Enhancing Communication in Construction Industry through BIM*

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Abstract: Construction stakeholders across disciplines still depend on traditional paper-based modes of communication. The collaboration efforts in construction industry still focus on the exchange of 2D drawings and documents. Nowadays, the increasing widespread adoption of information technologies adds a new dimension to the industry collaboration in construction projects. Building Information Modeling (BIM) is recognized as a great platform in exchanging information as well as visualizes playing an important role in industry collaboration transformation, replacing the traditional construction methods. The emergence of multiple applications with the ability to directly use and exchange information between stakeholders provides opportunities to enhance communication between industry stakeholders within the project collaboration. However, existing studies in this area have not indicated a clear picture on how BIM can help in improving communication between different parties in a project development. To rectify this problem, this paper aims to study underlying factors to the communication problems and the BIM technology methods implemented in Malaysia in dealing with communication problems between industry stakeholders in the construction industry. The research is carried out through case study on a BIM project in Malaysia. The semi-structured interview was analyzed with content analysis using the matrix table. Research findings revealed that BIM technology methods implemented in the case study have enabled communication between client and contractor to be more meaningful. Thus, this research encourages positive thinking of the industry practitioners regards to maximized collaboration, information sharing and mutual benefit while ensuring market competitiveness in construction projects.

Key words: Communication; Building information modeling; Construction; Management; Technology

1 Introduction

Construction process requires collaboration between people and the contractor should be able to communicate in a clear and concise channel [1]. Communication which is open, honest and efficient is a key factor and key to the success of building construction [2]. Communication has been one of the interesting issues studied in the construction industry. This is probably due to the growing role of communications covering all areas and the problem of human relationships that can be associated with communication [3]. Without doubt, the effectiveness of communication between the client and the contractor will determine the time, cost and quality of the construction project.

As mentioned above, parties involved in a construction project have always been challenged to provide construction project on budget with good control, with the use of limited manpower and accelerated work schedule. However, the parties involved in a construction project assignments independently with the lack of contact with each other appears to be one of the causes leading to lack of effective communication in the construction industry. Traditional methods of construction have resulted in poor communication between the contractor and the client. This has resulted in project delays and redundant tasks.

Nonetheless, past researches have shown that the employment of Building Information Modeling (BIM) in the construction industry has made delivery more accurate and clear, thus improving communication between project stakeholders [4]. BIM is a data-rich, object-oriented, intelligent and parametric digital representation of the analyzed. It generates information that can be used to make decisions and to improve the process of delivering the facility [4]. This interesting research finding creates an avenue to research on the underlying factors that affects the communication problem between

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industry stakeholders. Besides that, this creates a need to study on the BIM technology methods implemented in Malaysia in dealing with communication problems between industry stakeholders in the construction industry.

2 Background of Study

Before we discuss on the traditional and BIM technology methods, it is imperative to understand “communication” in this research context. Communication is viewed as the activity of conveyance, exchange, and transmission of information (ideas and facts, from simple social or emotional concepts to sets of highly complex instructions)\(^5\). In general, the concept of communication is based on a two way exchange of information. Just providing (sending) information is basically not communicating except in some uncommon situations where the receiver has nothing to do with the service being delivered; in most cases, a receiver has to do something (respond) with the information to establish communication. Hence, “communication takes place when information is both provided and received; a form of confirmation that information was in fact transmitted and received is important”\(^6\). In order to achieve an effective communication, information should exist only once, rather than be duplicated unnecessarily. Great attention has to be given to develop a method by which duplication of information can be avoided and the whole project team support will have access to the most updated information for the project.

However, there is a vast difference of effect on communication through traditional method and BIM technology method. One simple illustration used by\(^7\) is exemplified to a Baton passing relay sport. When the project moves through the development stages between different functions, it is passed like batons in a relay race, except the baton is more “thrown over the wall” because little contact take place between the functions as the products passes between each other. The traditional process actually throws the baton over the wall and the BIM process keeps the baton and it is passed from one participant to other without it been thrown over the wall. Further review on traditional methods and BIM technology methods are discussed below.

2.1 Traditional methods

In the conventional method, the information for the design of a building was increasingly communicated by paper documents. The biggest problem with paper based documents is the incorrect visualization of the project information (“the devil is in the detail”). As long as the building information provided with such documents of conventional method do not effectively support visualization, understanding, and collaboration; the building design communication they provide is limited. Drawings and other building design documents from this method are most often complicated due to the lack of coordination of the applications used and among the professionals involved in the design process. The complexity and lack of coordinated documents produced using the CM and the involvement of many non-coordinated individuals can create strenuous demand on the communication between the architect and the client\(^8\).

Construction processes in the form of manual or computer (Computer Aided Design) (CAD) are referred to as the “traditional method” in this study. The traditional method originally relies on 2D (2 Dimension) drawing. CAD is able to produce 2D CAD drawings and documents to enable the AEC (Architect Engineer Construction) industry to design and build what the architect, client, contractor and consultant should see of the situation and the structure of a building (Figure 3). However, CAD can be a source of misunderstanding, and many people involved in the construction of the building would agree that using only drawings and documents is an imperfect method for building planning\(^1\). The well-known Computer aided design and drafting (CADD) has done nothing to solve the complication and lack of coordination in the conventional method, and hence no change in the essential process of communication—the documents are still used as instruction for building simple as well as complex objects. If the building design is not fully visualized, understood, and communicated, it cannot be effectively represented in the design documents and may consequently create problems later\(^6\).

With the use of traditional methods, analysis is conducted from the information of the building design. Parties involved in the project will then need to make copies and take precaution to avoid errors. A slight mistake will likely lead to huge loss of information throughout the construction phase. This will result in the client having to bear most of the financial burden caused by inefficient information presented and communication problems occurred\(^1\).
In terms of traditional design method, construction professionals use pen and paper or computer device to store programs and information. This information is compiled together and causes difficulty to convey clearly to the building designers. Ambiguous information and diagrams will result in the need for data re-entry \(^1\). Moreover, information provided to the client which is presented in 2D (on paper) is also one of the causes leading to less effective communication between the parties involved in the construction. Clients will have to make niggling effort to deliver relevant information to those involved in construction projects to operate the building. The major problem with the paper-based documents is information visualization project has not been accurate \(^1\). With this, the client is often prone to errors and ends up spending excessive time in the construction project to solve the problem. Thus, retaining traditional methods in a construction project will cause continuous communication problems, which will be detrimental to project collaboration amongst industry stakeholders.

2.2 Building information modelling (BIM)

BIM, on the other hand, is a clear solution to the communication problems compared to the traditional methods. BIM is defined as a modelling technology and associated set of processes to produce, communicate, and analyse building models \(^9\). Building information modelling is a verb to describe tools, processes and technologies that are facilitated by digital, machine-readable documentation about a building, its performance, its planning, its construction and later its operation. Therefore BIM describes an activity, not an object. In this context, building information model on the other hand, is the result of the modelling activity and further explained as a digital, machine-readable record of a building, its performance, its planning, its construction and later its operation.

BIM is also made of intelligent building components that include data features and parametric methods for each object \(^10\). Apart from that, BIM is used for building design, construction and
management. It provides high quality, reliable, fewer errors and better coordination project design scope, schedule and cost information. This is made possible as BIM is a new approach that aims to produce building design information based on 3D digital models ranging from information and complete data (Figure 4)\(^{[1]}\).

Being a coordination-based and centralized in a single virtual model, BIM creates strong communication for evaluating the true collaboration of a design process for interdependency and mutual support of the architect and the client during a building design process to work toward the success of the project. By virtue of the increased ability to communicate (visualize, understand, evaluate, and coordinate) through the use of a BIM, it becomes possible to speed up and improve understanding, and coordination in a building design. Moreover, good communications in the BIM process helps to reduce error, wastage, and risk by reinforcing the architect-client relationship in the collaborative design process. In addition, BIM plays the role of knowledge program for contractors making recommendations to the architects and engineers to handle unexpected circumstances. This will reduce the time for productive work such as lack of resources, lack of labor and machinery damage. This will improve the efficiency and productivity of the construction work in the construction process\(^{[1]}\).

For the successful use of BIM in the construction industry, BIM should be focused on communication and collaboration\(^{[1]}\). An extensive definition of BIM explains BIM as one the means of communication in the construction industry but it brings a change of roles and relationships involved in the project\(^{[12]}\). The change of roles of the parties involved in the relationship of each client and the contractor is found to have helped them see the importance of responsibility and a comprehensive overview of the project. By using this technology, the interaction between the client and the contractor can be enhanced. BIM will be a platform on which both parties can contribute their ideas and experience to the optimum\(^{[13]}\). Thus, discussion will be effective, process are accelerated changes can be easily executed in the project plan.

The involvement of BIM in the construction industry has increased the communication between the client and contractor. BIM has the benefits of visualization and collaboration, where both are able to solve problems that occur during the use of traditional method such as the problem of commitment, communication which lack bilateral relations, weaknesses of using paper and pen to convey information, paper documents that do not have proper visualization\(^{[6]}\). Visualization and collaboration functionality available in BIM enables the parties involved in the project to describe and solve problems throughout the design process and reduce design errors and changes during the construction\(^{[14]}\).

Consequently, numerous benefits could be gained by implementing BIM in the project, whether it is used as an isolated application or collaborative application. According to\(^{[6]}\), the clearest benefit from BIM is that a 3D model improves the ability to visualize (understand) what is being presented. Many people have difficulty understanding 2D drawing and according to\(^{[15]}\), it is estimated that 98% of the industry cannot understand drawing. While according\(^{[9]}\), the 3D model generated by the BIM software is designed directly rather than generated from multiple 2D views. It can be used to visualize the design at any stage of the process with the expectation that it will dimensionally consistent in every view. According to\(^{[15]}\), based on the case study of implementing building information modeling for programming of healthcare facilities, the major benefit of 3D visualization is that it could be quickly evaluated by technical and non-technical staff alike. Meanwhile, according to\(^{[9]}\), BIM technology facilitates simultaneous work by multiple design disciplines. While collaboration with drawing is also possible, it is inherently more difficult and time consuming than working with one or more coordinated 3D models in which change control can be well managed. This shortens the design time and significantly reduces design errors and omissions.

### 3 Methodology

A semi-structured interview was conducted and was analyzed with the matrix table. Accordingly, it is believed that a deeper and more detailed quality of information could be obtained with interview opted as the methodology instrument. Interviews are one of the commonly used for data collection in the case study method\(^{[17]}\). The data collected from the party involved of the project UTHM Multipurpose Hall by conducting case study and using content analysis to analyze it. The main reason for using content analysis in this study because content analysis is best for observation of specification and measurement accurately\(^{[18]}\). This research scopes down to two main important industry stakeholders, which are the client and contractors. Thus, the study will be focused on the communication between these parties and the BIM technology methods implemented.
Table 1 below is the summary details of the 5 Respondents. The researcher conducted semi-structured interviews with BIM project manager, consultant, architect, civil engineer and director of facilities management. Their experience in the field of construction is from 10 years to 24 years. They have been involved in building projects Sultan Ibrahim hall study in their departments. They have contributed important information, valuable and useful to achieve its objectives.

<table>
<thead>
<tr>
<th>RESPONDENT</th>
<th>POSITION</th>
<th>WORKING EXPERIENCE</th>
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<tbody>
<tr>
<td>Respondent 1</td>
<td>BIM project manager</td>
<td>20 years</td>
</tr>
<tr>
<td>Respondent 2</td>
<td>Consultant</td>
<td>24 years</td>
</tr>
<tr>
<td>Respondent 3</td>
<td>Architect</td>
<td>10 years</td>
</tr>
<tr>
<td>Respondent 4</td>
<td>Civil Engineer</td>
<td>13 years</td>
</tr>
<tr>
<td>Respondent 5</td>
<td>Facility management director</td>
<td>13 years</td>
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</table>

Figure 5 shows the study area of this research. Sultan Ibrahim Hall is located at Universiti Tun Hussein Onn Malaysia (UTHM), Parit Raja, which is the southern part of Malaysia. The hall was built with the methods of design, prepare, test and commission (design and build). The overall cost of the project hall is RM30 555 000. This project was built and completed in one and a half years in August 2012. Workers involved in this project are more than 100 people. The objective of the Sultan Ibrahim building hall project is to expand existing venues to accommodate more students during convocation and examinations. Sultan Ibrahim House consists of two floors. The upper floor can accommodate 500 people while the ground floor can accommodate 2000 people. Hall has rooms for seminars and banquets room can accommodate 500 people. It has a lobby area and available for the Sultan during convocation. Sultan Ibrahim Hall also has colorful LED lights while there are cargo lifts for transporting goods. The existence of Sultan Ibrahim Building has brought many benefits to the students and lecturers. The hall is also the first building using BIM technology in UTHM.

4 Data Analysis

This section is divided to two parts, where the data is analyzed before further discussion. The first part presents the key problem areas of traditional methods leading to communication problems while the second part highlights the BIM technology methods which are employed to improve communication.

4.1 Communication problems resulting from traditional methods

Communication problems between the client and contractor in a building project is seen as a major issue especially when it wastes time, incurs cost and cause unnecessary reworks. Thus, four questions were posted to the five respondents to examine on the root problems leading to the communication problem in the building project. The data analysis is summarized as below.
1) Lacking the understanding of technical knowledge
A client who does not fully understand the structure of construction industry may hamper the communication problem amongst client and contractor. This is because a client who is unable to communicate a clear concept and idea to the contractor may end up feeling dissatisfied with the quality of the contractor.

2) Problem of information delivery
Respondent 4 and 5 further elaborated that information delivered vaguely will cause communication hiccup. For instance, when a client gives instructions to the consultant about concept A, the consultant may have translated wrongly into concept B and conveyed the distorted message to the contractor, who may further misinterpret it into concept C. This is a common communication problem between client and contractor.

3) Not exercising full authority
Respondent 2 mentioned that the client did not enforce the "Building by Law 1984" before the start of the project hence causing all parties to not fully comply with the rules and regulations in the specification. For example, an architect's drawing which is not entirely clear, when submitted to the client will bring about communication problems between the contractor and client because the drawing itself cannot be clearly understood by the contractor.

4) 2D drawings unable to provide holistic picture of the object
Respondent 1 and 2 pointed out that 2D drawings are not able to portray the object as a whole and the construction details as well and sometimes will cause wrong interpretation to those read it. Respondent 3 explained that the Mechanical & Electrical and Civil & Structure will have a conflict during the installation of building construction part if the contractor misinterpreted the 2D drawings. For example, the pipe cannot be installed in the space provided for the Civil & Structure due to the inaccurate estimation. In the end, Civil & Structure are forced to remove bricks just in order to have sufficient space for pipe installation.

5) Difference of driving factor to profit gaining
When two parties have different focus on gaining profit, communication efforts may be affected as well. Respondent 1 stressed that the primary focus of profit gaining of a client is on the standard of the building whilst the primary focus of the contractor is on the cost. The lack of flexibility of the contractor will cause a tendency to not stick to the standard of client. Hence, communication is interrupted and ends up disrupting the whole construction process flow.

6) Lack of client’s commitment
All respondents agreed that client’s commitment is one of the most critical issues leading to the communication problem between contractor and client. Respondent 4 elaborated that misunderstanding often happens when a client does not communicate directly with the contractors. Apart from this, respondent 2 also highlighted that the media has replaced the face to face communication between client with consultant and the consultant with the contractor. For instance, fax, email and SMS have replaced the mode of communication of this era. It is important to state that all conflict may not be easily solved without involvement and commitment of the client in construction phase.

4.2 BIM technology methods employed to enhance communication
In order to overcome the problem of communication between the client and the contractor in the construction industry, BIM was introduced in a construction project to fix the problem issue. Four questions were answered by five respondents, and they were to provide feedback and comments useful for both researchers and objectives of expanding the effectiveness of BIM in the construction industry. These data can be summarized in Table 2 and.

<table>
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<tr>
<th>SUGGESTION</th>
<th>ANNOTATION</th>
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| Displaying all the data which were included in the model | - “All parties received the same images based on 3D model objects ...” (Respondent 2)  
- “The model is only referred to as 'BIM' when the model has data entered into it ...” (Respondent 1) |
| Virtualization and visualization | - "Building objects can be pictured completely ..." (Respondent 1)  
- “Visualization can resolve the conflict between architects work with architects, C & S and M & E” (Respondent 3)  
- “The arrangement of furniture, tables can be arranged to fit in the field of home” (Respondent 4) |
| Combine all of the concepts from the parties involved | - “Coordination of architects become more systematic and less conflict between C & S and M & E ...” (Respondent 4) |
Capable of displaying project construction similar to drawings

- “An inexperienced contractor who is unable to read and understand the drawing plans properly will often wrongly translate the drawings…” (Respondent 4)
- “2D drawings are only able to be understood by those who drew them…” (Respondent 2)

Facilitate the management process in the construction industry

- “Combines all of the concepts from the parties involved…” (Respondent 1)
- “Sharing information based on the model…” (Respondent 2)
- “BIM model has auto clash detection…” (Respondent 2)
- “To help calculate the cost of…” (Respondent 1)
- “Can see the movement of cranes in the site…” (Respondent 1)
- “Clients can test the energy and save energy…” (Respondent 1)

Communication based on model

- “Communication becomes more meaningful…” (Respondent 1)

### BIM TECHNOLOGY TO ENHANCE COMMUNICATION

1) Displaying all the data which were included in the model

BIM function displays all data that was included in the model precisely and accurately. BIM provides benefits to all parties involved in the construction industry to transform building aspirations into reality by converting aspirations to data which are then inserted into the model. These data represent the desire of the parties involved to build the project and will follow the client's request as well. The software used by Respondent 1 to create BIM is Revit model. Respondent 2 said that all parties will get the same image based on 3D models of objects with the use of BIM technology. With this, the parties can discuss and share ideas and experiences based on the model because the model would present a complete virtual object.

2) Virtualization and visualization

In addition, BIM also has the function of virtualization and visualization to picture the object structure of the data included in the model. Object building will become a reality where the height of the building objects can be seen from drawing compared to 2D where only the length and area of object construction can be seen. Thus, the concept is called visualization and this has helped the parties involved to see through every dimension of the building structure. Respondent 3 mentioned that visualization has addressed conflict between consultants work with architects, Civil & Structure and Mechanical & Engineer and construction projects are able to run smoothly. For example, the Civil & Structure and Mechanical & Engineer often face conflict involving the problem of lighting to be installed but the lack of space available. BIM plays a role to incorporate all the concepts involved before construction, not only to solve the conflict Civil & Structure and Mechanical & Engineer, but also to build trust between each other.

Apart from that, Respondent 4 shared that BIM model can envision building objects become clearer and includes its detailed arrangement of furniture, tables can be arranged to fit in place of the field house. A place to put furniture and desks can be measured before the model before putting furniture and desks into the room of the house. This has provided considerable benefits to the client who loves to decorate.

3) Combine all of the concepts involved

Furthermore, BIM is able to combine all the concepts from all the parties involved in this construction project. For example, architects, contractors, Mechanical & Civil & Structure Engineer and will include any concept, materials used and the type of building materials used in the software. Their concepts are converted into data included in the software and displayed on the screen. Respondent 2 also
commented that all data will be combined together and called the BIM model. The parties will be able to share information on the model and any changes in construction projects can be completed immediately. With this, all the parties involved are not only able to understand the concept of each party as a whole and also to understand the pattern of work colleagues better.

4) Capable of displaying project construction similar with drawings

In addition, the BIM also has a function that is capable of displaying the construction project similar to the drawings. This has helped the contractor to build the construction project towards the client's needs in the construction industry. Apart from contractors who can understand the plan, Respondent 2 emphasized that all parties involved will also enjoy the benefits compared to 2D drawings which are only understood by those who prepared it.

5) Facilitate the management process in the construction industry

As BIM model has the ability to display the lookalike of the construction project with the design drawing, thus it facilitates the management process in the construction industry. The construction of the building with the use of traditional methods has led to unsystematic management, bringing up the issue of conflict which results in double installation. This also causes the client to blame any parties and eventually affecting the atmosphere of the working environment. Respondent 4 shared that after the entry of BIM in the construction industry it has systematically improved coordination and reduce architectural conflicts between Civil & Structure and Mechanical & Engineer. Any conflicts which happen in the structure of the building will be detected before the start of the project and they can resolve the conflict earlier.

Apart from that, Respondent 5 said that a BIM model has an auto-clash detection function and this has facilitated the process of building construction. Any conflict in a construction project or building construction overload problems will be detected by the BIM model. BIM model will be lit red during the construction of buildings and units that are facing a contradiction. The system has reduced the installation of two times when conflict occurs during the construction process.

Respondent 1 also stated that the BIM model is capable of calculating the cost of building materials. All prices for building materials will be included in the model, this not only helps the client can calculate the total cost of the project with precision and accuracy, but also all of the construction project to make transparent in terms of cost. BIM model also has a function in the calculation of the number of components in a built up space of the building. For example, a client can know how many air-conditioning to be opened in the shopping center so that the temperature in the building is simple and can save energy. Government always encourages every shopping center put the building temperature is 25 degrees Celsius. In addition, the lights installed in the building are also required to enter data into the model and the data with the longevity of the switch. For example, life expectancy for the light switch is 2000 hours and in case of light switches do not work before 2000 hours, the client has the right to request replacement of a new switch suppliers. Typically, a building construction has been completed will be checked by a consultant in the past will be able to protect the rights of the client. BIM models can also test the movement of cranes in construction site. For example, if space is not allowed movement of the crane because of its size, the contractor can give orders to drive the crane so that the crane can lift and lower materials more efficiently. Furthermore, the BIM model can also help contractors can make scheduling Critical Path Method. With this, the contractor is able to calculate the building more accurate and precise. Contractors do not have to suffer because of the delay compensation to be completed in a specified time.

6) Communication based on model

Respondent 1 also noted that the problem of communication between the client and contractor issues often occur when a conflict exists and they will point the finger or blame each other. They often end up finding the person responsible to bear this burden, but without thinking and finding ways to overcome the root problems. However, with the incorporation of BIM in the construction industry, the communication between client and contractor has indeed become more meaningful because they are based on the model. Any party who fails to follow according to client specifications or requirements will be specified in this model. Clients and contractors are able to communicate harmoniously and BIM model can serve as a reference their responses when conflicts occur.

Apart from those mentioned above, more practical BIM modeling approach to improve the communication between client and contractor are also discussed by the respondents. The rules for BIM technology can improve the communication between the client and contractor to display all the data entered into the model, virtualization and virtualization, simplifying the management process in the construction industry, capable of displaying building project identical to drawings, and combining all of
the concepts involved and communication based model. All respondents agreed that BIM visualization functions can fully understand the concept and requirements of the client and construction projects can be built according to client expectations to the fullest. BIM has played an important role to improve the communication between the client and the contractor based on the opinion of many respondents and their communication to be effective and clear.

5 Findings

A client who is inexperienced and do not understand the structure of the projects will cause communication problem between client and contractor [19]. A client who lacks understanding to the construction structure will make changes any time, thus disrupting the communication flow and process flow. In addition, client who doesn’t fully understand drawing may cause unnecessary changes to be done. This is a critical issue that needs to be addressed by finding a most appropriate channel in communication. BIM is an effective platform where the client and contractor are able to optimally contribute their opinions and experiences [13]. Besides that, contractors who do not understand the language, technical terms and desires of the client is an issue that always seen in the construction industry [1]. When the client wants to convey to the contractor, he will deliver his message through the consultant. If the contractor does not understand the heart of the client, the contractor will misinterpret the message of the client through the consultant.

The client's commitment is a factor leading to communication problem between contractor and client. When a client intends to communicate with the contractor, he will go through the consultant without involving himself in the construction phase [20]. If the delivery of information from the consultant to the contractor is not entirely same as the client's needs, communication problem will arise. Hence, the presence of client plays an important role to maintain the quality of construction projects. Any issue of conflict that occurs in the construction industry will be made known to the client immediately and further action can be done to rectify the problem so as not to face the problem of time and financial losses.

Consequently, accountability of contractor is also one of the issues that hamper communication in the construction industry [21]. The reason a contractor does not account to the consultant (representative of the client) may be due to several factors. The contractor may be afraid to make changes, or the contractor is focused on lower cost rather than choosing the materials with high standard. Also, it could be the contractor’s preference to follow his own working style without following the method ordered by the consultant. In the end, the contractor will lose his credibility and trust from the client.

Moreover, the weaknesses of 2D drawing impedes communication problem in the construction industry. 2D drawing is based on vector lines, where it is not able portray the design of building information exactly and it will take longer time to understand and analyze it [1]. A 2D drawing is not able to represent the whole dimension of building design and the contractor is not able to obtain the exact and accurate estimation for the project.

Besides that, the contractor who has a passive attitude will lead to communication problems between client and contractor [22]. The contractor did not play his role in the construction industry is not able to lead and manage the workers as well and coordination of works will not be systematic and effective. For example, the contractor being passive to account to the consultant about the change of materials will result in more communication problems between client and contractor later.

All the communication problems between the contractor and client can be resolved with the employment of BIM which is able to integrate process chains and manage all information. Figure 6 shows the comparison of communication methods used by the client and contractor. The left section of the figure shows the traditional method of communication, mainly through 2D drawings. The communication will normally be one way and integration of information is not possible. Thus, many communication problems occur, resulting in not meaningful communication. However, the right section of the figure illustrates how BIM technology is able to create a 2 ways communication between the parties involved, resulting in a more meaningful communication and collaboration.
BIM technology is able to present the concept of the client to a 3D object which can be seen through visualization. Any problem 2D lines which are not clear can be overcome by the use of BIM as it can provide images for each unit structure of the building accurately and clearly. The accuracy and completeness of the present building construction drawings from BIM technology has solved the communication problem faced by the client and the contractor.

BIM not only has the concept of visualization to enhance understanding between the parties involved, but also have a new concept of BIM models work (collaboration). The new concept provides a platform for the parties involved in the project to share their information and knowledge. Trust and mutual understanding between parties involved could be built and they can understand the patterns of work and personality of each other. They will share ideas and motivate each other with the success of a construction project on time with good quality. Contractor has no excuse to be passive and irresponsible during construction due to having members of the project team with a common goal and mutual encouragement and support to ensure the success of the construction project. This can build a team to achieve superior construction projects effectively in the future. Communication between the client and the contractor to be more harmonious and quality because they are able to discuss and issue a joint opinion, based on the BIM model.

Thus, BIM has the answer for the parties involved to find a way to overcome the problem of communication between the contractor and the client in the construction industry. If BIM is still a concept that is less well known and understood by the parties involved, communication between all parties involved will not be repaired and construction efficiency in terms of cost, time and quality may not be visible. Therefore, the government plays an important role to be able to successfully implement
BIM widely in Malaysia. Convinced that this concept is not only used in the construction industry alone and this concept will be practiced in other industries in Malaysia. This will make communication between any party more meaningful and understanding between individuals more closely and deeply.

This model is a technology that is most effective and the ability to improve design quality that is understood by all parties involved in the construction industry [23]. With this, BIM has brought a significant impact on the construction industry. BIM-focused communications and collaboration (collaboration) [11] not only enhances cooperation between the client and the contractor, but also build a strong project team in the construction industry. Parties involved in the construction industry can enjoy the efficiency of communication with the use of BIM while improving the image of Malaysia in the construction industry.

6 Conclusion

If the client and the contractor continue to implement the traditional methods during construction, communication problems will always arise at any time. Weakness of 2D drawings and modes of information with the use of traditional methods should find a new idea or concept to overcome communication problems that often occur in the construction industry. The existence of a functional BIM visualization has satisfied the desire of all parties involved in a construction project as communication becomes more meaningful and communication will not be a problem which is encountered in the construction industry. Based on the data obtained, all respondents agreed that BIM is still a new technology in Malaysia. Finally, they are willing to try and believe this technology can improve communication between the contractor and the client. With the implementation of BIM, effective communication will increase the productivity and efficiency in the construction activities, thus enhancing project collaboration between industry stakeholders. This phenomenon calls for the need of an innovative multi-disciplinary collaboration model that is capable to help stakeholders to appreciate the importance of communication during collaboration and mutual benefits as well as opportunities that strengthen the competitiveness in globalization market.

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