

An Assistive and Research Framework Methodology for Ships' Upkeep and Repair Organisational Learning Performance

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Abstract

The Omani Dockyard (OD) requires the development of a research methodology, which encompasses an assistive framework to maintain the research boundary to support a research framework. A research framework is developed to understand the behaviour of variables. A deductive / quantitative – survey questionnaire is employed in the main research to statistically understand the ‘mindsets / opinions’ of a large population and an inductive / qualitative – semi-structured interview using selected senior managers for the total research. Another questionnaire was used to critically learn from the agreement of the senior managers if the proposed contributions were in line with the ships’ upkeep and repair ‘organisational performance’. The initial and most definitive requirement is also to understand the strength of independent and mediation constructs applicability for the enhancement of performance. The problem is in the area of ‘enhancement of organisational learning on knowledge and competencies’ to underpin ships’ upkeep and repair support performance for better availability of operational ships. This research methodology was designed for a ‘major piece of research’ involving a doctorate dissertation in ships’ support performance. The conclusion and recommendation for a ‘major piece of research’ formulated the framework / model to underpin performance. This study concentrates on the research methodology that was used for ships’ upkeep and repair performance of the Omani dockyard with a compressive description of the total results, which can be generalized for other studies.

Keywords: methodology, frameworks, knowledge, competencies, organisational learning performance

1. Introduction

The background of this study is that the Omani dockyard is committed in all respect to improve ships’ upkeep and repair support organisational learning performance for better availability. Typical areas that lead the inception of this study were the problems encompassing a variety of issues such as workloads, constraints caused by attrition of knowledge and competencies, changes in acquisition method and increases in assets.

The purpose of this study is to describe the research methodology, and the required research frameworks that were used to guide a dockyard on the perceptions of meeting its required objective. The linking determinants are a research methodology encompassing an assistive framework and research frameworks that employ appropriate constructs involving internal forces of cooperation, efficiency, innovation, direction, proficiency, concentration and effectiveness of training, supported by items of single and double-loop learning to improve ‘organisational learning performance’ (Mintzberg, 1991; Jashapara, 2003; Wang, 2008; Anvari et al., 2010). The chosen strategy involved an intensive literature review (LR) and the collection of quantitative data from a large population, i.e. that of an Omani Dockyard and its related environment. This was followed by qualitative data, which was gathered immediately after the analysis of quantitative data in a similar format of questionnaire. The final questionnaire that was used involved senior management to understand the level of agreement of our contribution to solve the problem.

In addition to LR, the research was processed in three parts. Part one of the research administered a survey questionnaire to a large population, involving senior and junior participants, and the outcome was thoroughly reported using correlation, multiple linear regression, mediation analysis and the Sobel Mediation Test. The

researcher used part two of the research for the collection of qualitative data through semi-structured interviews, using selected senior managers, in the form of a discussion formulated by “open-ended questions” to gain support, draw conclusions and propose solutions to the research problem. Part three distributed questionnaires to senior managers to ascertain that the contributions made are appropriate for solving the problem. This strategy is considered advantageous as it involves the collection of quantitative data from senior and junior managers, confirmed by qualitative data from a selected and limited number of senior managers and other practitioners for the total research, addressing the same issues but at different group levels. The final contributions for solving the problem were also assessed by a third, and final, questionnaire to learn from senior practitioners’ level of agreement.

The triple strategies employed two survey questionnaires and semi-structured personal interviews (Saunders et al., 2000b, p. 98; Denscombe, 2007; Saunders et al., 2009). They are the result of critical LR to establish relationships between this study and prior research and to identify gaps. They are also supported by experience in achieving the intended objective involving investigation, analysis, measurement, development and formulation to understand the relationship and effect of variables as follows:

- 1). The distribution of a survey questionnaire to groups of different seniority within the five organisations on different responsibilities, roles, education, study motivation, trade specialisations, length of service and any other specific educational qualifications (Saunders et al., 2000b, p. 99; Saunders et al., 2009).
- 2). Semi-structured personal / group interviews with some selected senior managers and participants to develop a deep understanding supported by the use of themes, to answer questions, achieve objectives and propose solutions (Saunders et al., 2000b; Saunders et al., 2009).
- 3). In addition to the semi-structured interview, the final part of questionnaire was based on what is proposed or needed to solve the problem is in agreement with the senior practitioners.

1.1 Problem Statement

The background of the problem results from commitment to improve ships’ upkeep and repair support demands involving several standards of variables that are important for a learning organisation. Realistically, the Enhancement of Organisational Learning on Knowledge and Competencies (EOL-K&C) for the improvement of ships’ upkeep and repair support ‘organisational learning performance’ in the OD has been an issue demanding ongoing improvement. The processes to solve problems were initiated in isolation, rather than solving the problem in a holistic manner or completeness.

The problem is experienced in the Omani Dockyard (OD) in area of performance improvement because of insufficient involvement and preparation of methods to manage the multi-discipline tasks. These require preliminary preparations through constructive operational frameworks / models of knowledge and competencies to address the EOL-K&C to improve performance in a dockyard environment. The processes require a variety of disciplines and frameworks when undergoing upkeep and repair for better performance management and availability of operational ships (Houghton & Lea, 2009; Law & Richardson, 2003; Conachey, 2004; Conachey et al., 2008; Saunders et al., 2000a; Rizzo et al., 2011). The problem requires the enhancement EOL-K&C to cater for an uncertain environment and to improve performance (Marchbanks, 1992; Garavan & McGuire, 2001).

Research methodology is important for ships’ upkeep and repair support ‘organisational learning performance’ to develop solutions in a dockyard environment. The problem requires sound research methodology processes that can support the enhancement of organisational learning to cater for an uncertain environment and to create methods of improving performance. This can be experienced because of insufficient involvement and preparation of methods to manage the multi-discipline tasks. The frameworks of methodology are essential to support the effective involvement and preparations of multi-discipline tasks. Complex maintenance, logistics and administration issues are caused by difficulty in maintaining modern organisational learning performance. The reason for the complexities in ships’ upkeep and repair support is that the availability of ships requires not only technical awareness, but equally needs concentration and the fulfilment of advanced preparations in an area of work package compilation. These factors must be supported by material acquisition to avoid problems in the upkeep and repair loop. The foregoing problem is experienced in areas of competencies in proficiency, efficiency and innovation in engineering and logistics support. It requires the participation of appropriate constructs to enhance ships’ upkeep and repair support ‘organisational learning performance’, whilst improving the availability of operational ships.

In summary, improvement in ships’ upkeep and repair support ‘organisational learning performance’ requires effective preparation, effective acceptance of new technology and effective acceptance of change. The process of

continuous change is extremely important, requiring the design of a distinctive productivity frameworks / models to enable the participation of people at various levels. Work preparation and acceptance involving technology has become a vital process, but it requires preparation of factors necessary to improve tangible and intangible performance, and there is no other way round for a 'public, disciplined / nonprofit organisation' but to learn new competencies.

1.2 Research Objective

The research objective is to solve the problem through opinions / mindsets for better ships' upkeep, repair and support for availability performance by the use of a constructive research methodology. There is a need to understand the behaviour, relationship and contribution of constructs through the formulation of constructive research processes, an assistive framework and a hypothetical research framework to understand and solve the problem in a holistic manner. Our questionnaire was designed to understand the different phases of issues in order to make decisions. The objective is therefore to present in a descriptive format of a complete research methodology that was used for a 'major piece of research' involving an engineering doctorate dissertation to support the method for answering the question to improve ships' upkeep and repair support 'organisational learning performance'" and the objective of creating and "formulating a framework / model that can commit and encourage learning for ships' upkeep and repair support 'organisational learning performance'".

2. Literature Review

2.1 Overview on Research Process

The research process for this organisational survey is unique and it used explanatory and exploratory research by drawing a picture to discuss the 'what' to develop insight and to clarify understanding of a problem (Saunders et al., 2000b; Saunders et al., 2009; Onwuegbuzie et al., 2009). For this organisational study that requires performance improvement, explanatory research was conducted through survey questionnaire to mainly understand the 'what?' (Saunders et al., 2000b; Saunders et al., 2009; Yin, 2009) involving items of single and double loop learning (Edwards, 2009; Argyris, 1976; Argyris, 1977; Jashapara, 2003). The descriptive and exploratory research supported a syllogism of studies, using applied research of practical relevance that was appropriate to improve understanding of the problem, and designed to deal with answering the research questions and achieving the objectives for a unique problem. The main purpose is to focus on a professional problem and create a solution for the required objective rather than to concentrate on a purely theoretical solution (Burian et al., 2010; Rudestam & Newton, 2001; Saunders et al., 2000b; Saunders et al., 2009). The intended processes enable the collection and confirmation of data (Saunders et al., 2000b; Saunders et al., 2009). They also guide the whole research whilst enabling freedom of explanatory and exploratory research, following a mixed method approach. The initial quantitative part involved an inferential statistical analysis of relationships and contributions between independent, mediating and dependent variables '(Saunders et al., 2000b; Saunders et al., 2009; Sekaran, 2009)'. The assistive and research frameworks are needed to enhance organisational learning on knowledge and competencies (OL-K&C) to underpin ships' upkeep and repair support 'organisational learning performance', using the appropriate constructs. The study encompasses six constructs of learning focused on cooperation, efficiency, innovation, direction, proficiency, and concentration (Mintzberg, 1991) as independent variables (IVs) with innovation, proficiency and concentration employing items of single- and double-loop learning (Jashapara, 2003). The assistive and research frameworks use 'effectiveness of training' as a mediating variable (MV) and ships' upkeep and repair support 'organisational learning performance' as a dependent variable (DV) (Hayes, 2013; Hair et al., 2010). Part one of the analysis is intended to involve a deductive approach, which is used for testing hypotheses and getting the feel of agreement from the workforce to meet the objectives. Part 2 & 3 are inductive and deductive approaches used to build, develop, and confirm existing theory (Gill & Johnson, 1997; Gill & Johnson, 2002; Rudestam & Newton, 2001; Sekaran, 2000; Sekaran, 2009) to meet the objectives.

2.2 Purpose of Research Methodology

The research methodology for the subject title is designed to inform the intended action and processes involving assistive and research frameworks. This is to find a method to create or maintain effective organisation learning on knowledge and competencies (K&C) in the ships' upkeep and repair support 'organisational learning performance', viability and availability. This requires the introduction of modern and better methods of developing skills and abilities through the sharing, creation and application of knowledge. Accordingly, the level of study methodology used 'what and does?' as the top requirement to seek insight (single loop learning), to develop an understanding of what is needed to solve the problem as the basic requirement to offer a viable understanding of the organisation (double loop learning) (Edwards, 2009). The whole process will require an

in-depth survey concentrating on modern procedures employing the ‘*What?*’ (Yin, 2009, pp. 8-10). The survey and semi-structured interview study will therefore offer considerable ability to ‘*what and does?*’ and has to avoid ‘Yes and No’ answers (Saunders et al., 2000b, p. 94; Onwuegbuzie & Leech, 2006).

The research is aimed at finding a means of proposing frameworks, tools and methods to improve the viability and availability of ships’ repair and upkeep support performance using exploratory and explanatory research. The research intends to offer a method for “systematic and rigorous inquiry or investigation that enables people to understand the nature of problematic events or phenomena” (Stringer, 1999, p. 5).

2.3 Research Strategy

The research strategy is designed specifically for the organisation to manage bias and ensure reliability, validity and normality. The envisaged responses to the research questionnaire statements have to allow freedom to move negatively to positively in a quantitative method. The purpose is to learn and ascertain the position of research hypotheses with a view to solving problems, answering the questions and maintaining clear objectives using the following mixed method approaches:

- 1) The first part is primary research. It was carried out by using a dedicated survey questionnaire to deductively collect data to test the hypotheses. These data were formulated using the help of material collected from the secondary research (literature review). The questionnaires were distributed to selected and knowledgeable participants to quantitatively learn from a variety of the senior and junior management population. The quantitative material from the primary research are required to learn from the tactical views and to produce the initial part of data collection with the second and third part of the data taking a leading role (Creswell, 2003; Denscombe, 2007) in order to make sensible findings.
- 2) The second part is also primary research. It is carried out from the knowledge learned in the first and second part of research to conduct in-depth semi-structured interviews with senior management and learn their views. The in-depth semi-structured personal / group interview is designed with tentative and qualitative hypothetical statements in mind. The questions were open and close-ended to allow comprehensive confirmation to take place from “Quantitative to Qualitative” and to make a sensible argument.
- 3) The third part is further supported by another set of questionnaire responses to learn from the most senior managers’ level of agreement for a final contribution to solve the problem.

2.4 Research Process Design

The outline of the research design is based on the research objective. It is intensive explanatory (deductive) and exploratory / descriptive (inductive) research, involving quantitative and qualitative research (Denscombe, 2007; Saunders et al., 2009). It employs mainly ‘open-ended questions’ with the rationale of acquiring “quantitative and qualitative” data with different levels of role (Denscombe, 2007) as this can be better understood by the practitioners in the Sultanate of Oman. From the exploratory / descriptive method, the researcher used organisation experience and that of his colleagues, critically supported by literature with the aim of collecting sufficient information and understanding of the topic. The survey involved ‘*what?*’ to gain new insight through questioning and phenomenal reasoning (Saunders et al., 2000b). The ‘*What?*’ is needed to understand the situation to solve problems whilst answering the questions and to meet the objectives using appropriate or modern research methods (Yin, 2009; Saunders et al., 2000b). This research commenced with a rigorous and critical literature review to compare and contrast with the current knowledge. The research abbreviated instrument in Appendix A was reviewed, validated and piloted within the context of the Sultanate of Oman as follows:

- 1) Exploratory / descriptive studies were used to understand the research problems, research questions and research objectives in the form of words and structures through literature to seek expertise followed by a summary.
- 2) Explanatory Studies were used to recheck the exploratory studies from the literature whilst supporting, analyzing and arguing to arrive at a rigorous finding and conclusion.
- 3) Survey questionnaire and semi-structured interview - At this stage, the researcher had collected sufficient knowledge as a result of (i) and (ii) to design a survey questionnaire, followed by the design of a semi-structured interview questionnaire. The final questionnaire was also designed to learn from the agreement of research contributions by the senior managers.

2.5 Conceptual and Theoretical Background

The study used explanatory and exploratory / descriptive research involving discussion of the ‘what’ to understand the problem (Saunders et al., 2000b, p. 97; Saunders et al., 2009). ‘What’ and ‘how’ were normally

used by scholars involving single and double loop learning for the syllogism of studies focusing on research problems and objectives involving deductive and inductive approaches (Saunders et al., 2000b, p. 245; Edwards, 2009; Saunders et al., 2009). This study employed the ‘What’ questions involving explanatory and an exploratory questionnaire (Saunders et al., 2000b; Saunders et al., 2009). “*In general, “what” questions may either be exploratory (in which case any of the methods could be used) or about prevalence (in which surveys or the analysis of archival records would be favoured). “How” and “why” questions are likely to favour the use of case studies, experiments, or histories (Yin, 2009, p. 10)*”.

Both methods of survey questionnaire and semi-structured interviews, were validated and piloted to strengthen reliability and validity (Saunders et al., 2000b; Saunders et al., 2009). The questionnaire was made brief through validation and it was made to maintain “questionnaire focuses and questionnaire phraseology (Gill and Johnson, 1997:88)” using a predetermined sequential approach. The adapted questionnaire from the literature was subjected to an internal consistency reliability test. The constructs phraseology and flow were produced and arranged based on Mintzberg, (1991). An additional construct of the mediating variable (MV) of ‘effectiveness of training’ was used (Hair et al., 2010; van Eerde et al., 2008; Velada & Caetano, 2007; Anvari et al., 2010; Orvis et al., 2009; Hayes, 2013). The internal consistency in Jashapara’s, (2003) and Marsick and Watkins’, (2003) studies, where the research instrument was adapted, used Cronbach’s Alpha to determine computing alpha Coefficient (Jashapara, 2003; Marsick and Watkins, 2003). All Jashapara’s, (2003) constructs scored an internal consistency above normal apart from ‘*cooperation*’ and ‘*direction*’ but they were used as they score higher reliability in pilot study. Jashapara’s, (2003) research model was adapted for this study.

2.6 Research Gap

The research gap is causing difficulties in maintaining the ships’ upkeep and repair performance in the Omani dockyard, requiring establishment of EOL-K&C management. No complete turnkey solution was found in the literature to solve problems of the Sultanate of Oman’s dockyard. Without knowledge and competencies creation and management compounded by ‘legitimacy of the governance system’, little can be done to strengthen knowledge, competencies and knowledge management (Al-Yahya, 2010). Equally importantly, there is also a gap in the literature relating to the framework for assessing performance as “there is no single model for evaluation of organisation performance that everyone can agree upon, rather organisational theorists offer complementary approaches” (Waheed et al., 2010, p. 335). The literature was found to lack the dedicated solution / reliable and practical frameworks / methodology for the developing country to support ships in a context like the Sultanate of Oman dockyard. There are a few very limited conceptual papers and almost no empirical papers on ships’ upkeep and repair support organisational learning performance that can be related to this study.

3. Research Instrument

3.1 Reliability Test

The questionnaire was validated followed by piloting and a final collection of data. The following pilot and final test results show the reliability test of both the pilot and final study in which the Cronbach’s alpha coefficients for the pilot study were within 0.719 to 0.880, and for the final study within a similar range of 0.685 to 0.851.

Table 1. Reliability coefficients for pre-test and final test

Variables	Pre-test (n = 40)		Final test (n = 362)	
	No. Items	Alpha (α)	No. Items	Alpha (α)
Cooperation	5	.880	5	.685
Efficiency	10	.719	10	.814
Innovation	5	.770	5	.760
Direction	7	.744	7	.802
Proficiency	5	.738	5	.783
Concentration	8	.805	8	.810
Effectiveness of Training	8	.824	8	.829
Organisational Learning Performance	12	.828	12	.851

3.2 Instrument Normality

Instrument normality assessment was conducted through an Exploratory Data Analysis (EDA). This is an important step in data cleaning and or in the elimination of error because no matter how carefully the data are keyed in; some errors are bound to occur (Norusis, 1992). The EDA was conducted for the following purposes:

- To clean the data from error,

- To test normality from the data distribution,
- To assure linearity between independent variables and dependent variable,
- To assure equality of variance,
- To confirm missing values and the reliability,
- To find out if the assumption of the selected tests were met or violated and if other patterns existed.

Before undertaking any statistical analysis for quantitative measurement, EDA was therefore carried out for all the variables as suggested by the literature (Norusis, 1992). The results are outlined in Table 2. EDA was checked using resistant statistics and visual representation such as skewness and kurtosis.

The EDA checks outlined above were carried out for cooperation, efficiency, proficiency, concentration, innovation, direction, effectiveness of training and organisational learning performance as specified in the literature. They were found to be within range and satisfied the normality assumptions (George & Mallery, 2002).

Table 3. Instrument normality assessment / normality exploratory data analysis

Skewness value between = 1.0 to -1.0 is excellent, =2.0 to -2.0 is acceptable (George & Mallery, 2003)			
Constructs	Descriptions	Statistics	Std Error
Cooperation	Skewness	-.177	.128
	Kurtosis	-.778	.256
Efficiency	Skewness	-.085	.128
	Kurtosis	-.231	.256
Proficiency	Skewness	-.324	.128
	Kurtosis	-.448	.256
Concentration	Skewness	-.114	.128
	Kurtosis	-.241	.256
Innovation	Skewness	-.245	.128
	Kurtosis	-.050	.256
Direction	Skewness	-.137	.128
	Kurtosis	.265	.256
Effectiveness of Training	Skewness	.061	.128
	Kurtosis	-.515	.256
Organisational Learning Performance	Skewness	-.116	.128
	Kurtosis	.088	.256

3.3 Research Process of Actions

3.3.1 Analyses

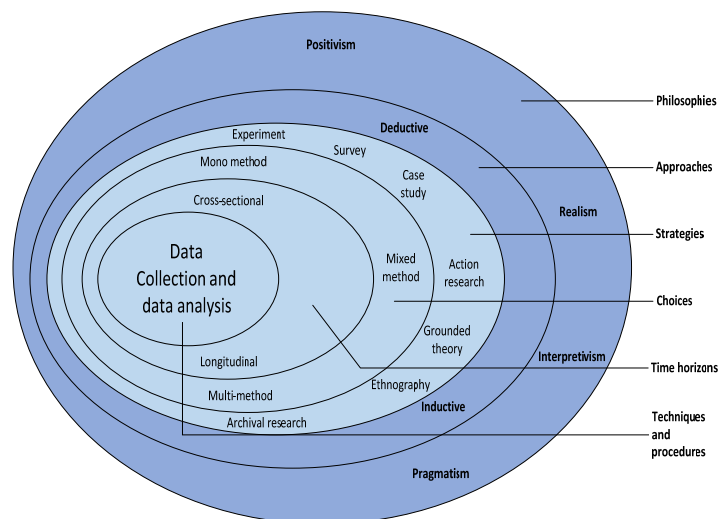


Figure 1. The research “onion” source @ Mark-Saunders, Philip Lewis and Adrian Thornhill 2008 (Saunders et al., 2009, p. 108)

The collected data were analyzed separately, with the aim of solving the problem and answering research questions whilst contributing and meeting the objectives through discussions and conclusions. The philosophies, approaches, strategies and methods / choices (Figure 1) were guided by the research guidelines with the

boundary maintained by the Assistive Framework for Organisational Learning Development of the questionnaire for ships' support in Figure 3 below, using dedicated variables / constructs (Mintzberg, 1991; Jashapara, 2003; Wang, 2008). The strategies themselves are directly linked to philosophies and approaches in 'the research process onion' in Figure 1 (Saunders et al., 2009) which is intended to offer better understanding of the research process (Figure 2).

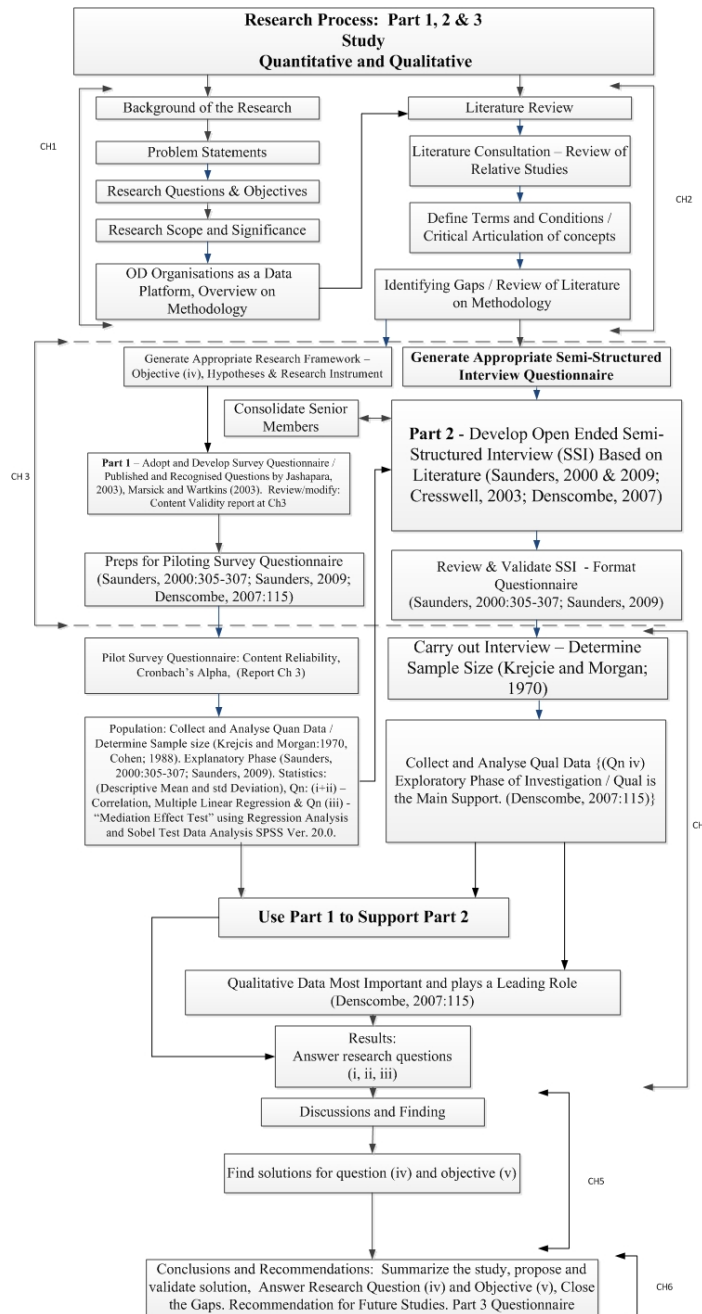


Figure 2: Research Process: Part 1 QUAN, Part 2 QUAL Method (Creswell, 2003; Denscombe, 2007; Saunders et al., 2009)

The process of the whole research is diagrammatically outlined in the form of process of actions in Figure 2. Gill and Johnson (1997; 2002) critically and briefly discuss the relationship between theory and practice, touching on the importance of theory dependent and theory laden research approaches. This research depends on the outcome of the null hypotheses from primary research, which were depicted and modified during the course of the Literature Review. The in-depth interviews and questionnaires were selected from recognised and approved items to provide nomological (concepts, constructs) validity for the instrument (Jashapara, 2003; Marsick & Watkins, 2003). The syllogisms chosen for this research paradigm are portrayed using explanatory and exploratory approaches as a mixed method (Creswell & Plano Clark, 2011; Denscombe, 2007; Saunders et al.,

2009). The research design abbreviated instrument in Appendix A below is a result of learning adapted from Mintzberg, (1991), Jashapara, (1993, 2003) and Marsick and Watkins, (2003) all of which is refined and modified to support the analysis. The research design involving 'methods and validity' (Simon et al., 2001) was chosen to answer unique questions and achieve objectives. Quantitative objectives involved objectivity (explanatory) and use principles based on testing theories through the survey questionnaire to accept or refute hypotheses (refer to sub Section 3.7.2). Qualitative objectives are subjective, involved with gaining understanding through description / exploration of our world values and beliefs, mostly attached to human events, methodologies and processes to create a constructive and applicable theory as a result of semi structured interviews (Gill & Johnson, 1997; Gill & Johnson, 2002; Creswell, 1994; Saunders et al., 2000b; Saunders et al., 2009). The strategies themselves are directly linked to philosophies and approaches in 'the research process onion' (Saunders et al., 2000b; Saunders et al., 2009) which is intended to offer better understanding of the research process. Qualitative interview results were in line with the outcome of the survey questionnaire results and it was understood that the organisation requires to make effort in area of 'cooperation' and 'direction'. They reiterated that effectiveness of training is an important variable to enhance the total performance of the organisation.

3.4 Deductive

The deductive approach is explanatory research that uses theory to test data. It is an objective process involving the explanation of causal relationships between independent and dependent variables. It is more scientific; moving from theory to data testing using quantitative process to answer 'What?' It reflects the positivist philosophy (Jon et al., 2001; Saunders et al., 2000b; Saunders et al., 2009; Creswell, 1994; Creswell, 2003). As already explained, the deductive approach is used to search for accuracy using statistical analysis and calculation and is subjected to rigorous tests. It collects quantitative data to translate them into mostly scientific principles to ensure validity and clarity. Samples are selected to generalize conclusions but this approach can be criticized because it ignores the more complex issues of the real world.

3.5 Inductive

The inductive approach is exploratory / descriptive research using the collection of data to build theory. It moves from data to the development of theory building using a qualitative process to answer questions and objectives. It is a subjective process reflecting the phenomenological tradition (Jon et al., 2001; Saunders et al., 2000b; Saunders et al., 2009; Creswell, 1994). The inductive approach concentrates on more understanding of the situation, particularly that of organisations and human events. It is a subjective approach involving the collection of qualitative data in a more flexible and structured manner to permit possible changes, whilst the research progresses.

3.6 Research Instrument Using Assistive Framework

The questionnaire was meant to address the total research. It is an economical method of gathering accurate data from a large group to permit statistical analysis. The questionnaire allowed those selected to respond to the statement at a variety of levels. The survey questionnaire was designed based on the selected or designed scale (Saunders et al., 2000b; Saunders et al., 2009). The population may therefore respond to the research statements / items positively or negatively at different levels to indicate whether the hypothetical theory fits the data or vice versa. The questionnaire was tabulated in plain language and compressed in a clear format to give better understanding and allow the whole process to be easy for those surveyed. The items were therefore self-administered / answered on-line, postal questionnaires or delivery and collection questionnaires. The purpose was to make a critical evaluation. The areas of interest were aimed at following the assistive framework in Figure 3 below. They addressed the frameworks of disciplines, which are intended to contribute to ships' upkeep and repair 'organisational learning performance'. The survey questionnaires were carefully adapted to suit the purpose. The abbreviated instrument in Appendix A below was carefully refined and integrated as solid items of questionnaire, validated, modified, translated and clearly presented.

3.7 Research Hypothetical Framework

The knowledge for framing this 'wide-ranging' research within the boundary was acquired through practical experience enhanced by a literature review formulated in the assistive framework in Figure 2 above. Conceptual and empirical learning from several authors in the literature review resulted in the formulation of the research framework at Figure 4 below to suit the ships' repair and upkeep organisational learning performance.

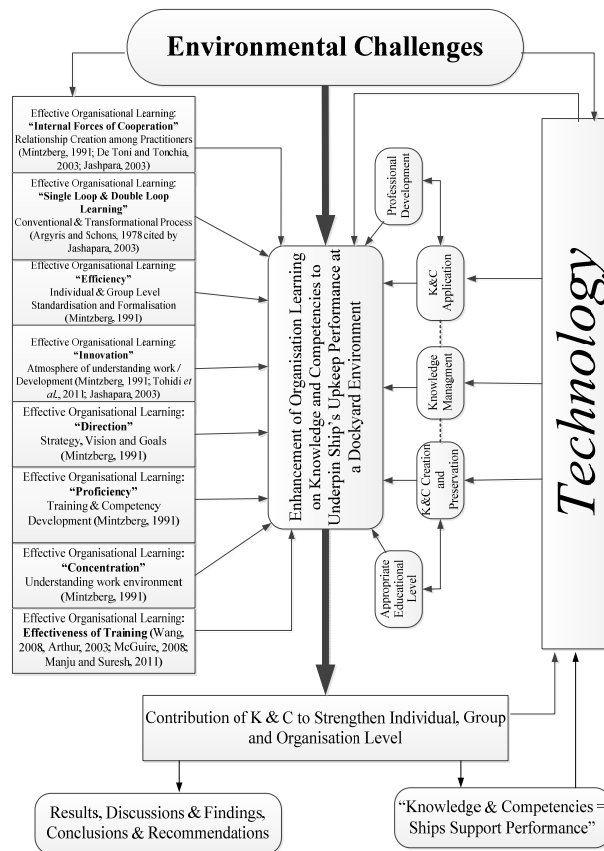


Figure 3: Assistive Framework for Organisational Learning and Development of Questionnaire for Ships Support

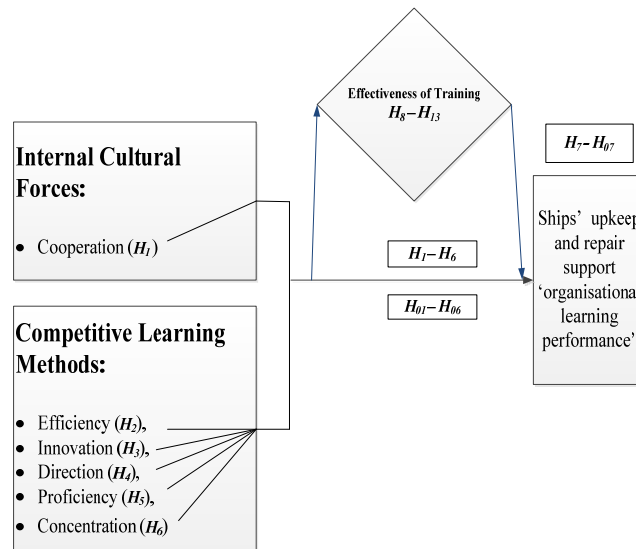


Figure 4: Research Framework and Hypotheses

The positive relation between the constructs and ‘organisational learning performance’ learned from the literature review is re-emphasised, particularly for a disciplined organisation involving individuals, teams and the organisation as a whole (Wehrle-Einhorn & Wehrle-Einhorn, 1994; van Eerde et al., 2008; Velada & Caetano, 2007; Donaldson, 2001; McGuire et al., 2008; Jashapara, 2003; Marsick & Watkins, 2003). As is clear from the literature review, effectiveness of training or learning from 1960 onwards has been a period of increased technological sophistication requiring careful observation of learning and effective training programs (Arthur et al., 2003). The literature reveals that an unplanned approach to training is the factor that causes ineffectiveness in knowledge, competencies and performance (McGuire et al., 2008). With such sophistication, it can become

difficult to maintain a positive relation between IVs and DV that could be caused by the attrition of knowledge and competencies (K&C) and their associated skills. Consequently, the research framework in Figure 4 above has the following hypotheses to answer all the research questions and to meet the intended organisational objectives:

3.7.1 Correlation Hypotheses

H₁ – H₇: There is no positive significant relationship between ‘cooperation, efficiency, innovation, direction, proficiency, concentration, effectiveness of training and ships’ upkeep and repair support ‘organizational learning performance’ among the respondents.

3.7.2 Regression Hypotheses

H₀ - The regression model of ships’ upkeep and repair support ‘organisation learning performance’ is significant when regressed against the independent variable.

H₀₁ – H₀₇: There is no significant effect of ‘cooperation, efficiency, innovation, direction, proficiency, concentration, effectiveness of training’ and ships’ upkeep and repair support ‘organization learning performance’ among the respondents.

3.7.3 Mediation Hypotheses

H₈ – H₁₃: there is no significant indirect effect between ‘cooperation, efficiency, innovation, direction, proficiency, concentration’, and ships’ upkeep and repair support ‘organizational learning performance’ through ‘effectiveness of training’ among the respondents.

As explained earlier this methodology is drawn from a ‘major piece of research’ involving a doctorate dissertation. Whilst the results of hypotheses are not part of this study, they are reported in a compressive and descriptive format that **H₁ – H₇** were positively correlated to organisational learning performance rejecting hypotheses **H₁ – H₇**. Summary ANOVAs illustrating a multiple regression model of organisational learning performance was used and the model as a whole was significant and therefore **H₀** was supported. When regressed **H₀₂, H₀₃, H₀₄, H₀₆ and H₀₇** significantly contributed to organisational learning performance, rejecting the five hypotheses. **H₀₁** and **H₀₅** failed to contribute to organisational learning performance, supporting the two hypotheses. When mediated through effectiveness of training and with the application of Sobel mediation, all the variables had a significant effect to organisational learning performance, rejecting **H₈ – H₁₃**. The results of the hypotheses were found to be both in line and in contrary to other studies (Jashapara, 2003; Sàez-Martínez & González-Moreno, 2011; Homayounizadpanah & Baqerkord, 2012; Zebst et al., 2012; Najib & Kiminami, 2011; Derick & Brummel., 2013; Anvari et al., 2010; Delaney & Huselid, 1996; Wang, 2008; Velada & Caetano, 2007).

3.8 Research Population and Sampling

Sampling process was essential for this research when collecting both quantitative and qualitative (Part 1, 2 and 3) data. This is outlined in Figure 2 above where these unique organisations minimise biases. The research process in Figure 2 is designed to manage the research and data collection procedure quantitatively and qualitatively, whilst the research framework in Figure 4 above is specifically designed for hypothesis testing. The research instrument is based on the Assistive Framework in Figure 3 above; designed to control the research boundary and to test variables.

Specifically, this research used “*probability - involving stratified sampling*” from a sample of groups with special reference to involve all specialisations and to minimize bias or the variability of samples (Denscombe, 2007; Sekaran, 2009). This research is based on the operational management of engineering maintenance and logistics support organisations learning. The research was conducted with a disciplined, rich and experienced population within the Public and Disciplined Dockyard in the Sultanate of Oman. The survey was targeted at the senior, middle and junior management, supervisors and educated and specialist personnel. The questionnaires were distributed in a *stratified sampling method* that involved all specialisations to minimize bias (Denscombe, 2007; Sekaran, 2009). The population was 100% male and was in line with the required determination for sample size (Krejcie and Morgan, 1970) (refer to Table 4). As in Al-Raqadi, et al., (2015a, 2015b), the survey questionnaire was also determined using a method for computing power sample size for regression coefficient (Cohen, 1988) is given by:

$$n = \frac{L}{f^2} + K + 1$$

Where:

n = sample size;

L = is a tabled value corresponding to a specific power value. As Cohen stipulated the conventional power value at $\alpha = .05$ is .8 which is also equal to 7.85.

f = is an effect size measure for the regression coefficient. It is 0.15 as suggested by Cohen (1988) that smaller effect size yield more sample size;

K = is the number of predictors in the regression equation. There are six (6) predictors in this study.

Therefore:

$$n = \frac{7.85}{0.15^2} + 6 + 1 \quad n = \frac{7.85}{0.0225} + 7 \quad n = 348.889 + 7 \quad n = 355.889 \approx 356$$

Table 4. Distribution of Questionnaire - Source: (Al-Raqadi et al., 2015a; Al-Raqadi et al., 2015b)

Organisations	Specialisation	Population (Approx)	No. of Questionnaire Distributed	Questionnaire Respondents
Decider of Service, Customer and Platforms	Planning, work-package	200	40	20
Operation Groups	compilation and Trials			
Provider / Maintainer of Service	Maintenance of Platforms / Ships	1400	230	212
Provider of Material	Logistics	300	40	33
Operation and Drafting	Human Resources	100	20	13
Personnel and Training	Specialised Knowledge and Competencies	900	100	84
Total		2900	420	362 (86.2%)

3.9 Semi-Structured Interview

The semi-structured interview was designed to form part of the research for the “Enhancement of Organisational Learning on Knowledge and Competencies to Underpin Ships’ Upkeep and Repair Support Performance in a Dockyard Environment”. Following the approach used for statistical analysis, the study consists of seven main sections including Cooperation, Efficiency, Innovation, Direction, Proficiency, Concentration and Effectiveness of Training to support the Organisational Performance Dimension. This is the principal focus of the study, which offered an important insight and it is designed to support or reinvigorate the outcome of the quantitative / statistical analysis. The items were carefully noted down and targeted on the need to understand the behaviour of the seven constructs for an overall organisational performance. Suggestions were jotted down in bullet point forms, and joined together following ‘open-ended questions’, formulated in Sections and Tables using a dedicated designed questionnaire. The sampling method for this part of the research was based on Krejcie and Morgan (1970) and a maximum of 25 senior managers were used from the five organisations in Table 4 above. The aim was to learn from appropriate arguments to answer the research questions and the objectives, to strengthen the findings and recommendations. Semi-structured interviews were carried out using four groups of senior managers.

The semi-structured interviews were designed to reinvigorate the statistical analysis. The semi-structured interview is widely used in flexible design and for this study it is used as a “quantitative – qualitative study”. The interview was prepared with a list of topics. The responses were given with considerable freedom in a sequencing method, involving introduction comments, list of topics, sets of associated prompts and closing comments (Robson, 2002). For this type of cross-sectional and unique research, involving mixed method, the semi-structured interview has been reported to be the prevalent approach (Saunders et al., 2009). The list of questions prepared depended upon the knowledge of interviewee(s) at the time. The whole process required flexibility although the researcher played a major role. The questions allowed a flow of conversation with data recorded by note taking. This was explained to the interviewees whilst maintaining the ethical principles. Whilst the purpose of this semi-structured interview was to explore or explain themes, every effort was exercised to compare it with the outcome of statistical analyses to understand the relationship between variables (Saunders et al., 2009).

3.10 Validating Solutions - Level of Overall Agreement

The contents of discussions and findings that are required to contribute to organisational learning performance, amalgamating conclusions and recommendations were validated using senior management. Their purpose is to answer the questions and objectives to improve dockyard / ships’ upkeep and repair support performance by formulating frameworks / models that can commit and encourage learning. They are carefully measured using

specially designed questionnaire items to address the areas of discussions, findings, conclusions and recommendations with the results clearly articulated. The purpose was to critically learn from the agreement of the senior managers if the proposed frameworks / models, structures, problems solving methodologies / techniques, processes etc., can positively and significantly contribute to the enhancement of organisational learning on knowledge and competencies to underpin ships' upkeep and repair support performance in a dockyard environment.

This research methodology was designed purposely for a 'major piece of research' involving a doctorate dissertation and the research question and objective stipulated in the above paragraph was not meant to be answered in this study. This research methodology was used to examine several problems, questions and objectives including the one stated above for the aforementioned dissertation.

4. Discussion and Conclusion

The researcher carefully selected the above methodology, in the interest of the organisations, involving the main research questions and objectives, the variables in Figure 4 and the hypotheses in sub Section 3.7.1 – 3.7.3, that are necessary to improve organisation wide knowledge, competence and ships' upkeep support performance. The research methodology selected allowed the freedom to apply various, vigorous and rigorous research processes to offer the necessary systemic and holistic outcome, particularly from the practitioner's point of view, for which a single method might not allow wider coverage (Salehi & Golafshani, 2010; Kiessling & Harvey, 2005; Jick, 1979; Onwuegbuzie et al., 2009; Burian et al., 2010). The Survey questionnaire structure distributed brought transparency and precision to the whole study in a quantitative format. The in-depth semi-structured personal / group interviews were conducted to increase the atmosphere of thought and ideas from the senior management in a qualitative manner. The research methodology is strongly supported by a syllogism of research methods including quantitative and qualitative approaches (Burian et al., 2010). The selected research method enjoyed full theoretical support from the assistive framework in Figure 3, which maintained the boundary of this research. It equally involved an ideological study concentrating on the objective of research through part 1, 2 and 3 allowing for 'validation, accuracy, checking for bias and developing better research instrument (Denscombe, 2007, p. 110)'. The research methodology is designed based on the research problems and objectives. The research methodology is enhanced by an intensive literature review to outline any possible tentative solutions, supported by other documentation review and colleagues' experience.

4.1 Research Limitation and Delimitation

This research experienced difficulties in adopting or adapting the correct research methodology for this study. The design of 'fit for purpose' research methodology delimited some of the problems that were experienced during the course of literature exploration. Another limitation was experienced in finding the right research instruments for several parts of this research. The adaption involving modification of items delimited the problem of formulating research questions items and themes to participate in finding solutions for this research. The adaption of research framework supported by modification to include a mediation variable enhanced this framework to understand and solve the problem.

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Appendix A

Research Abbreviated Survey Questionnaire Instrument

Abbreviated Questionnaire Items	
Cooperation - Item 1-5:	“development of trust”, “reducing misunderstanding”, “having greater collaboration”, “having greater understanding”, “having greater agreement and execution”.
Efficiency - Items 6-15:	“mistake handling”, “identification of skills”, “development of learning”, “people development”, “effective ways of doing jobs”, “honest feedback to learn”, “asking why to learn”, “sharing professional information”, “focusing and working”, “focusing and thinking”.
Innovation - Items 16-20:	“discovering new ways”, “generating ideas”, “questioning for improvement”, “questioning current ways”, “develop changing methods”.
Proficiency-competencies – Item 28-32:	“two-way communication”, “execute work at hand”, “database as a process of knowledge management”, “measuring gaps”, “lessons learnt”, “resources spent on training”, “customers’ views”.
Concentration – Item 33-40:	“need of ISO”, “achieve product activity”, “develop capabilities”, “unite technical effort”, “develop product reliability”, “serving the customer”, “satisfy operators’ demand”, “justification, investigation, operators’ demands”.
Effectiveness of Training Item 41-48:	“Encourage self learning”, “support learning request”, “opportunities to learn”, “share up-to-date information”, “empower others”, “mentor and coach”, “ensure learning consistency”, “concentrate with outside communities”.
Organisational Learning Performance – Item 49 – 60:	“maintain productivity”, “learning, flexibility and productivity”, “flexibility and customer satisfaction”, “maintain staff satisfaction”, “create job satisfaction”, “performance and job standard”, “implement suggestion”, “technology and information processing”, “raise staff morale”, “achieve goodwill organisation capital”, “Maintain wellbeing of staff”, “encourage change management”.

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