

# Technical Competency Development Need Analysis for Naval Technicians

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**Abstract:** *“Type-training” has been the main technical skill enhancement program targeted at naval professionals in many small and medium scale naval forces. Even though these programs draw significant amount of resources, periodically, the level of effectiveness of such programs requires more investigation. The objective of this study is to examine the implications of different training attributes on technical skill competencies. This study develops a survey questionnaire to collect data from 150 respondents in active service, who followed the type-training programs. The investigation shows a linear relationship between the training attributes and technical skill competencies supporting the hypotheses proposed for the study.*

**Keywords:** *Type-training Programs, technical skills, training success factors, technical competency development*

## 1. Introduction

Higher operational availability of ships and crafts are the manifestation of the strategy of effective repair/ maintenance carried out for the machinery and equipment onboard. The maintenance always provides required support for all types of industries by keeping equipment and machinery in a reliable working condition. The researchers showed that the maintenance team in an organization is always accountable for the development;

implementation and periodic assessment of effective asset maintenance plan (Smith and Mobley, 2007, p3-25). The successful maintenance requires technical skills, techniques, spares, and the methods for utilizing assets appropriately. Among these, technical skills profoundly affect the maintenance performance as the slightest human error could directly affect the performance of machinery.

The Engineering Directorate of Sri Lanka Navy (SLN) also launches several strategies to inculcate effective repair/ maintenance of ships/crafts and machinery fitted onboard. Among them, the development of a skilled labour force can be considered as one of the key elements implemented to uplift the maintenance standard. In order to achieve this, the Engineering Directorate arranges to conduct several training programs such as basic training programs, on-the-job training, type-training programs, programs for training of instructors etc. Among them, type-training programs are considered as the primary backbone and the most important training type as it directly uplifts/ improves the knowledge of technicians in relation to handling and maintaining a selected type of machinery. By doing so, it is expected to develop vertical specialization of technicians who undertake repairs.

However, it is observed that the skill acquisition of technicians is not in a satisfactory level as for the available records of naval dockyard indicates reoccurrence of same failures within short periods of time and extended repair durations. Further, it is observed that when some technicians who are assigned with repairing tasks fail to complete them successfully, the efficient technicians who are already attending to their tasks have to be further burdened with those incomplete tasks too. Hence, following research questions were raised so as to identify the factors that lead to the successful training of technicians.

- What are the factors that affect the success of type-training programs when improving technical competencies of technicians?
- What are the elements which help in identifying the current levels of technical competencies acquired by technicians, who completed training programs?

Based on the above research questionnaire, following objectives were set for the research study.

- To identify the factors that affect the success of training programs.
- To evaluate current levels of technical competencies of technicians who completed type-training programs.
- To evaluate the relationship between the factors affecting the success of training programs and the current level of technical competencies.

## 2. Literature Review

The topic "training" is widely discussed and a growing area which has many ranges of arms. Different authors/researchers have defined

training in many ways. For example, training was defined as a planned method for changing an individual's attitude, knowledge, skill, or behavior through learning experience in order to achieve successful performance in a specific task or set of activities (Wilson.,1999). There are two types of training methods, i.e., On-the-Job Training (OJT) and Off-the-Job Training (OFJT). OJT is mostly planned, structured, and implemented at the trainee's workplace itself. The supervisors, managers, trainers, and colleagues spend long periods of time with trainees to teach previously determined skills (Kempton.,(1995). However, OFJT can involve lectures, group discussions, reading, training courses, one-to-one tutorials, and workshops. The type-training programs conducted by SLN can be considered as the most efficient training programs for the technical skill development of its staff, which are fallen into the category of the OFJT.

While conducting type-training programs, many factors involve in the success of a training module. Of these, the consent, interest, involvement, and dedication of the trainees, and the organizational support are key areas for the delivery of a successful training module. Nikandrou *et.al* (2009, p255-270) categorized these training success factors into three categories, i.e., Trainee Characteristics (TC), Training Program Design (TPD), and Organizational Characteristics (OC). These training success factors were deeply studied in the specific study context of this research and identified that these factors can be demonstrated by the indicators shown in Table 1.

Table 1. Operationalization Table for IVs

Training Success Factors	Indicators
Trainee Characteristics	Conscientiousness
	Self-efficacy
	Need for dominance
	Learning goal orientation

	Motivation to learn
	Valence
Training design	Training Content
	Training methods
	Competence of trainer
Organizational characteristics	Superior support
	Peer support
	Opportunity to use
	Feedback

Once the training is successfully completed, the trainees are exposed to the working environment. Still, there should be an evaluation mechanism after the completion of training to ascertain whether trainees have achieved desired expectations of training programs. Kirkpatrick(1959, pp.21-26) introduced four levels of training evaluation criteria during the training process namely reaction, learning, behavior and results respectively. The applicability of these evaluation criteria for the specific study context was studied and it was observed that only the learning and behavior evaluations are applicable to the type-training programs in Naval Dockyard as shown in Table 2.

Table 2. Operationalization Table for DVs

Current levels of competencies	Indicators
Learning (Training Process Performance)	Communication skills
	Technical Skills
	Job Understanding
Behavior (Returned Value)	Trainee's Commitment
	Work Quality
	Effort
	Self Confidence

Training is identified as one of the major solutions that provide organizations to gain higher work performance. Therefore, organizations should provide appropriate tuition fees, salary increments, allowances, and facilities if employees were to be encouraged to gain the required competency levels by following the training programs successfully

(Rosenwald,,2000). The main focus of encouraging employees to follow training programs is to improve the organization's performance in the competitive world. In this regard, it was suggested that organizational performance (e.g., profitability, efficiency, and output) is benefited directly and indirectly by the employee performance (Jehanzeb and Bashir,,2013). However, the provision of training through outside providers incurs higher investments and therefore, many organizations are establishing internal training facilities to improve the technical skills of their employees. By doing so, organizations would be able to develop technical skills specific to the organizational requirements.

Based on the review of literature, following conceptual model was developed to demonstrate the relationships between training success factors and current level of technical competencies. This conceptual framework shows a simple linear relationship between the set of explanatory independent variables and the response (dependent) variable.

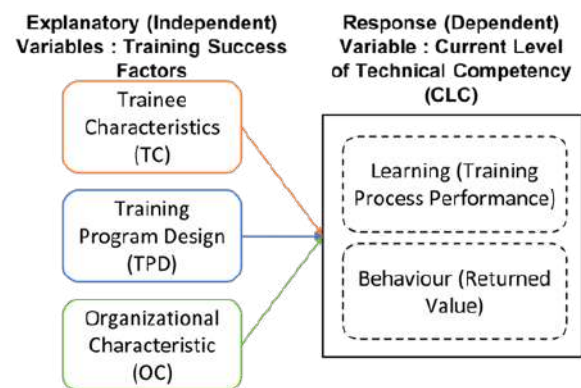


Figure 1. Conceptual Model

Based on above conceptual model, the following hypotheses were proposed.

H1. Trainee characteristics positively related to the development of technical competencies.

H2. Training program design has significant positive effect on the development of technical competencies.

H3. Organizational characteristics have significant positive effect on the development of technical competencies.

### 3. Methodology

#### A. Population and Sampling

Naval Dockyard Trincomalee has more than 1200 technicians working in the fields of marine engineering, electrical engineering and shipwright. Of these, there are about 600 marine engineering technicians who were grouped into separate workshops of different strengths of the respective workshops. Of these technicians, about 550 technicians had undergone type-training programs. The sample of the study was 150 marine engineering technicians who have successfully completed type-training programs. Using stratified random sampling method, these technicians were selected representing each workshop.

#### B. Methods of Data Collection

The study used a survey questionnaire to collect primary data. There were two sets of questions to represent independent variables and dependent variables, which were on Likert scale where 1 denoted strongly disagree and 5 denoted strongly agree.

### 4. Results And Findings

The accuracy and assessment of the research study are reflected in the reliability calculation, which is regarded as a crucial factor in a research study. Cronbach's Alpha test of reliability is a widely used method for

determining the reliability of scale items. The reliability values calculated for the research study is shown in Table 3. Thereafter, validity assessment was done by circulating the questionnaire among the engineers in naval dockyard and about 83% agreed with the questionnaires prepared.

Table 3. Reliability Statistics

Variable	No of items	Cronbach's Alpha
TC	14	0.985
TPD	7	0.968
OC	6	0.947
CLC	12	0.982

Descriptive statistics were calculated for all items included within independent variables and dependent variable. Tables 4 to 7 provide descriptive for training program design, trainee characteristics, organizational characteristics, and current level of technical competencies.

Table 4. Descriptive statistics for Training Program Design

	N	Mean	Std. Deviation
TPD_TC1	150	4.31	.657
TPD_TC2	150	4.17	.680
TPD_TC3	150	4.47	.598
TPD_TM1	150	4.23	.533
TPD_TM2	150	4.37	.584
TPD_CT1	150	4.17	.599
TPD_CT2	150	4.13	.571
Valid N (listwise)	150		

Table 5. Descriptive statistics for Trainee Characteristics

	N	Mean	Std. Deviation
TC_Co1	150	4.41	.821
TC_Co2	150	3.92	.747
TC_Co3	150	4.22	.623
TC_SE1	150	4.21	.701
TC_SE2	150	4.06	.837
TC_ND1	150	3.85	.893

TC_ND2	150	3.79	.411
TC_ND3	150	3.77	.680
TC_LGO1	150	3.70	1.002
TC_LGO2	150	3.66	.850
TC_LGO3	150	4.11	.860
TC_ML1	150	4.20	.897
TC_ML2	150	3.75	.874
TC_Va1	150	3.91	.810
Valid N (listwise)	150		

Table 6. Descriptive statistics for Organizational Characteristics

	N	Mean	Std. Deviation
OC_SS1	150	4.02	.670
OC_SS2	150	4.42	.495
OC_PS1	150	4.23	.424
OC_OU1	150	4.21	.701
OC_OU2	150	3.75	.874
C_FB1	150	4.11	.799
OC_FB2	150	4.06	.837
Valid N (listwise)	150		

Table 7. Descriptive statistics for Current Level of Technical Competencies

	N	Mean	Std. Deviation
CLC_1	150	3.85	.893
CLC_2	150	3.77	.680
CLC_3	150	3.70	1.002
CLC_4	150	3.66	.850
CLC_5	150	4.11	.860
CLC_6	150	4.20	.897
CLC_7	150	3.75	.874
CLC_8	150	3.91	.810
CLC_9	150	4.31	.657
CLC_10	150	4.17	.680
CLC_11	150	4.47	.598
CLC_12	150	4.23	.533
Valid N (listwise)	150		

The violin plots created for each combined variable of the IVs are given in Figure 2. The means and standard deviations of the variables are shown in Figure 3.

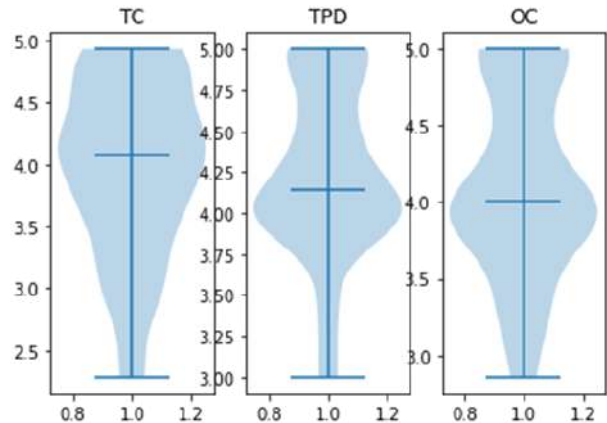


Figure 2. Violin plots of IVs

The above violin plots show distribution of IVs around their median values. TPD and OC show a similar elongation of data.

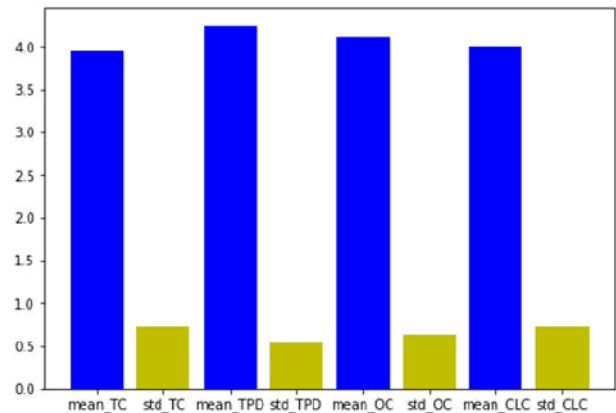


Figure 3. Summary of descriptive statistics When evaluating the descriptive statistics related to the trainee characteristics, lowest mean and highest standard deviation denoted that the respondents were not enthusiastic and interested on the learning or following type training programs. Hence, following concerns can be highlighted.

- a. Technicians were not so keen to discuss the subject matters with

counterparts/ peers as most respondents have indicated values below 4 for the questions raised in the TC\_ND1 to TC\_LGO2.

b. The mean values for TC\_ML2 denote that the technicians are not that enthusiastic in clarifying their doubts and encouraging their lecturers while the lectures are being held or in any practical training sessions as well.

When evaluating statistics on training program design, it was observed that many respondents agreed with the method of conducting training programs as mean and the standard deviation related to these are of high value and lesser gap respectively. Further, they have indicated about the quality of trainers and their talents in a very positive manner. When statistics related to the organizational characteristics were observed, it revealed that all the trainees were happy with the support from the organization and the facilities provided during the training program. However, there was minor degraded feedback about the limitations and restrictions on the working environment. One of the reasons came out was the use and availability of tools and equipment when they were attached to respective workshops after their training. It is also revealed that senior technicians are reluctant to make tools and equipment available for the newcomers to apply the skills learnt during the training programs assuming that the newcomers may damage these due to their less exposure with compared to the seniors themselves.

Further, when analyzing the responses of current level of technical competencies, it was observed that most of the mean values are below 4.00 and have the highest standard deviations. Hence, it shows a clear doubt about the self-confidence of technicians about their competencies even after following type training program.

On the completion of descriptive analysis, the multivariate data analysis was conducted. The correlation analysis (Pearson Correlation) was used to evaluate the relationships between variables. The correlation plot for IVs versus DVs is shown in Figure 4.

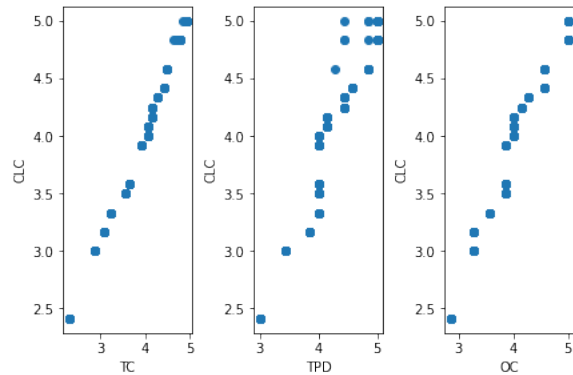


Figure 4. Correlation plot

The above plots show a positive correlation between each IV and DV.

The hypothesis testing was carried out using regression analysis. A linear regression model was implemented using SPSS Version 22. The summary of regression analysis is given in Table 8 and Table 9.

Table 8. Summary of regression analysis

IV	R <sup>2</sup>	F	Sig. of F	Beta	t	Sig. of t
TC	0.99	14974.35	0.000	0.995	122.37	0.000
TPD	0.913	1556.22	0.000	0.956	39.44	0.000
OC	0.957	3280.89	0.000	0.978	57.27	0.000

Table 9. Summary of coefficients table

Model	Un-stand. Coefficients		Stand. Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.201	.051		-3.917	.000
TC_MEAN	.791	.031	.796	25.580	.000
TPD_MEAN	.132	.035	.098	3.820	.000
OC_MEAN	.125	.042	.109	2.987	.003
Dependent Variable: CLC_MEAN					

Based on the results shown in Tables 8 and 9, all the hypotheses were accepted, and results support the positive relationship all IVs have with the DVs. The relationship shown in the following equation could be developed based on the data.

$$CLC = -0.201 + (0.791 * TC) + (0.132 * TPD) + (0.125 * OC) + MSE$$

The mean square error (MSE) amounts to 0.2105. Residual plot for DV is shown in Figure 5.

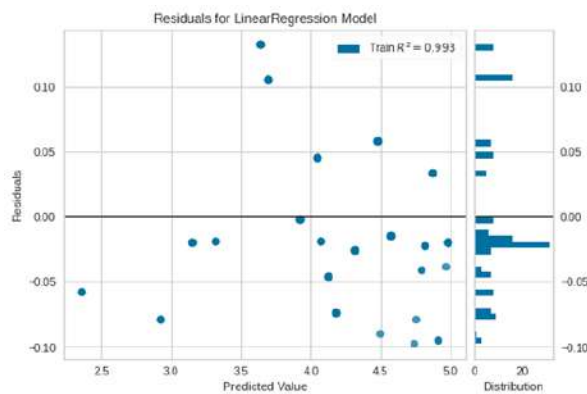


Figure 5. Residual plot for DV

## 5. Conclusion

This research helped to identify important factors related to the success of training where in house training is conducted. The training success factors which were identified under three categories have the positive effect on the competency of technicians. As presented in Table 1, conscientiousness, self-efficacy, need for dominance, learning goal orientation, motivation to learn and the valence were used to measure the trainee characteristics. The training program design was measured using training content, training methods and competence of trainers, which directly influence of success of the training. The organizational characteristics incorporated factors of supervisor support, peer support, opportunity to use, and the feedback.

The research evaluated the level of skill achievement using learning and behaviour changes as showed in Table 2. When understanding this subject, it was observed that Kirkpatrick model is mostly appropriate for training evaluation and there were many researchers followed the same model and developed many alternative models. The original model incorporates with the reaction criteria, learning criteria, behaviour criteria and results criteria. Another successful research suggested that the communications skills, technical skills, job understanding, trainee's commitment, work quality, effort and self confidence can also be considered in evaluating the success of training (Yusof and Fauzi, 2013, p.1275-1280). Hence, the researcher amalgamated these two models as shown in Table 2.

The findings imply the need of trainees having an awareness of the type-training program before the commencement of the same. This will allow trainees to understand the need for training from the organisational point of view. Rewards will benefit trainees in motivating trainees to follow type-training programs. Further, it is essential to have appropriate evaluating criteria that make the trainees to work hard to gain given qualifications. It can also expect that a higher level of evaluation criteria will make trainees more interested in the chosen type-training program and become dedicated to continuously learn the given subject matter.

Overall, this paper highlighted the factors for successful type-training programs and its implications for the skill development. The paper also highlighted the importance of the evaluation of training outcomes.

Concerning future research, organizations could conduct training programs targeting products and services offered or the financial growth. The engineering directorate of SLN

could also conduct type-training programs by selecting most eligible technicians for respective trainings' within the Naval Dockyard to support of higher skills achievement of the naval fleet. Further, it is possible to assess the skills of technicians based on their educational background and the same could be applied at the time of recruitment.

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