**WattWizards – Technical Report**

**1. Introduction**

Electrical engineers and technicians often struggle with precision and efficiency in electrical calculations, particularly in industrial and workshop settings. **WattWizards** is a software web application designed to streamline electrical circuit analysis and computations, reducing errors and saving time. The application has been developed iteratively using Agile methodology, allowing continuous refinement based on user feedback.

**2. Project Objectives**

* Improve accuracy in electrical calculations and circuit analysis.
* Provide an intuitive and user-friendly interface for technicians and engineers.
* Incorporate tools to enhance user experience (UX) and accessibility, such as a support-based chatbot.
* Maintain flexibility for future updates and modifications.

**3. Methodology: Agile SDLC**

Agile methodology emphasizes iterative development, collaboration, and adaptability. The project was divided into several **sprints**, with deliverables refined at each stage based on feedback and data analysis. Key stages included:

**3.1. Planning and Requirement Analysis**

* **Survey Data Collection**: Conducted surveys to understand user needs, focusing on common errors, time constraints, and feature preferences.
* **Key Features Identified**:
  + Support for electrical calculations.
  + Real-time error detection and correction.
  + Integration of user support tools (e.g., chatbot).

**3.2. Design and Prototyping**

* Initial prototypes included:
  + An **Excel-based tool** to test feasibility for calculations.
  + A simple Python GUI using **CustomTkinter** for desktop applications.
  + Wireframes for web application design using **HTML5 and CSS3** for structure and layout.
* Focused on modular design to allow seamless integration of future features.

**3.3. Development**

The development process consisted of three major stages:

1. **First Stage**:
   * An **Excel sheet** was developed to perform basic calculations.
   * Identified Excel's limitations for handling complex computations, prompting the transition to a desktop application.
   * Developed a **Python-based desktop application** using the CustomTkinter module for its lightweight GUI capabilities.
2. **Second Stage**:
   * Transitioned to a **web application** using HTML5, CSS3, and JavaScript for a more scalable and accessible solution.
   * Integrated an **AI chatbot** using **OpenAI** API for user support.
3. **Final Stage (Full Scale Web Application)**:
   * Enhanced the web application with modern frameworks:
     + Frontend: **React.js/Bootstrap** for dynamic and responsive UI.
     + Backend: **Node.js, Express.js & Laravel (PHP-based Framework)** for robust server-side functionality.
     + Database: **MySQL** for efficient data storage and retrieval.
   * Redesigned the AI chatbot as a **command-based tool** using JavaScript, streamlining UX and accessibility for users with minimal training.

**3.4. Testing**

* Conducted unit testing and integration testing after each sprint to ensure functionality and reliability.
* Performed usability testing with engineers and technicians to validate UX enhancements.

**3.5. Deployment**

* The application will be deployed as a cloud-hosted web app accessible on desktops and mobile devices.
* Regular updates rolled out based on user feedback collected via surveys and support queries.

**3.6. Maintenance and Continuous Feedback**

* Established a continuous feedback loop, enabling agile responses to feature requests and issue reports.

**4. Key Features**

* **Automated Calculation Tools:** Reduces manual errors and improves efficiency.
* **Support Chatbot**:
  + Initially developed with OpenAI's API for advanced user assistance.
  + Redesigned as a command-based helper module using JavaScript to simplify interactions.
* **Responsive Design**: Fully responsive UI, ensuring seamless operation across desktops, tablets, and mobile devices.
* **Database Integration**: MySQL database for efficient data management and future scalability.
* **Cross-Platform Functionality**: Designed for desktop and web environments with planned expansions to mobile platforms.

**5. Results**

* **Positive Feedback**: Surveys revealed significant improvement in calculation accuracy and time efficiency.
* **Adoption**: Engineers and technicians reported increased workflow productivity.
* **Technical Validation**: Successfully transitioned from basic prototypes to a scalable web application, meeting all functional requirements.

**6. Conclusion and Future Work**

This project successfully delivered a robust, user-friendly application to address calculation challenges faced by electrical engineers and technicians. The iterative development using Agile methodology ensured responsiveness to user needs and technological advancements.

Future improvements will focus on:

* Enhancing AI chatbot capabilities with natural language processing (NLP).
* Extending mobile application functionality.
* Introducing multilingual support to broaden accessibility.

**7. References**

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