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for Science Technology & Maritime Transport

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# **MEASUREMENT OF STRESS AMONG MARINE ENGINEERS: A METHODOLOGICAL INTERVENTION**

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Towards a  
SUSTAINABLE **BLUE**  
**ECONOMY**

20 - 22 March, 2022  
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# Overview of the presentation

- Background of the research
- Rationale of the present study
- Methodology
- Conclusion

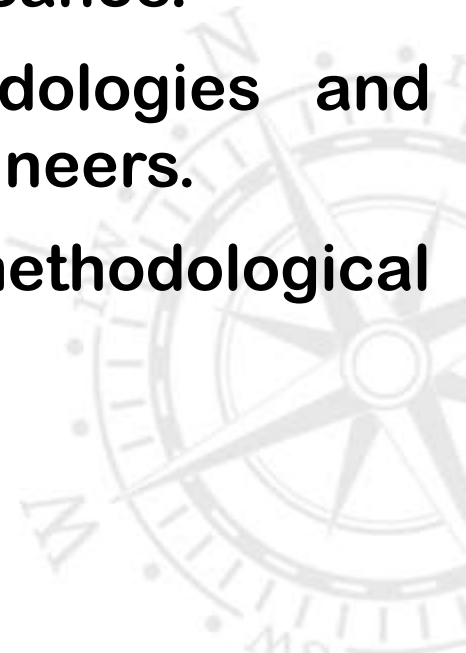


# Background

- ▶ Research anxiety on stress among seafarers.
- ▶ Factors affecting stress among seafarers (existing scientific evidences); Separation from family, Long hours of work, Cultural differences, Voyage planning, Lack of on-board socialisation, Company policies, etc.
- ▶ Research Gap:
  - ▶ Scanty focus on stress among marine engineers
  - ▶ Measurement and understanding of stress among marine engineers during Covid-19

# Rationale of the present study

- ▶ Covid-19 and stress among marine engineers
- ▶ Measurement of stress among marine engineers during Covid-19 is of paramount significance.
- ▶ Existing stress measurement methodologies and their limited applications to marine engineers.
- ▶ The present study provides a methodological intervention.



# Methodology

- ▶ A FIVE point Likert scale based questionnaire consists of 37 items (later on 3 items removed due to reliability and validity issues)
- ▶ Stressors identified (based on existing scientific evidences):
  - ▶ Job itself
  - ▶ Planning
  - ▶ Company policies
  - ▶ Away from family
  - ▶ Lack of socialization on-board
  - ▶ Cultural differences on-board
- ▶ The questionnaire was forwarded to Indian marine engineers who sailed for a significant period during Covid-19 pandemic



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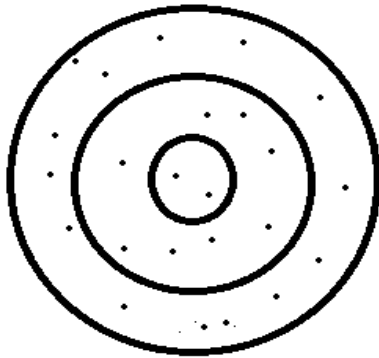
- ▶ **Instrument Reliability:** A high reliability scored questionnaire doesn't produce significantly different results of a respondent if the questionnaire is administered several times on him.
- ▶ **Cronbach's Alpha** is the most widely used measure of reliability of a Likert scale instrument.

### Threshold values of Cronbach's Alpha

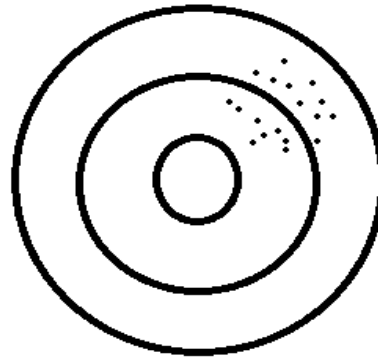
Cronbach's Alpha	Acceptability
$\geq 0.90$	Excellent
$\geq 0.8$ but $< 0.9$	Good
$\geq 0.7$ but $< 0.8$	Acceptable
$\geq 0.6$ but $< 0.7$	Questionable
$\geq 0.5$ but $< 0.6$	Poor
$< 0.5$	Unacceptable

Source: George, D., & Mallery, P.(2018)

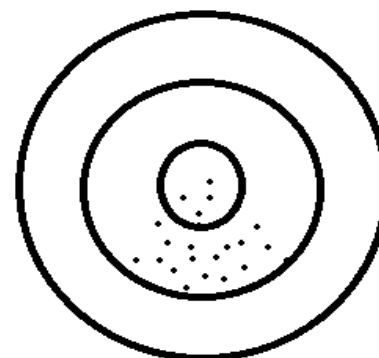
## Contd....



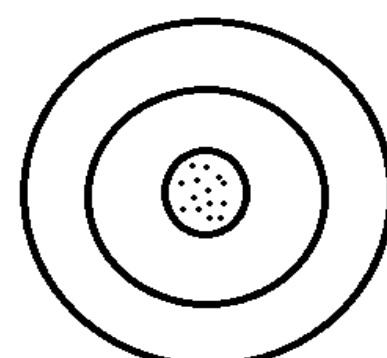
**Neither valid nor reliable:** The research methods do not hit the heart of the research aims (not valid) and repeated attempts are unfocussed



**Reliable but not valid:** The research methods do not hit the heart of the research aims, but repeated attempts get almost the same (but wrong) results



**Fairly valid but not reliable:** The research methods hit the aim of the study very closely, but repeated attempts have very scattered results (not reliable)



**Valid and reliable:** The research methods hit the heart of the research aim and repeated attempts all hit in the heart (similar results)



# Contd...

## ► Results of the Reliability Test

Latent Variables	Cronbach's Alpha	No of Items	Reliability status
Job itself	0.778	08	Acceptable
Planning	0.773	08	Acceptable
Company policy	0.862	07	Good
Family affairs/ away from family	0.903	04	Excellent
Lack of socialization	0.737	03	Acceptable
On-board cultural diversity	0.741	04	Acceptable
Overall Reliability	0.878	34	Good

*Source: Authors own estimation based on the questionnaire self developed*



## Contd...

- ▶ **Instrument Validity:** Validity refers to, the extent to which the questionnaire measures what it is supposed to measure.
  - ▶ **Face validity:** Clarity, brevity and completeness of the questionnaire items.
    - ▶ Respondents replied that they didn't face any difficulty in understanding and comprehending the items.
  - ▶ **Content validity:** Degree to which the items of a questionnaire reflect a specific domain.
    - ▶ Four experts rated the instrument as highly relevant.

## Contd...

- ▶ **Convergent validity:** Determines whether the items of a variable are associated closely or not.
  - ▶ Confirmatory Factor Analysis was conducted to obtain Composite Reliability (CR) and Average Variance Explained (AVE).
  - ▶ CR of a variable needs to be higher than its AVE and the AVE is greater than 0.50.
  - ▶ In case AVE is less than 0.50 but the CR is more than 0.60, convergent validity is still adequate.

# Contd...

## Composite Reliability and Average Variance Extracted

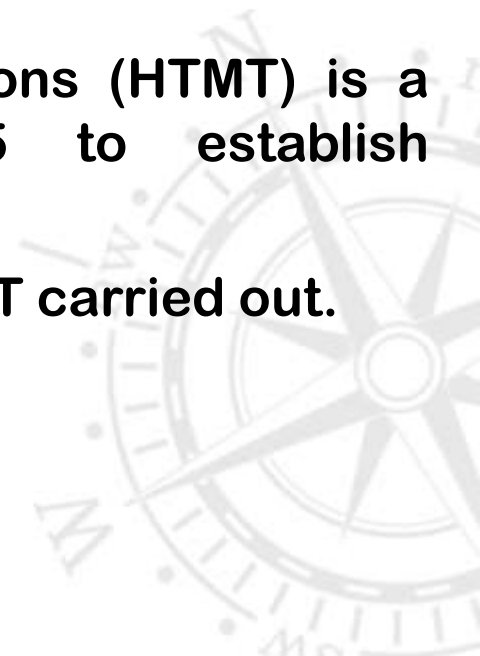
Variables	CR	AVE
Job itself	0.87	0.47
Company policies	0.84	0.44
Job associated Planning	0.87	0.59
Away from Family	0.99	0.95
On-board Culture differences	0.85	0.40
Lack of Socialisations	0.87	0.70

*Source: Authors own estimation based on the questionnaire self developed*

**Hence, convergent validity is established**

## Contd...

- ▶ **Discriminant validity:** Explains whether the items of one construct diverge from another construct or not.
  - ▶ Heterotrait-Monotrait ratio of correlations (HTMT) is a new approach proposed in 2015 to establish discriminant validity of an instrument.
  - ▶ To validate the present instrument, HTMT carried out.
  - ▶ Threshold value of HTMT is  $<.90$



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**Heterotrait – Monotrait ratio of Correlations**

Constructs	Job itself	Job Planning	Company policy	Away from family	Lack of socialisation	Cultural difference
Job itself						
Job planning	0.86					
Company policy	-0.01	-0.15				
Away from family	0.29	0.36	-0.15			
Lack of socialisation	0.50	0.62	0.12	0.59		
Culture difference	0.20	0.46	0.08	0.46	0.41	

*Source: Authors own estimation based on the questionnaire self developed*

**Hence, Discriminant validity is established**

## Summary of Reliability and Validity Statistics

Statistical procedure	Status	Conclusion
Cronbach's Alpha	All constructs are above threshold value	Questionnaire is reliable and valid
Face validity	The respondents didn't face difficulty in understanding the questions	
Content validity	The subject experts rated highly relevant	
Convergent validity	AVE and/or CR is above threshold levels.	
Discriminant validity	HTMT values of all constructs are less than 0.90.	

*Source: Authors own estimation based on the questionnaire self developed*

**Hence, the instrument is reliable and valid**

## Conclusion

- ▶ The present instrument is developed to understand stressors and thus facilitate measuring stress levels among seafarers in maritime sector during uncertainties like Covid-19 pandemic.
- ▶ The instrument can also be engaged in measuring stress during extraordinary situations among other categories of seafarers, subject to collection of data and testing reliability and validity.
- ▶ The instrument would facilitate development of stress coping strategies by shipping companies for working marine engineers on-board during extraordinary situations like Covid-19.



Thank YOU



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