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# Perceived Quality of Safety Training Onboard Ship – The Swedish Case

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**ABSTRACT:** This is a statistic study on the perceived quality of safety training. The study is based on respondents from the Swedish register of seafarers. The results show that the experience of safety training is generally positive among the seafarers. The level of positivity is influenced by personal circumstances (such as onboard position and age) and by external factors in the work environment (such as ship type, trade area and flag state). However, the effect of onboard position diminishes when age and external factors are controlled for. In this situation, only the positive effects for cabin crew and age remain with strength and significance. Most ship types show strong positive effect, except for road ferries and vessels for max 12 passengers. When it comes to trade area it is only sheltered trade that shows a significant positive effect. Moreover, a homeland flag in the stern leads to a significant increase in the perceived quality of the safety training. These findings are discussed in the concluding part of the paper.

## 1 INTRODUCTION

### 1.1 *Background to the study*

Serious incidents can come with catastrophic consequences for staff and passenger onboard ships. Maritime personnel are naturally the group most affected by the safety aspect at sea. On the one hand, they are constantly exposed to potential shipping related risks and on the other hand, they are the group that continuously have to carry out repetitive safety training activities.

All in all, it can be said that a tireless focus on maritime safety work is necessary. In order to counteract the possibility of drowsiness in safety work and training activities it is important to engage research in the field of maritime safety training.

The commitment to safe and sustainable operations and environments in working life faces a

growing need for new perspectives, not least when it comes to shipping. Traditionally, research and development of safety and quality management systems has mainly focused on analyzes of adverse events and accidents. With this perspective, two problems occur. Firstly, the perspective encourages the choice to mainly react to accident- and incident statistics, which is an approach best suited in businesses with many recurring negative events. This means that after the negative events decrease, the risk indicators also decrease, which tends to lead to a false sense of safety and a reduced commitment to safety work (Hollnagel, 2010: 281-283). This focus has also led to a pursuit of the human factor, while the system in which an incident has occurred may remain unchanged.

Currently, most industries, especially high-risk industries such as shipping, are facing growing complexity, while at the same time increased

demands for efficiency, quality, sustainable operations and working environment must be met. All of this is happening in the face of an unpredictable future of increased focus on digitization and automation in shipping activities. Given this background it is necessary to study the safety work at sea from all different angles.

### 1.2 *The objectives of this study*

The purpose of the study presented in this paper is to investigate Swedish seafarer's experiences, or perceptions, of safety training onboard ships. Specifically, the objectives of the study are to investigate (i) whether perceived quality of onboard training differs due to age among the Swedish seafarers, (ii) whether the perceived quality differs due to trade area, (iii) whether the perceived quality differs due to vessel type (iv), whether the perceived quality differs due to flag state, (v) and whether the perceived quality of onboard training differs by gender.

## 2 THEORETICAL BASIS FOR THE STUDY

### 2.1 *Earlier research on attitudes to work*

Quantitative research on seafarers' attitudes to work is not abundant. There are, however, a number of studies from different parts of the world (e.g., Guo et al. 2005, Guo et al. 2010, Pan et al. 2011, Sencila et al. 2010, Turker & Er 2007). A particular research interest can be seen within the cruise sector, probably due to the link between employee job situation and customer satisfaction in service occupations (e.g., Larsen et al. 2012, Testa 2001, Testa & Mueller 2009, Testa et al. 2003). Moreover, there are some attitude studies on Swedish seafarers with quantitative approaches, where some focusing on job satisfaction onboard merchant ships (Olofsson 1995, Werthén 1976), and several recent studies that focus on commitment to work and occupation (Hult 2012, Hult & Snöberg 2013, Hult & Österman 2015; Österman & Hult 2016; Sandberg et al. 2020).

There is one recent study with explicit focus on safety training for seafarers (Viktorelius et al. 2023). Based on interviews and observations, this study shows that there are shortcomings in how simulations are carried out and evaluated. The shortcomings have a lot to do with shortage of time combined with increased demands which make it difficult to engage in safety training. It emerged that the exercises are often carried out on rule-based incentives rather than with focus on organizational learning and knowledge needs. Even the generally advocated structure of preparatory briefing and final debriefing proved to be deficient in the cases studied.

### 2.2 *This study on safety training onboard ships*

The results from the final study presented in previous section, concerning safety training for seafarers, calls for further studies. Therefore, this study will focus on seafarers' attitudes towards safety training on board

ships, in where we may find some answers related to the shortcomings described above. Thus, the aim for this study is to investigate the perceived quality of safety training among Swedish seafarers using a quantitative approach. The details of this approach will be outlined in the following section.

## 3 METHOD

### 3.1 *The method and data*

The method required from the presented objective is quantitative, based on a targeted survey. The survey construction began in January 2022 at the same time as a dialogue with the Swedish Seafarers Register concerning access to postal addresses for registered seafarers was initiated. After conducting an ethics review according to the data protection regulation, a large file with 12 022 e-mail addresses was obtained. The survey was sent out to all addresses on March 24, 2022.

The survey was closed on April 12, 2022 after two reminder mailings. The number of respondents turn out to be 2 365 individuals, which gave a response rate of 19.67%. Although the number of respondents is unusually large, the percentage response rate was relatively low. Therefore, we must ask ourselves to what extent a survey response from 2 365 individuals can be considered as representative of all 12 022 individuals in the Swedish Seafarers Register.

According to a traditional non-response analysis, we should assume that the actual respondents are likely to have a greater interest in- and perhaps higher ambitions with the safety training compared to those who didn't respond. In our case, a non-response analysis is problematic also for other reasons. There were incoming remarks from several receivers of our survey who did not know they were in the register. Some claimed that they did not even consider themselves as belonging to the occupational category. Nevertheless, the following analysis rests on the unusually high number of 2 365 actual seafarers.

### 3.2 *Processing of data and analysis*

The Statistical Package Social Science (SPSS) were used throughout the analysis. The dependent variable of perceived quality of safety training – from now referred to as 'perceived safety training quality' or 'PSTQ'. The variable was constructed as an index using internal reliability control. The dependent variable was based six attitude questions on which respondents were asked to take a position by selecting a fixed option on a five-point Likert Scale, from strongly agree to strongly disagree. A completed factor analysis indicated that the six aspects form a uniform component with very high reliability (0.906) where the highest possible value is 1.0 and the lowest allowed 0.7. The appropriate indicators for PSTQ turned out as shown in Table 1.

The indicators were then recoded so that 0 denotes the option that entails the lowest PSTQ and 4 the highest. The indicators were then summarized in the index of PSTQ. To facilitate interpretation of the

results, the index was divided by its maximum value and multiplied by 100. The PSTQ-index is thus permitted to vary between 0 and 100, where 100 is the highest perceived training quality possible.

Table 1. Indicators of perceived training quality for seafarers

To what extent do you agree or disagree with the following statements when thinking about your current (or recent) work at sea?
I experience the safety training onboard as well thought out.
I experience the safety training onboard as varied.
I find the safety training onboard stimulating.
I find the safety training onboard interesting.
I experience the safety training as realistic.
The safety training makes me feel safe in my work at sea.

Table 2 presents the mean value and standard deviation for the index. The high mean value and the low standard deviation indicates that seafarers are quite united in their perceived quality of safety training. Cronbach's Alpha is a test of the internal correlation among the indicators in each index – the higher the value (between 0 and 1), the more reliable the index. Table 2 shows that the index turn out stable.

Table 2. The Perceived Training Quality – Swedish seafarers in 2022

Mean value (0-100)	67.98
Standard deviation	18,57
Cronbach's Alpha	0.644

## 4 RESULTS

### 4.1 The perceived quality of safety training at sea

In the following, it will be shown how the perceived training quality (PSTQ) relates to age, gender, trade area, ship type, flag and position. At the very end, a multivariate analysis is displayed where the variables presented below that show initial significance will be included. Significance levels and numbers of respondents for each category are given below the tables.

Table 3, display eventual gender differences when it comes to perceived quality of the safety training. Here it becomes obvious that there are basically no differences at all when it comes to gender. The gender variable will therefore not be used in the final multivariate analysis.

Table 3. Gender and the perceived training quality

	B coefficient	Significance
Constant man	68,059	0,000
Woman	-0,199	0,847

Significance levels: \*\*\* = 0.001 level, \*\* = 0.01 level, \* = 0.05 level.  
Number of respondents according to gender: 1386 men and 431 women.

Table 4 shows that the effect of age comes with the highest level of significance. Age displays a positive linear relationship, with + 0.175 per year on PSTQ.

Table 4. Age and the perceived training quality

	B coefficient	Significance
Constant youngest	60,196	0,000
Age (effect per year)	<b>0,175***</b>	0,000

Significance levels: \*\*\* = 0.001 level, \*\* = 0.01 level, \* = 0.05 level.  
Number of respondents 1812.

In Table 5 it appears that sea personnel in near costal trade and European trade express a significantly lower PSTQ than personnel in sheltered trade.

Table 5. Trade area and perceived training quality

	B coefficient	Significance
Constant Sheltered trade	70,326	0,000
Near Costal trade	<b>-3,002**</b>	0,007
European trade	<b>-4,004**</b>	0,002
Ocean trade	<b>-1,304</b>	0,473

Significance levels: \*\*\* = 0.001 level, \*\* = 0.01 level, \* = 0.05 level.  
Number of respondents for respective trade area: Sheltered trade 429, Near Costal trade 847, European trade 404, Ocean trade 139.

It appears in Table 6 that personnel from all ship types listed below express lower PSTQ than the constant, which in this case are other ship types. The category 'Other types of ships' refers to those who did not specify a ship type in the questionnaire.

Table 6. Vessel type and perceived training quality

	B coefficient	Significance
Constant Other vessels	71,245	0,000
Tankers	<b>-4,485*</b>	0,012
Dry cargo	<b>-10,639**</b>	0,002
Ro-Ro	-2,431	0,220
Passenger ship	<b>-2,652*</b>	0,046
Ro-Pax	<b>-4,566**</b>	0,003
Offshore	<b>-6,713*</b>	0,031
Road ferry	<b>-7,642*</b>	0,023
Max12pass	<b>-5,923</b>	0,092

Significance levels: \*\*\* = 0.001 level, \*\* = 0.01 level, \* = 0.05 level.  
Number of respondents for respective ship type: Tankers 181, Dry cargo 33, Ro-Ro 131, Passenger ship 756, Ro-Pax 325, Offshore 41, Road ferry 35, Max12pass 32, Other vessels 268.

Table 7 shows that personnel who sail under the Swedish flag express a significantly higher perceived safety training quality compared to those who sail under another flag. The difference is clearly significant, with which the flag variable can be used in the final multivariate analysis.

Table 7. Flag and perceived training quality

	B coefficient	Significance
Constant foreign flag	64,889	0,000
Swedish flag	<b>3,503**</b>	0,010

Significance levels: \*\*\* = 0.001 level, \*\* = 0.01 level, \* = 0.05 level.  
Number of respondents according to Flag: Swedish flag 1610, Other flag 213.

In Table 8, a multivariate analysis of the variables age, trade area, vessel type, flag and onboard position is presented in two steps against the dependent variable, the perceived quality of the safety training. In Step I, the effect of position is shown. Here it appears that commanders and cabin attendants report significantly higher perceived safety training quality compared to security personnel (who are in the constant). It can be added that also chief engineer, restaurant personal and hotel administration are very close to the lowest significance level (all marked in bold). It can also be noted that all positions are above the constant in perceived training quality.

In Step II, Table 8, it is first shown what happens to the values for different positions when all other explanatory variables are entered. All the values for

the positions are changing when the effect of age, trade area, vessel type and flag are brought into the equation. The positive effect of being a commander loses its previous significance, even if the coefficient remains high. In terms of position, it is now only the positive effect of being a cabin attendant that remain significant concerning the perceived safety training quality (PSTQ) after controlling for the additional variables in the model.

Moving down to the added explanatory variables, we can note that increasing age still has a significant positive and linear effect on PSTQ. It also appears that it is only sheltered trade that shows a significant positive effect compared to near costal trade (which is in the constant). Regarding ship types, only the effects for offshore and road ferry are without significance. All ship types show a positive effect except ships with a maximum of 12 passengers which display a coefficient significantly below the constant (which are dry cargo ships).

At the bottom of the variable list, it appears that the Swedish flag still has a positive and significant effect on the perceived safety training quality. Below the variable list the R-Square is presented. The R-Square can be understood as the model's explanatory value, where a value of 1 would mean that all variation in the material is fully explained (which in most cases would be impossible). When it comes to analysis of survey responses, one can be completely satisfied that the explanatory value has increased from .019 in Stage I to .049 in Stage II.

Table 8. Final multivariate regression on perceived training quality

	Step I		Step II	
	Coefficient	Sig	Coefficient	Sig
Constant	59,821	,000	42,114	,000
Commander	<b>10,910*</b>	,030	<b>9,217</b>	,066
Chief Mate	5,340	,306	5,342	,304
Second Mate	5,443	,299	5,743	,272
Chief Engineer	<b>9,449</b>	,069	7,424	,153
First Engineer	1,045	,851	1,248	,822
Engineer	5,501	,314	5,277	,330
Crew deck	7,808	,123	6,763	,178
Crew machine	6,534	,213	6,381	,219
Restaurant pers	<b>8,651</b>	,086	<b>8,771</b>	,078
Cabin attendant	<b>13,095**</b>	,013	<b>12,702*</b>	,015
Hotel admin	<b>10,045</b>	,068	<b>10,646</b>	,051
Other positions	7,054	,176	6,929	,180
Age	-	-	<b>,143***</b>	,000
Sheltered trade	-	-	<b>3,301*</b>	,012
European trade	-	-	,177	,896
Ocean trade	-	-	<b>3,676</b>	,062
Tankers	-	-	<b>8,143*</b>	,020
Ro-Ro	-	-	<b>8,319*</b>	,021
Passenger ship	-	-	<b>7,036*</b>	,037
Ro-Pax	-	-	<b>8,031*</b>	,020
Offshore	-	-	<b>7,984</b>	,070
Road ferry	-	-	,452	,922
Max12pass	-	-	<b>-7,683*</b>	,028
Other vessels	-	-	<b>11,230***</b>	,001
Swedish flag	-	-	<b>3,539*</b>	,023
R-Square	,019		,049	

Levels of significance: \*\*\* = 0.001-level \*\* = 0.01-level, \* = 0.05-level. Number of respondents for respective position: Commander 331, Chief Mate 119, Second Mate 108, Chief Engineer 130, First Engineer 51, Engineer 62, Crew deck 270, Crew machine 112, Restaurant 334, Cabin attendant 95, Hotel admin 58, Other positions 122. Constant in Step I: Security. In Step 2: Security, Lowest age, Near Costal trade, Dry Cargo ship, Flag other than Swedish.

#### 4.2 Conclusion, future work and recommendations

The overall conclusion of the above analysis is that the experience of the quality of safety training is influenced partly by personal circumstances such as position and age, and partly by external factors in the work environment. But it is also clear that the effect of the personal circumstances fades when the external factors are entered. In that situation, it is only the positive effects for cabin crew and age that remains with both strength and significance.

Moving to the external factors and the trade area category, it is only sheltered trade that show a significant positive effect on the perceived training quality. A possible explanation for this is that the safety training is perceived to be easier and more manageable on smaller ships with a smaller crew where everyone knows each other well.

Finally, it may be added that Table 8 in Step II can be used to predict the positivity in the experience of safety training for different types of cases. Below, such a prediction is exemplified with the case of a 60-year-old cabin attendant onboard an ocean-going passenger ship under the Swedish flag:

Constant:	42,114
+ 60 years old (0,143*60):	8,58
+ Cabin attendant:	12,702
+ Passenger ship:	7,036
+ Ocean trade:	3,676
+ Swedish flag:	3,539
	<hr/>
	= 77,647

Thus, the positive experience of safety training for a 60-year-old cabin attendant onboard an ocean-going passenger ship under the Swedish flag should therefore, statistically calculated, be 77.647 on a scale of 0–100. Then, of course, it is not certain that this type of case exists in reality.

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