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# Research and Practice of Delivering Tabletop Exercises

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## What Are Tabletop Exercises (TTXs)?

*A form of a teaching activity aimed at training **teams** in responding to **crisis** situations.*

### TTXs are:

- used to **train personnel** in the **mitigation** and **resolution** of **incidents**.
- **driven by injects**, pre-scripted messages, which advance the exercise and stimulate further actions and discussions.
- focusing on **communication**, **coordination**, and **collaboration** (non-technical skills).
- sharing certain traits with some other forms of **active learning**.
- an **established training method** used in practice, yet **mostly outside universities**.



# Goal of the Paper

*Understand the **state of the art** of research and practice of **delivering tabletop exercises**.*

- We reviewed **academic publications** that deal with TTXs.
- We examined **five** research **questions**:
  1. What **formats** of exercises are used?
  2. Who are the exercise **participants**?
  3. How are the **exercises developed, assessed, and evaluated**?
  4. How are the **results applied**?
  5. What are the **future directions**?

## Method of Conducting the Literature Review

- Search query in the **Scopus citation database** of peer-reviewed papers.
- **140 candidate papers** in the first round.
- We set **inclusion** and **exclusion criteria** (more details on next slide).
- Two authors **screened all candidate papers** and applied these criteria independently.
- We rejected two papers in the second selection round.
- Total: **14 papers** selected for review.



## Paper Selection Criteria

- Deals with **TTXs in IT or OT operations or security**.
- **Written in English** with **full text available** (no page limit).
- **Describes exercising or supporting the exercise** of a complex process.
- Reports on an **exercise involving teams or groups**.
- Supports an **educational goal**.
- **Generic methodologies applicable to TTXs** in IT/OT and security are included.

## RQ1: What Formats of Exercises Are Used?

- TTXs are designed as a **series of injects** (events, problems, or situations).
- The **scenario is unknown** to the **exercise participants** beforehand.
- The injects are provided by **exercise facilitators** to participants.
- **Only four papers** mention the **use** of any **software tool** during the TTX.
- TTXs last from **several hours** (3x) through **one day** (6x) to a **few days** (1x).

## RQ2: Who Are the Exercise Participants?

- Trainees come from **diverse sectors**. The most frequent were **critical infrastructure organizations** (e.g., utilities, energy).
- **Two TTXs** were carried out for **university students**.
- One TTX was conducted for a large **law enforcement organization**.
- The **number of trainees** ranged from **20 to 108**.
- TTXs were **designed** by national/transnational **authorities** (2x) or **academic staff** (4x).
- The type of the **organizing entity determines** the **target group** and its **diversity**.



## RQ3: How Are the Exercises Developed, Assessed, and Evaluated?

### Development

- **No prevailing trend** in the process of **exercise preparation**.
- Various **guidelines for exercises** from NIST, ENISA, or ISO 22398.
- Software for **TTX development** (web-based collaborative tool for designers).
- **Automated scenario generation** (machine learning and GPT-2).
- Challenging problem: how to provide **realistic** and **expedient scenarios**.

## RQ3: How Are the Exercises Developed, Assessed, and Evaluated?

### Assessment

- One paper proposes a **method** and a **tool** for structured **assessment of trainees**.
- One paper includes **unstructured assessment** of trainees' actions **after the TTX**.
- One paper studies **errors made by facilitators** during their interactions with trainees.

### Evaluation

- **Six papers** addressed TTX evaluation, but **none reported** specific **qualitative or quantitative** research **methods**.
- The evaluation is conducted as a **feedback from/to trainees** and a **discussion with** the exercise **designers** and **facilitators**.

## RQ4: How Are the Results Applied?

- A few papers distill **recommendations** and **lessons learned** from **TTX preparation** or **delivery** applicable to other exercises.
- **Papers do not refer to supplementary materials** (such as software tool implementation or exercise scenario) that **other educators can directly use**.
- One paper outlines eight **scenarios** as an **inspiration** for **creating a new exercise**.

## RQ5: What Are the Future Directions?

- The reviewed papers **reported diverse future work**.
- **Enhancing instruction** and **tools for TTX exercises** (e.g., generating exercise content, create an online platform to facilitate running TTXs).
- **Advanced training** and assessment approaches (e.g., develop **comprehensive training** for more relevant insights and feedback).
- **Evaluation** and **feedback mechanisms** (e.g., incorporate **lessons learned** from exercise runs into future sessions to **continuously refine** and **improve** the training).

## Summary of the Observed Trends

- Most papers **report on specific exercise runs** or describe **exercise formats**.
- The **explicit learning phase** typically occurs **post-exercise**, involving **trainee reflections** and **scenario debriefs**.
- The reviewed **papers lack actionable artifacts** and supplementary materials. This **hinders educators from adopting TTXs** as a teaching method.
- Current TTX practices depend on **manual preparation of exercise content, lacking automation** and **reusability**.

## Conclusions and Future Directions

- Despite their **long use in practice**, the lack of tools for delivering, and evaluating TTXs has **limited their adoption in computing education**.
- TTXs **train competencies** required in the workplace, they have been **introduced into computing courses** as an innovation, especially within **cybersecurity curricula**.
- The **future research and practice directions** include developing and using **advanced TTX software** moving the exercises from the traditional pen and paper format.

*Read the full paper at <https://doi.org/10.1145/3649217.3653642>*

*Thank you! Questions and feedback are welcome.*

## Stay in Touch

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### Cybersecurity Laboratory

🖥️ <https://cybersec.fi.muni.cz>

🐦 <https://twitter.com/cybersecmuni>

### INJECT Exercise Platform for Tabletops

🖥️ <https://inject.muni.cz>

📄 <https://doi.org/10.1145/3649217.3653639>



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