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Assessing Nuclear Safety and Security Cultures: A Case Study of the Jordan Research and Training Reactor (JRTR)

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Abstract

Nuclear safety and security cultures are essential for ensuring the safe operation of nuclear facilities. This case study aimed to evaluate safety and security cultures at the Jordan Research and Training Reactor (JRTR) as a self-assessment. Utilizing 29 safety culture indicators and 27 security culture indicators, the study employs a quantitative approach that includes questionnaires to assess employee perceptions, identify strengths and weaknesses, and propose improvement strategies. Results revealed a positive safety culture, with employees demonstrating a commitment to the highest safety protocols. Additionally, The JRTR exhibits a well-established security culture, with staff recognizing their responsibility in upholding security standards. However, areas for improvement include enhancing the physical environment, increasing familiarity with safety and occupational health regulations, improving work management practices, and ensuring ongoing staff reliability. The study proposes targeted strategies to strengthen both cultures, emphasizing continuous training, effective communication, and proactive risk management and suggest recommendations to be adopted to foster a resilient operational environment, ensuring the safe and secure operation of the JRTR. This work contributed to the broader understanding of cultural and social factors influencing nuclear facility management, particularly in developing nuclear newcomer countries.

Keywords: JRTR, Nuclear Safety Culture, Nuclear Security Culture, Research Reactor, Nuclear Facilities, Safety and Security Self-Assessment.

Introduction

The Jordan Research and Training Reactor (JRTR) is a multipurpose research reactor located in Jordan. It is the first nuclear reactor built in the country and plays an important role in scientific research, training, and radioisotope production. The JRTR conducted a safety culture and security culture assessment of its employees under the title "Self-assessment Questionnaire - JRTR". The questionnaire was conducted to provide an in-depth evaluation of safety and security culture based on the responses. It also highlights strengths, weaknesses, and areas for improvement, offering actionable recommendations to enhance workplace safety and security practices.

Methodology

- ✓ **What**: Safety culture and Security culture assessment "Self-assessment"
- ✓ **Whom**: JRTR employees
- ✓ **How**: Questionnaire method
- ✓ **Tool**: e-learning platform of the JRTR (**completely anonymous and confidential**).
- ✓ **Sample**: JRTR employees (85 out of 120) (managers, supervisors, engineers, technicians, and others) [Confidence Level 95%, Margin of error 5.65%]
- ✓ **Self-Assessment Survey** :
  - ➢ Part #1: Demographic information
    - ✓ Gender
    - ✓ Biological, age groups
    - ✓ Educational level
    - ✓ Period of work
  - ➢ Part#2: Safety and Security culture indicators
    - ✓ five-point Likert scale
- ✓ **The main four indicators studied:**

1. Safety culture and Nuclear Security culture
2. The Management performance and support
3. Job satisfaction
4. Workplace and Work Environment

Conclusions

- ✓ JRTR achieved **a good level** in safety, security, and professional development, supported by strong management.
- ✓ To strengthen its culture, JRTR **should** enhance security awareness, improve task oversight, manage human-technology risks, and boost employee motivation.
- ✓ Focused **improvements** in training, collaboration, and engagement **will** further enhance safety and security, and foster a proactive workforce.
- ✓ The **results indicate** a satisfactory interface between safety and security, with an overall score of **79.6%.** However, further enhancements and increased awareness are needed to achieve a more mature safety and security culture.

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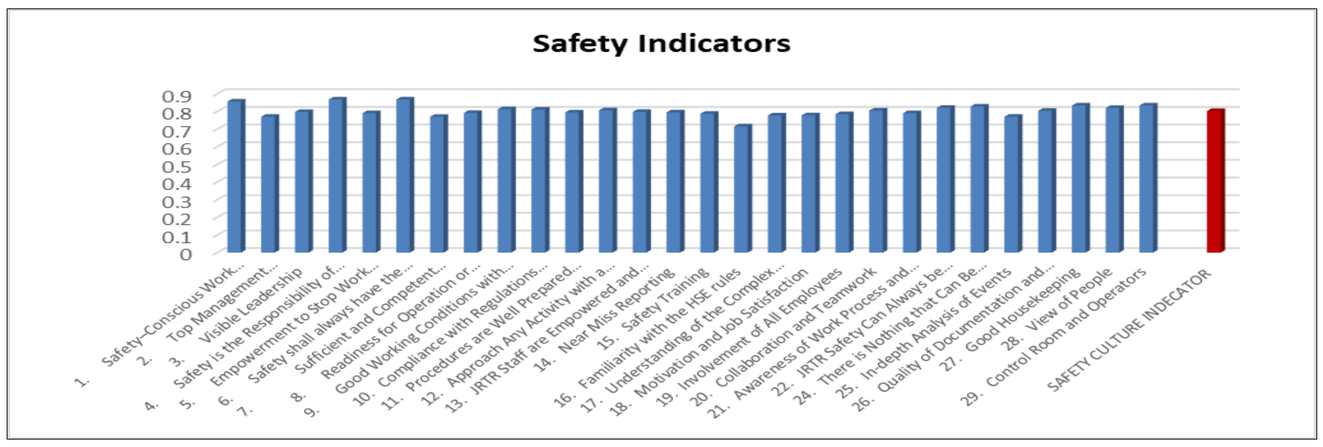
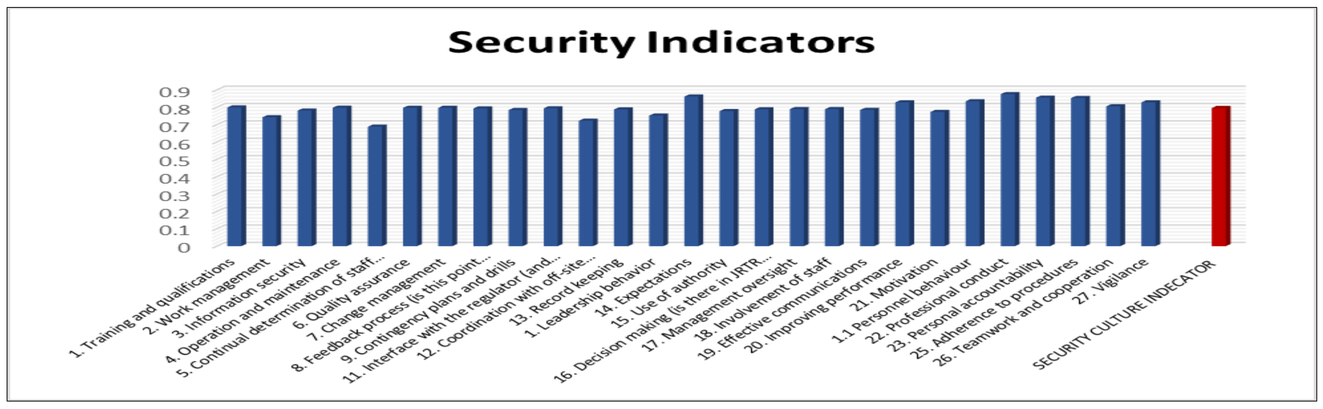
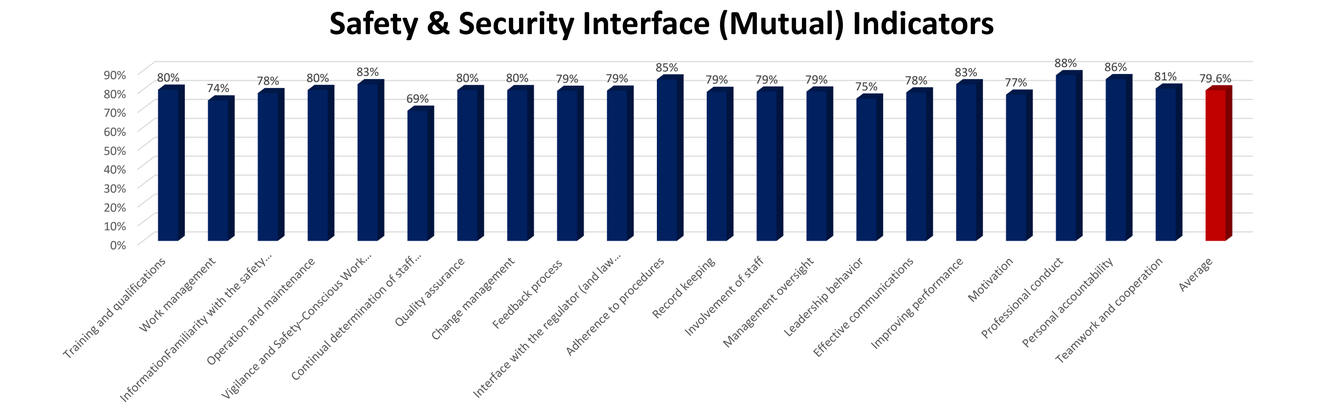
Results

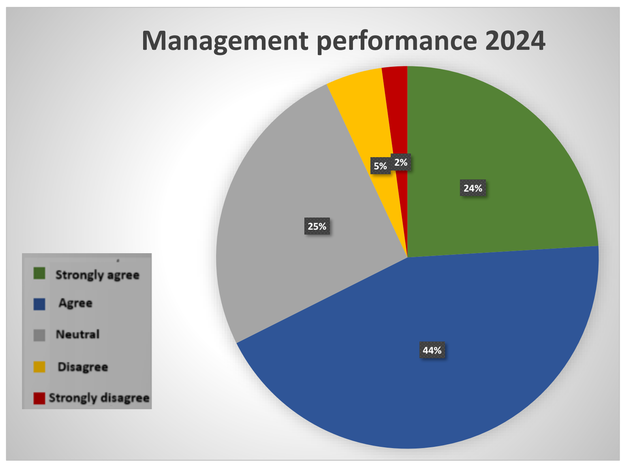


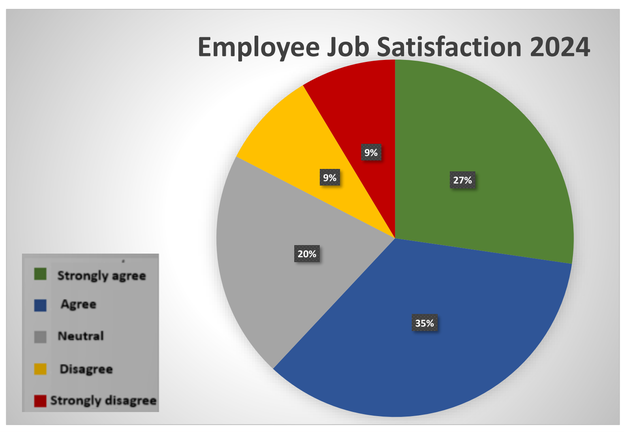




Indicators Direct Manager And Top Management	Percentage
Performance and administrative support	78%
Performance Senior management	77%
Performance and support Direct manager or department head	78%
Administrative control	79%

Indicators Related To The Work Environment	Percentage
Safety and security conscious work environment	86%
Empowerment to stop work when faced with unsafe conditions	79%
Good working conditions in relation to time pressure, workload and stress	81%
JRTR employees are empowered and encouraged to raise safety concerns without fear of retaliation	80%
Work management	74%
Improved performance	83%
Indicators related to the work environment	86%





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