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**Guide3. APT Project Final Report Capstone subject**

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| **1. APT Project Final Report** |
| The purpose of this report is for you to describe the most relevant aspects of your FFW Project. It is important that you provide a rationale for the decisions you had to make throughout the process.    Below, you will find different fields to be completed with the requested information, which give a summary of your FFW project and its main results. |

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| Project name | *Automated forms digitization system - HortiScan* |
| Area(s) of performance | *Performance areas related to Project Management, Data Science and Software Engineering will be addressed. Specifically, the development of an automated digitization system and a mobile application involve competencies in software design and development, computer systems implementation and data management.* |
| Skills | *- Software Development: Capabilities to design, implement and maintain software systems that solve specific problems.*  *- Project Management: Ability to plan, manage and execute projects efficiently.*  *- Information Technology Application: Use of advanced technologies such as Machine Learning and Deep Learning to solve complex problems.*  *- Innovation and Continuous Improvement: Ability to innovate in technological processes and improve operational efficiency through automated solutions.* |

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| **Contents of the final report** | |
| 1. Relevance of the APT project | *The project seeks to address the issue of manual digitization of forms in the horticultural sector, which presents significant challenges due to poor handwriting and data complexity. The relevance of this project lies in its ability to improve efficiency and accuracy in data capture and processing, which is crucial for informed decision making and effective resource management in the agricultural sector.*    *- Context: This problem is located in the Santiago Metropolitan Region, impacting horticultural producers and research teams at the Natural Resources Information Center (CIREN).*    *- Impact: The proposed solution would directly benefit horticultural producers by providing more accurate and timely data, and the research team by speeding up their work and improving the quality of the information collected.*    *- Professional Relevance: This project is relevant to the field of Computer Engineering, as it involves the development and application of advanced technologies to solve practical problems and improve operational processes.* |
| 2. Objectives | * *General objective: To develop an automated digitization system that improves efficiency and accuracy in the capture and processing of forms in the horticultural sector, using advanced technologies such as Machine Learning and Deep Learning, ensuring secure storage of information and its accessibility for decision making.* * *Specific objectives:*    + *Implement an OCR system enhanced with Maching Learning algorithms to digitize manual forms.*   + *Develop a mobile application to capture images of the forms in the field.*   + *Automate data validation to ensure consistency and accuracy of the information collected.*   + *Securely store the digitized information, accessible to CIREN's research team.* |
| 3. Methodology | *For the development of the APT Project, a traditional project management approach was used, complemented with the Kanban system. This approach allowed a clear and structured organization, ideal for the context of the project, where constant interaction with CIREN officials was not possible. The project phases were as follows:*  *1. Requirements analysis: Clearly defining the forms and data to be digitized, identifying the key aspects to be improved.*  *2. System design: Designing the architecture of the automated digitization system and the mobile application.*  *3. Development of the OCR system, mobile application and web platform: Implement the digitization system with OCR, the mobile application, ensuring offline data capture, and web platform where it allows users to view and edit the forms processed by OCR.*  *4. Testing and validation: Perform exhaustive testing of the system and data validation algorithms, identifying any errors for correction.*  *5. System deployment and storage: Integrate the system into CIREN's central database, ensuring the accessibility and security of the information.*  *The relevance of the methodology employed lies in the fact that it effectively addressed the specific constraints of the project, particularly the lack of continuous contact with CIREN officials. The choice of a traditional approach provided a clear and defined structure, adequate to plan and execute each phase in an orderly manner, ensuring that all activities were aligned with the established objectives. At the same time, the integration of the Kanban system provided flexibility to manage the workflow visually, allowing to identify and resolve bottlenecks without relying on constant interactions.* |
| 4. Development | *The development of the APT Project followed a structured flow aligned with the needs of the end user, despite the challenges presented by the limited interaction with them during the process. The stages developed are detailed below:*   1. *Project Analysis.*  * *In the initial meetings with the end user, the scope and requirements of the project were defined, based on the specific needs presented.* * *A requirements management plan, a project definition plan and its justification were developed. This allowed structuring the work, even considering that the user only requested to see the final product without being involved during the development.*  1. *System Design*  * *Mockups were made to define the interface and user experience of both the mobile application and the web platform.* * *A modular architecture was established that integrated advanced technologies:* * *Angular and Ionic for the development of the mobile and web user* *interface.* * *Spring Boot as backend for business logic management.* * *Integration with OnlyOffice for document visualization.* * *OCR implementation with Python using ProcessBuilder to run the necessary OCR algorithms.*  1. *System Development:*  * *It was developed iteratively, addressing both mobile and web functionalities.* * *OCR was designed to handle complex forms, optimizing data capture and digitization under real-world conditions.*  1. *Testing and Validation*  * *Extensive testing was carried out based on the defined functionalities and their constraints. These tests validated the accuracy and efficiency of the system.* * *The results were positive, with a high percentage of passed tests versus rejected tests.*  1. *Deployment*  * *In the first instance, the system was deployed in local environments, both on mobile devices and web platforms.* * *This allowed for an evaluation in controlled environments before proceeding with deployment in a production environment.*   *Challenges and Enablers*   * *Difficulties: The lack of continuous interaction with the end user was a significant challenge. This was mitigated by meticulous planning and a structured approach, which allowed progress to be made without requiring constant feedback.* * *Enablers: The use of modern technologies and effective team collaboration were key to meeting project deadlines and objectives.* |
| 5. Evidence | *The evidence of the APT Project supports each stage developed and demonstrates the fulfillment of the objectives set. These include:*   1. *Initial documentation and planning:*  * *Requirements Management Plan: Document detailing the requirements gathered in initial meetings with the end user.* * *Project definition plan: Justification of the scope, timelines and objectives of the project.* * *Initial Mockups: Images of the interfaces designed for the mobile application and web platform in uizard, which guided the development of the system.*  1. *Technical development:*  * *System screenshots: Images of the final user interface, both mobile and web, showing the implemented functionalities.* * *OCR Evidence: Comparison of the original forms with the digitized results, demonstrating the accuracy of the system.* * *Integrations: Functional example of OnlyOffice, showing the ability to view and edit scanned documents.*  1. *Testing and validation:*  * *Testing report: report detailing the percentage of successful and rejected tests, along with the test scenarios used.* * *Error log and solutions: Documentation of problems encountered during testing, along with corrective actions implemented.*  1. *Deployment:*  * *Evidence of local deployment: Screenshots of the application running on both local computers and mobile devices, ensuring cross-platform functionality.* * *System demonstration: Videos or images of the system in action, showing from the capture of forms to the generation of digitized documents and their visualization on the web platform.* |
| 6. Professional interests and projections | *The APT Project had a significant impact on professional development by allowing the exploration of areas such as:*   1. *Software Engineering: The design and implementation of the system required advanced skills in application development and data management.* 2. *Data Science: The use of Machine Learning AND Deep Learning to improve OCR accuracy expanded knowledge in this area.* 3. *Project Management: Experience with methodologies such as Kanban reinforced planning and execution skills.*   *Future projections include the interest in deepening the development of solutions based on artificial intelligence and exploring its application in other sectors such as logistics and health. The project consolidated a professional vision focused on technological innovation and continuous process improvement.* |