Designing a New Video Streaming Module for Product Life Cycle Management

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Due to technological advancements, factory work environments that once relied on analogue processes and paperwork have progressively transitioned to digital workflows. This shift from analogue to digital operations can be facilitated by a Product Lifecycle Management (PLM) system, which manages all of a company's data throughout its entire lifecycle. The data managed includes elements such as personnel, manufacturing, processes, and engineering, as the PLM system encompasses all relevant information. The client develops the Aras PLM system, where video instructions for factory workers are part of the data for specific companies. However, the video streaming module has not yet been developed, so Aras PLM's customers rely on alternatives like PowerPoint presentations. These outdated methods lead to various inefficiencies, such as video stuttering and long loading times. As a result, the need for a new video streaming module focused on user interface (UI) design and user experience (UX) has become clear. This new module is intended for three user groups: administrators, engineers, and factory operators. Administrators control the information displayed to operators, while engineers design the video module to integrate with the data server. Factory operators are the end-users who view the module.

Based on these circumstances, a research question was formulated: How can the usability of the new video module be improved? The research and analysis phase explored several aspects, including database processes within the Aras PLM system, user interface design principles (using Nielsen's 10 usability heuristics) [1], authentication and authorization protocols, video file analysis, user analysis, and search filter analysis. The search filter analysis aimed to enhance the efficiency of video searches.

To refine the research question, a design guideline was created by applying Nielsen's 10 usability heuristics to both the concept and the final prototype design. This guideline was consistently referenced throughout the design process. A list of requirements covering general, functional, ergonomic, technical, and search filter criteria was developed based on the research and analysis. These requirements also outline the validation methods for the design, which will be used in future evaluations once the video module is fully developed.

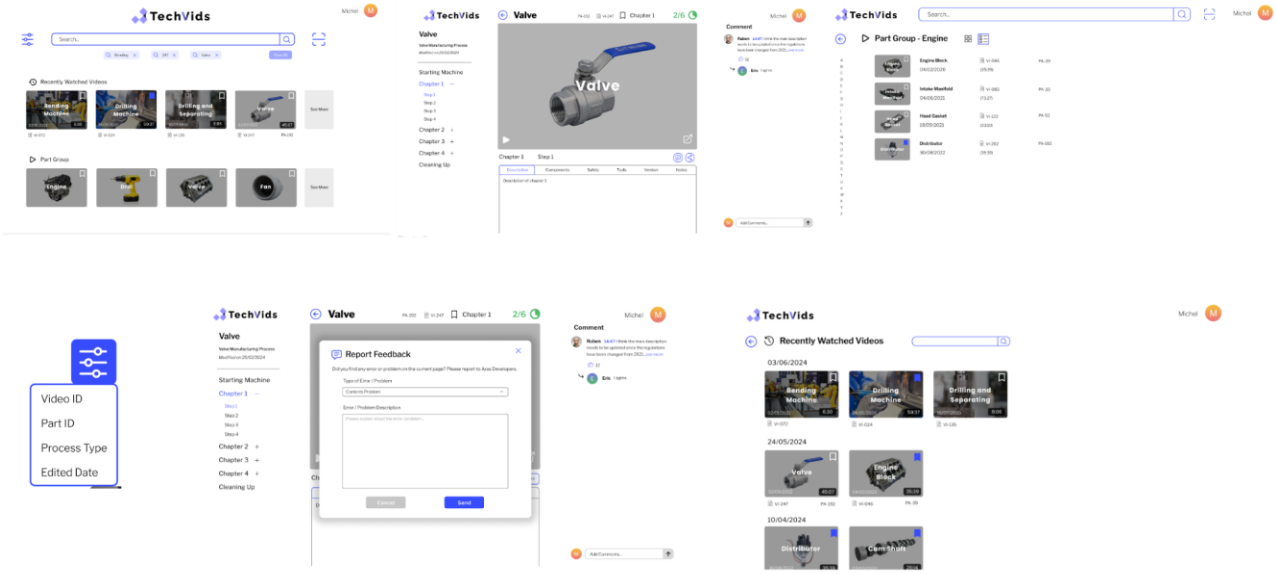
Using these requirements and design guidelines, two design concepts were created in Figma, each with distinct design priorities. The functionality, intuitiveness, and aesthetics of each concept were assessed through surveys and usability testing [2]. The results of this quantitative research determined the final design.

Following the survey results, the final prototypes were developed in three formats: Figma, coding, and database prototypes. The Figma prototype was used for usability testing and to showcase the complete design of the video module (see Figure 1). The coding prototype, developed in Vue.js, represents the final deliverable for the client, ensuring optimal compatibility with the PLM program's server. While the layout and design composition of the coding prototype match the Figma prototype, the coding prototype builds a real web application, which is the format ultimately delivered to end-users. Lastly, the database prototype was created for Aras engineers, mirroring the Figma design but focusing on data organization for seamless integration with the web application. The specifications of the Aras Innovator program were applied to the data structure.

After prototype development, interviews were conducted as part of the qualitative research to further test usability. The evaluation criteria remained consistent with the quantitative research: effectiveness, functionality, intuitiveness, and aesthetics [2]. The Figma prototype was used to comprehensively assess the design, and participants expressed satisfaction across all criteria.

To evaluate the design process and outcomes, the research question, design guidelines, and requirements were referenced. Since the design concepts were developed with a focus on usability, and testing results indicated high user satisfaction, the research question was effectively addressed through the final designs. Additionally, all 10 design guidelines were successfully incorporated into the final design [1], validating the guidelines' applicability. Any untested or unsatisfactory elements from the requirements were noted for future improvements. Based on this evaluation and feedback from the qualitative research, further development plans and recommendations are proposed.

Figure 1. Final Design of Video Streaming Module



References

[1] Nielsen, J., and Molich, R. (1990). Heuristic evaluation of user interfaces, Proc. ACM CHI'90 Conf. (Seattle, WA, 1-5 April), 249-256.

[2] ISO, I. (2018). Ergonomics of human-system interaction—Part 11: Usability: Definitions and concepts (ISO 9241-11: 2018)