

## Crisis Management Field Exercise Data

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**Summary:** This abstract describes the domain of crisis management field exercise data. As one of several possible data formats, patient actor data from mass casualty exercises are described. They are assessed by patient actors in the field and stored in a table spreadsheet. As one analysis method, quality indicators can serve as an aggregated view with the special purpose of evaluating the exercise actor's performance in crisis management and patient relief.

**Keywords:** Exercise data, mass casualty exercises, quantitative data, quality indicators.

### 1 Introduction

Crisis simulations and exercises are the only chance first responders and technical relief practitioners have to gain feedback on their mission skills. Contrary to serious games and simulation exercises, in field exercises, practitioners move real vehicles and equipment to accomplish and enable individual and organizational learning for practitioners. In general, there is a lack of research in the area (Beerens et al 2016). Regarding exercise data, few data sets are available publicly.

Depending on used evaluation methods, field exercises generate various kinds of data. As **data-challenge** this domain describes both qualitative data (e.g. audio/video media files, observer reports) and quantitative data (e.g. timestamps with achieved accomplishment milestones, patient treatment data). The data domain of field exercise data belongs to the sector resilience that itself is of cross-sectoral nature related to classical city sectors like mobility, environment and administration.

### 2 Method of data assessment or delivery

Field exercise data is assessed using different **exercise assessment methods**, such as process evaluation and qualitative observation (Drews et al 2019). Additionally, to assess data, handed-over mission-operational artefacts such as mission reports could in the aftermath serve as exercise data and resource for evaluation.

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One established **quantitative assessment method** is regarded as mature with regard to process experience, data quality and awaited measurement errors (Sautter et al 2014, Drews et al 2016, Sautter et al 2019). Qualitative approaches are also quite mature as well as established among practitioners and researchers. Other quantitative methods require some further development (Drews et al 2019).

The domain consists of described **various data types**. As an example, this abstract refers to quantitative patient actor data, assessed by the first aforementioned method.

### 3 Data management

The dataset structure is adopted from a generic framework for Research Data Governance and consists of bibliographic metadata and files as major categorization (Sautter, Wuchner, 2020). Beside datacite and dublincore<sup>4</sup> fields the schema contains also more specific fields like “research question” and an own entity for “research method”.

As a possible metadata structure, an **exercise data set** could be described by a title, such as “Two mass casualty field exercises run with bus scenario in order to evaluate electronic patient tags’ efficiency”. A further metadata field could describe the exercise setting as well as used research methods and obtained data in 5 sentences. The metadata field research question could in this example be “Are electronic patient tags more efficient then manual patient tags?”. The research object could be described as “Mission accomplishment of first response and fire brigade units”. The research subject could be outlined as “Patient actors assessing particular mission accomplishment milestones”.

As the method has further been implemented by a special exercise evaluation spreadsheet, a **“research instrument dataset”** could be described as follows. The name of the research instrument that could be “mass casualty exercise evaluation tool” in this case as well as an adequate five sentences description. Important thereby is the version of the research instrument due to potential schema evolution. A link to the research instrument website could be given, which may in this case be the reference to a corresponding publication offering the table spreadsheet as a working tool “manv-uebungen.iao.fraunhofer.de”.

For describing the **methods** that have been both applied for data assessment and data evaluation, methods could be described by their title, type description and literature reference. Table 1 illustrates such a range of methods for the example dataset.

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<sup>4</sup> Bibliographic meta data standards

| Research-method-ID* | Research method                            | Type of research method | Description of research method  | Bibliography   |
|---------------------|--|-------------------------|---|--|
| 1                   | treatment assessment sheet <sup>5</sup>    | data collection         | form in which role players and/or evaluators document time stamps and essential interventions and result of triage. | (Sautter et al 2014), (DRK 2016), (Drews et al 2018), (Sautter et al 2019) |
| 2                   | observer protocol                          | data collection         | Semi-structured report, which is filled out by observers.   | (DRK 2016), (Pottebaum et al 2014)   |
| 3                   | Camera data                                | data collection         | Raw data of cameras used to capture the exercise.   | (Pottebaum et al 2014), (DRK 2016)   |
| 4                   | Speech protocols                           | data collection         | Protocols of given orders and reports within an exercise  | (Pottebaum et al 2014)   |
| 5                   | quality indicator calculation <sup>6</sup> | data analysis           | Calculation of quantitative indicators based on process-milestones collected by patient actors                      | (Sautter et al 2014), (DRK 2016), (Drews et al 2018), (Sautter et al 2019) |
| 6                   | summary/synopsis of observer protocols     | data analysis           | Experts observing the exercise create a summary of their observations   | (DRK 2016)   |
| 7                   | collected presentation cards               | data collection         | Trainees as well as patient actors collect 3 positive and 3 negative aspects on cards                               | (DRK 2016)   |

Table 1: Example methods, potentially relevant for a field exercise dataset

<sup>5</sup> German Versorgungsbewertungskarte, see at <http://manv-uebungen.iao.fraunhofer.de/>

<sup>6</sup> Based on a spreadsheet, e.g. available at <http://manv-uebungen.iao.fraunhofer.de/>

Additionally, domain-specific metadata fields could allow a first overview on field exercise dataset for domain experts. Possible **domain-specific meta data** could look like illustrated in table 2 (first approach).

| Property      | Value                               | Unit             |
|---------------|-------------------------------------|------------------|
| Situation     | Train crashed to car, 24 injured    | Text             |
| Mass casualty | yes                                 | Boolean (yes/no) |
| Weather       | Cloudy, light rain                  | Keywords         |
| Mission units | LF, RTW, RTH, KTW, KOM <sup>7</sup> | Keywords         |
| Day time      | 1.20 AM, night, weekend             | Keywords         |

Table 2 : First approach on domain specific meta data for field exercises

A typical **grouping criteria for field exercise data** is the scope of a particular experiment/exercise or exercise series with a particular focus in terms of exercise goal and research question. Therein typically one to three exercise runs could be part of a single dataset. In case more than one exercise run is grouped by the dataset, files would be grouped according to exercise runs on the top level and according to assessment or evaluation methods on the second level of the file system structure.

Currently, exercise **data is stored** on local file systems. Metadata are not yet assessed and maintained systematically. As **raw data** files generated by assessment methods, analog data, such as hand-written papers, may play a role. After their digitization and assessment, for the quantitative patient actor data, the aforementioned spreadsheet serves as a container file. Further media data such as helmet camera movies potentially enhances the data per exercise run. Observer reports also may be digitized and brought to a common format. An adequate option for observer reports e.g. could be to not digitize the handwritten paper reports but just ask each observer to provide a 1-pager containing his main observations as **aggregated data** after the exercise run.

## 4 Conclusion

Field crisis management exercises are both important for practitioners and essential as a research field. An assessment and usage of exercise data for both mission debriefing and scientific insights has been achieved so far. This domain abstract envisions an open standard for exercises data, containing out of metadata and file structure containing data from qualitative and quantitative exercise assessment methods. The granularity of the

<sup>7</sup> German abbreviations for fire brigade vehicles, ambulance, helicopter, bus

data set is dominated by the corresponding research question, while a single data set contains various field exercise runs, that represent practitioners running a mission tactic in a simulated crisis environment e.g. represented by patient actors.

As a next step, dataset from particular exercises shall be published on a research data repository. Due to privacy and data protection limitations, just an excerpt of the whole data structure can most likely be made openly accessible. According to the vision of NFDI4City and the preceding HEFE project, an internal pendant of the dataset could nevertheless contain comprehensive data that has not been deleted in the data protection compliant data extraction and deletion process.

As remaining task to the research community, a classification e.g. for all possible crisis scenarios is needed to be established as a standard for exercise dataset.

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