Layered scenario mapping

Layered scenario mapping is a technique used to gain insight into the ‘situation one designs for’. It is a systemic technique and emphasises presenting information in different layers going from an overview to very detailed information. The technique proposes a structured approach to collecting and presenting data and provides a template for sorting and presenting the data in a layered manner hierarchically, spatially, and temporally.

The layered scenario mapping process

Preparation

A) Identify the scenario to map out. The scenario should be representative and cover the most important aspects of the ‘situation one designs for’. The selection can be informed by the objectives of the design project, and criteria for selecting the scenario can be based on frequency (how often something happens) and/or criticality/importance (related to the potential consequences if something goes wrong). Some insight on the situation one is designing for is required to select an appropriate scenario. Involvement of users and subject matter experts is encouraged. Identify the main steps and make draft of the outline.

B) Define type of data to be collected. This depends on both the needs of the design project and how the data will be presented (see Designing the scenario). The template provided on the next page can be used as a starting point. Adapt according to your needs.

C) Identify data sources. The users, subject matter experts, and the field site may be primary sources of information. Other sources may include user training materials, user manuals, regulations and procedures, incident reports relevant to the scenario, and online materials shared by users.

D) Plan how data collection should be carried out and decide on methods and techniques to be used. Observational studies, interviews with users and subject matter experts, and other techniques involving users are valuable approaches. The guide Design-driven field research at sea¹ may prove valuable if you plan to do field studies.

The template on the next page can be used as the basis of an observation form. Communication analysis tools such as Comms Usage Diagrams² can be used to identify who communicates with whom in the scenario and by which means, link analysis³ can be used to identify how actors physically move, and Applied cognitive task analysis (ACTA)⁴ can prove valuable in determining expertise needed and identifying critical points.

Consider what kinds of video/audio recordings to make and what images to take and the equipment needed to do so. Making a list can be useful.

E) Make practical arrangements. Agree with companies and users on field trips, interviews, etc. Note: This can be time consuming. Start early and set aside sufficient time for this activity.

Data collection

Collect data as planned. Note: You may need to carry out data collection activities several times as deficiencies are identified and new needs emerge during designing of the scenario.

Designing the scenario

Decide on the format and layout of a scenario map that supports the presentation of both overview information and detailed data. Designing the map goes beyond listing the data collected. It involves developing new knowledge by interpreting the collected data, collating the data, and designing the data. Use visual presentation whenever appropriate. Spatial and temporal data are particularly appropriate for visual presentation.

The map can be presented analogously or digitally. The template presented on the next page can be used for paper-based versions. Note: The template is suggested as a starting point, and the layout of the map should be adjusted to the needs of the specific design project.

Validation of scenario

Ensuring that the information included in the map is correct is important. Invite users and other subject matter experts to examine and validate the scenario.

¹ Design-driven field research at sea. The Oslo School of Architecture and Design
Layered scenario mapping template

Scenarios: Rig operations PSV

1. MV Thor is on its way to the rig Beta to deliver 14 containers, brine, cement, and fresh water. It will also receive 12 backloads.

2. Actors in the scenario:
   - Captain (or First officer)
   - Second officer
   - Chief engineer
   - Deck crew rig
   - Crane operator rig
   - CCR operators rig
   - Organizer/planner onshore

3. Captain checks ECDIS to assess distance to rig's 500 m safety zone. Confirms that they expect to get away from rig in time for entering the 500 m safety zone. Confirms that they expect enough force to have enough force to get away from rig if needed.

4. Second officer turns the vessel heavily towards the rig. The loading operations take 3 hours and 45 minutes. When they are finished, the captain pulls out from the rig's 500 m safety zone. Confirms that they expect to have enough force to get away from the rig if needed.

5. Second officer contacts rig's CCR to get contact information and coordinates the assignment of a crane.

6. Captain and second officer agree on which side of the rig to position the vessel and agree on which crane will be used. Today, the vessel should be positioned on the starboard side alongside the rig. As always, they mentally assess whether or not the vessel should be positioned on the starboard side alongside the rig. They always ensure that there is no danger of collision between the vessels.

7. During the loading operations, both the captain and the second officer ensure that the vessel position is kept by thruster control system. Tests all thrusters, testing the UHF radio channel and informing CCR on the ship. Before they reach the 500 m safety zone, they complete the pre-entry 500 m safety zone checklist.

8. This includes assessing weather conditions, starting bow thrusters and testing all thrusters, testing the UHF radio channel, and informing CCR on the ship. Before they reach the 500 m safety zone, they complete the pre-entry 500 m safety zone checklist.

9. The following describes the scenario of a PSV doing rig operations in the Norwegian sector of the North Sea, starting from outside the safety zone. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

10. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

11. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

12. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

13. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

14. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

15. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

16. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

17. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.

18. The ship is at the aft of the bridge. The second officer sets all thrusters in zero at the front and yells ‘all in zero’ to the captain, and then the captain pulls out from the rig's 500 m safety zone.
Layered scenario mapping template

The template on the previous page suggests how information can be presented with overview information to the left and detailed information to the right. The overview gives the reader a frame of reference to use when making sense of the detailed information. The detailed view consists of a timeline matrix with step-by-step descriptions. The number of steps depends on the length of the scenario and the needed level of granularity. The following content elements are included:

1) Descriptive title

2) Visual presentation of ship’s technical specifications. Presents what the users physically control and the technical systems to design for controlling.

3) Description of the scene and introduction to scenario. Lets the readers of the map know the setting of the scenario.

4) Presentation of actors involved in scenario. Lets the readers know who is involved. Colour coding of the actors can be useful.

5) Written scenario story. Presents the scenario from start to finish. Provides the readers with an initial frame of reference to use when interpreting the detailed information. Also useful in developing the outline of the timeline matrix.

6) Document info. States which data sources the map builds on. Includes version of the document and date. Adds to the trustworthiness of the map.

7) Timeline. Not necessarily linear in a mathematical sense (it must not have a fixed scale where one step represent a set time period).

8) Visual presentation of vessel position. The vessel is shown in relation to other objects, such as the port and the rig.

9) Mode. The mode of operation indicates what kinds of rules apply and the technical mode of the vessel.


11) Actors involved. Presents the main actors involved at each step. Colour coding from item 4 is used.

12) Communication. Shows who communicates with whom and by what means for each step. Colour coding from item 4 is used.

13) Position. Visual presentation of the users’ position at each step in a bird’s-eye view (here, position on the ship’s bridge). Colour coding from item 4 is used.

14) Equipment used. Shows what kind of equipment is used at each step.

15) Information needed. Describes the functions the users need to be able to carry out at each step. Needed when designing controllers and other interactive elements.

16) Critical points. If the step is particularly important to ensure safety, it is highlighted, and the critical factors are pinpointed. The critical points can, for example, be identified through ACTA or risk analysis.

18) Illustrative photos. Provide contextual information and can, for example, show the physical environment or the equipment used. Could also include pictures of the actors in the scenario.

Advantages to the technique

- Easy to understand and requires little training
- Offers a framework for sorting and making sense of large amounts of data from a range of sources.
- The map can support collaborative work and be used to share insight among a design team.
- Different disciplines of a development team can use the map for different purposes.
- The map can be used to document work done on the project, such as field research.

Limitations of the technique

- Can be time-consuming and relies on substantial data collection.
- May lead to fixation on the current situation and requires conscious interpretation of what the scenario means for the design of future situations.

Things to consider

- The example used in this guide is a ship’s bridge but can be adapted to other complex environments.
- To overcome the limitations of the technique, consider combining it with more open-ended and future-oriented techniques.
- Information with a lower level of detail gives a more open-ended map that invite interpretations useful at the start of the design process, while more detailed information may result in a less-open map useful later in the design process.