The Dynamics of Human Trust in Aviation Automation Technology

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Overview

- Introduction
- Definition of key concepts
- Gap in current research
- Purpose of study
- Research question
- Methods
- Applications
- Christian Worldview

Introduction

- Roles of a Tool
- Need for Trust in the Tool
- Defining, Measuring & Calibrating Trust
- Similarities: Trust and Faith

Key Concepts

- Trust
- Distrust
- Performance – What?
- Purpose – Why?
- Process – How?

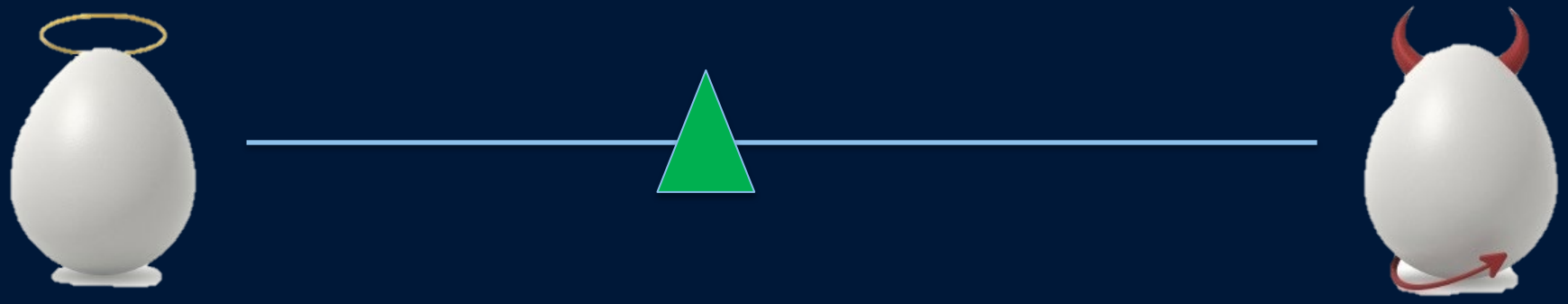
Trust

- Shapes, defines, and limits the human-automation technology relationship
- Requires human uncertainty and vulnerability (risk)

Distrust

- Not defined
- Behavior?
- Positive consequences?

Trust/Distrust Dimensionality



TRUST

DISTRUST

Single Linear Continuum

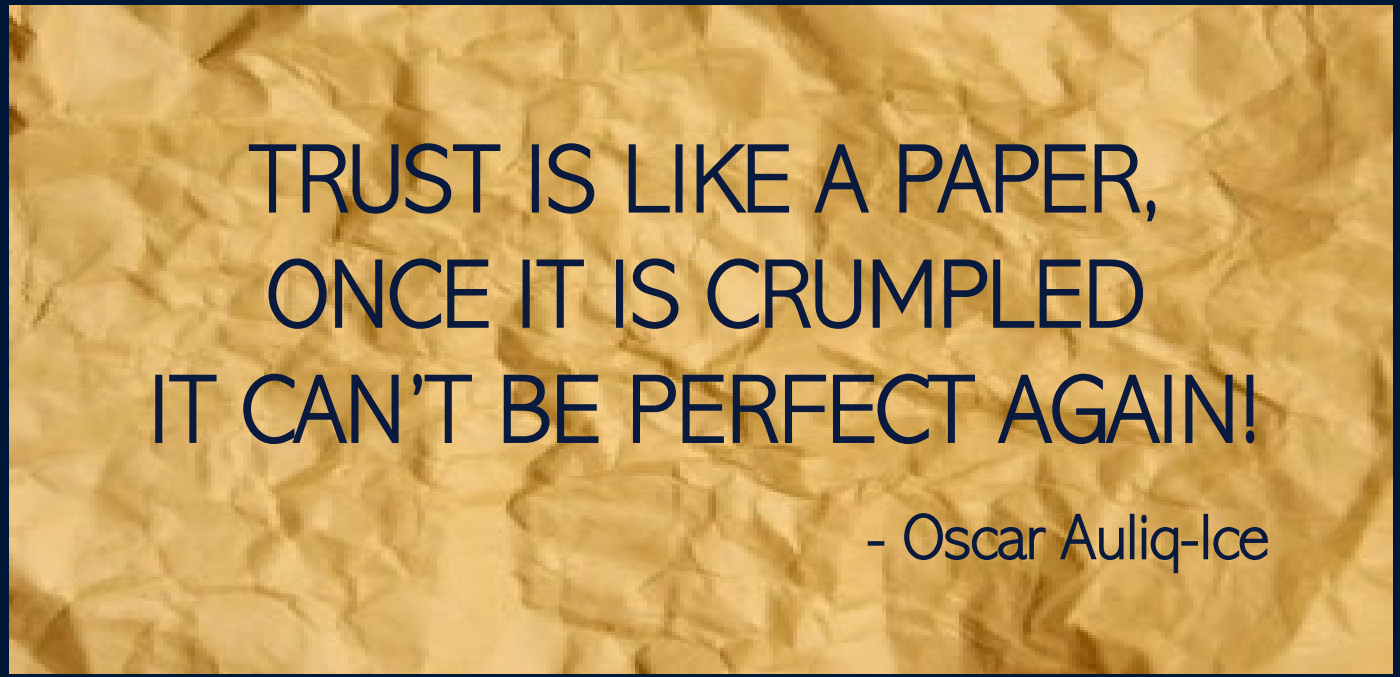
Trust/Distrust Dimensionality

TRUST

DISTRUST

Separate Constructs

Trust


TRUST IS LIKE A PAPER,
ONCE IT IS CRUMPLED
IT CAN'T BE PERFECT AGAIN!
- Oscar Auliq-Ice

Risk

- Imperfect Entities:
  - Humans
  - Automation Technology
- Risk lies in imperfection
- Risk: Result ≠ Desired Outcome

Risk

Despite the imperfections of automation, pilots are prone to trust and rely on automation

Calibrated Trust

The user's trust accurately matches the technology's capability and trustworthiness encouraging appropriate and timely use

Trust and Reliance

Trust = Attitude

Reliance = Behavior

Behaviors Affected by Trust

- Use
- Misuse
- Abuse
- Disuse

Study Variables

INDEPENDENT

- Performance
- Purpose
- Process

DEPENDENT

- Trust

Performance

What does the automation technology do?

The current and historical operation of the automation

Purpose

Why does it do it?

The degree to which automation is used within the designer's intent

Process

How does it do it?

The degree to which the automation's algorithms are appropriate for the situation and able to achieve the pilot's goals

Transparency

If the system performance, purpose, and process are not transparent to the pilot, trust is unlikely

Purpose of Study

How automation systems' purpose, performance and process influence pilot trust in automation technology

Methods Challenges

- No agreement on definition
- Definition required to measure
- Accurate measurement metric

Methods

Online administration of a 31 item Likert-based *System Trustworthiness Scale* to a convenience sample of volunteer pilots

Application

By investigating perceptions of trust in automation technology, pilot education and aircraft system technology may be developed to facilitate calibrated trust and appropriate use.

Application

Pilots tend to use automation they trust and do not use automation they do not trust

Christian Worldview

- Risk
- Trust
- Distrust
- Unexpected Results

Christian Worldview

FAITH

Trust in the unseen and not understood

Key References

- Alarcon, G. M., Capiola, A., Lee, M. A., Willis, S., Hamdan, I. A., Jessup, S. A., & Harris, K. N. (2023). Development and validation of the system trustworthiness scale. *Human Factors*. https://doi.org/10.1177/00187208231189000
- Conviser, R. H. (1973). Toward a theory of interpersonal trust. *Pacific Sociological Review, 16*(3), 377-399. https://doi.org/10.2307/1388493
- Lee, J. D., & See, K. A. (2004). Trust in automation: Designing for appropriate reliance. *Human Factors, 46(1)*, 50-80. https://doi.org/10.1518/hfes.46.1.50_30392
- Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *The Academy of Management Review, 20(3)*, 709–734. https://doi.org/10.2307/258792
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With Calibrated Trust and True Faith, You Can Take on The World

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