Day in the Life Of: Applying the Process to the Nuclear Industry

Lisa Kelly[1], Rachel Selfe[2] & Suzy Sharpe[1]

[1]Mott MacDonald, [2]AtkinsRéalis

SUMMARY

Day In The Life Of (DITLO) methodologies have been utilised in the rail industry to elicit user experiences and drive a greater shared understanding of how systems or designs will operate in a variety of scenarios. This paper describes the application of this approach to the nuclear industry, in order to improve the integration of design, engineering and safety disciplines, and to achieve a holistic understanding of the user's environment to enhance operability and human performance.

KEYWORDS

DITLO, Scenarios, Workshops, Nuclear, Multidisciplinary

Introduction

Nuclear construction projects typically follow a standard approach to construction, with stakeholders developing designs within separate teams and then presenting these in reviews for wider discussion. Whilst this approach can result in a safe design that meets project requirements, it does not necessarily result in one that recognises the needs of its users and the tasks they undertake. Issues can often be identified too late to enact real change, requiring procedural and other post-hoc solutions to mitigate risks.

On a recent nuclear construction project, Human Factors (HF) Specialists identified an opportunity to improve the collective understanding of a building's future operation by utilising rail industry knowledge of Day In The Life Of (DITLO) methods. This process provides additional benefits to standard construction processes, as it can be used to inform changes to technical requirements, roles and processes, in addition to reducing risk (Bye 2017) and increasing operability.

The DITLOs were undertaken during Royal Institute of British Architects (RIBA) design stages 2 and 3. The goal of the DITLOs was to identify key user needs, requirements, issues, risks, dependencies, assumptions and inform analysis such as task analysis and process flow diagrams.

DITLO Scenarios

Prior to DITLOs being undertaken, the HF team reviewed scenarios to develop a list of potential scenarios or topic areas that demonstrate the design is operable (see Figure 1). The following list was created:

- Normal scenarios – analysis of a normal day, moving through the building and operational tasks therein. Consideration of all users within the building.
- Abnormal scenarios – conditions which occur less frequently but may have a minimal impact on normal operations, e.g. lights requiring replacement, fire drills.
- Degraded scenarios – less frequent conditions with a moderate impact upon operations within the building, e.g. preventative maintenance.

- Emergency – fire or other emergency scenario, including emergency responder tasks, site and building security incidents.

The type and number of DITLOs applied on a project is likely to be dependent on the number of key scenarios used to demonstrate the building is fit for purpose, with further scenarios potentially being identified during initial DITLO sessions. DITLO scenarios are developed in consultation with other stakeholders such as end-users, Operational Readiness and Capability. Example scenarios are presented in Figure 1, and promote discussions in the DITLO scenario definition phase.

Application of the DITLO methodology

DITLO methods can be applied at macro and micro levels: from following a user from the moment they start their shift to the moment it ends, or for one task they undertake within a day. DITLO is a flexible process and bounded by the purpose of why it is being undertaken. For example, the DITLO may want to improve understanding of:

- The detail of particular tasks undertaken at certain points in the day, to understand where safety may be compromised or human errors occur.
- The interaction between the user activities and the physical environment, to recognise whether the design/environment supports the user in effectively completing their tasks.
- Detailing tasks and mapping those tasks, to understand where there may be gaps in procedures and processes.
- Gaining task detail and human movement, to inform other disciplines such as architecture, HVAC and mechanical handling.

The goal of the session requires defining with other stakeholders in advance, to create a framework to bound the DITLO, ensuring it remains focused and that the key project questions to be addressed during the DITLO are captured.
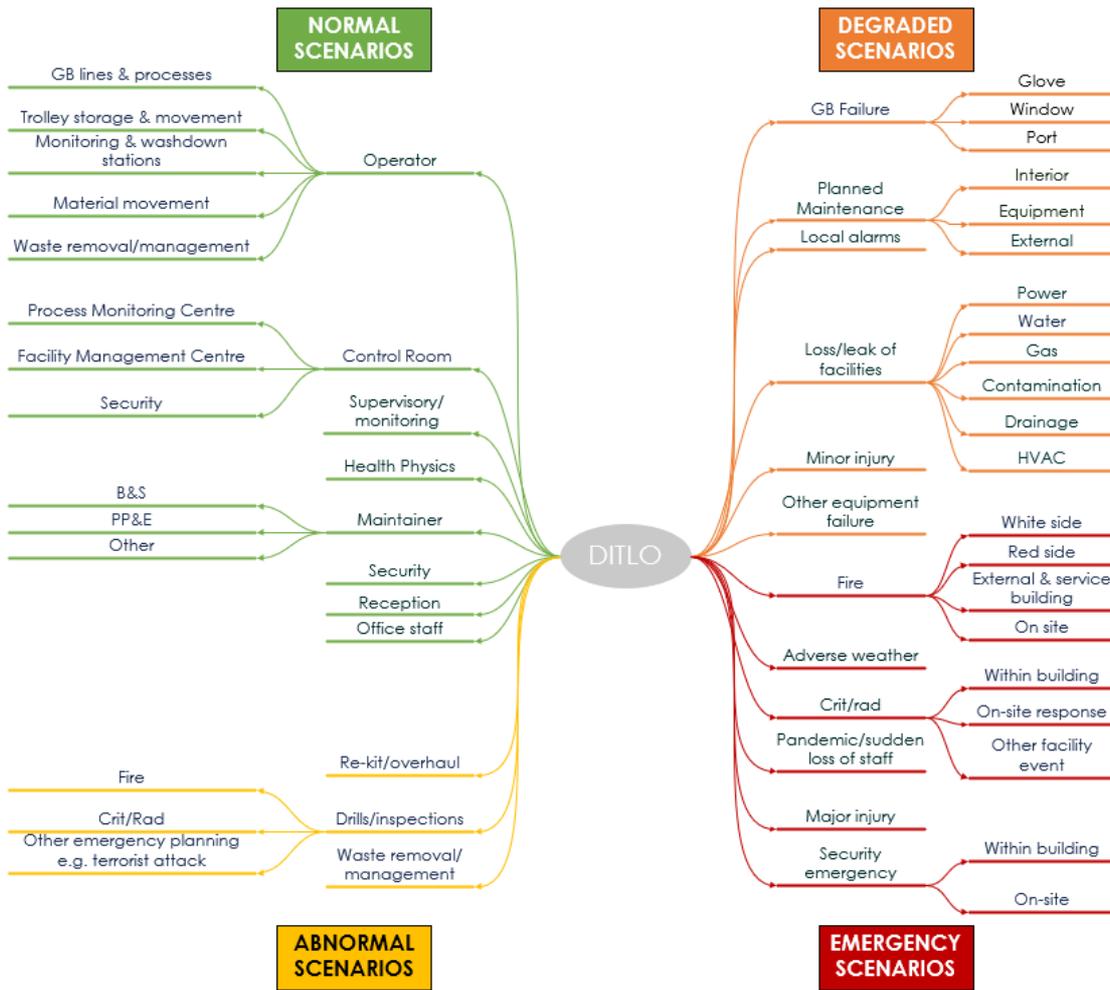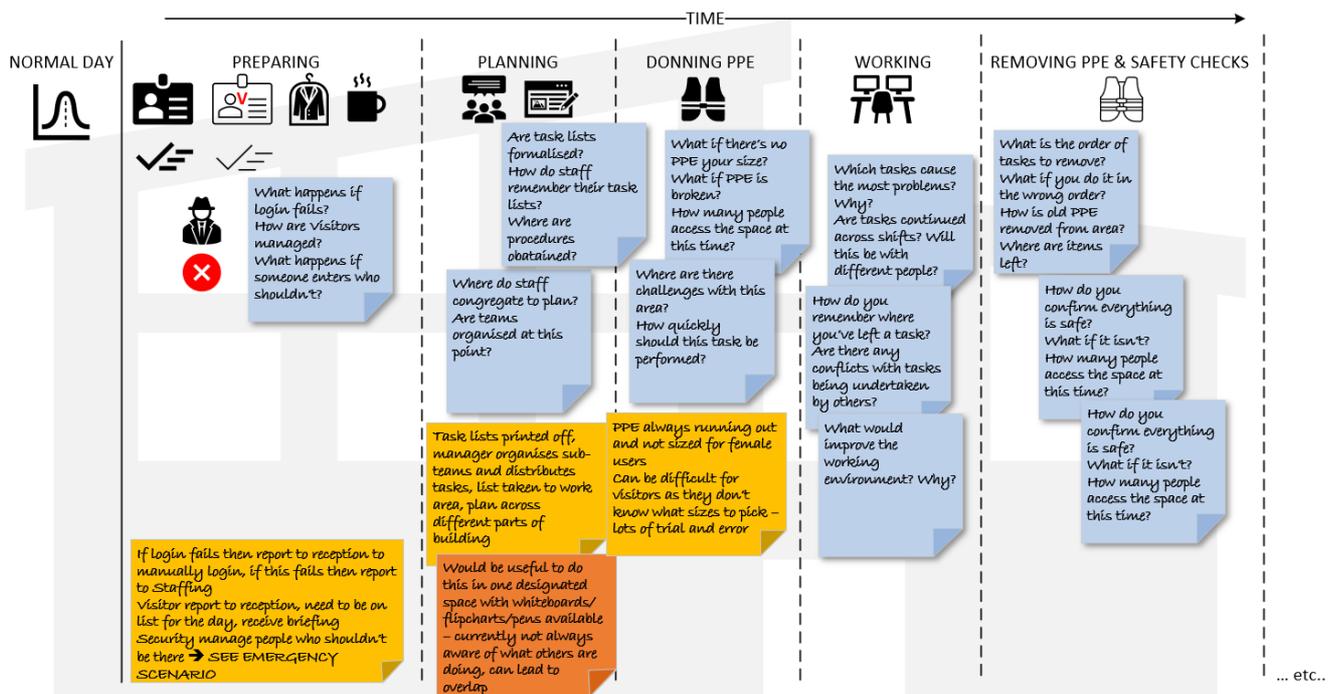
Figure 1: Example DITLO Scenarios

Figure 2: Example swim lane with sticky notes

Method

Preparation

Agendas or briefing notes were provided in advance of DITLO sessions, to ensure the appropriate stakeholders were identified and the scope and boundaries of the session were clearly communicated. Other simple, but necessary, logistical aspects such as the workshop location and room size, including the availability of food and welfare facilities, were carefully planned in advance to provide an inclusive working environment.

Conducting the workshop also required ensuring flipcharts, screens for presenting information and audio equipment were sufficient. This is in addition to planning dynamic data capture methods such as swim lanes, and how they were presented during the day, e.g. the need for sticky notes, marker pens, etc. Planning these aspects ensured the HF team were supported by the environment in delivering the DITLO workshop.

Managing the DITLO

Where possible, the HF team utilised an in-person workshop format to discuss different scenarios, following a multidisciplinary, holistic approach that focused on the detail of day-to-day end user tasks (Bye 2017). This provided flexibility and helped to ensure attendance. The goal was to have all DITLO stakeholders in the room, however, due to the geographic location of project team members and the volume of attendees, a blended approach was utilised, with those contributing the most, such as end-users, being present in the room and other wider project members attending virtually. The scribe, therefore, also monitored the meeting 'chat' function for questions or comments to input into the discussion to ensure key points were not missed. The facilitators ensured that those attending the meeting virtually were included within discussions, providing prompts and opportunities to ensure they had the space to contribute.

During each workshop the following format was followed:

- Define the scope and task(s) being explored in the DITLO – clarify scope of the DITLO with attendees to ensure the discussion remains focused on the topic.
- Present the purpose of the DITLO, clarify role of HF for the day, and allow all those attending to introduce themselves, including name and their role in the project.
- Conduct detailed walk/talk-through of the DITLO topic:
  - Focusing on any current operational experience – this helps to clarify current user needs. This is an in-depth, holistic discussion focusing on everyday and safety critical elements of a task. This helps to establish the 'as-is', from which existing assumptions and needs can be challenged to ensure 'new' is not simply a replication of 'current', and to identify issues or efficiencies in the current design.
  - Breaking the task(s) into sections whilst focusing on usability, performance and safety. This helped provide a semi-structured approach, giving structure and focus without limiting discussion and allowing other elements to be added throughout the session.
  - Mapping of the task goals, equipment and personnel interactions to the current design to identify potential issues.
- Reviewing several scenarios associated with the topic area, such as normal, degraded and emergency. These were established in advance where possible, however, it is necessary to retain some flexibility to include emergent scenarios during the session.

- Utilising 'swim lanes' to visually capture information on the different stages of the process being discussed for each scenario (see Figure 2).

There are often procedures or a task analysis which can describe the task and could be used when running the DITLO, however, it was important to not be too prescriptive in presenting the task steps to allow challenge of current, accepted norms and processes, and to limit assumptions being made. A semi-structured approach provided sufficient prompts to keep the session focused, but without constraining or limiting discussions. This helped ensure users discussed their task steps in greater detail and included the nuances of their working day that are unlikely to be captured by procedure.

Data Capture

A benefit of the DITLO process is the huge amount of rich detail generated. To ensure no data was lost and to aid facilitation and fluid discussion, data was captured in three ways during the sessions:

1. *Sticky notes capturing key information from the group presented in swim lanes* – visual representation of the tasks being discussed and the data captured within the room ensured delegates remained focused. Sticky notes were used to write down key information and presented within the relevant swim lane section of the task being discussed (see Figure 2).
2. *Detailed notes* – A scribe was also utilised during the DITLO to ensure all data were captured from discussions within the session. The scribe also captured actions if further information was required, or decisions needed to be made outside of the DITLO.
3. *The car park* – A 'car park' space was provided where off-goal topics, important to the stakeholders but not necessarily to the goal of the DITLO, were captured. This ensured that stakeholders felt their needs were noted and not dismissed, whilst allowing the workshop to progress and not sidetracked.

Output

A technical note was produced which summarised the key findings of the DITLO including actions, issues, risk, assumptions, observations and dependencies. The elements captured were not limited to HF considerations and provided insight and input across disciplines, promoting further engagement and integration between parties. Where HF specific aspects were captured, the associated documentation was updated accordingly, such as the Human Factors Issues Log (HFIL) and Human Factors Requirements Register (HFRR), in addition to informing aspects of the Task and Error Analysis. Other teams were also able to advance their documentation, such as requirements, process flow diagrams, early hazard identification, etc. The in-depth operational experience and task information gained through the DITLOs also permitted the identification of safety critical tasks. The technical note was circulated to the DITLO stakeholders for comment and input and, once issued, the document promoted a 'paper-trail' of evidence demonstrating how the design had matured and communicating the 'golden thread' of change over time.

Outcome

Benefits

In addition to the benefits outlined previously in terms of eliciting user requirements, validating assumptions and improving the understanding of how designs will be operated, other benefits were also noted.

The organic workshop approach provided benefits in understanding of the differences between what a user is assumed to do according to procedure, versus what they actually do and why there may be a difference. It also engaged end users in thinking about the reality of their day, rather than passively agreeing or not engaging in depth with the task steps presented. This delivered a detailed,

real world understanding of the task, equipment and physical and personnel interactions. When mapped to the design, it highlighted gaps or inefficiencies or confirmed where the design philosophy worked.

Utilising non-technical skills such as clear communication and providing a collaborative workspace for conducting the workshop was fundamental to ensuring success and optimal output from the sessions. Providing a space where attendees feel psychologically safe, and valued to both offer their opinion and challenge others, is where a HF understanding of human behaviour can add benefit.

In an increasingly online or hybrid working environment, project teams rarely meet and share information in person. The DITLOs therefore provided an opportunity for multi-discipline integration and discussion in both a formal and informal context (e.g. during coffee breaks, breakouts, etc.), providing opportunities to overcome barriers to communication. This allowed attendees to collaborate and share a common understanding and purpose, and to build future collaborative relationships.

The process also allowed other disciplines (e.g. architects, piping, security) to understand the importance of early user input and learning from experience (LFE), which ensures design outputs understand and support key safety activities. In addition, it highlighted the benefit of HF involvement in refining requirements, amending system level requirements and identifying design changes early on, minimising the likelihood of costly re-design at later stages. Multi-discipline attendance at the DITLOs has helped bring the requirements to life, by providing an understanding the operational context from the end-users. For instance, understanding the underlying purpose of the requirement can not only ensure requirements are specific, it can also indicate what success or satisfaction of the requirement may look like.

Challenges

The DITLOs have not been without their challenges. Whilst the benefits of DITLOs have now been recognised within the wider project team, resulting in the stakeholder invite list to each DITLO growing, it has required a significant amount of effort to bring some stakeholders on the journey. Furthermore, the collaboration with other disciplines is necessary, but the increase in stakeholders at the DITLOs means that not all can attend in person and online stakeholders are not always actively participating in discussion. Further work is required to encourage online members to contribute more, rather than passively monitoring the workshop.

Ensuring the correct stakeholders are at the DITLOs can be a challenge, especially with competing demands on their time from others. Therefore, ensuring those essential to the running of the DITLOs are identified and early invites are distributed can help, together with a clear brief on the scope and purpose of the DITLO.

An additional challenge following the DITLOs has been distributing the information into the wider project team. The most effective approach is still being established, and may develop further as the DITLOs progress into RIBA 4 and become part of the routine project activities. However, given the success of the DITLOs, and the benefits they have added to the project to date – in helping to identify where design changes are required – it is likely that it will become easier to disseminate DITLO outputs.

Learning From Experience

Feedback forms are issued at the end of each DITLO to explore how useful the DITLO was to each stakeholder; the extent to which they were able to engage with the session; and what, if any, changes would they like implemented in future running of DITLOs. This allows continuous

improvement on the administration, preparatory activities, facilitation, and running of blended events, to improve future DITLOs.

Next Steps

With each DITLO conducted, our HF team are learning about what works and what should be amended going forward. With the continuing success of the DITLOs supporting both HF activities and the wider disciplines within the project, it is likely that the DITLOs will continue to be run throughout RIBA 4, and across other projects due the valuable operational context provided. The DITLO method, although initially novel and looked upon with a certain amount of scepticism and fear, is now seen as an integral method adding value to project processes. It permits logical movement through both user tasks and activities, mapping them onto the desk and testing whether the design compliments both the user tasks and fulfils the stated purpose of the building.

Reference

Bye, R, (2017). DITLO: Finding the Value in the Everyday. Sixth International Human Factors Rail Conference, 6-9th November 2017, London.