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Does the knowledge and skill acquired during simulator training gets applied on the job by the seafarers- An empirical study

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Abstract*: Training is an integral part of organisational development process. A training imparted is expected to have the desired results. The results depend upon various factors. After a successful training, it is also important to evaluate if the acquired knowledge and skills were applied on the job by the trainees. The study is aimed at identifying the favourable and unfavourable perceptions of the trainees for all the factors of the knowledge acquired during the training imparted, being used on the job. The results show that the knowledge and skill acquired during the simulator training is being used on the job by the seafarers.*

Keywords*: Training transfer, transfer of knowledge, training evaluation maritime training, simulator training,*

I. Introduction

A simulator, in the simplest way, may be defined as a machine with a similar set of controls designed to provide a realistic imitation of the operation of a ship, vehicle, aircraft, or other equipment. Simulation is the imitation of the operation of a real-world process or system over time. The act of simulating something first requires that a model be developed; this model represents the key characteristics or behaviours of the selected physical or abstract system or process. The model represents the system itself, whereas the simulation represents the operation of the system over time.

There are three attributes that every simulation has. If all three attributes exist, then you can legitimately call something a simulation. However, if even one attribute is missing, then it's not a simulation.

Here are the three attributes required for every simulation;

A simulation:

a) Imitates something real, but

b) It is not real, and

c) It may be altered by its users (hence instructor plays an important role)

Training Evaluation:

Training evaluation is considered a critical component of analysing, designing, developing, and implementing an effective training programme. To understand whether the training programme had the desired results or not, the training programme needs to be evaluated.

Even if the participants leave the training room looking happy and they also give high scores on an evaluation or feedback sheets, it may not necessarily mean that the course participants learned or if they can apply what they learned to their job. Of course, it may be taken that course participants enjoyed themselves for the time spent in the training session with some of old friends or shipmates. Only a systematic, targeted approach to training evaluation will help you answer the question, did participants learn?

There are many models and different ways to evaluate training. The Four-Level Model approach is most often used to evaluate training and development programs (Kirkpatrick, 1994). It focuses on four levels of training outcomes: reactions, learning, behaviour, and results. The major question guiding this kind of evaluation is, "What impact did the training have on participants in terms of their reactions, learning, behaviour, and organizational results?"

II. Sample size

Sample Size:

There were 2850 students/officers trained at the four training centres chosen for research. Out of these 2850 students 1922 were trained using simulators.

Hence N= 1922. A 95% confidence level is deemed acceptable and thus statistically z = 2. The proportion of responses that would be relevant to the survey is p. If p is 0,5 , a new formula is derived as illustrated in the equation below;
Mathematically derived Yamane formula;

$$n = \frac{N}{1 + Ne^2}$$

Where:

n = required responses
e^2 = error limit
N = sample size

Source: Yamane (1967:258)

If another value were to be used for p, the denominator in the formula in equation above would increase and a smaller response size would then be required. p = 0,5 therefore offers the biggest possible response rate and confidence and risk levels can be maintained.
Placing information in mathematical formulae above at a 95% confidence level and an error limit of 5% results in:

$$n = \frac{1922}{1 + 1922\ (0,05)2}$$

= 331 responses

III. The Research Methodology

Kirkpatrick's model level three i.e. Behavior (The Transfer of Training)has been used for this study to evaluate if the knowldge and skills acquired during the training are being utilised on the job.

Kirkpatick gave the following guidelines for evaluating Behavior (The Transfer of Training):
1. A systematic appraisal should be made of on-the-job performance.
2. The trainees who attended the simulator based trainingg were sent a questionnaire to get the feedback on whether they were able to apply the knowlege and skill acquired on the job.
3. A statistical analysis was carried out using SPSS version 20 and a one sample t-test was carried out.

Survey method has been used for measuring the The transfer of training imparted by using maritime simulators. The course participants were observed before, during and after training. The questionnaire for the purpose was prepared based upon and adapted from Kirkpatrick's model. The questionnaire was served to the specialists in the field for their views. The questionnaire was tested for internal consistency using Cronbach's Alpha Test. The final questionnaires were used to collect the data for the study. The data collection was done from three training centres.
One sample t-test: A one sample t-test is a type of Univariate analysis. It is used whenever the variable is on Interval scale or Ratio scale. For this study, all the factors of knowledge acquired after training being used on the job, are on interval scale. A hypothesis test uses sample data to test a hypothesis about the population from which the sample was taken. One sample t-test using SPSS is one of many procedures available for hypothesis testing. Testing a hypothesis means making inferences about one or more populations when sample data are available. The following tools are utilised for this research:

- Charts and tables for diagrammatic representation
- Microsoft: Excel, power point and word
- Cronbach's Alpha test
- One sample t-test

Hypothesis:
H $_a$: There is a significant difference in the perceptions of the trainees for all the factors of the knowledge acquired being used on the job. (Ha: $\mu \neq 3$).
H $_0$: There is no significant difference in the perceptions of the trainees for all the factors of the knowledge acquired being used on the job. (H_0: $\mu = 3$).

Analysis;
The paired t-test was used to analyse the scores of the repsondents before and fater training. For teesting the hypotheses, one sample t-test was utilised. The results of paired t-test are given as below;

A one-sample t-test was run to determine whether the scores as calculated using Kirkpatrick's model and SPSS, were different from the hypothesized score of 3. The scores were assumed to be normally distributed.

Out of the total twelve questions from the questionnaire, it was decided to choose the most relevant to indicate the knowledge and skills acquired during training is being used by the seafarers on the job. A total of eight questions were picked up and analysed by formulating sub-hypothesis.

H1 $_0$: I did not have the opportunity to use the knowledge and/or skills presented in this course.
H1 $_a$: I have had the opportunity to use the knowledge and/or skills presented in this course
H2 $_0$: I did not use the knowledge and/or skills presented in this course, to good extent.
H2 $_a$: I used the knowledge and/or skills presented in this course, to good extent.
H3 $_0$: There is no increase in my confidence using knowledge and skills as a result of this course.
H3 $_a$: There is an increase in my confidence using knowledge and skills as a result of this course.
H4 $_0$: I did not have a good access to the necessary resources to apply the knowledge and/or skills on your job.
H4 $_a$: I had good access to the necessary resources to apply the knowledge and/or skills on your job.
H5 $_0$: As a result of this course, my performance on the course objectives has not changed for good.
H5 $_a$: As a result of this course, my performance on the course objectives has changed for good.
H6 $_0$: I did not receive help, through coaching and/or feedback, with applying the knowledge and/or skills on the job.
H6 $_a$: I received help, through coaching and/or feedback, with applying the knowledge and/or skills on the job.
H7 $_0$: As a result of this course, my overall job performance has not improved.
H7 $_a$: As a result of this course, my overall job performance has improved.
H8 $_0$: The simulator training did not help me do my job better.
H8 $_a$: The simulator training helped me do my job better.

The results are analysed using the table below;

Factors	**Sub Hypothesis**	***p*-Value**	**Inference(α=0.025)**
Change in behaviour	H1 $_{0 : oppor\ to\ use\ k\ s}$=3 H1 $_{a}$: $_{oppor\ to\ use\ k\ s}$ ≠3	.001	$H1_0$ – Rejected $H1_a$ – Accepted ($p < \alpha$)
	H2 $_{0 :\ act\ use\ k\ s}$ =3 H2 $_{a}$: $_{act\ use\ k\ s}$ ≠3	.001	$H2_0$ – Rejected $H2_a$ – Accepted ($p < \alpha$)
	H3 $_{0 :\ confi\ in\ k\ s}$ =3 H3 $_{a}$: $_{confi\ in\ k\ s}$ ≠3	.001	$H3_0$ – Rejected $H3_a$ – Accepted ($p < \alpha$)
	H4 $_{0 :\ resource\ in\ k\ s}$=3 H4 $_{a}$: $_{resource\ in\ k\ s}$ ≠3	.001	$H4_0$ – Rejected $H4_a$ – Accepted ($p < \alpha$)
	H5 $_{0 :\ perfo\ change}$=3 H5 $_{a}$:$_{perfo\ change}$ ≠3	.001	$H5_0$ – Rejected $H5_a$ – Accepted ($p < \alpha$)
	H6 $_{0 :\ coach\ f\ b}$=3 H6 $_{a}$: $_{coach\ f\ b}$ ≠3	.001	$H6_0$ – Rejected $H6_a$ – Accepted ($p < \alpha$)
	H7 $_{0 :\ overall\ perfo}$=3 H7 $_{a}$: $_{overall\ perfo}$ ≠3	.001	$H7_0$ – Rejected $H7_a$ – Accepted ($p < \alpha$)
	H8 $_{0 :\ sim\text{-}\ job\ better}$=3 H8 $_{a}$: $_{sim\text{-}\ job\ better}$ ≠3	.001	$H8_0$ – Rejected $H8_a$ – Accepted ($p < \alpha$)

There was a statistically significant difference between means ($p < .05$) and, therefore, we can reject the null hypothesis and accept the alternative hypothesis. These results suggest that the knowledge acquired during training is being used by the seafarers on the job.

Perception Table

Factors	Mean	Inference/Decision
Change in behaviour		
To what extent did you use the knowledge and/or skills prior to attending this course?	3.34	Favourable perception by the respondents.
To what extent have you had the opportunity to use the knowledge and/or skills presented in this course?	4.04	Favourable perception by the respondents.
To what extent have you actually used the knowledge and/or skills presented in this course, after completing the course?	4.17	Favourable perception by the respondents.
To what extent has your confidence in using the knowledge and/or skills increased as a result of this course?	4.33	Favourable perception by the respondents.
To what extent have you had access to the necessary resources to apply the knowledge and/or skills on your job?	3.99	Favourable perception by the respondents.
As a result of this course, my performance on the course objectives has changed by.	4.01	Favourable perception by the respondents.
To what extent have you received help, through coaching and/or feedback, with applying the knowledge and/or skills on the job?	3.99	Favourable perception by the respondents.
As a result of this course, my overall job performance has changed by %	4.16	Favourable perception by the respondents.
I feel that the simulator training helped me do my job better.	4.54	Favourable perception by the respondents.

There was a statistically significant difference between means ($p < .05$) and, therefore, we can reject the null hypothesis and accept the alternative hypothesis.

IV. Conclusions

Most respondents agreed that the simulator training improved their overall performance, had access to the necessary resources to apply the knowledge and/or skills on job; there is an increase in confidence using knowledge and skills. They also agreed that the simulator training helped them to do their job better. The null hypotheses (Main hypotheses and sub hypotheses) were rejected and alternate hypotheses were accepted. These results suggest that the knowledge acquired during training is being used by the seafarers on the job.

V. Future Works

In near future the training effectiveness of other maritime training courses being offered by other training centres may be carried out similarly, using the research methodology as discussed above.

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References

[1]. Tracey, J. B., Tannenbaum, S. I., & Kavanagh, M. J. (1995). Applying trained skills on the job: The importance of the work environment. Journal of applied psychology, 80(2), 239.

[2]. Cheng, E. W. (2000). Test of the MBA knowledge and skills transfer. International Journal of Human Resource Management, 11(4), 837-852.

[3]. Minbaeva, D., Pedersen, T., Björkman, I., Fey, C. F., & Park, H. J. (2003). MNC knowledge transfer, subsidiary absorptive capacity, and HRM. Journal of international business studies, 34(6), 586-599.

[4]. Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. Personnel psychology, 41(1), 63-105.

[5]. Cheng, E. W., & Ho, D. C. (2001). A review of transfer of training studies in the past decade. Personnel review, 30(1), 102-118.

[6]. Olivero, G., Bane, K. D., & Kopelman, R. E. (1997). Executive coaching as a transfer of training tool: Effects on productivity in a public agency. Public personnel management, 26(4), 461-469.

[7]. Seafarer's Training, Certification and Watch keeping Code (STCW Code) London: IMO

[8]. IMO/MSC circular 645 dated 06 June, 1994 (Kvitrud, A. (2011, January). Collisions between platforms and ships in Norway in the period 2001-2010. In *ASME 2011 30th International Conference on Ocean, Offshore and Arctic Engineering* (pp. 637-641). American Society of Mechanical Engineers.

[9]. Nadler, J., Thompson, L., & Boven, L. V. (2003). Learning negotiation skills: Four models of knowledge creation and transfer. Management Science, 49(4), 529-540.

[10]. Kirkpatrick, D. L. (2009). *Implementing the Four Levels: A Practical Guide for Effective Evaluation of Training Programs: Easyread Large Edition*. ReadHowYouWant. com.

[11]. Kirkpatrick, D. (2007). *The Four Levels of Evaluation: Measurement and Evaluation* (Vol. 701). American Society for Training and Development.

[12]. Burke, L. A., & Hutchins, H. M. (2007). Training transfer: An integrative literature review. Human resource development review, 6(3), 263-296.
[13]. Barnett, ML "The role of simulators and the qualifications of instructors and assessors under the STCW Convention" Marine Simulation and Ship Manoeuvrability (Marsim 1996) Copenhagen September 1996.
[14]. Asariotis, R., Benamara, H., Finkenbrink, H., Hoffmann, J., Lavelle, J., Misovicova, M & Youssef, F. (2011). *Review of Maritime Transport, 2011*(No. UNCTAD/RMT/2011).
[15]. Swanson, R. A. (2007). *Analysis for improving performance: Tools for diagnosing organizations and documenting workplace expertise*. Berrett-Koehler Publishers.
[16]. Are Equipment Simulators Effective When Used For Technology-Based Training? P. Gibbings K. McDougall
[17]. Project on Improvement of Local Administration in Cambodia: Manual on Training Evaluation
[18]. Board, M. (1992). Shiphandling Simulation:: Application to Waterway Design. National Academies Press.
[19]. Orlansky, J., Dahlman, C. J., Hammon, C. P., Metzko, J., & Taylor, H. L. (1994). The Value of Simulation for Training (No. IDA-P-2982). INSTITUTE FOR DEFENSE ANALYSES ALEXANDRIA VA.
[20]. Board, M. (1996). Simulated Voyages:: Using Simulation Technology to Train and License Mariners. National Academies Press.
[21]. Harrald, J. R., Mazzuchi, T. A., Spahn, J., Van Dorp, R., Merrick, J., Shrestha, S., & Grabowski, M. (1998). Using system simulation to model the impact of human error in a maritime system. Safety Science, 30(1), 235-247.
[22]. Sandaruwan, D. (2011). A Ship Simulation System for Maritime Education. ICTer, 3(2).
[23]. Barnett, M., Gatfield, D., & Habberley, J. (2002). Shipboard Crisis Management: A Case Study. In Proceedings of the Human Factors in Ship Design and Operation Conference.. RINA.
[24]. Kluj, S. (2005). A diagnostic simulator applied to engineering training. Global J. of Engng. Educ, 9(2).
[25]. Gatfield, D., & IEng, A. (2006). Using simulation to determine a framework for the objective assessment of competence in maritime crisis management. INTERNATIONAL SIMULATION AND GAMING YEARBOOK-NEW SERIES-, 14, 44.
[26]. avidovitch, L., Parush, A., & Shtub, A. (2006). Simulation-based Learning in Engineering Education: Performance and Transfer in Learning Project Management. Journal of Engineering Education, 95(4), 289-299.
[27]. http://www.kongsberg.com
[28]. http://www.transas.com
[29]. www.nautinst.org
[30]. www.istd.co.in
[31]. www.astd.org
[32]. www.maib.gov.uk