

Influence of building information modelling construction essay



**ASSIGN
BUSTER**

<http://research-acumen.eu/wp-content/uploads/Wolverhampton.jpg>Name:

Patrick O'NeillAward: Bsc (Hons) Quantity SurveyingModule code:

6CN010Department: School of technologyStudent no: 1023268Supervisor:

John ReynoldsDate: 20th April 2013Words:" Presented in partial fulfilment of the assessment requirements for the above award".

Declaration

" This work or any part thereof has not previously been presented in any form to the University, or to any other institutional body whether for assessment or other purposes. Save for any express acknowledgements, references and / or bibliographies cited in the work, I confirm that the intellectual content of the work is a result of my own efforts and no other person".

Acknowledgment

I would like to express my gratitude to my Dissertation supervisor, John Reynolds, who has taken out his precious time in providing his assistance throughout my dissertation work, his knowledge and understanding over the subject has helped me to learn crucial aspects that were required for undertaking my dissertation. Finally, I must also express my gratitude to my family and friends whose help and care was always there in any respect with regards to the completion of my dissertation. Signature

.....Date

Abstract

" Building Information Modelling (BIM) is a revolutionary technology and process that has transformed the way buildings are designed, analysed, constructed, and managed" (Hardin, 2009, p. 2). BIM has taken the

<https://assignbuster.com/influence-of-building-information-modelling-construction-essay/>

construction industry into a new-era where all processes has fasten up, the benefits are not just time and cost savings but also reduction of risks and uncertain in construction process. From the through literature review of many researchers works published in various journals suggestions are being made as how this BIM approach is being carried out in construction industry, at the same time a critical literature review is also being conducted on the cost estimation within BIM technologies and whether this can benefit or harm the future role of the quantity surveyor. A questionnaire was designed to identify how the use of BIM will affect the future role quantity surveyor. The questionnaires were distributed to family and friends working within the construction industry and also construction professionals within the UK. From analysis the results obtained and comparing them with the literature review. it is very clear that the construction industry is lagging in implementing e-procurement approach when compared to other industries and having realizing the potential benefits the BIM is being offering in various fields of construction industry the construction professionals are very much confident that BIM approach can enhance the construction process. Implementing BIM within the construction industry although the Government Chief Construction Adviser Paul Morrell called for BIM adoption on UK government construction projects of £5 million and over. And also in June 2011 the UK government published its BIM strategy, announcing its intention to require collaborative 3D BIM (with all project and asset information, documentation and data being electronic) on its projects by 2016 (Elena Poletayeva, 2011). At this current time there is a clear indication that BIM isn't being used to its full advantage within the construction industry

ContentsTable of chartsMAIN

HEADING: CAPITAL LETTERS BOLD
Sub heading: Lower case bold
Sub-sub heading: Lower case plain text, or lower case bold, italic.

1. 0 INTRODUCTION

The following research will investigate and analysis how the use of BIM will affect the future role of the quantity surveyor. According to the Royal Institute of British Architects RIBA (2012), almost a third of construction consultants are now using BIM. Thenbs (2011) provided information that in May 2011 UK Government Chief Construction Adviser Paul Morrell called for BIM adoption on UK government construction projects of £5million and over. Thenbs (2012) stated that Building Information Modelling covers geometry, spatial relationships, light analysis, geographic information, quantities and properties of building components. BIM data can be used to illustrate the entire building life cycle. Quantities and properties of materials can be extracted easily and the scope of works can be easily defined. Furthermore systems, assemblies and sequences can be shown in a relative scale to each other and relative to the entire project.

1. 1 Problem identification and purpose of study

" The main role of Quantity Surveyors is to estimate the building cost, the modern quantity surveyor provides a service that covers all aspects of procurement, contractual and project cost management. The role of the quantity surveyor plays a very important role in all phases of any type of Construction Company" (surveyors, 2013). The modern quantity surveyor plays a central role in the management of construction projects (Towey, 2012 p. 26)." estimators have developed their computing skills in using

estimating systems but mostly relying in adopting spread sheets and <https://assignbuster.com/influence-of-building-information-modelling-construction-essay/>

database ages"(Brook, 2008 p. 9). Repository (2012) stated that over the years the need for more cost effective, better quality and environmentally friendlier construction has grown, these factors are the main Influences on the development of technology in the construction industry. Building Information Modelling (BIM) is one of the technologies that have been creating a buzz in the construction industry over the last few years. Ukconstructionessays (2012) provided information that Building Information Modelling, or better known as BIM is not; strictly speaking a new technology as it has been developing and used by other industry sectors since 1950s i. e. the automotive and aero plane industries. As technology evolves, we are forced to evolve with it or run the risk of being left behind. The traditional way of utilising the services of a quantity surveyor has largely been at the stage of costing a design, and the production of procurement and construction documentation (Asworth and Hogg, 2002p. 67). With the development of technology like BIM, the responsibilities of professionals are starting to shift. BIM includes a series of cost management functions that could change the processes of cost management of construction projects. This forces the quantity surveyor to focus more on different parts of the cost management process, than what would have previously. Not only will BIM influence the cost management functions and responsibilities of the quantity surveyor, but also the technology and types of software that are currently used in quantity surveying offices. The responsibilities of quantity surveyors will be changed as some of their traditional roles will be replaced by the use of, so that their focus will shift from bill producers to cost managers, which will shift the design process from costing to a design to designing to a cost.

1. 5 Structure of the dissertation

The whole dissertation is primarily divided up into 6 chapters

Chapter 1: Introduction

Chapter 2: Literature review

Chapter 3: Research Methodology

Chapter 4: Analysis & Discussions

Chapter 5: Conclusion & Recommendations

Chapter 6: References

1. 6 Aims & Objectives

Aim:

The objective of this dissertation is to identify if the use of BIM in the construction industry is going to affect the future role of the quantity surveyor.

Objectives:

To understand what is BIM
To Research into whether BIM will help aid the Quantity Surveyor
To Research into whether BIM will affect the role of the Quantity surveyor
To summarise, analyse and evaluate the data collected in order analyse how the use of BIM will affect the future role of the quantity surveyor. Critically analyse the data collected from these questionnaires by comparing theoretical conclusions with the empirical research findings to draw conclusions. To prepare a questionnaire to collect data from practitioners within the construction industry in the UK in regards to whether the use of BIM will affect the future role of quantity surveyor. Clear objectives are important to determine whether this study is achieving what it set out to do. It is also important to write program objectives as specifically as possible to provide program clarity and strong links to evaluation. It is

much easier to evaluate a program when clear objectives have been developed my peer (2012).

1. 7 Restraints & Limitations

The main restraint is the access and use of BIM software as a full time student I do not have access to BIM software within the construction industry or at the university. Archicad or Autodesk will need to be used to understand fully what BIM is and how it works; a student version can be downloaded online. The research will involve the use of academic materials such as textbooks, journals, published and unpublished documents and internet sites. The data analysis will be carried out by sending out questionnaires to a range of construction professionals working within a Birmingham consultancy, and the results presented in bar charts and analysed after. Another restraint is how many people answer and return the questionnaire, the more people that answer the questionnaire will be beneficial within the analysis as a greater number of people will give much more accurate results. Many of the potential individuals who will carry out the questionnaire may have busy schedules so research must be taken into ensuring that questions are suitable and are able to draw suitable responses from at the end. It will be hard to measure how many construction companies currently use BIM and whether It is having an effect on the role of quantity surveyors working within the construction industry as there isn't enough time to gather research from every construction around the UK . Throughout the study an open mind will be maintained whilst undertaking the research and analysis of the data collected.

1. 8 Research Beneficiaries / Dissemination

This research will be useful into identifying whether the use of BIM will affect the future role of the quantity surveyor or aid the future role of the quantity surveyor. And to also identify what specific ways the quantity surveyor may benefit from using BIM and in what specific ways the quantity surveyor may be affected by the use of BIM in the future. Other categories to benefit from this research include the researcher, students and academics. By undertaking this research companies and people working within the construction industry can have a better understanding on the use of BIM approach and how it can be implemented within the cost estimation stage of a project and also into different phases of a project and the views of other professionals working within the UK construction industry on this application can be found and thus can implement that application effectively for the success of the project.

2. 0 LITERATURE REVIEW

2. 1 Introduction

In this chapter 2 of literature review, a critical literature has been conducted about how the use of BIM can aid the role of quantity surveyor and how BIM may be a threat to the future role of the quantity surveyor.

2. 2 Building Information modelling

Constructionbusinessowner (2012) provided information that BIM allows early collaboration and integration of the design information in a 3-D environment programs are widely used in the early stages to eliminate potential issues that would be costly to rectify in the field. All parties

involved benefit. Designers can identify and correct design issues before they result in rework and schedule delays. Contractors have more reliable information and can better plan for equipment use and construction sequencing. Owners can "walk" the project in a 3-D environment during the design. And facility managers can pinpoint ergonomic issues and plan maintenance activities more efficiently by sharing the model with their vendors and contractors. BIM will only benefit users if it leads to improved design, faster delivery, reduced price or improved value. A combination of these factors will dictate how successful BIM implementation will be in the coming years. When all members of the construction team work on the same model, from early design through to completion, changes are automatically coordinated across the project and information generated is therefore of high quality. The construction industry is widely acknowledged as unique and conservative. Building Information Modelling (BIM) systems have the potential to revolutionize current practices and to automate the measurement of quantities from construction drawings. However, there are fears that such developments could threaten the future role of the quantity surveyor.

2.3 Advantages of BIM

The application of BIM has the result of many advantages, such as: Greater speedThe multi-dimensionality of BIM allows various deliverables and documentation to be prepared simultaneously to the design of the building. Furthermore, the use of object-oriented design and the re-use of information accelerate the creation of drawings (Ashcraft, 2007) REFENCED. Changes made to a certain aspect of the model or the design will be automatically

updated through the rest of the project, which allows for major time savings.

R

2. 3. 2 Lower costs

Sabol (2012) provided information that BIM offers the capability to generate take-offs, counts and measurements directly from a model. This provides a process where information stays consistent throughout the project and changes can be readily accommodated. Building information modelling supports the full project lifecycle and offers the capability to integrate costing efforts throughout all project phases. According to Chuck Eastman (2011) at any stage of the design, BIM technology can extract an accurate bill of quantities and spaces that can be used for cost estimation.

2. 3. 3 Uniform design base

With traditional methods every stakeholder uses the same information but interprets it in a different way and enters it into a different format. As this information is exchanged between different parties, errors might be transferred with it. BIM ensures that all parties work on the same base model, that coordinates building objects created across various disciplines which will quickly expose errors (Howell and Batcheler, 2005). 2. 3. 4 Drawing fabrication All floor plans, sections and elevations will be accurate and consistent with one another, as they are produced directly from the same model (Howell and Batcheler, 2005). 2. 3. 5 Cost Estimation Cost estimating is currently a time consuming process, requiring an entire team of estimators. Acebytes (2012) provided information that there are multiple factors hindering the transition to model-based

estimating; however, the risks are justified by the benefits of estimating with <https://assignbuster.com/influence-of-building-information-modelling-construction-essay/>

BIM. Building Information Modelling has the capability to automate a quantity take-off, which will reduce the time and costs required to estimate a project. By using a building information model instead of drawings; the take offs, counts, and measurements can be generated directly from the underlying model and the information can be linked to generate bills of materials, size and area estimations along with other related estimating information. According to Hardin (2009) another strategy for leveraging BIM during a project is to use the BIM file for updating estimates very quickly, last minute design changes can be altered and updated much more quickly than typical take off methodologies can catch up with.

2. 4 Disadvantages of BIM

Precisedraftunginc (2012) provided information that BIM requires more effort at the front end of a project to establish the initial framework. But the payoff is that you are able to extract a much higher quality and greater quantity of information from that model. BIM allows changes to happen easily, so clients may continue to make changes too late in the process, and that can impact construction and design costs. BIM results in much larger file sizes than traditional CAD systems, and requires higher performing computer hardware to operate it effectively. BIM requires more thoughtful design. We now have to do what all good designers have done in the past: Think in 3d and visualize the final product!

2. 5 BIM tools used in construction industry

3. 0 RESEARCH METHODOLOGY

A Quantitative research methodology will be used. According to Shamil Naoum, (2006 p. g39) quantitative research is based on a hypothesis or a theory composed of a variable measured and analysed with statistical procedures. Quantitative research enables the author to measure and analyse data. Benefitof (2012) provided information that the relationship between an independent and dependent variable is studied in detail. The use of standard means in quantitative research means that any research may be replicated, analysed and also compared with other similar studies.

Quantitative research allows for greater accuracy and objectivity of results gained . Quantitative research usually filters out all external factors and if well designed, it provides unbiased and real results. Quantitative research is a great method to finalise results and disprove or prove a hypothesis. It is useful for testing results gotten from doing various qualitative experiments, thereby leading to the final answer. Quantitative Research will provide the advantage of finding a premeditated set of result from a range of professionals in the construction industry.

3. 1 Advantages of quantitative data collection:

Numeric estimates
Opportunity for relatively uncomplicated data analysis
Data which are verifiable
Data which are comparable between different communities within different locations
Data which do not require analytical judgement beyond consideration of how information will be presented in the dissemination process.

3. 2 Disadvantages of quantitative data collection:

Gaps in information - issues which are not included in the questionnaire, or secondary data checklist, will not be included in the analysis. A labour intensive data collection process. Limited participation by affected persons in the content of the questions or direction of the information collection process. (Reliefweb 2012) A Questionnaire will be produced to obtain the data. Statpac (2012) provided information that Questionnaires are very cost effective when compared to face-to-face interviews. Questionnaires are easy to analyse, they are familiar to most people. They are less intrusive than telephone or face-to-face surveys. The results from the questionnaires will then be produced into bar charts and analysed. The questionnaires will be sent by letter to a construction consultancy in Birmingham Rider Levitt Bucknall in which I gained work experience with in 2011. Questionnaires will also be sent out to a number of Contractors within the west midlands area this will aid within the analysis as the research will be gained by both contractor and consultants and a deeper and more accurate conclusion will be gained at the end of the study. The nature of the data required will be based on personal opinion from a range of construction professionals working within a construction consultancy and a construction contractor. The main type of research that will be used for this study will be applied Research, the following resources will be consulted:

1. Text books

Various text books will be consulted as well as a series of electronic books. This will be one of the main sources of information

2. Journal articles

Journals articles are usually more easily obtainable as they are more freely available in electronic form which is easily accessible via the internet. It will also serve as a main source as journals and articles holds the most recent information on the topic.

3. Electronic resources

Various electronic resources will be consulted, as information is easily accessible through the use of a variety of search engines.

3.3 Data Collection

Within this research, to achieve the objectives a quantitative approach is being implemented by a structured questionnaire to obtain the information from various people within the construction industry who work or who have worked as a role of a quantity surveyor/ estimator. This research is structured in such a way that to start with a pilot test of the structured questionnaire is prepared so as to enable the practicability of the proposed questionnaire applicable to the study. The data collection process is applicable to the complete research

3.4 Data Analysis

The data collected from these questionnaires will be critically analysed and summarised and all the data is interpreted in charts and logical style format. From these statistics a logical argument is drawn from the results obtained from critical comparison with the findings of the current literature. This is mainly to have a better idea of what their thoughts and views in person. The objective is to unravel the data and present it in an academic format that is

credible to professionals within the construction industry. In doing so it will emphasize key variables and whether the use of BIM will affect the future role of a quantity surveyor and how, and to also understanding the usage of BIM, establishing if any drawbacks, benefits are present; which can then be formulated to become educational information. Finally, from these statistics a logical argument is drawn from the results obtained from critical comparison with the findings of the current literature. From all these approaches we can draw a conclusion and possible recommendations shall be made from the research findings so as to validate on if the use of BIM will affect the future role of the Quantity surveyor.

3. 5 Summary

In this chapter of Research Methodology, by discussing about the different type of research methods such as qualitative and quantitative, the quantitative type of approach with an closed structural questionnaire survey has been chosen for this dissertation as this type of approach would be the best suitable one with respect to both time and approach and mostly all these questionnaires has been sent through E-mail as to reduce the time span and to choose much more IT services effectively so that the respondent should be flexible to answer the questionnaire. The responses collected are being represented in a charts and logical style format so as from these statistics the data can be compared with the literature review and make a conclusion accordingly.

4. 0 RESULTS

4. 1 Introduction

This chapter is mainly intended to cover the results in detail from the questionnaire sent to the various construction professionals within the UK in a statistical format by making use of Excel and MS Word. The questionnaire data has been broke down critically by representing in graphs and tables. To cover the results in detail gained from the questionnaires that were sent to the various construction professionals working within the UK construction industry. The results have been present in a statistical format by the use of MS Excel and Ms Word.

4. 2 Results Explanation

4. 2. 1 Respondents size

The questionnaire was distributed to 79 construction professionals through email and directly by hand. Out of these 79 questionnaires 37 complete responses have been obtained and 13 responses were incomplete responses. Number of questionnaires originally distributed: Sample Size originally distributed = 79
Response received (complete response) = 37
Completed responses received: Number of incomplete Responses =

Chart 1: How many years in QS role?

4. 2. 2

Chart 2: Graphical Representation of construction professionals Respondents

4. 2. 3

5. 0 DISSCUSSION OF RESULTS

5. 1 Introduction

This chapter 5 mainly discusses the analysis made in chapter 4 and from those detail analysis the main research problems are being selected and discussed in detail in relation to the literature review. In this chapter an outline is created on the major findings and how these can be such an important factors in the present project are explained and suggestions are being made for future research if needed

5. 2 Analysis of the results

From all these 21 questions in the questionnaire, an outline of the research findings can be formulated by analysing the results obtained to this questionnaire. The main research findings in this research are: BIM has been widely used in all sectors within the construction industry. Better quality and collaboration between all parties within the project can be achieved by BIM approach. Now-a-days BIM has become a mandatory requirement by the client. Cost savings and reduction in time are the main benefits identified by e-procurement approach. E-procurement is lagging in construction industry and the lack of upper management support has been proved to be main

drawback in implementing e- procurement. BIM approach can be possible solution for nullifying the problems in procurement process.

5. 2. 1question-----

In relation to the question posed to the companies with regard to their areas of application of BIM approach their projects, the best way for drawing a conclusion for this question would be analysing these responses according to the size of companies and their approach in relation to BIM. When we see on a whole a major respondents have selected architectural designing and structural designing as the major areas of BIM approach but when we classify these responses according to the size of companies,

5. 2. 2

5. 2. 3

5. 2. 4

5. 2. 5

6. 0 CONCLUSION AND RECCOMENDATIONS

6. 1 conclusions

The aim of this research report was to study the influence of BIM on the quantity surveying profession. One of the most apparent and vital consequences that will result from implementing BIM into the quantity surveying profession is the effect that it will have on the traditional roles and responsibilities of the quantity surveyor and the structure of quantity surveying firms. BIM's capabilities of automating the production of bills of quantities, which is one of the quantity surveyors fundamental tasks, will have both positive and negative effects on the quantity surveying industry.

<https://assignbuster.com/influence-of-building-information-modelling-construction-essay/>

The automatic production of bills of quantities will enable quantity surveyors to get involved in the early design stages of a construction project and make designers aware of cost implications and manage costs from early on. This will enable designers to design to a cost instead of quantity surveyors costing to a design, which will satisfy the employers need for cost effective construction. In the past measurement was usually undertaken by senior quantity surveyors, but over the years it has diminished into a task delegated to more junior personnel while professional quantity surveyors take up more strategic roles (Ashworth and Hogg, 2007). With BIM automating quantity take-off, junior quantity surveyors will not play such a significant role in quantity surveying firms as before. This could change the need for large production teams in quantity surveying firms and cause quantity surveying firms to become smaller. The reduction in labour hours and human resource due to the automation of this vital task can have an impact on the professional fees earned by quantity surveyors. As fewer resources are placed into the production of cost information, professional fees will have to be adjusted accordingly. The time saved by BIM capabilities will give quantity surveyors the opportunity to develop and focus on other activities that might not be seen as essential intraditional practices, but that will offer major benefits to employers. Newservices can be rendered by quantity surveyors such as managing the vast and continuous data exchange between the different consultants of a BIM based construction project, or they can specialise in existing practices such as value management. The continuously changing and technologically evolving construction industry has forced quantity surveyors to evolve with it in order to meet these ever changing needs. The research in this report has <https://assignbuster.com/influence-of-building-information-modelling-construction-essay/>

confirmed this statement, and has shown that BIM, although a great advantage to the construction industry, will oblige quantity surveyors to keep reinventing themselves and develop the scope of their services in order to maintain their leading role as construction cost managers. Although work is required initially to develop the skills and processes needed to integrate BIM and QS processes, the resulting benefits undoubtedly justify the investment. Recent years have witnessed the realization of many of the ideas of BIM visionaries, and the next five years will see increasing numbers of successful implementations, changes in the building industry, and new trial uses and extensions of what can be achieved with BIM, beyond its use today. This period will see the transition of BIM to accepted mainstream practice; and the transition will impact all building professionals and participants. But the greatest impact will be on the individual practitioner, who will need to learn to work, design, engineer, build, or manage with BIM. (BIM HANDBOOK DESKTOP) Estimators have to assess the risks of the project and with BIM you can be more sure of the correctness of the drawn material and the monetised possibility of errors under the build. The question is only how soon they will be liable to correct their ways of working with the same present advised. It will only take one company to burst the bubble - all of the sudden all eyes will be turned to the contractor who went 5-8% under all the other tenders. The companies left behind still stuck to the 2D system will never know what hit them and will very soon have to turn the key. " In practice this is time-consuming both for contractors and sub-contractors, and the amount of paperwork had increased immensely. Nevertheless, contractors always need a " bill of quantities", whether produced by the clients quantity surveyor, by an in-house commission or by <https://assignbuster.com/influence-of-building-information-modelling-construction-essay/>

sharing the services of an independent quantity surveyor." There will be a higher demand to the contractors to be able to build accordantly to drawings as a model can be pulled out and digitally measured. They will have to be more accurate in their tenders as the possibility of extra works cause of quality on the drawings will be higher.

6. 2 Recommendations

From the research, the possible recommendations that can be suggested are: The usage of the BIM must be made in all sectors of construction industry rather than sticking to only some areas so there by increase the effective in the projects especially in small scale industries where they use it only for mainly architectural design and structural designing. The construction industries who felt the procurement process is lagging when compared to other sectors must be ready to implement the new BIM approach to achieve the benefits. The clients should also be very precise in selecting the contractors andsubcontractors as when they intent to make use BIM approach in their project, theyshould make sure that all the people he is employing should be well aware of thisBIM approach so that a good collaboration between all parties during the whole lifecycle of the project can be maintained which reflect on his project in terms of quality, cost and time.

6. 3 HYPOTHESIS

To incorporate BIM efficiently into the Quantity Surveying profession, Quantity Surveyors will need to focus on the following aspects: Updating software and computer systems in the work placeUndergoing training on the cost management functions of BIMAdjusting their services and

responsibilities to the cost managementFunctions of BIMGaining knowledge
<https://assignbuster.com/influence-of-building-information-modelling-construction-essay/>

on the new contractual aspects that is related to BIM on specific construction projects

References (in text citation)

Definition of Quantity Surveyors . 2013. Definition of Quantity Surveyors . [ONLINE] Available at: <http://www.surveyors.com/quantity-surveyors/definition-of-quantity-surveyors/>. [Accessed 10 January 2013]. Ashworth, A., and Hogg, K. (2007). Willis's Practice and Procedure for the Quantity Surveyor, 12th Edition, Blackwell Science, Oxford London

References

Tiwari, S., Odelson, J., Watt, A., & Khanzode, A. (2009). Model Based Estimating to Inform Target Value Design. AECbytes. [ONLINE] Available at : <http://www.aecbytes.com/buildingthefuture/2009/ModelBasedEstimating.html>. [Accessed 13 November 2012] Benefits of Quantitative Research | Benefits Of. 2012. Benefits Of Quantitative Research | Benefits Of. [ONLINE] Available at: <http://benefitof.net/benefits-of-quantitative-research/>. [Accessed 04 November 2012] How to Benefit From Using BIM | Construction Business Owner Magazine. [ONLINE] Available at: <http://www.constructionbusinessowner.com/topics/software/how-benefit-using-bim>. [Accessed 13 November 2012]. Cost estimating. 2012. [ONLINE] Available at: http://www.dcstrategies.net/files/2_sabol_cost_estimating.pdf. [Accessed 13 November 2012]. Setting objectives. 2012. Setting objectives. [ONLINE] Available at: <http://mypeer.org.au/planning/setting-objectives/>. [Accessed 14 November 2012]. Advantages of Written Questionnaires. 2012. Advantages of Written Questionnaires. [ONLINE] Available at: <http://www.https://assignbuster.com/influence-of-building-information-modelling-construction-essay/>

statpac. com/surveys/advantages. htm. [Accessed 04 November 2012]. BIM in construction - Building Information Modelling (BIM) article from NBS. 2012. [ONLINE] Available at: <http://www.thenbs.com/topics/bim/articles/bimInConstruction.asp>. [Accessed 04 November 2012]. BIM, What is Building Information Modeling?. 2012. BIM, What is Building Information Modeling?. [ONLINE] Available at: <http://www.precisedraftinginc.com/bim.html>. [Accessed 21 December 2012]. Definition of Quantity Surveyors . 2012. Definition of Quantity Surveyors . [ONLINE] Available at: <http://www.surveyors.com/quantity-surveyors/definition-of-quantity-surveyors/>. [Accessed 19 December 2012]. [ONLINE] Available at: http://reliefweb.int/sites/reliefweb.int/files/resources/qualitative_and_quantitative_research_techniques.pdf. [Accessed 11 November 2012]. 2013. . [ONLINE] Available at: http://repository.up.ac.za/bitstream/handle/2263/16349/Gee_Influence%282010%29.pdf?sequence=1. [Accessed 10 January 2013]. Building information modelling. 2012. Building information modelling. [ONLINE] Available at: <http://www.ukconstructionessays.com/essays/construction/building-information-modelling.php>. [Accessed 19 December 2012]. NBS: BIM Roundtable Discussion. 2012. NBS: BIM Roundtable Discussion. [ONLINE] Available at: <http://www.thenbs.com/roundtable/>. [Accessed 07 November 2012]. 2012. . [ONLINE] Available at: http://repository.up.ac.za/bitstream/handle/2263/16349/Gee_Influence%282010%29.pdf?sequence=1. [Accessed 20 December 2012]. Modern Built Environment - New Construction Strategy - Articles - Open Innovation. 2013. Modern Built Environment - New Construction Strategy - Articles - Open Innovation. [ONLINE] Available at: <https://connect.innovateuk.com/assignbuster.com/influence-of-building-information-modelling-construction-essay/>

[org/web/modernbuiltktn/articles/-/blogs/new-construction-strategy?](http://org/web/modernbuiltktn/articles/-/blogs/new-construction-strategy?ns_33_redirect=%252Fweb%252Fmodernbuiltktn%252Farticles)

ns_33_redirect=%252Fweb%252Fmodernbuiltktn%252Farticles. [Accessed

10 January 2013].