could be a change order, new drawings, an Instruction, etc. [Standard forms]

3. How long does it take, from the moment of decision for your company to action changes on the shop floor? I.e. from decision to action?

Depending on the scale of the decision or change it could be hours to weeks. What needs to be ensured is that there is no bottle neck within the document control system i.e. that there is no backing up of DIN's due to the workload of the document controller i.e. the Gate Keeper. For example a decision may have been made by the customer but to actually get that decision communicated through the supply chain, to get the action or change to be acted upon on the shop floor should be closely monitored and recorded as there are many decisions and changes which could add time to the project. It is in the interest of the contractor that this time is minimised. It is also in the interests of the customer that decisions are acted upon and the time recorded so as not to be falsely attributed to the actual waiting for a decision from the Engineer, CA or customer. [Say days]

4. Is the time taken from decision to commencement of action on the shop floor measured? I.e. for every decision for example recorded in a log?

Yes. Time is measured from decision to actually commencing on the shop floor . However time is not measured from the decision to actual receipt of the required actor within the supply chain. It should be measured for reasons as before described in No. 3

It would be beneficial to include the time in a log, especially on larger projects.

5. How does your company ensure that your subcontractors on the shop floor i.e. site floor are using the correct / current drawings? With the latest revisions?

- By ensuring a current drawing register is in place and that all actors are using the latest edition via meetings and communication.
- By walking the site and inspecting the drawings that the operatives have in their possession. (This although is time consuming, it is very effective as the head office of the contractor may not have timely issued the new drawings or decision to the site floor)

6. Does your company operate document control procedure and if so how is it implemented?

Previous companies I have worked for have operated a document control procedure, one of which I personally have embraced and adapted to suit any new company I joined who did not have a standard Document Control (DC) Procedure. The majority of which I have found not to have a sufficient or standard DC procedure i.e. the existing DC was insufficiently developed only templates, very basic.
Therefore a site filing index is set up, on the computer and in hard copy on site, all communications, are properly stored within the index using the company's standard forms. There are set standard communications within the industry which we all know of for example Request for Information RFI etc. so record keeping now becomes easy to maintain. All actors are aware of the filing procedures so any information can be found subject to hierarchical authority clearance of course.

7. Does your company employ an individual document controller i.e. gate keeper on site or in the office or both?

My last company did employ a Document Controller (Gate Keeper) at head office not on site, it was here where I experienced the bottle neck / back up of information waiting to be issued to the actual actors on site. Remedial action taken was to spread the workload i.e. the individual site became the DC removing a link in the chain, ensuring timely distribution of communication. [Yes] At my previous company, The Project Manager was his own DC supported by his Portfolio / Contracts Manager who ensured timely communication of Drawings instructions etc.

8. Has your company used a shared software document control application with a customer and if so which one? For example 'Aconex - online information management solutions'

Yes Aconex

9. Do you think a paperless document control facility would be beneficial?

No. Hard copies are always required on site for example drawings need to be on the site floor not in a computer. However the paperless communication i.e. emails is time saving and environmentally friendly. Not all communications need to be printed so it could save money also.
Academics, authors and promoters of paperless DC continually fail to understand that operatives need hard copy drawings at their disposal, at the work face.

10. Do you think there are disadvantages to using the paperless document control?

Yes, as before described in No.9

11. Would your company be willing to use a paperless shared document control with your customer for duration of a project, for example Aconex?

Yes my last company in the Middle East used Aconex.

12. Do you have a site filing system that is used throughout your organization on all projects without fail or question?

Speaking for my most recent employer, no.
Remedial action was to introduce my own, as before described in Q6.
[The respondent acknowledges that there is no filing system further supporting of lack of risk management and possible learning curves involved if or when the management changes adding further support to the dissertation argument]

13. Would you be willing to supply a sample of your site filing index for this survey?

Yes

14. How would you or what would you recommend for improving communication between the customer and the contractor and or the whole supply chain?

- Timely communication and monitoring the speed of information transfer to actual action through the supply chain.
- Be open and honest with the customer; ensure that they are aware of the difficulties as well as the benefits through communication.
- Material / procurement tracking is essential and should be open book.
- Request honesty from the suppliers and guarantee of delivery be it material or action / work completion.

15. What is the average value of a typical project that your company are involved with?

BD100million i.e. £170million
[Q16 3000 average operatives]

18. What would be your advice to achieve project success?

- To establish a communication system that all actors should follow
- To ensure a complete Client brief
- Minimise changes by ensuring the complete Client brief
- Ensure the contactor has a “can do attitude” and fully embraces the project goal.
- Embrace a none adversarial project sharing the gains and the risk
- Ensure honesty and timely communication.
- Active participation by the clients agent CA
- Early procurement, avoid false promises
- Track all procurement and ensure proof of product especially in the Middle East
- Ensure correct labour levels, and capable management.
- Cash flow must be guaranteed.

Appendix H, Sample Questionnaire

1. How does your company avoid adversarial relationship or conflict with your customer or their agent?

2. How are changes communicated through your supply chain i.e. staff and subcontractors?

3. How long does it take, from the moment of decision for your company to action changes on the shop floor? I.e. from decision to action?

4. Is the time taken from decision to commencement of action on the shop floor measured? I.e. for every decision for example recorded in a log?

5. How does your company ensure that your subcontractors on the shop floor i.e. site floor are using the correct / current drawings? With the latest revisions?

6. Does your company operate document control procedure and if so how is it implemented?

7. Does your company employ an individual document controller i.e. gate keeper on site or in the office or both?

8. Has your company used a shared software document control application with a customer and if so which one? For example ‘Aconex - online information management solutions’

9. Do you think a paperless document control facility would be beneficial?

10. Do you think there are disadvantages to using the paperless document control?

11. Would your company be willing to use a paperless shared document control with your customer for duration of a project, for example Aconex?

12. Do you have a site filing system that is used throughout your organization on all projects without fail or question?

13. Would you be willing to supply a sample of your site filing index for this survey?

14. How would you or what would you recommend for improving communication between the customer and the contractor and or the whole supply chain?

15. What is the average value of a typical project that your company are involved with?

16. What is the approximate number of operatives on an average site including subcontractors?

17. What is your business? I.e. Main contractor, Clients Agent or Sub Contractor?

18. What would be your advice to achieve project success?

19.

Please fill in the boxes with an X. For example if you think 'Weather' has a large effect on project success ' enter X (for High) in the Weather row. Note there is no weather row it is used as an example so as not to lead.				
		Low	Medium	High
1	Cash Flow			
2	Speed of Decision response			
3	Time - decision to reach the shop floor			
4	Procurement			
5	Motivation			
6	Document control			
7	Design & build-ability			
8	Change orders			
9	Communications			
10	Control of the project			

Please state your position:
E.G., Project manager =PM , Director = Dir, Quantity Surveyor = QS, Other

Position _____

May I take this opportunity to thank you for your time in completing this survey.

There is no right or wrong answers, the information gathered will be collated for the purpose of a University dissertation which is attempting to identify best practice of communication within a construction project and ascertain if communication, organizational control of documents and methodology is one of the main factors in achieving project success. Communication; The key to project success (Construction Industry only) or please send email back to me terencemcdonough@gmail.com

Appendix I, Sample Filing system from one respondent, ID07-DIR-SC-CA

SITE MASTER FILES

FILE NO.	FILE HOLDER	DESCRIPTION	FILING BASIS
Correspondence and Minutes of Meetings			
0.0	ADMIN	Correspondence to POSCO	date, ref no.
0.1	ADMIN	Correspondence from POSCO	date, ref no.
0.3	ADMIN	Acknowledgement of Site Instructions	numerical
0.4	ADMIN	Minutes of Client Meetings	numerical
0.4.1	ADMIN	Minutes of Design Meetings (Arup/JRP)	numerical
0.4.2	ADMIN	Minutes of Project Progress Meetings (CK)	numerical
0.4.3	ADMIN	Minutes of Coordination Meetings (POSCO)	Numerical
0.4.4	ADMIN	Commissioning Meetings	Numerical
0.4.5	ADMIN	Minutes of Internal Weekly Progress Site Meetings	Date
0.4.6	ADMIN	Minutes of Internal Procurement Meetings	Date
0.5	ADMIN	Weekly Labour and Plant Returns	date, ref no.
Stakeholder Correspondence			
1.0	ADMIN	Correspondence To/From Vattanac	date, ref no.
1.1	ADMIN	Electricity / Drainage and Water Board - Correspondence To/From	date, ref no.
1.2	ADMIN	IT / Telecom - Correspondence To/From	date, ref no.
1.3	ADMIN	Police and Emergency Services - Correspondence To/From	date, ref no.
1.4	ADMIN	Local Authority - Correspondence To/From	date, ref no.
1.5	ADMIN	Environment Agency - Correspondence To/From	date, ref no.
1.6	ADMIN	HSE Inspectorate	date, ref no.
1.7	ADMIN	Fire Officer Correspondence	date, ref no.
1.8	ADMIN	General Public	date, ref no.
Personnel and Human Resources			
2.0	ADMIN	Timesheets Payroll	I
2.1	ADMIN	Appointed Persons Notifications	Alphabetical
2.2	ADMIN	Personnel Monthly	
2.3	ADMIN	Personnel Issue File including PPE Issue Sheets	
2.4	ADMIN	Site memoranda & notices	Date
Plant and Materials			
3.0	ADMIN	Plant Orders (Copy)	
3.1	ADMIN	Plant on / off hire	alpha, date
3.2	ADMIN	Correspondence to Plant Suppliers	alpha, date
3.3	ADMIN	Potential Suppliers general Correspondence	
3.4	ADMIN	Actual Suppliers Correspondence	
3.5	ADMIN	Materials Request (Copy) and LPO's	date, ref no.
3.6	ADMIN	Material Delivery Tickets	date, ref no.
3.7	ADMIN	Invoices Pending and Cleared	date, ref no.

3.8	ADMIN	Advice & Transfer Notes	date, ref no.
3.9	ADMIN	Material Returns	date, ref no.
3.10	ADMIN	Petty Cash	
FILE NO.	**FILE HOLDER**	**DESCRIPTION**	**FILING BASIS**
Sub-contractors			
4.0	ADMIN	General Correspondence to all Sub Contractors and Suppliers	date, ref no.
4.1	ADMIN	Correspondence to/from Potential Subcontractors Labour Only	alphabetical
4.2	ADMIN	Correspondence to/from Potential Domestic Subcontractors	alphabetical
Project Management and Planning			
5.0	CON	Work Execution Plans	*
5.1.0	CON	Contract Programmes	
5.1.1	CON	Phasing Plans	Numerical
5.1.2	CON	Weekly Site Programmes (3 Weekly)	Numerical
5.1.3	CON	3 Weekly Programme Mark-ups	Numerical
5.1.4	CON	Suppliers and Subcontractors Programmes	Numerical
5.2	CON	Risk Registers	Date
5.3	CON	Delivery Schedules	
5.4	CON	Material Schedules	
Construction Correspondence			
6.0	CON	Specifications	Numerical
6.1	CON	Construction Drawing Issue Sheets	Numerical
6.2	CON	Sub-contractor Drawing Register and Transmittals	Numerical
6.3	CON	Construction Drawings, Schedule, Data Sheets, Register and Transmittals	Numerical
6.4	CON	Supplies/Sub-con Drawings, Schedules, Data Sheets Register and Transmittals	Alphabetical/Numirical
Change Control			
7.0	CON	Early Warning Notifications	
7.1	CON	Request for Information/CK Technical Queries Generated	Numerical
7.2	CON	Request for information/Technical Queries from Third Parties/Suppliers	
7.3	CON	Comments on Drawings, Data Sheets Schedules etc	Numerical
Site / Construction Management			
8.0	CON	Contractors Proposals	Numerical
8.1	CON	Temporary Works Register and Drawings	Numerical
8.2	CON	Material Certificates	material type
8.3	CON	Material Call Off Files inc. Reconciliations	location, date
8.4	CON	Test Results	Numerical
8.5	CON	Condition Surveys	
8.6	CON	Certificates of Calibration (Instruments, Meters etc)	Numerical
8.7	CON	Weather Records	date, time
8.8	CON	Survey and Progress Photographs	date, location

8.9	CON	Daily Diaries	Date
8.10	CON	As-Built Progress Drawings Mark-up	Date
8.11	CON	Red line mark ups of Construction Drawings	Date
FILE NO.	**FILE HOLDER**	**DESCRIPTION**	**FILING BASIS**
Health, Safety and Environmental – MA SHE Filing System			
9.0	SAFETY	Health and Safety Plan	alph / date
9.1	SAFETY	Site Register	date, no.
9.2	SAFETY	Attendance Records - Inductions	Alphabetical
9.3	SAFETY	Permits	Numerical
9.4	SAFETY	Environmental & Sustainability	Alphabetical
9.5	SAFETY	Risk Management, including Method Statements	Date
Quality + Performance			
10.0	QA	Audit	Date
10.1	QA	Quality Plans / ITP	Project
10.2	QA	Performance Measures - Perfect Delivery	Date
10.3	QA	Non-conformance Control	
10.4	QA	Management Review + Quality Review	
10.5	QA	Quality Monitoring Reports	
10.6	QA	Forms and Templates	
10.7	QA	Assets Register	
10.8	QA	Signatory List + Competency	
10.9	QA	QA – Additional Records	
Hand-back Records			
11.0	QA	Hand-back / Practical Completion Certificates	
11.1	QA	Health & Safety Files, inc O&M documents	
11.2	QA	As-Built Drawings	
11.3	QA	Training Records and Plans	
11.4	QA	Operation & Maintenance Manual Reviews	
11.5	QA	Maintenance Plans	
11.6	QA	Spare	
11.7	QA	Fault and Defects Reports – Snag Lists and Close-outs	
Commercial Management and Cost Reporting			
12.0	QS	Instructions and Variation Orders from POSCO	numerical
12.1	QS	Approval of Subcontractors – Suppliers	Numerical
12.1.1	QS	Instructions to Subcontractor and Suppliers	numerical
12.1.2	QS	Day works	Date
12.1.3	QS	Sub-contractor Valuations and Labour / Plant returns	Numerical
12.2	QS	Third Party Claims	Date
12.3	QS	Insurances	
12.4	QS	Valuations	date, no.
12.5	QS	Valuations and Final Accounts	date, no.
12.6	QS	Cash flow Forecast	date, no.
12.7	QS	Costs Monthly/Weekly	
12.8	QS	Financial Reports	
12.9	QS	Weekly Cost Reports	

Appendix J, Pilot Questionnaire

		1	2	3	4	5	6	7	8	9	10	11	12
	Fill in the matrix to show the interactions of the factors. For example if you think 'Weather' has a large effect on Motivation ' enter H (for High) in the Weather row and Motivation collumn. Show the effects as H for High, M for Medium and L for Low. For no effect leave the cell blank. Note there is no weather row it is used as an example so as not to lead.	Cash Flow	Speed of Decision responce	Time taken decisiont to shop floor	Procurement	Motivation	Acceleration of Performance	Design & build-ability	Change orders	Communications	Control of the project	Planning	Disruptions
1	Cash Flow		M	M	H	H	H	H	H	H	H	M	H
2	Speed of Decision responce	M		H	H	M	M	M	H	H	H	H	H
3	Time - decision to reach the shop floor	M	H		H	H	H	H	H	H	H	H	H
4	Procurement	H	H	H		H	H	H	H	H	H	H	L
5	Motivation	H	H	H	H		H	H	M	H	H	H	H
6	Acceleration of Performance	H	H	H	H	H		H	H	H	H	H	H
7	Design & build-ability	L	M	M	M	M	H		M	M	H	H	M
8	Change orders	H	H	H	H	H	H	M		H	H	H	H
9	Communications	M	H	H	H	H	H	H	H		H	H	H
10	Control of the project	H	H	H	H	H	H	H	H	H		H	M
11	Planning	H	H	H	H	H	H	H	H	H	H		M
12	Disruptions	M	M	M	M	L	L		L	L		L	

Please state your position E.G., Project manager =PM , Director = Dir, Quantity Surveyour = QS, Other

Name: Position: PM

Appendix K, Raw Data

																									Questions that have a numerical value																										
			Position						Country responding from												Business				Q3	Q3	Q3	Q3	Q4	Q4	Q6	Q6	Q7	Q7	Q8	Q8	Q9	Q9	Q10	Q10	Q11	Q11	Q12	Q12	Q13	Q13	Q15	Q16			
ID	Proffession	ID	PM	Dir	QS	DM	CA	PL	ABD	Ba	Cam	Con	Du	Ku	Ni	Om	Buisness	Qa	SA	UK	MC	SC	CA	DC	Imm	hrs	dys	wks	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	£	No.	ID	Country	key
01-DIR-MC-UK	Dir	1		1													M.Cont			1	1					1			1		1			1		1		1	1		1		1		1		3,500,000	25	1	UK	UK
02-PM-MC-UK	PM	2	1														M.Cont			1	1							**1**	1		1			1		1	1		1		1			1	1		3,000,000	25	2	UK	
03-QS-MC-ABD	QS	3			1				1								M.Cont				1					1				1	1		1		1			1	1		1		1			1	100,000,000	2000	3	Abu Dhabi	ABD
04-PM-MC-UK	PM	4	1														M.Cont			1	1					1				1	1			1		1	1		1		1		1		1		4,500,000	27	4	UK	
05-QS-MC-QA	QS	5			1												CA	1					1				1		1		1		1		1		1		1		1			**1**		**1**	**3,400,000,000**	**30000**	5	Qatar	QA
06-DIR-SC-UK	Dir	6		1													Sub Con			1		1			1				1		1			1	1		1		1		1		1			1	3,000,000	8	6	UK	
07-DIR-SC-CA	MD / Dir	7		1							1						Sub Con					1			1					1	1		1		1		1		1		1		1		1		18,400,000	1500	7	Cambodia	CA
08-DIR-SC-SA	Dir	8		1													Sub Con					1				1				1	1			1		1	1		1			1		1		1	0	0	8	Saudi	SA
09-DIR-MC-SA	Dir	9		1													Re.Estate		1		1				1					1	1		1			1	1		1			1	1			1	15,300,000	200	9	Saudi	
10-PM-SC-SA	Snr PM	10	1														Sub Con		1			1				1			1		1		1			1	1		1		1		1		1		9,000,000	1400	10	Saudi	
11-PM-SC-SA	PM	11	1														M.Cont		1		1						1		1		1		1			1	1		1		1		1		1		0	0	11	Saudi	
12-QS-SC-UK	QS	12			1												Sub Con			1		1				1				1		1		1		1	1		1		1			1		**1**	125,000	13	12	UK	
13-PM-MC-NI		13	1												1		M.Cont				1					1				1		1		1		1	1		1		1			1		**1**	1,200,000	50	13	Nigeria	NI
14-PM-MC-DU	Arc	14	1										1				M.Cont		1		1						1		1		1		1		1			1	1			1	1		1		200,000,000	800	14	Dubai	
15-DM-MC-ABD	PM	15				1			1								M.Cont				1					1				1	1		1		1		1		1		1		1		1		20,000,000	500	15	Abu Dhabi	
16-DIR-DC-BA		16		1						1							D. Cons							1		1				1	1		1		1		1		1		1		1		1		10,000,000	60	16	Bahrain	BA
17-QS-MC-OM	QS C Man	17			1											1	M.Cont				1						1		1		1		1		1		1		1		1		1			1	306,100,000	6000	17	Oman	OM
18-PM-MC-SA	PM	18	1														M.Cont		1		1				1				1		1		1		1			1	1		1		1			1	16,250,000	750	18	Saudi	
19-PM-MC-BA		19	1							1							CA				1						1		1		1		1			1	1		1		1			1	1		60,990,000	850	19	Bahrain	
20-PM-CA-UK	PM CA	20					1										CA			1			1				1			1		1		1		1	1		1		1		1		1		1,000,000	15	20	UK	
21-QS-MC-SA	QS	21			1												M.Cont		1		1							**1**	1		1		1		1		1		1		1		1			1	450,000,000	3000	21	Saudi	
22-DIR-CA-BA	CA / PM	22		1						1							CA						1					**1**	1		1		1		1		1		1		1			1		1	311,000,000	6000	22	Bahrain	
23-DIR-MC-CO	Dir	23		1								1					M.Cont				1				1					1	1		1		1			1	1			1	1			1	6,990,000	150	23	Congo	CO
24-PL-CA-BA	Planner	24						1		1							CA						1					**1**	1		1		1		1		1		1		1		1		1		160,400,000	650	24	Bahrain	
25-DIR-SC-BA	Dir	25		1						1							Sub Con					1					1		1		1		1		1			1	1		1		1			1	1,520,000	15	25	Bahrain	
26-PM-CA-UK	Dir	26					1										M.Cont			1			1					**1**	1		1		1		1		1		1			1		1		**1**	100,000,000	100	26	UK	
27-PM-CA-BA		27	1							1							CA						1				1		1		1		1			1	1		1		1			1	1		**500,000,000**	5000	27	Bahrain	
28-PM-SC-KU	PM	28	1											1			Sub Con					1					1		1		1		1			1	1		1		1		1			1	804,000	40	28	Kuwait	KU
29-DIR-MC-UK	PM	29		1													M.Cont			1	1						1			1	1			1		1		1	1			1	1			1	100,000	10	29	UK	
30-DIR-MC-UK		30		1													M.Cont			1	1				1				1		1			1	1		1		1		1		1		1		250,000	10	30	UK	
31-PM-MC-BA	Snr PM	31	1							1							M.Cont				1						1		1		1		1		1			1	1		1			1		1	170,000,000	3500	31	Bahrain	
No Reply	QS	32															M.Cont																															No Reply	32	NZ	
No Reply	PM	33															M.Cont																															No Reply	33	UK	
No Reply	QS	34															M.Cont																															No Reply	34	Qatar	
No Reply	QS	35															M.Cont																															No Reply	35	Bahrain	
No Reply	PM	36															M.Cont																															No Reply	36	UK	
No Reply	PM	37															M.Cont																															No Reply	37	UK	
No Reply	PM	38															QS																															No Reply	38	Singapore	
No Reply	PM	39															CA																															No Reply	39	Bahrain	
No Reply	Dir	40															M.Cont																															No Reply	40	Qatar	
ID	CA / PM	ID	Position						Country responding from												Business				Q3	Q3	Q3	Q3	Q4	Q4	Q6	Q6	Q7	Q7	Q8	Q8	Q9	Q9	Q10	Q10	Q11	Q11	Q12	Q12	Q13	Q13	**Total value of projects**			Country	
	QS C Man		PM	Dir	QS	DM	CA	PL	ABD	Ba	Cam	Con	Du	KU	Ni	Om	Buisness	Qa	SA	UK	MC	SC	CA	DC	Imm	hrs	dys	wks	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No					
			11	11	5	1	2	1	2	7	1	1	1	1	1	1		1	6	9	17	7	6	1	6	9	11	5	19	12	28	3	21	10	17	14	23	8	31	0	25	6	21	10	14	17	5,873,429,000				