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The Critical Role of UX in the Digital Transformation of the Energy Industry

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Summary

The energy industry is in the process of undergoing a profound digital transformation. This transformation is using advanced technologies to enhance efficiency, safety, and sustainability. User Experience (UX) design plays a pivotal role in this evolution, ensuring that sophisticated tools and data are not only accessible but also useable for professionals in diverse operational contexts. This paper explores the strategic importance of UX in enabling the digital transformation of the energy industry. We discuss examples where UX-driven solutions have empowered decision-making, leading to measurable improvements in performance and quality. By considering the role of the UX in the digital strategy, we will show how we aim to bridge the gap between the technology and the people who rely on it.

The Critical Role of UX in the Digital Transformation of the Energy Industry

Introduction

The energy industry is in the process of undergoing a profound digital transformation. This transformation is using advanced technologies to enhance efficiency, safety, and sustainability. User Experience (UX) design plays a pivotal role in this evolution, ensuring that sophisticated tools and data are not only accessible but also useable for professionals in diverse operational contexts.

UX goes beyond the user interfaces; it encompasses the entire user journey and the design of intuitive, accessible, and user-centred systems that simplify complex operations, enhance decision-making, and promote cross-departmental collaboration. In general, well-designed UX reduces learning curves, accelerates technology adoption, and minimizes operational risks. Conversely, poor UX can lead to inefficiencies, HSEQ hazards, and missed opportunities.

This paper explores the strategic importance of UX in enabling the digital transformation of the energy industry. We discuss examples where UX-driven solutions have empowered decision-making, leading to measurable improvements in performance and quality. By considering the role of the UX in the digital strategy, we will show how we aim to bridge the gap between the technology and the people who rely on it.

In seismic processing, modern systems must handle massive datasets to generate detailed images of subsurface structures. These workflows involve intricate steps such as signal enhancement, noise reduction, and migration. A well-designed UX ensures geophysicists can efficiently configure processing parameters, visualize intermediate results, and rapidly iterate to refine models. By integrating task-oriented tools the UX has been designed to improve productivity and allow the user to concentrate on delivering an optimised product.

Similarly, well data analytics platforms benefit from UX designs that integrate real-time drilling data, predictive maintenance algorithms, and workflow automation into cohesive dashboards. By focusing on user needs—such as contextual alerts and easy access to historical data—engineers can make faster, more informed decisions, optimizing production while mitigating risks.

In the energy transition, UX is equally critical in applications such as numerical weather prediction for wind farms. Accurate weather forecasts are vital for operational planning and maintenance, but without user-centred design, interpreting these predictions can be challenging. Effective UX ensures that meteorologists and wind farm operators receive clear, actionable insights tailored to their specific needs, enabling better resource management and minimizing downtime.

By addressing the complexities of the energy industry's workflows, UX facilitates the adoption and utility of cutting-edge technologies. By moving beyond simple aesthetics, UX aims to improve the interaction between users and systems to ensure usability, satisfaction, and business value. We believe that prioritizing UX is a key element in unlocking the full potential of digital transformation and driving sustainable progress in the energy industry.

UX Case Studies – Seismic Processing and Imaging

The challenge of designing the UX for a seismic processing and imaging system is to create a system in which an extremely large amount of interlinked job and dataset assets can be managed and understood, whilst simultaneously providing extremely rich metadata to the geophysicist consumer, enabling rapid and informed use and analysis. Figure 1 gives an example of the UX design that was

developed – showing the efforts to balance access to the various stages of data management, imaging job build and parameterization and HPC job submission.

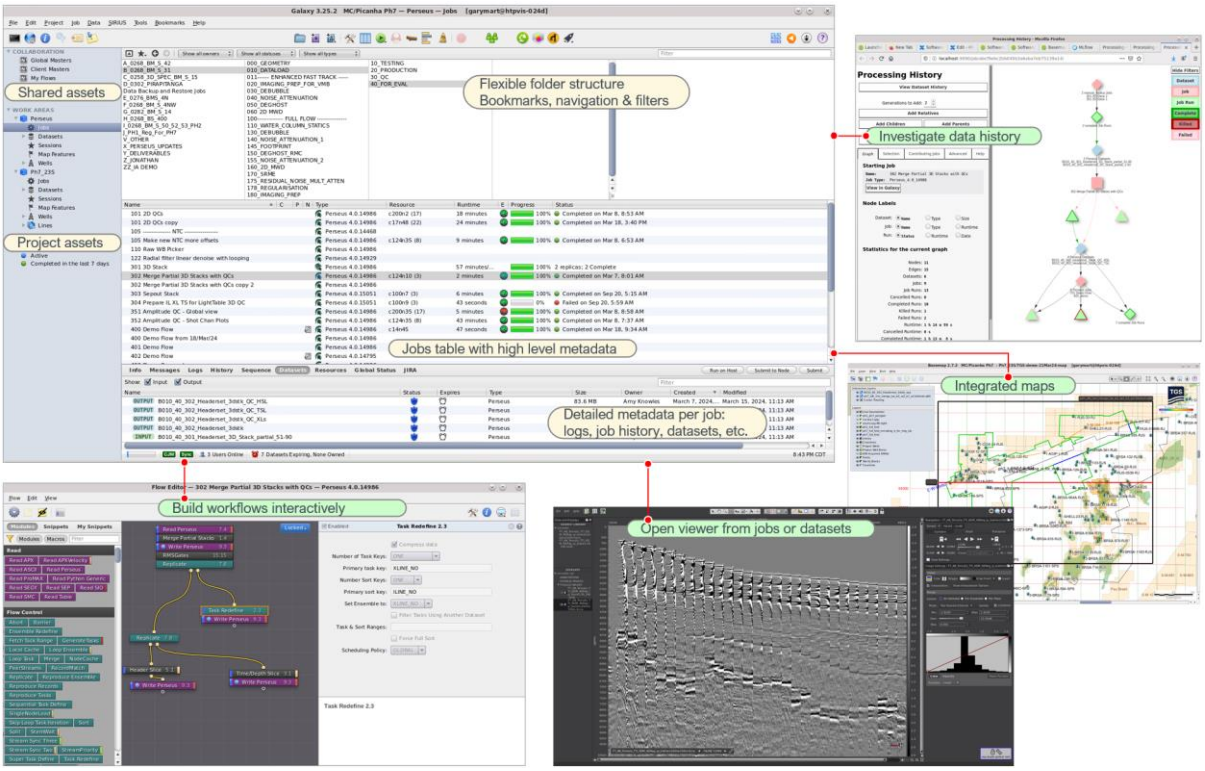

Figure 1 *Example UX for the seismic processing and imaging system. Within a single screen the user can (i) manage the (often numerous) seismic datasets that must be combined during the imaging sequence (ii) build and parameterize the sequence itself (often a complex flow of many individual modules) and (iii) submit and manage the imaging jobs itself on either the on-premises or cloud HPC system in use. (TGS, 2024a)*

UX Case Studies – Seismic Data Library management

As the provider of the largest seismic data library in the world (Grimstad *et al*., 2024) , it is vital that the library users can easily understand (a) the data they own (b) the status of new data being added to the library and (c) the availability of data within the library. The complexity of this is given by the large number of datasets that are associated with a given survey and the ever-changing nature of library access – especially given the cloud transition that the industry is presently undergoing. In Figure 2. we show an example of the UX designed for an internal or external user to query the library and understand what is available at the required granularity.

The user can quickly drill down into each of the datasets shown in the map and easily access visual representations of the data location (e,g, cloud or on-premises storage) and the availability of the different data products (often in tens, if not hundreds) that are available for each dataset.

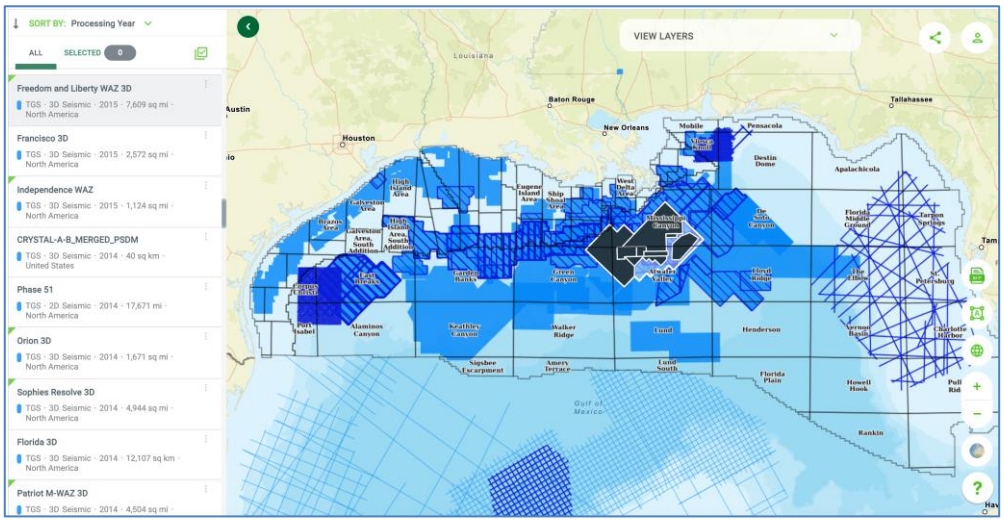

Figure 2. *Example UI map built to quickly allow the user (both external and internal) to query the data that has been licensed in a given area*

UX Case Studies – Wind Assessments

A good case study for building a strategically important system with a strong UX design philosophy is a wind assessment system that has been developed over the last few years. The aims of the system can be simply represented as:

- Provide a visual representation of a number of different and interdependent risks into something easily understandable by the user.
- Turn dozens of charts, thousands of attributes, and millions of data points into actionable decisions by giving users to access the data at the level they need it.
- For the developers who need to drill down into the data itself, provide accessibility to the underlying datasets on demand.
- Easily generate a single "executive summary" document that summarizes the key information for a given area.

In Figure 3 an example of the visual representation of an area under consideration for wind development is shown – illustrating the number and complexity of the different datasets that need to be taken into consideration during the assessment. The lower icons in Figure 1. show how these different data inputs can be summarized at an overall areal level to give an indication of the suitability of a particular given area.

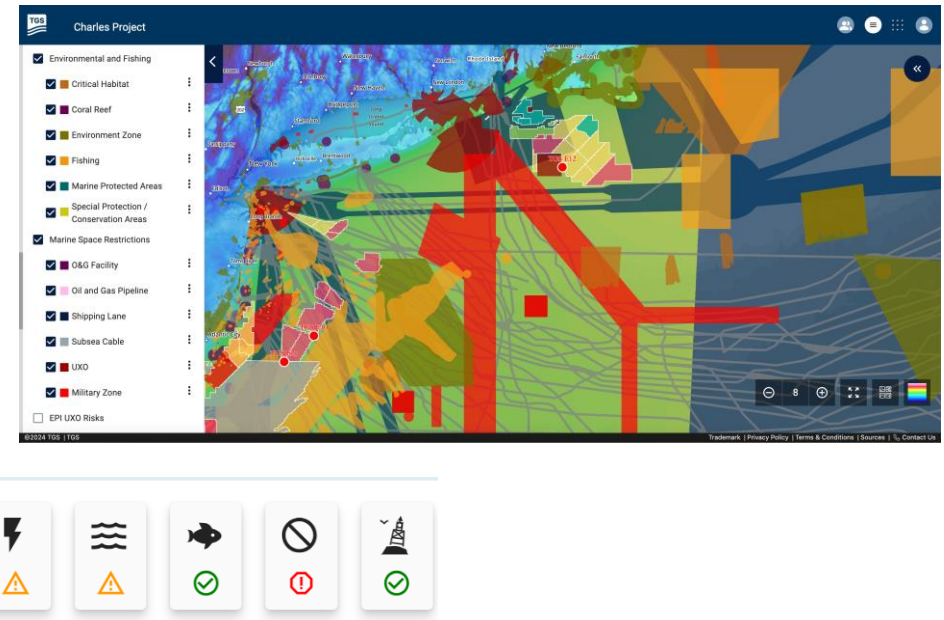

Figure 3 *Example wind assessment map (top) and summary icons (below). The UI for the map allows the layering of different attributes (shown are environmental and fishing restrictions and marine space restrictions). The summary icons represent, for the selected area (L->R): Wind Assessment, Transmission Line Availability, Seabed Assessment, Environment Analysis, Marine Space Restrictions Analysis, Nearby Buoy for observational Wind Measurements . (TGS , 2024b).*

Conclusions

In this paper we have shown examples of how a well-designed UX is core to enabling digital transformation within the energy industry. Both the internal and external user community require easy access to, and manipulation of, diverse, large-scale and complex datasets – the UX is designed to facilitate efficient workflows and the optimum use of underlying systems.

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