# Factors Affecting the Willingness to Use Decision Support Systems in a Military Context

**Research Project in Cooperation with the *Bundeswehr Office for Defense Planning* and the *Helmut Schmidt University***

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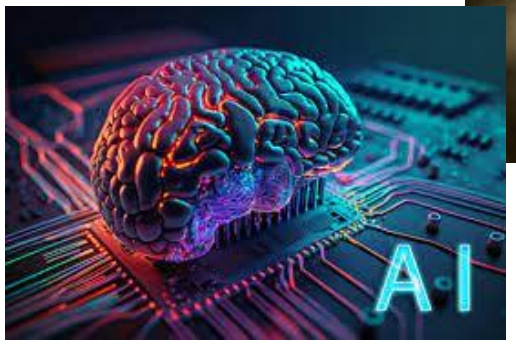
# Introduction of the Authors

- Captain Oliver Bornschlegl, M.Sc.
- Mathematical Engineering at the University of the German Armed Forces in Munich (2018)
- IT-Officer and Analyst
  - Assistant Head of Branch at the Bundeswehr Office for Defense Planning – Scientific Support and Interoperability (since 2020)

- Mr Georg-Friedrich Goehler, M.Sc.
- General engineering science at Technical University Hamburg (B.Sc.)
- International management and engineering at Technical University Hamburg (M.Sc.)
- Project employee working on my PhD at Helmut Schmidt University




# Factors Affecting the Willingness to Use Decision Support Systems (DSS) in a Military Context

# Agenda

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- Research Project
- Analytical Methods
- Results
- Limitations
- Conclusion

- **Research Project**
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**What are the Factors Affecting the Willingness to Use Decision Support Systems in a Military Context?**

Literature Review

Public and military sources

➔ Deductive Factors

Qualitative Study

Semi-structured Interviews

➔ Inductive Factors


Quantitative Study

Questionnaire

Structural Equation Modeling

Hypothesis &
Basis for scale development

Scientific basis for the development & implementation of DSS in the military

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## Data Collection

- Semi structured interviews
- Use of scenarios
- Collecting expert contributions on deductive factors from the literature
- Collecting further contributions to DSS, which form the basis for inductively collected factors
- Conducting the interviews until saturation

## Example of a scenario to query the deductive factor explainability

- Scenario:

The decision support system "INT-Checker" reads and evaluates reports from all accessible sources. It compares and evaluates all sources and can search more sources than a human analyst. Furthermore, it evaluates the plausibility of the results in a gradual gradation by assigning a value between 0 and 10. The value 0 is assigned for a classification as not plausible, and the value 10 for a classification as plausible.

- Situation:

An immediate message arrives from the HUMINT area. There is an urgent warning of an air landing in the own area near Neustadt an der Donau in one hour. The information is assessed as trustworthy by the analyst. However, the system "INT-Checker" evaluates the information as not trustworthy.

- Question:

Would you trust the system in this case, even if you cannot understand the decision?

## Data Processing

- Transcription of the interviews on the basis of sound recordings
- Coding of the transcribed interviews with MAXQDA software
- Allocation of code segments to deductive and inductive factors
- Creation of the inductive factors during the code segment assignment process

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## Deductive Factors

- Resilience
- Speed
- Explainability
- Transparency

## Mediators

- Acceptance of
- Trust in

## Willingness to use DSS

- Willingness to use DSS

## Inductive Factors

- Traceability
- Controllability
- Experience
- Usefulness

## Deductive Factors

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## Resilience

- Persistency of service provision in the light of changes and uncertainties

## Deductive Factors

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### Speed

- Time advantage generated in decision-making
- Integration into work processes and structures

## Deductive Factors

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| **Explainability** | **Traceability** |
|---|---|
| ➢ To grasp and communicate the system's output | ➢ To review the system's functionality |
| communication process decision maker ⇔ Analyst | understanding process Analyst ⇔DSS |

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## Transparency

- characteristics of a white box
- Transparency regarding
  - Causal relationships
  - Abstraction steps
  - Information input

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- Traceability
- **Controllability**
- Experience
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## Controllability

- Influence the system so that it operates in the desired manner
- Train and guide DSS in a similar way to a human analyst
- DSS must accept feedback

## Deductive Factors

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- Speed
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## Mediators

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## Inductive Factors

- Traceability
- Controllability
- **Experience**
- Usefulness

## Experience

- Individual experiences of the user
- Transmission of collective experiences of the user community

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## Willingness to use DSS

- Willingness to use DSS

## Inductive Factors

- Traceability
- Controllability
- Experience
- **Usefulness**

## Usefulness

- DSS providing beneficial services
  - Assist in managing complexity
  - Highlight what would be unpredictable or easily missed

## Deductive Factors

- Resilience
- Speed
- Explainability
- Transparency

## Mediators

- **Acceptance of**
- **Trust in**

## Willingness to use DSS

- Willingness to use DSS

## Inductive Factors

- Traceability
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- Usefulness

## Acceptance and Trust

- Explain causal relationships
- Both act as Mediators in Structural Equation Model

## Deductive Factors

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## Mediators

- Acceptance of
- Trust in

## Willingness to use DSS

**Willingness to use DSS**

## Inductive Factors

- Traceability
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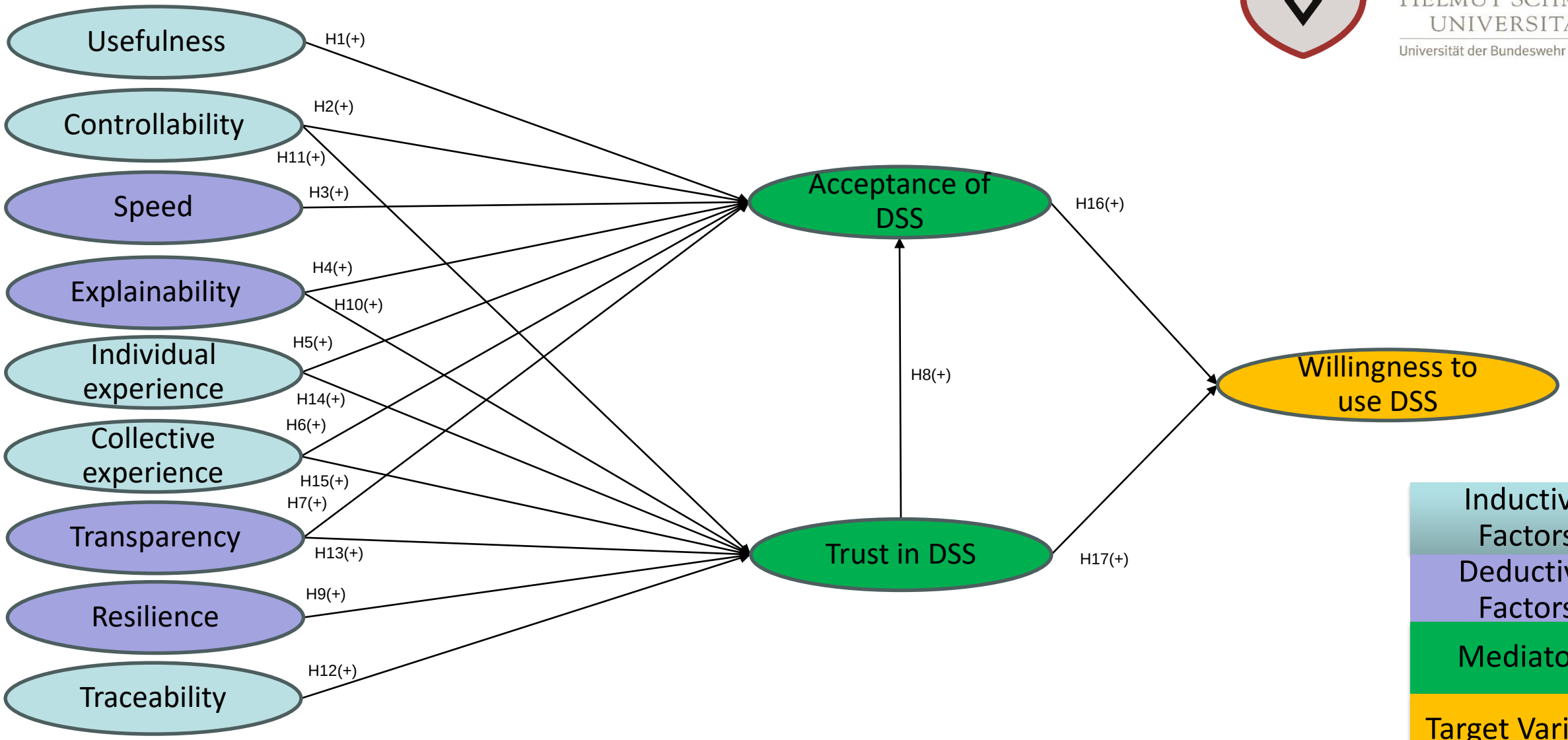
## Factors Affecting the Willingness to DSS

- Research topic of this project
- Dependent variable in Structural Equation Model

# Results - Hypotheses



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**Context of the limitations**:

Limitation 1

Only small sample size (5 interviewed experts)

**But:** Saturation of content regarding new aspects has been achieved

Limitation 2

All interviewed experts are G2 staff officers

**But:** G2 staff officers are also generally trained officers

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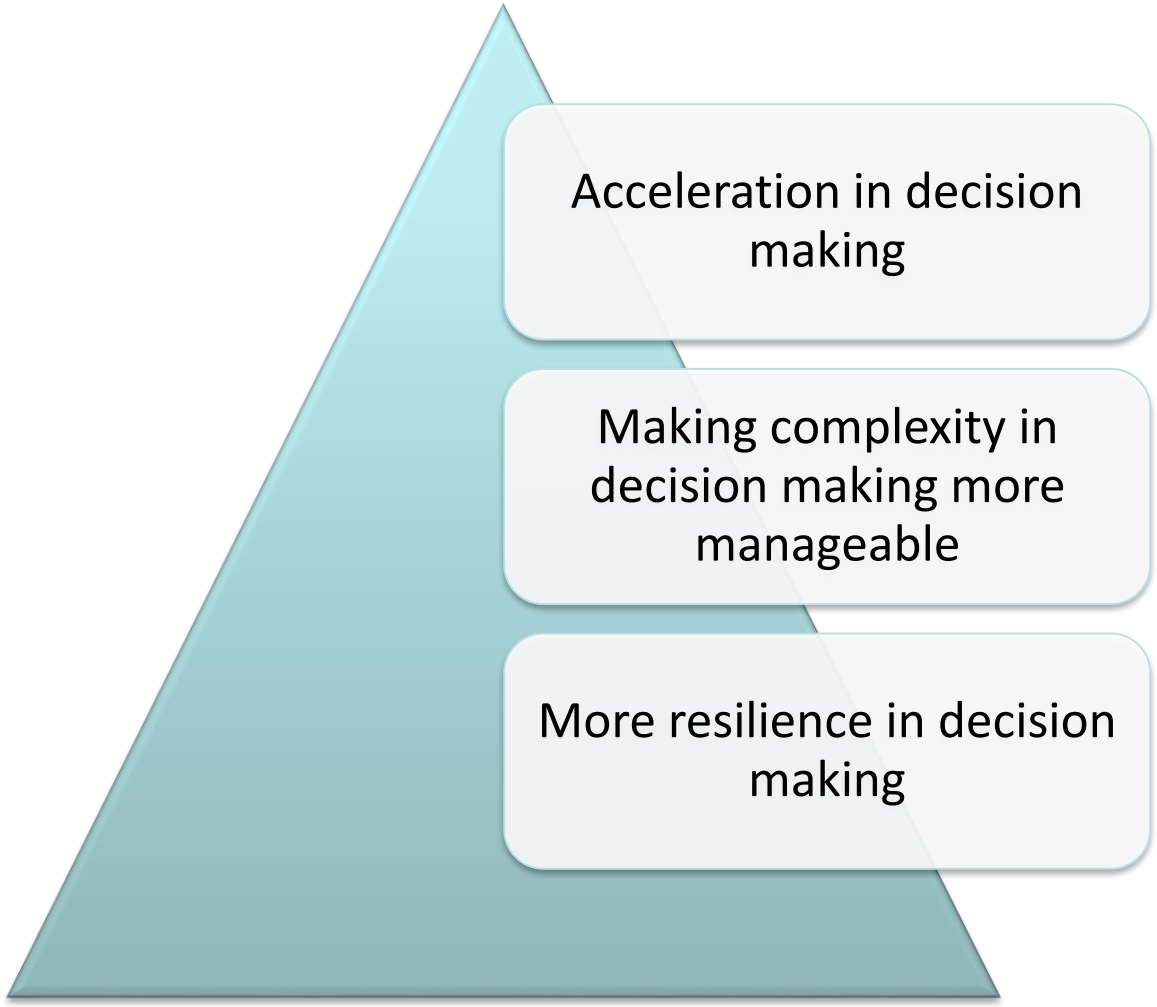
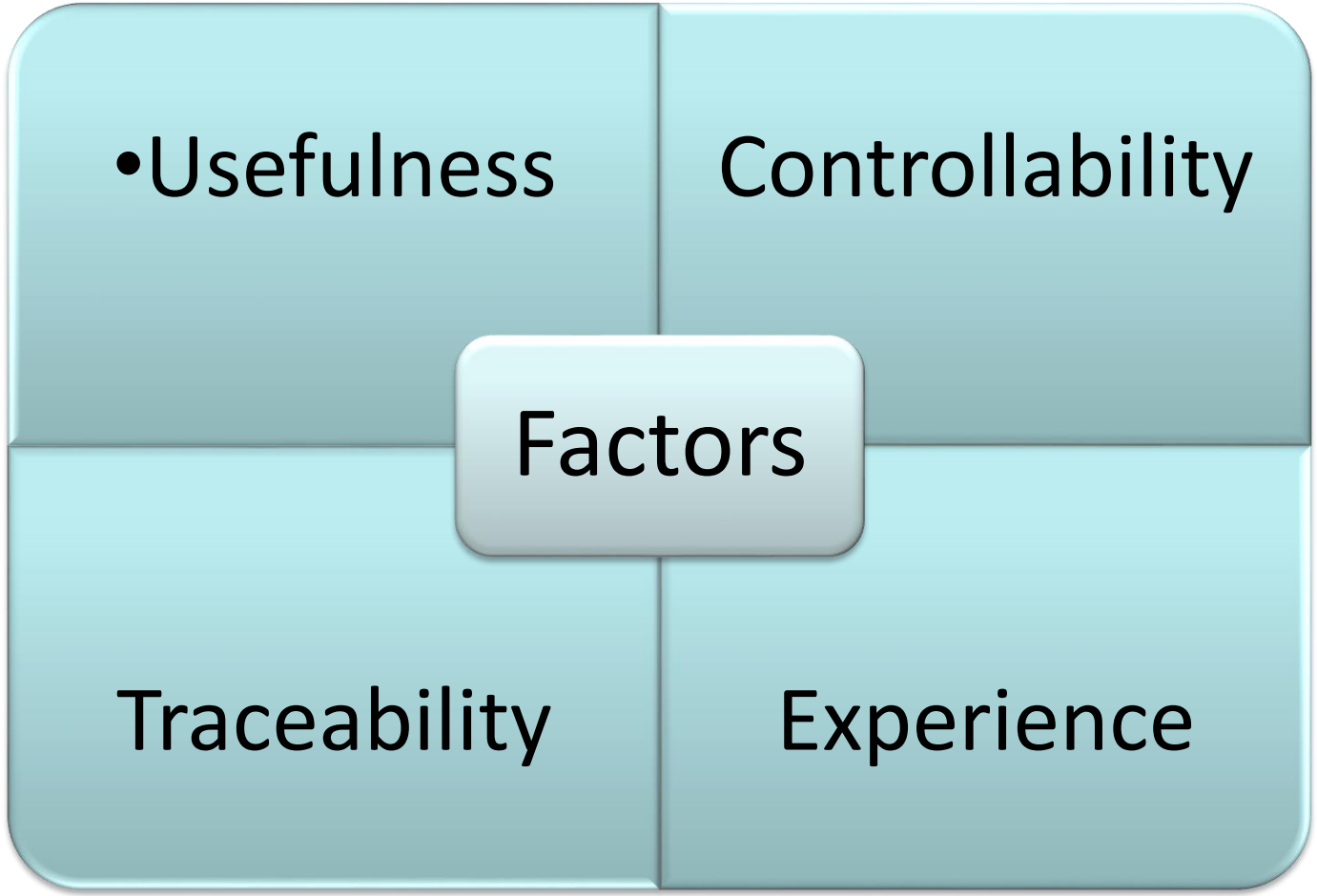
**Main expectations of experts for DSS**:



**Factors with effect on trust in and acceptance of DSS were surveyed inductively**



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## Key takeaways

- Desire to retain decision-making autonomy as a user of DSS
- Demand for systems that can be adapted to the user's specifications.
- Need to question statements or assessments of the DSS and compare them for control reasons.

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# Thank you for your attention

# References

Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2017), A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), 2nd ed., Sage, Los Angeles.