Timely Feedback in Unstructured Cybersecurity Exercises

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Outline

Cyber Range and Defence Exercises
  Introduction to Cyber Ranges
  Cyber defence exercise

Experiment
  Scoring Timeline for Feedback
  Post-exercise & Scoring Timeline Survey
  Discussion
Introduction

Global shortage of cybersecurity workers with the skills to prevent or respond to cyber
security attacks ->

- **Cyber defence exercises** (CDX)
  - unstructured, step-by-step hands-on trainings
  - enable participants to experience cyber attacks first-hand with real-life limitations
  - intensive, short-term events lasting several days

- ... feedback from these exercises?
Introduction

![Cyber Exercise Score Table]

**Figure:** A scoring table, the only feedback for the learners
Figure: Exercise participants, their interactions and tasks.
## Exercise Phases

**Table:** Phases of the exercise with time allocation

<table>
<thead>
<tr>
<th>Order</th>
<th>Phase</th>
<th>Duration</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exercise familiarization</td>
<td>3 hrs</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Actual exercise</td>
<td>6 hrs</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Post-exercise survey</td>
<td>5 mins</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Break</td>
<td>25 mins</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Scoring timeline interaction</td>
<td>10 mins</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Scoring timeline survey</td>
<td>5 mins</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Quick exercise debriefing</td>
<td>15 mins</td>
<td>2</td>
</tr>
</tbody>
</table>
**Scoring Timeline**

![Scoring Timeline Diagram](image-url)

**Figure:** Scoring timeline providing personalized feedback for each team.
Post-exercise & Scoring Timeline Survey

E1  My knowledge and skills were sufficient.
E2  I found exercise difficult for me.
E3  Exercise was well organized and structured.
E4  Exercise was beneficial and useful to me.
F1  The scoring timeline of my team displayed after the end of the exercise provided useful feedback.
F2  Do you have any comments on the scoring timeline?

Figure: Answers distribution E1 – E4 and F1.

1 = strongly disagree, 5 = completely agree
Discussion

- **Teams sought out feedback** regardless of their achieved score
- **A need for more detail** according to survey question F2 ("Do you have any comments on the scoring timeline?")
- **Benefits for instructors** which lie in reflection from the learners
- **Two limitations of the study** – small group of participants, simplicity of the timeline evaluation survey
Conclusion

- Motivation – very limited and/or delayed feedback in CDX
  - -> limited opportunity to learn from the mistakes
- Our experiment: an analysis of a simple survey and an interaction with a new tool
- Feedback gathering was automatized; only limited level of detail
- The new feature was valued by learners
- Future work
  - Learners would welcome more detailed feedback
  - Not only show the point gain/loss, but also a comment from the instructor
Any questions?

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