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National Engineering Degree in Computer Science

Option : Software Engineering

Elaborated By

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Web and mobile application for school life management

Defended on 14/08/2023, in front of the jury :

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Examiner: **xxx**

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Hosting Company

Academic Year 2024 - 2025

Dedication

First and foremost, I would like to extend my deepest gratitude to God, the Almighty, for His boundless blessings and gifts that have made the completion of this project possible.

To my dear mother Latifa,

the most extraordinary and cherished woman in my life. Thank you for your strong belief in me, your endless love, and your constant support. I am profoundly blessed to have you as my mother.

To my dear father Mohamed,

You consistently guided and encouraged me along the right path. Your patience, unwavering support, and continual inspiration have been my guiding lights. Thank you for always being there for me.

To the angels in my life, my sister Ons and my brother Idriss,

you are my sources of joy and delight. Thank you for standing by me at every step, for looking up to me, and for encouraging me through every challenge. Your presence in my life is a constant source of motivation.

To my my beloved husband Tarek BELABED,

I express my heartfelt gratitude for your steadfast presence in my life. Your support and love provide me with peace and the strength to strive to be the best version of myself. Thank you for being a wonderful, loving, and supportive partner.

To To my cherished childhood friends, Amani, Rawand, Kawther, and Itaf

you make every moment special and memorable. Thank you for being the best companions I could ever wish for and for always being there for me.

To my entire family and friends

I am incredibly fortunate to have you in my life. Each of you holds a special place in my heart. Thank you for your encouragement and companionship. Your presence has adorned my life with countless precious moments of happiness.

Acknowledgement

As I conclude this internship, I would like to extend my heartfelt gratitude to those whose invaluable support and guidance made this project possible.

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Lastly, I extend my heartfelt gratitude to the ***members of the jury*** *for taking the time to examine and evaluate my work. Their feedback is deeply appreciated. I also wish to thank every professor at* ***ISSAT Sousse*** *for their profound impact on my academic journey.*

Abstract

This work was conducted at Naxxum Group, Lac2, Tunisia, as part of the requirements for obtaining the National Diploma of Engineer in Software Engineering at the Higher Institute of Applied Sciences and Technology of Sousse. The primary focus of this project was the development of an innovative e-learning platform leveraging the latest technological advancements to create both mobile and web applications designed to provide an exceptional user experience.

The project aims to enhance the educational ecosystem by integrating features that allow parents and teachers to monitor and manage various aspects of students' school life effectively. These applications empower parents and students by providing real-time updates on academic progress, attendance, and other critical activities, ensuring they remain actively involved in the educational journey.

Résumé

Ce travail a été réalisé au sein de Naxxum Group, en Tunisie, dans le but d'obtenir le Diplôme National d'Ingénieur en Génie Logiciel à l'Institut Supérieur des Sciences Appliquées et de Technologie de Sousse.

Le projet vise à améliorer l'écosystème éducatif en intégrant des fonctionnalités permettant aux parents et aux enseignants de surveiller et de gérer efficacement divers aspects de la vie scolaire des élèves. Ces applications donnent aux éléves et aux parents ainsi la possibilité de recevoir des mises à jour en temps réel sur les progrès académiques, la présence et d'autres activités essentielles, garantissant ainsi leur implication active dans le parcours éducatif .

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List of Acronyms

- **2TUP** = **T**wo **T**racks **U**nified **P**rocess
- **API** = **A**pplication **P**rogramming **I**nterface
- **CM** = **C**onfocal **M**icroscopy
- **CT** = **C**omputed **T**omography
- **DVR** = **D**irect **V**olume **R**endering
- **ESS** = **E**mpty **S**pace **S**kipping
- **FM** = **F**luorescence **M**icroscopy
- **Fps** = **f**rame **p**er **s**econd
- **GPU** = **G**raphics **P**rocessing **U**nit
- **IDE** = **I**ntegrated **D**evelopment **E**nvironment
- **MRI** = **M**agnetic **R**esonance **I**maging
- **SCM** = **S**ource **C**ode **M**anagement
- **TCP** = **T**ransmission **C**ontrol **P**rotocol
- **TDD** = **T**est **D**riven **D**evelopment
- **TF** = **T**ransfer **F**unction
- **UI** = **U**ser **I**nterface
- **UML** = **U**nified **M**odeling **L**anguage
- **UX** = **U**ser **E**xperience
- **VCS** = **V**ersion **C**ontrol **S**oftware
- **VDI** = **V**olumetric **D**epth **I**mage

General Introduction

Education is the foundation of societal advancement and individual growth, essential for preparing future generations with the knowledge, skills, and values needed in a complex, interconnected world. As the demands of the modern era shift, educational systems must adapt accordingly. Integrating advanced technology into education has become essential, not merely an option. By revolutionizing education with technological advancements, we can enhance the learning experience, streamline administrative processes, and offer more personalized and effective teaching methods. This transformation is vital to ensure that education stays relevant and meets the diverse needs of all learners in the 21st century.

Lumina, a private preparatory school, has faced numerous challenges and difficulties in its manual and on-site operations. To enhance, revolutionize, and simplify its school management system, Lumina has chosen to develop both a mobile and web application. Our final year project, named Lumina serves for the institution and aims to transform educational operations through the use of cutting-edge technologies. Lumina is a comprehensive web and mobile application designed to streamline various aspects of school life management, catering to the needs of administrators, teachers, students, and parents alike. By integrating Artificial Intelligence and intuitive user interfaces, Lumina offers a seamless platform for communication, organization, and easy access to essential information. This fosters a more conducive learning environment and significantly improves overall school management efficiency.

This report encapsulates the different phases of our endeavor of a 6-month internship and it will be split into five chapters each will emphasize a different aspect of the project.

- The first chapter aims to introduce the hosting organism and to present the general context of the project to gain a perspective about the conveyed work.
- The second chapter is devoted to identifying needs assessment and delving into the working methodology used in the implementation of the project.
- The third chapter includes the initial release.
- The fourth chapter is focused on presenting the fourth release.
- The fifth chapter has the goal of exploring the fifth and final release.

As we cloture this report, a conclusion is devoted to presenting the results of the accomplished

work as well as discussing future enhancements along with the possible perspectives and directions of this project.

Chapter 1

Project General Context

Introduction

The purpose of this chapter is to place the project in its general context, namely the problem to be addressed and the proposed solution in detail. In the first section, a brief presentation about the hosting organisms and their respective areas of expertise will take place. Followed by an introduction of the general context, and the methodology employed for this project.

1.1 Overview of the hosting organism

In this section, we will make a general presentation of the company where our internship took place.

1.1.1 Naxxum Group

1.1.1.1 Presentation

Naxxum is a globally recognized custom software development company that was founded in 2014. It employs skilled IT specialists and applies the leading tools and methodologies to build cutting-edge solutions. As a prevalent European software development company, Naxxum Group has earned the trust of many clients all over Europe, Africa, Asia North America. Its positive record, client referrals, and dedicated professionals reflect its continuous success.

Figure 1.1: Logo Naxxum [1]

1.1.1.2 Naxxum organisational chart

Our internship is a part of the Diamond Cruise unity activity as shown in the figure below.

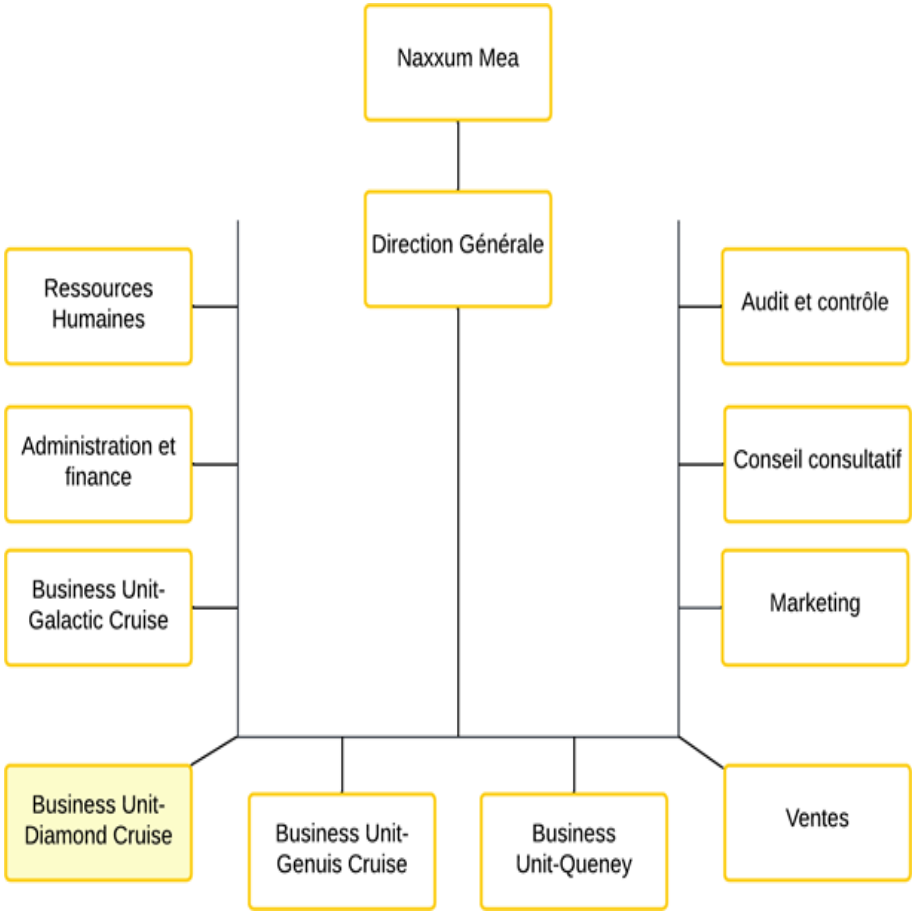

Figure 1.2: Naxxum Organigram

1.2 Project presentation

This internship project, entitled "Conception and Development of a School Management Web and Mobile Platform," is being carried out to obtain the National Diploma of Computer Science Engineer at the Higher Institute of Applied Sciences and Technology of Sousse. In this section, we will present the general context of the project, followed by the problem statement and the motivating factors behind this work. Finally, we will present the proposed solution designed to address the identified issues.

1.2.1 Project context

In today's digital era, school management applications have emerged as indispensable tools for educational institutions worldwide. These platforms serve as comprehensive hubs, facilitating efficient communication, streamlining administrative processes, and enhancing the overall educational experience for students, teachers, and parents. This project aims to develop a Web and a mobile platform dedicated to the management of school resources within an academic institution. This platform is designed to provide a diverse range of services specially tailored to various stakeholders,

including administrators, parents, students, and teachers.

1.2.2 Problem statement

Lumina is a private preparatory school with 200 students and 30 teachers. This educational institution has noticed a remarkable lack, and decline in school life management. This problem was triggered when a student had no online resources to access his courses or timetable. Considering the great impact of that period of life on teenagers, having a school application will engage them and encourage them in their educational path. Besides, it is paramount for parents to have a survey, get involved in their children's academic journey, and get a hold of the latest school updates. Currently, the question is how to improve efficiency and transparency in managing school life for all students, parents, teachers, and school admins. This challenge also involves identifying the most suitable technologies and architectures adapted to develop a robust and scalable solution. This is to ensure data security and a user-friendly interface while considering the diversity of devices and browsers used by end users.

1.2.3 Analysis of the existence

In this context, several existing websites and platforms address similar challenges.We selected the most famous websites in Tunisia dedicated to preparatory schools which are :

- **Education.tn:** is a digital platform operated by the Ministry of Education in Tunisia. It serves as a centralized hub for educational resources, information, and services tailored to students, teachers, and educational stakeholders nationwide.
- **Erridha :** is an independent educational website for an institution located in Tunisia. It offers a comprehensive educational program catering to students from various age groups, typically ranging from primary to secondary levels.
- **Pronote:** is an educational management software widely used in French schools. It facilitates the management of student data, including grades, attendance, schedules, and communication between teachers, students, and parents. The platform provides a centralized system for school administration and helps streamline various academic and administrative tasks.

In this section, We will delve into these websites, providing insights for comparison and informed decision-making in the form of a table for a clearer and more comprehensive view :

Table 1.1: Existing Solutions

Solution	Features	Disadvantages
فضاء الولي **Figure 1.3:** education.tn logo	**User-Friendly:** It offers easy navigation and a guided experience. **Online registry:** Public school students sign up online instead of the on-campus registration process.	**Limited access:** It lacks comprehensive automation and access to courses and timetables. **Web only**: It is not accessible from mobile devices.
Erridha **Figure 1.4:** Erridha	**Cross-platform :** Available as a web and mobile application. **Basic school life Features**: It enables the parents and students to review their scores, homework, and school information.	**Lack of AI integration :** Eriadh misses AI-driven features.
PRONOTE **Figure 1.5:** Pronote	**Cross-platform.** **AI integration:** It leverages AI in different features.	**Performance Issues**: The website can sometimes experience slow loading times, especially during peak usage periods..

After analyzing various websites and applications, we concluded that the limited compatibility of these platforms with different devices and browsers can impede user adoption, undermining their effectiveness and accessibility. Additionally, the user experience in these apps is unsatisfactory and sluggish due to the absence of a robust architecture in their development. This has resulted in teachers and administrators avoiding their use, often resorting to manual, on-campus operations instead.

1.2.4 Proposed solution overview

Our proposed solution aims to solve the previously mentioned issues. We will achieve these ends by using the right technologies, and a well-designed IT system. This solution must be easy to

implement and economically accessible for schools while providing a user experience that is both simple and useful.

Our solution described in Figure 1.3 will provide the following functionalities:

— **Data centralization:** is a powerful practice that allows you to store data in one localization so it gives direct access.

— **Availability on all devices:** To ensure all teenagers have absolute access to their school supplies, this application is developed for both computers and mobile phones.

— **Intelligent app:** With the integration of artificial intelligence many new features are available on the app.

— **Better Cost Control:** If the budget is limited or shortfall the project can be stopped.

1.3 Adopted methodology

IT projects are getting increasingly sophisticated due to the variations of needs and specifications that hold significant importance during project development. This is why computer scientists have reinvented project management methods. Adopting a development approach is essential for ensuring a satisfactory level of software quality. A well-defined methodology enables a better estimate, delivers stable systems, keeps the customer updated, creates a clear understanding of the upcoming task, and identifies obstacles earlier for adjustments.

1.3.1 Agile methodology

Definition

An agile method is an iterative and incremental approach conducted in a collaborative spirit with just the right amount of formality. It produces a high-quality product while accommodating evolving customer needs. Thanks to the agile method, those concerned (Administrators, Teachers, Parents , Students) of this application obtain better visibility of data management than with a classic method. Involving those in need in the process allows the team to obtain regular responses in order to directly apply the necessary changes. This method aims to accelerate the development of software. In addition, it ensures the production of functional software throughout the duration of its creation.[2] In fact, the agile methodology aims to have:

— **Better quality of communication**: The customer has the possibility to clarify or modify its fur and custom needs.

— **Better visibility** : The client has better visibility on the progress of their project.

— **Better product quality**: Tests are carried out continuously.

— **Better cost control**: The project can be stopped due to a lack of budget.

1.3.2 SCRUM framework

1.3.2.1 Definition

SCRUM is an agile framework that follows an iterative and incremental process. A SCRUM project always goes through a well-known sequence of events that manage the development of complex products. It highlights the relative effectiveness of management and product development practices, allowing for continuous improvement. SCRUM consists of several elements: the SCRUM Team and its associated roles, events, artifacts, and rules, which are detailed in the following figure:

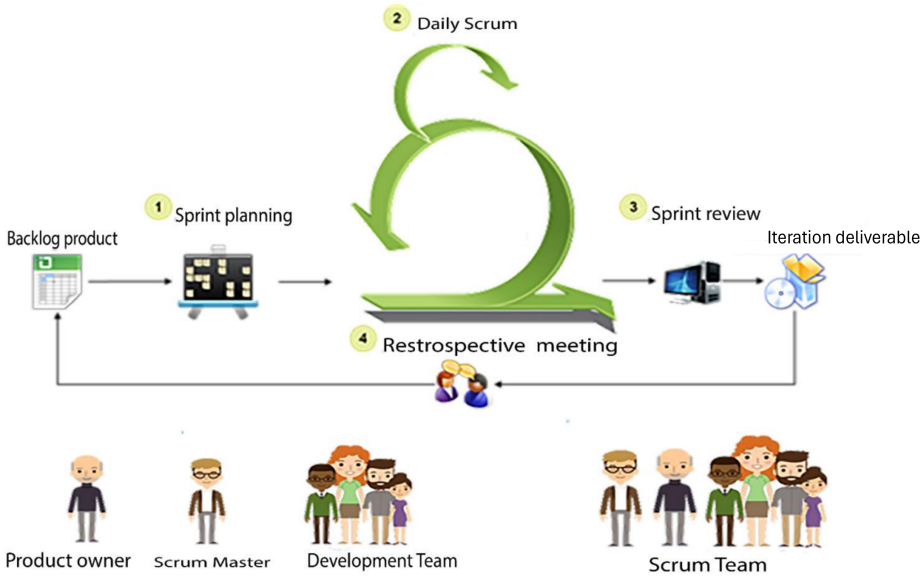

Figure 1.6: SCRUM overview

1.3.2.2 Scrum team

The main unit of SCRUM is the Scrum team. In a Scrum Team, there are no sub-groups or levels of hierarchy. It operates as a unified group of professionals dedicated to achieving a single aim: the Product Goal. Each member holds a significant role as shown in the following image:

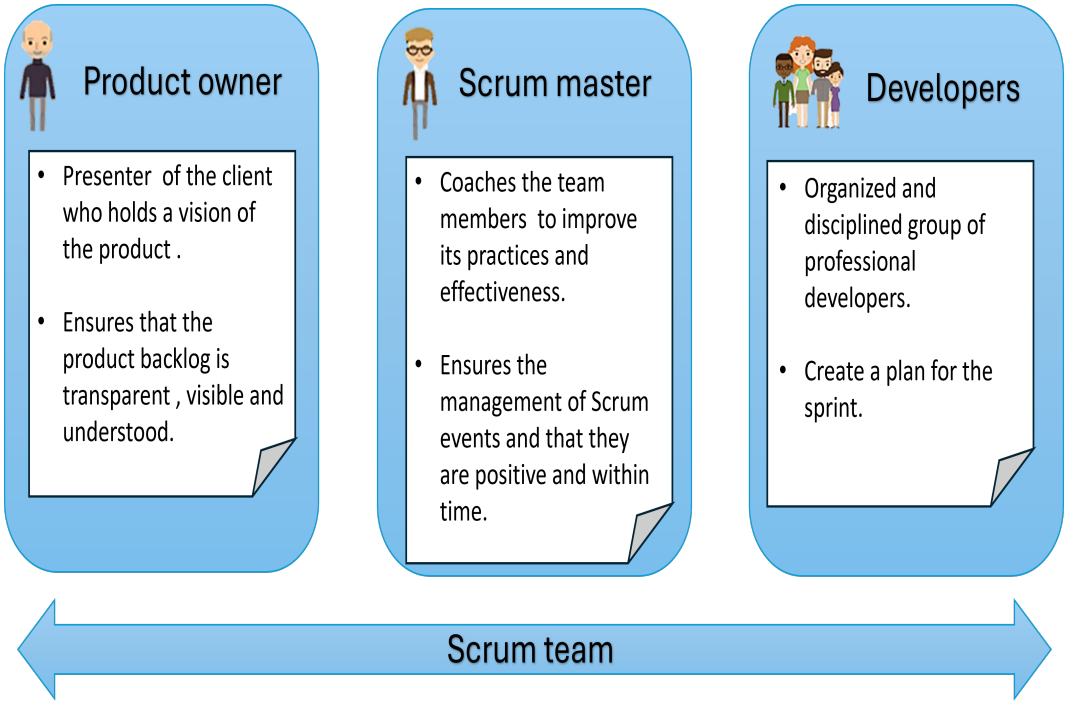

Figure 1.7: Scrum team overview

1.3.2.3 Scrum events

Sprint Planning

This initial Agile meeting occurs at the beginning of the iteration, where the team decides which user stories will be included in the development cycle.

Daily Meeting

This is the most hands-on meeting in the Agile cycle. It happens daily, lasts 15 minutes, and involves the entire development team. Each team member has 2 minutes to discuss: — What they accomplished the previous day. — Their planned tasks for the current day. — Any challenges or issues they are facing.

Sprint Review

This meeting concludes the development iteration. The Scrum team showcases its work to the stakeholders to demonstrate that all developed features meet the specifications. Each user story is carefully reviewed, and a demonstration is provided.

Sprint Retrospective

This meeting aims to evaluate the sprint, leverage best practices, and identify any errors or inefficiencies observed during the iteration. It is an important opportunity for the entire team to share their perspectives on the team's performance, both from a technical and organizational viewpoint.

Conclusion

In this chapter, we have situated our subject within its broader context, identified the problem, and followed with an analysis of our proposed solution, outlining what is needed to address the requirements concisely and effectively.

Webography

[1] Group. url : https://naxxum.com/company/about-us//, [consulted : 14-04-2024].