Improvement in Ship Repair Works: Experience in Implementation of Production Friendly Drawing in Shipyard

Mazlan Yasin[#1], Nor Hasni Osman[*2]

[#]*Othman Yeop Abdullah, Graduate School of Business, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia*

[1]s95121@student.uum.edu.my

[*]*School of Technology Management and Logistic, College of Business, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia*

[2]has1218@uum.edu.my

***Abstract*— This paper is about studied the conflicts within the Production Department where ship repair works are carried out without proper establishment and full utilization of Production Friendly Drawing (PFD) produced by the Engineering Department. In order to resolve this problem, the qualitative study method was conducted in the shipyard to propose the best solution to overcome this issue. Production need to utilize the PFD to ensure ship repair works perform in accordance with "best engineering practice" while designer in Engineering Department must ensure the production drawing produced is friendly enough and accurate. PFD as one of the conflict resolution is chosen to overcome this issue while qualitative as a method being deploying to engage the production and designer intervention to come out with more efficient and effective solution for this problem. There are two findings have been discussed and compared in which the conclusion of the result was very significant.**

***Keywords*—** *Production Friendly Drawing, Conflict Resolution, Communication, Qualitative study, Korean Best Practice*

1. Introduction

This is an article about research on conflict occurring between Production and Engineering Departments in local shipyard involved in ship repair works. Preparing production drawing was a task given to the Engineering Department whilst Production Department is the party performing ship repair works. The existing practice in Production Department is most of the workers are doing work by using sketch, photos and previous experience. This practice of ship repair works is not professional, not in accordance with good engineering practice and definitely needed to be improved. This practice may be contributing to the significant problem in the shipyard as it creates issues such as low-quality products, which effect reworks, increase of cost and late time delivery[1]. The significant problems in the shipyard such as low-quality products, which effect reworks, increase of cost and late time delivery are attributed to the current practice.

In November 2013, when the shipyard engaged a consultant from South Korea, an advice has already been given that design approach needs to be looked into seriously. The consultant advised the Engineering Department to make the production drawing more comprehensive so that it is friendly to be used in workplace. The foundation of dynamic production logistics subsystem of any organization should be drawing documentation of production layouts [9]. However, in the process of implementing this initiative, conflicts took place between the two departments.

In many instances Production Department did not use the production drawing that was prepared by the Engineering Department. In fact, there is always conflict between these two departments when Production staff always asked Engineering staff to amend the production drawing according to the work that has been done instead of they do work in accordance with the drawing provided. This conflict has to be investigated and studied in order to improve ship repair works. This kind of conflict could cause reworks due to performing ship repair works without guidance by the production drawing, which will lead to element of

[1] Source: Business Review by Asian Business Solutions Sdn Bhd dated 29 July 2013.

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waste. Waste can be defined as any activity, which does not add value [10]. Assistance by having a proper production drawing by Engineering Department will only sought when the Production staffs are stuck and unable to accomplish their works. Conflict between the two departments will only end when this situation arises. In this case, Engineering Department will assist even though the Productions' Standard Operating Procedure does not mention the involvement of Engineering Department[2]. This situation has long existed and remained unchanged due to culture and unavailability of production engineering function in Production Department[3].

This conflict, existing working culture and unavailability of production engineering function in Production Department resulting works performance not as expected. Low performance works by Production and subcontractors has been registered in the Risk Register List of the Enterprise Risk Management since 2009[4]. Besides, it has been also highlighted in the survey made by the ABS in 2013[5]. Thus, low performing Production and subcontractors become a significant problem encountered in the Shipyard. This problem conceives issues of competitive priorities such as reworks on low quality products, increased cost of project, late delivery time of project and flexibility to respond and adapt to changes in customer needs [13].

Observation will be carried out on the utilization of production drawing during ship repair works by the Production to verify that they are working based on production drawing provided by the Engineering. At the same time design issues in Engineering Department will also be studied to identify if there is any relationship in terms of communication and conflict between utilization of production drawing for ship repair works and preparation of the production drawing. Finally, improvement on present design approach in producing friendly production drawing by the Engineering and utilizing production drawing by the Production will be studied and proposed.

2. Layout Literature Review

2.2 Ship Repair

The 3rd Industrial Master Plan identified Shipbuilding/ Ship Repair (SBSR) industry as a strategic industry that could help transform Malaysia into a fully developed economy by 2020 [23]. Prime Minister Datuk Sri Najib bin Tun Haji Abdul Razak wrote: "The SBSR industry must continue to be resilient and maintain its competitiveness. All players must prepare to face the challenges in the next few years until the price stabilises". Some of these challenges may be classified as technology, new approaches in improving productivity, overcoming cost of production and improving capability and competency [14].

2.3 Conflict

Conflict can be divided into three levels, which are individual level, group level and organizational level conflict. Level of Conflict affecting organizations can occur in individuals, between individuals, and between groups [17]. The valuable determination of such clashes or conflict can regularly be accomplished through a judicious procedure of critical thinking, combined with an ability to investigate issues and choices and to hear each out other. Conflict might be lessened by making a group more durable and homogeneous. In the event that the administrator of a group finds that there is not as much as sufficient measure of substantive conflict inside his or her group, he or she embraces the troublesome task of expanding conflict through structural changes [16].

2.4 Three Type of Conflict Theory

2.4.1 Traditional Theory of Conflict

Traditional Theory of Conflict lasted until the nineteen-forties of the twentieth century [20]. Gadalrab stated the adopters of this school of thought believed that an unwelcome behavior triggered conflict in the workplace must be wipe out even if by force as soon as it appears [8].

[2] Source: Procedure for Monitoring System Workshop dated 30 June 2014.
[3] Source: Procedure for Management of Ship Repair Project dated 2 December 2015.
[4] Source: Briefing on Shipyard Risk Management dated 15 January 2016.
[5] Source: Business Review by Asian Business Solutions Sdn Bhd dated 29 July 2013.

2.4.2 Theory of Human Relations of the Conflict

Theory of Human Relations of the Conflict is the development of the traditional theory of conflict and popular in 1940-1970. Conflict is a natural occurrence in all groups. The human relations school of thought accepts conflict. It believes that conflict may benefit a group's performance [15].

2.4.3 Modern Theory of Conflict

Robbins et al mentioned Modern Theory of Conflict is a positive constrain, as well as vital for a person to perform successfully. Settling conflicts implies testing typical procedures and methods with an end goal to enhance singular efficiency or present inventive frameworks [15].

2.5 Outcome of Organizational Conflict (Constructive or destructive)

Conflict within organization normally has positive and negative impact. In particular, it's important to separate between functional and dysfunctional conflicts. The interactionist perspective does not suggest that all conflicts are great. Comparatively, a few conflicts strengthen the objectives of the group and enhance its execution; these are functional or constructive forms of conflict. quoted that Robbin says the group's goals are supported by functional conflict and the performance of group indirectly can be improved. It will give an advantage to the group if the conflict leads to a normal competition where every groups work harder to produce more than others do [15]. It is representing a battle between groups to bring out their ideas and goals to enhance the performance of employees and organization. According to Kinicki and Kreitner, constructive conflict gives a chance to its member to analyze problem and overcome it with all opportunities they have. It can inspire to new ideas, learning, and growth among individuals [15].

Dysfunctional or Destructive Conflict is one of the conflict forms that block the performance of group to grow. Conflict is viewed as an inescapable and attractive in every organization but when it is not adequately taken care of, conflict can destroy connections and, in this manner, meddle with the trading of thoughts, data and assets in groups and between divisions. Kinicki and Kreitner stated that dysfunctional conflict hinders and prevents organizational goals from being achieved. productivity of an organization will decline as the performance of organization is restrain by Dysfunctional conflict. This conflict introduction is described by contending singular interests abrogating the general enthusiasm of the business. Administrators withhold data from each other. Representatives harm others' work, either purposefully or through unpretentious, conflict-motivated lack of engagement in cooperation [15].

2.6 Definition of Intergroup Conflict

Intergroup conflict defines as the collective incompatibility or difference between two or more divisions, departments, or subsystems in connection with tasks, resources, information, and so on [16]. This definition is relevant to the situation that exist in Shipyard.

2.7 Nature of Intergroup Conflict

Intergroup conflict is also called interdepartmental conflict. It refers to conflict between at least two units or groups inside an organization. The case of this sort of conflict is conflicts amongst line and staff, marketing and production, and field staffs and headquarters. On uncommon sort of intergroup conflict is amongst labour and administration [16].

Figure 1. Thomas-Kilmann Conflict Mode Instrument.

Management scholars have created and recommended a scope of alternatives for dealing with organizational conflict. Figure 1 frameworks the different parts of the Conflict Resolution Grid, which is the aftereffect of broadly acknowledged research introduced by Thomas and Kilmann [19].

In conclusion, to overcome the conflict, Shipyard had implemented PFD for ship repair works which enable the Production and subcontractor to carry out their works in efficient and effective manner. To make the PFD functioning well, Engineering Department designers have to be strengthen with knowledge, experience and skill in using design tools.

3. Methodology

This research applied qualitative method in collaboration and participation between Engineering Department staff and Production Department Staff in shipyard. The researcher is part of the Engineering staffs who is involved directly in the existing business process which conflict is perceived and need to be studied. Triangulation data concept will be used in this study. Triangulation data can be defined as a combination of similarity of phenomena in a method, and a method metaphor can also be described as a triangulation. The triangles talk about the methods of convergence and generally produce more objective information about effective outcomes. Triangulation of data will be done from data that collected through multiple sources to include interviews, observations and document analysis [5].

3.2 Interview Approach

Interviews will be conducted using semi-structured questions. By choosing a semi-structured interview, the interview process is not very strict, unlike the structured interview. In a semi-structured interview, the purpose is to explore the subject matter in the context of a free model and allow respondents to comment on their opinions and thoughts on their own experiences. Researchers need to pay careful attention to the participants' responses and follow their directions in using semi structured interviews [6]-[7]. The target interviewees are as shown in Table 1.

Table 1. The Target Interviewees

Managerial Levels & Workers	Engineering	Production	Total
Middle Management (Assistant Manager, Manager and Senior Manager)	5	9	14
Supervisors (Senior Executive & Executive)	22	19	41
Workers (Non-Executive)	13	132	145

3.3 Observation

Meetings, discussions, brainstorming and presentation cycles are especially frequent in the use of Action Research cycles. In doing so, the observation, response, judgment and intervention (ORJI) framework becomes the guideline. Schein introduces a method in which researchers may reflect the basis of their experiences, cognition, judgment and ORJI role [4]. Schein created a model directly related to observation with a purpose of bringing attention to emotions and reactions generated from observations [3].

3.4 Document Review

The work will be divided into details for each respondent to be included in the review process. The comparison between the written document and the actual process will be validated on this stage. This role will be more accurate in triangular data analysis. The importance of examining written evidence and exist in such a way that different spoken languages are physically persistent and therefore can be separated in space and time [1]. Document clustering techniques are widely recognized as a useful information tool for reorganizing data and information [11] in documents that are mined and collected. There are various ways to compile and review all of the information in particular that has been recorded, as indicated by previous researchers. In this study, all the information will be summarized in a single folder, using a simple process of collecting all the relevant files, and then viewing them one by one. Next, the process of analyzing all the information that has been collected in one folder will be facilitated by the use of NVIVO software.

3.5 Data Analysis Procedure

Data analysis procedures will be started once the collected data from various sources were converted into transcribed form. This includes interview information from audio tapes, notes, etc. Thereafter, the data reduction process begins with the reading and re-reading of the transcribed data. Next, identifying the emerging themes will be done upon reading of each transcript during the reduction process. The files will be placed in the same folder for ease of process analysis. Subsequently the "open coding procedure" was initiated to identify the emerging themes. Upon identification, the theme was separated accordingly in order to avoid any misplacing of information in the system.

There are six steps in the data analysis [5]. The analysis is in linear order as the cognitive operation is not simply static; organize and set up the data for analysis, read through the data, detailed analysis with coding process, the coding process to get a description of the scene or people as well as categories of the data for analysis, advance how the description of the compositions will be interpreted in the qualitative narrative and interpret the significance of the data.

For the first step, organize and prepare the data for analysis. For this step, gather and review all information from audio records and interview documents, then transfer all the information into a single transcript document. Then, read through the data. The next important step is to discover the overall meaning in the information to achieve a general sense of the ideas and information given by the participants. A detailed analysis begins with the coding process. Then, all information will be organized into categories and labelling all the information with conditions by referring to the information given in the interview sessions. The coding process will describe the categories for analysis.

In this research analysis, codes will be generated for all the information and all categories will be analyzed in a general description in NVIVO 11. As a Qualitative Data Analysis application, NVIVO 11 requires knowledgeable skills to attain maximum accuracy out of the research findings. However, learning how to leverage from NVIVO 11 was made easy with the tutorials that were packaged with the software while workshops and trainings were readily provided for a more impressive outcome through using special techniques.

4. Research Finding

4.2 Traditional Practice of Ship Repair Work

As mentioned earlier, Production and contractor staffs carry out ship repair works in a traditional way. They are doing works based on sketch, photo and experience. Previous records have demonstrated delay of Royal Malaysian Navy (RMN) ships undergo refit in the shipyard [18]. During this period, all ships under repair still practice traditional method of performing repair works. Along the way, lots of conflict happened in order to ensure ships under repair will be delivered as scheduled.

Table 2. Ship Repair Works Delay

Ships	Start Date	Schedule Completion Date	Actual Completion Date	Months Delayed
SR1	26/12/2008	07/11/2009	27/05/2011	18.87
SR2	12/08/2008	28/08/2009	23/12/2011	28.23
SR3	20/01/2009	21/01/2010	24/03/2011	14.23
SR4	10/03/2009	01/06/2010	29/03/2011	10.03
SR5	03/11/2009	01/11/2010	31/07/2012	21.27
SR6	14/03/2011	13/03/2012	26/11/2012	8.60
			Average	16.87

The conflict happened mainly due to non-existence of PFD for guidance of ship repair works. Information in Table 2 demonstrated data from six (6) ships under repair (SR) in shipyard which indicate start date (SD), schedule completion date (CD), actual CD and delay in day, month and year. As for SR1, SD was 26 December 2008, planned CD 7 November 2009 and actual CD was in 27 May 2011 which result delay for 18.87 months. The delay for SR2, SR3, SR4, SR5 and SR6 are 28.23, 14.23, 10.03, 21.27 and 8.60 months respectively. The average of delay for all 6 ships under repair is 16.87 months which equal to one and half (1.5) year. The average of delay becomes benchmark for the delay of ship repair in shipyard.

4.3 PFD and Practical Transfer of Technology

An agreement between Might Meteor Advanced

Manufacturing (MMAM) and a subsidiary of Malaysian Industry Government Group for High Technology (MiGHT) was signed in order to improve the efficiency and effectiveness of ship repair projects [2]. As a consequence, South Korean experts were made to be present in Malaysia to contribute in consultation services and best practices where ship repair is concerned. Among the contents of the service agreement was to bring in experts from South Korea. These experts, with vast experience in ship repair and shipbuilding (SRSB) will merge with the project management team at Boustead Naval Shipyard (BNS) [14]. This was consistent with the BNS rationalization programme where delivery has to be in accordance to the stipulated completion date. Failure to adhere to this date will result in heavy penalty against the BNS imposed by the government.

Six Malaysian trainees were attached to the South Korean team in this project. The case in point was KD LEKIR, which was a Corvette Class surface combatant built in Kiel, Germany in 1980s. The ship, which belonged to the Royal Malaysian Navy (RMN) was undergoing refitting and Service Life Extension Programme (SLEP) at BNS [22]. The team joined the shipyard in November 2013 with a 15 months contracts, expiring February 2015 – four months after the completion date of KD LEKIR repair programme on the 30th October 2014 [14].

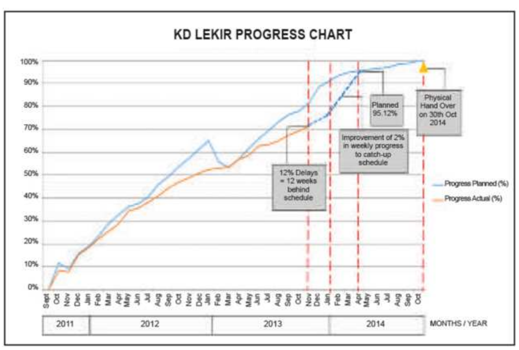

Figure 1. KD LEKIR Status Repair Progress as at November 2014

The painstaking task of setting the pace for South Korean Best Practice had to be worked out by the Malaysian-South Korean Team together with the shipyard project management team. The repair works had already started; however, progress was slow. The implication of the delay was late-delivery charges (LD) imposed onto the shipyard. In Figure 1, the blue line indicates the projected progress as compared to the actual, which is the red line. A 12 weeks delay equivalent is demonstrated in this figure. At the end of the project, the gap should be made closer and the two lines meet. With the guidance from competent South Korean Shipyard experts and locals with more than 20 years' experience in ship repair industry, what seemed difficult in the beginning, began to show progress after two months.

5. Conclusion

This research identified two different approaches that have been practiced and the finding was very significant. Comparison between traditional practices of ship repair and new approach of PFD shown a very clear indication that shipyard has to emphasized seriously on the implementation of PFD. With this initiative, the Shipyard managed to recover the delay of a ship undergoing a ship-life extension program and avoided liquidated damages amounting to RM63 million. The Shipyard also managed to reduce its average delay for ship repair from 17 to 6 months [21].

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References

[1] Ahuja, R. (2007). *Towards an Understanding of Excellence in Urban Pedagogy: A Portrait of a High School*. The Qualitative Report, 12(1), 1–19.

[2] Boustead Heavy, C. I. (2014). *Boustead Heavy Industries Corporation Annual Report 2014*. Kuala Lumpur.

[3] Cannata, M. B. (2013). *What is the Effect of Observation by an OD Practitioner on the OD Practitioner ' s Intended Outcome of an OD Intervention ?* University of St. Thomas.

[4] Coghlan, D., & Shani, a. B. (2009). *The*

Challenges of the Scholar--Practitioner: Introduction to the Special Issue. The Journal of Applied Behavioral Science, 45(1), 5–7. http://doi.org/10.1177/0021886308328852

[5] Creswell, J. W. (2013). *Research Design-Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications International Educational and Professional Publisher (4th Editio). Thousand Oaks, California 91320: SAGE Publications.

[6] Dagbjartsdóttir, S. (2012). *Quality Status and Quality Aspects in the Icelandic Construction Industry,(May)*. Retrieved from http://skemman.is/item/view/1946/12769

[7] Dodge, P. R. (2011). *Managing School Behavior: A Qualitative Case Study*. Iowa State University.

[8] Elmaghri, M. (2013). *The Causal Factors of Interpersonal Conflict in The Libyan Cement Industry*. University of Salford, Salford, UK.

[9] Hart, M., Lukoszová, X., & Taraba, P. (2013). *Methodics of Production Layout Design and Its Importance to Logistics Management*. Research in Logistics & Production, 3(3), 225–238.

[10] Jakubiec, M., & Brodnicka, E. (2016). *Kaizen Concept in the Process of a Quality Improvement in the Company*. The Company in Today's Eonomy - Theory and Practice, 89–101. http://doi.org/10.19253/reme.2016.01.008

[11] Kishida, K. (2003). *Techniques of Document Clustering: A Review*. Library and Information Science.

[12] Leung, Y. F. (2010). *Conflict Management and Emotional Intelligence*. Southern Cross University, Lismore, NSW. Southern Cross University, Lismore, NSW.

[13] Naqshbandi, M. M., & Idris, F. (2012). *Competitive Priorities in Malaysian Service Industry*. Business Strategy Series, 13(6), 263–273. http://doi.org/10.1108/17515631211286100

[14] Omar, A. M. (2015, September). *South Korean Best Practice, Applied to Malaysian Ship-Repair and Shipbuilding (SRSB) Industry*. Jurutera The Monthly Buletin of The Institution of Engineers, Malaysia, 12–15. Retrieved from http://www.myiem.org.my

[15] Omisore, B. O., & Abiodun, A. R. (2014). *Organizational Conflicts: Causes, Effects and Remedies.* International Journal of Academic Research in Economics and Management Sciences, 3(6), 118–137. http://doi.org/10.6007/IJAREMS/v3-i6/1351

[16] Rahim, M. A. (2001). *Managing Conflict In Organizations*. Quorum Books (Third Edit). London and New York.

[17] Sarangi, A. (2011). *Managing Conflict Through Confrontation: An OD Intervention*. International Journal of Research in Commerce, IT and Management, 1(6 (November)), 131–134.

[18] Solutions, A. B. (2013). *Boustead Naval Shipyard Business Review*.

[19] Thomas, K. W., & Kilmann, R. H. (2012). *Thomas – Kilmann Conflict Mode Instrument*.

[20] Violetta, B. (2012). *Development of Conflict Management Strategies to Increase the Organizational Effectiveness in Nordic Companies.* School of Business, Reykjavik University, Iceland. Reykjavik University, Iceland. http://doi.org/10.1007/BF03192151

[21] Yushak, M. S., Dolah, R., Bakar, N. A., & Jamaludin, K. R. (2016). *Mediating Effects of Resistance to Change to Successful Lean Transformation.* Journal of Advanced Research Design, 1(1), 1–12.

[22] Yushak, M. S. Bin. (2017). *Management of Resistance to Change Using Lean Principles in Transforming a Shipyard Operations*. University Teknologi Malaysia.

[23] Zainal, K., Nor, A. M., Intan, S. W. T. A. R., Mahfar, N., & Jalil, D. S. A. (2015). *Malaysian Shipbuilding/Ship Repair Industry Report 2015/2016*. Malaysian Industry Goverment Group for High Technology (MIGHT).