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# **EXECUTIVE SUMMARY**

NightCore Mech is a company that provides software solutions to enterprises and build systems that provide value to business processes and analytics. The company has been around since 2019 and is located in Centurion East, Gauteng. We provide our clients with efficient solutions that aid in the growth and profitability of their enterprises. NightCore Mech consists of project managers, frontend and backend developers, SQL developers and database administrators, as well as prototyping developers and unit testers. Each member of the company has a variety of skills that contributes to knowing how to implement and design systems to address business requirements. Our project team is experienced and confident in our capabilities to perform a feasibility study on the design and implementation of software to identify academic misconduct committed by students at the NWU. The current requirements from the client (NWU Registrar), with Mr Zander Janse van Rensburg as the project overseeing manager, requires our company to design and build a modular workflow system that would assist lecturers in academics to identify and report academic misconduct cases according to standing NWU SOPS. The NWU Registrar must address plagiarism by evaluating each case individually and appointing experts to prepare technical reports. External subject matter experts (SMEs) are requested to examine the technical reports with an additional report that provides a deeper insight on the alleged plagiarism if the technical reports do not self-evidently emphasize the severity of the plagiarism. Manually comparing the allegedly plagiarized text in issue with the original text as evidence text is a requirement for the technical report, which can become difficult and lead to certain similarities being overlooked. The developers of NightCore Mech must adhere to standard project management methodologies and frameworks/bodies to plan and implement the lifecycle of this project, with a hybrid methodology between the Waterfall and Agile models or the suggested MPMM / Method 123 that will be implemented. The project team conducted some recent research on project management methodologies/frameworks and concluded that about 70% of projects fail due to time and budget constraints, as well as scope requirements and changes.

According to the requests of the bidder, the academic misconduct system should adhere to the following:

* The automation of comparisons of question text with evidence text and it must produce a similarity measure for the two texts (2019-2021). Through the use of a similarity metric, the software should reduce the time spent manually comparing two texts and generalizing the assessment of how severe the conjectured copying is. The software must combine text-matching skills with stylometric analytics to provide more accurate reports, better explain academic misbehaviour, and enable improved decision-making.
* The current software offers capabilities like a crude text comparison tool and a stylometric tool that does not perform optimally. The rudimentary text comparison tool is used to point out similarities between texts in technical reports, whereas the stylometric tool is underutilized due to its extensive possibilities in assisting the investigator in authorship recognition.
* The application should be standalone and terrestrial-based, being able to operate on multiple systems at once.
* Daily data updates should occur.
* The system should be able to maintain database transactions over time.
* The development method/methodology must adhere to a proper project management methodology. The MPMM / Method 123 or a hybrid Waterfall/Agile method is preferred.
* The project should conform to ISO 21500 standards firstly, secondly to PMBoK as well as the PRINCE2 Method and the HERMES method.
* The application should be able to detect text similarities between two sources as a minimum requirement.
* The application should have stylometric functionalities, the application should be able to detect original authorship of a document.
* Application should be memory-efficient and resource overhead should be avoided.
* Feedback reports should be based on stylometric performance metrics used to identify authorship and contract-cheating.
* Statistical analysis and knowledge should be crucial during the development phase.
* Instead of creating a database to persist data, the development team can create a local corpus of documents to compare and identify contract-cheating.

Based on the abovementioned requirements, the development team of NightCore Mech decided to develop a web-based application that facilitates ease of access and efficient integrations should be developed. The web application can be hosted on efficient cloud platforms such as Microsoft Azure or AWS. If it happens that hosting with the aforementioned platforms are not a feasible option, the development team will make the necessary arrangements with the NWU Registrar to host the application.

## FINANCIAL PROPOSAL

The NightCore Mech contractors will deliver all the requirements as requested by the client within 8 months at a total cost of R852 997.37 (VAT and disbursements included).

## BROAD-BASED BLACK ECONOMIC EMPOWERMENT

NightCore Mech is considered a Level 2 contributor with a 0% B-BBEE procurement level. Because the company earned less than R10 000 000 in the last financial year, the company qualifies for the B-BBEE Exempted Micro Enterprise BEE exemption.

# **BIDDER’S RESPONSE**

|  |  |
| --- | --- |
| **Criteria for Functional Evaluation** | **Research Solutions’ Response** |
| Details about the company's software development projects that the team has completed in the last 12 months. These initiatives will be reviewed, with information about the project sponsors provided in the section below. | **Entire team**  Completed a Vitality Web App that manages Active Rewards.  Completed a Social Media Web application in which users could share photos.  Completed a database system for a fire damage assessment system. |
| Detailed CVs of team members who will be directly involved in delivering the required services. The individuals must have prior experience in software development. | Every member’s full CV can be found in the addendums section. The following is a summary of their experience:  **Hanno Visagie**  3 years of coding experience in C#, C++, Java, CSS, HTML, SQL and ASP.NET. 3 years of experience in project management along with experience in systems analysis and design. 3 years of experience in decision support systems and business intelligence along with data analysis.  **Hano Strydom**  1 Years’ experience using ASP.Net, Maven, Spring  2 Years’ experience using Oracle & SQL  Worked on numerous projects  3 Years’ experience in programming (Python, Java, C#)  **Michael Rosin**  3 years of web design (back-end) using ASP.NET, C#, .NET and database management using Oracle, SQL Server, MS Access, MS SQL and implementing BI/ETL solution. 3 years of programming experience such as C#, C, C++, Python, Java, VB.NET and PHP.  **Annika du Toit**  3 - years information technology experience which includes coding in several languages. (Java, Python, C\C++, C#, ASP.NET).  2-year experience in database management (ORACLE).  **Llewelyn Anthony**  3 years of experience developing .NET desktop applications and ASP.NET MVC applications.  2 years of experience working with HTML5/CSS3/JavaScript and React Single-Page applications while using Git as a source-control tool.  5 years of experience as a SQL developer and a year of experience with Postgres.  A year’s experience worth of Python and NodeJS scripting.  Recent training on setting up Docker containers and execs.  Spent 2 years as a System analysis and software lifecycle mentor.  **Shené Boshoff**  3 years of programming and software development experience.  2 years of database management experience.  1 year of systems analysis experience. |
| A minimum of three (3) contactable references where the bidder has completed the software project. | Janet Liebenberg  Senior Lecturer  North-West University  Email: Janet.Liebenberg@nwu.ac.za  Tel No: +27 18 299 2536  Linda Redelinghuys  Lecturer  North-West University  Email: 10143882@nwu.ac.za  Tel No: +27 18 299 2531  Zander Boonzaaier  Lecturer  North-West University  Email: 28749995@student.g.nwu.ac.za |
| Based on the deliverables referred to in Section 5 above, a detailed project plan with timelines on how the assignment will be carried out including the risks that might be involved (including risk mitigation factors). | A full project plan and budget can be found in sections 10 and 11. The project will take place over 9 months with 8 phases. The phases are the following:   1. Scope definition and project planning 2. Problem analysis 3. Requirement analysis 4. Logical design 5. Decision analysis 6. Physical design and implementation 7. Testing 8. Installing and deployment |

# **ADVANTAGES OF USING NIGHTCORE MECH**

NightCore Mech is a respected private company that has learned and grown exponentially in the past three years. We happen to be a dream team of marketers, project managers, sales leaders, web designers and end-to-end eCommerce consultants who are experts in our industries. We specialize in converting Enterprise eCommerce business concepts into scalable, high-performing storefronts with robust, functional, and user-friendly solutions. We provide unique software solutions to organizations and individuals. Based on our own experience, we provide expert opinions, analysis, and suggestions to organizations or individuals. We are expert problem-solvers who offer solutions to overcome enterprise obstacles and improve performance.

The key advantages of hiring us as your e-commerce software consultant are as follows:

1. Perspective:

Simply receiving an outsider’s perspective on your company can aid in its growth. Our e-commerce software experts work with a variety of businesses, observing which ideas and approaches are feasible. Any company can become trapped in an echo chamber, which stifles innovation. We can assist you in re-imagining your business operations and marketing tactics, in addition to making software recommendations and managing e-commerce optimization on your site.

1. Improved customer experience:

We notice difficulties and propose solutions.

1. Streamlined workflow:

We can assess your company procedures and software, drawing on years of experience assisting other e-commerce businesses, to offer relevant solutions. Identifying areas of your company that could benefit from process automation can help you boost your profile.

1. A competitive edge:

We use an omnichannel strategy to e-commerce to help your company obtain or keep a competitive advantage. However, if your software isn’t integrated across channels, you risk missing out on sales or keeping clients waiting too long for a solution to arrive.

1. Branch out into new sales channels:

To generate visitors to your website, e-commerce success necessitates more than just SEO or paid search. You can utilize omnichannel marketing to reach out to customers in a variety of ways.

1. Expert evaluation:

Without re-platforming, an e-commerce software expert investigates numerous options for improving your site’s performance and functionality. Our professional e-commerce consultants concentrate on iterative, platform-agnostic enhancements to your applications. We won’t offer you a solution redesign or features you don’t need unless they provide value to your company. However, if your e-commerce software is at the end of its life cycle, an e-commerce expert can assist you with the re-platforming process.

# **BACKGROUND**

The Registrar of the North-West University is responsible for various administration tasks within the university. These tasks include record keeping of university student marks and a wide range of other supporting records and documents. The university’s view on information governance, in conjunction with Gartner’s definition, states that it views information governance as an overarching framework that provides an oversight of information and the processes by which it is generated, processed, and curated at the university.

The NWU Registrar is responsible for investigating various cases of alleged plagiarism committed by students, by inspecting cases individually and appointing experts to develop technical reports. The technical report currently involves manually comparing the alleged plagiarised text in question with the original text as evidence text, which can be tedious, and sometimes leads to similarities being overlooked.

If the technical reports fail to emphasise the severity of the alleged plagiarism, external subject matter experts may be requested to adjudicate the technical report with an additional report which further elaborates on the alleged plagiarism.

This tender, therefore calls for the design and development of a workflow system that will be able to facilitate academics in reporting academic misconduct cases according to standing NWU SOPs.

# **PROJECT TEAM**

|  |  |
| --- | --- |
|  | **Project Leader**  Hanno Visagie  Qualifications:   * BSc Information Technology (North-West University) * Current BSc (Hons) Computer Science and Information Systems student at North-West University |
| A person sitting on a boat  Description automatically generated with medium confidence | **Prototype Lead**  Hano Strydom  Qualifications:   * BSc Information Technology (North-West University) * Current BSc (Hons) Computer Science and Information Systems student at North-West University |
| A person standing in front of a body of water  Description automatically generated with medium confidence | **Back-end Lead**  Michael Rosin  Qualifications:   * BSc Information Technology (North-West University) * Current BSc (Hons) Computer Science and Information Systems student at North-West University |
|  | **Database Administrator**  Annika du Toit  Qualifications:   * BSc Information Technology (North-West University) * Current BSc (Hons) Computer Science and Information Systems student at North-West University |
| A person smiling for the camera  Description automatically generated with medium confidence | **Development Lead**  Llewellyn Anthony  Qualifications:   * BSc Information Technology (North-West University) * Current BSc (Hons) Computer Science and Information Systems student at North-West University * 2017 – 2018 QCTO National Certification Information Technology: Systems Development (SAQA ID 48872, NQF 5, 131 Credits). MCSD and BI. |
| A person smiling for the camera  Description automatically generated with medium confidence | **Hosting Platform Manager**  Shené Boshoff  Qualifications:   * BSc Information Technology (North-West University) * Current BSc (Hons) Computer Science and Information Systems student at North-West University |

# **UNDERSTANDING OF PROJECT BRIEF**

NightCore Mech will aim to integrate a software-based solution that will address the following business requirements:

* Design and develop a standalone terrestrial-based system that can be used by multiple systems at a time.
* The integration and use of project management method123 for designing and developing the project, or an alternative hybrid Waterfall/Agile method.
* Promote the significance of a simple and user-friendly interface.
* Eliminate unnecessary time wasted while using the software
* Increase the efficiency of staff members by delivering software that works.
* Compile documentation/user manuals for employees, in a category-based framework, which will act as a guide to avoid confusion.
* Work closely with stakeholders to ensure that all the requirements are met.
* Ensure concurrent use of the software.
* At the end of the project lifecycle, the developers at Nightcore Mech should be able to deliver a system that enables lecturers at the NWU to identify academic misconducts/contract-cheating.
* Feedback Reports should be provided by the system indicating text similarities between various sources to identify plagiarism on different levels conducted by a student.
* Application should be web-based
* Automation of feedback reports, with stylometric performance metrics visualised in order to detect contract-cheating and original authorship
* Side-by-side comparison of source document and evidence texts, without the need to manually identify text similarities
* Machine learning algorithms and stylometric analysis should be implemented to detect authorship and text similarities
* Text similarities is a minimum requirement of the application
* Use document metadata to support stylometric analysis
* A local corpus should be stored on a device to compare documents and identify contract-cheating and authorship
* Computing resources should be managed efficiently, and memory overhead should be avoided
* Daily data updates should occur.
* The system should be able to maintain database transactions over time.

The NightCore Mech team will revise the previous project to obtain some valuable insight into understanding what the exact requirements of the stakeholders are and what fell short of their expectations. Software solutions often fall short of the stakeholder expectations due to not satisfying the business requirements as a result of poor communication or failure to adhere to system design methodologies or best practices. To overcome these challenges, NightCore Mech utilises a holistic approach and strictly follows various methodologies that facilitate communication and collaboration throughout the various phases and environments of the project. Please refer to Figure 1 for more information



**Figure 1: Environments in the holistic approach to information and communications technology management**

Subsequently, NightCore Mech will follow this holistic approach to ensure that the best decisions regarding the development of software are chosen that will satisfy the requirements provided by stakeholders. To achieve this goal, NightCore Mech must identify which aspects of the software solution are of high importance by conducting an all-inclusive feasibility study that will identify crucial aspects and requirements in conjunction with the objectives established by stakeholders.

# **AIMS AND OBJECTIVES**

Nightcore mech facilitate academics in REPORTING ACADEMIC MISCONDUCT CASES ACCORDING TO STANDING NWU SOPS.

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**Objective 1: Comply to all relevant legislations and regulations indicated. This include but are not limited to the Legal Ramifications of Plagiarism, The Copyright Act, The NWU policy on plagiarism and other forms of academic misconduct.**

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**Objective 2: Improve the facilitation of academics in reporting academic misconduct cases within the NWU by monitoring the level of plagiarism committed by students.**

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**Objective 3: Upgrade current technological application to enhance the ability of the NWU to provide more accurate plagiarism reports.**

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**Objective 4: Introduce a technological solution that includes:**

* **Software that detects numerous ways of paraphrasing and automatically compare two similar texts.**
* **Understand academic misconduct better and provide an accurate report for each student to determine those suspected from cheating.**
* **Executable standalone terrestrial-based system working on multiple platforms.**
* **Have the capacity to update data on a daily basis.**
* **Database maintenance of all transactions over time.**
* **Adhere to a proper PM methodology.**

# **DELIVERABLES**

Nightcore mech facilitate academics in REPORTING ACADEMIC MISCONDUCT CASES ACCORDING TO STANDING NWU SOPS.

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**Deliverable 1: Include project purpose and scope, develop project plan, specify qualifications of team, determine roles and responsibilities, risk report, progress reports.**

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**Deliverable 2: Budget Analysis of proposed project solutions and requirements.**

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**Deliverable 3: Implement the proposed solution and report performance outcomes of technological solutions**

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**Deliverable 4: A document that lists all the technical requirements – this include but are not limited to:**

* **Software architecture design document**
* **User requirement document**
* **User manual and user training for technological solution**
* **Ensure that the customer owns all source codes, database scripts, content, and associated documentation.**

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**Deliverable 5: Management and the Board will be provided with a project completion report.**

# **METHODOLOGIES**

## Design Methodology to be utilised

NightCore Mech utilises a combination of Agile practices and the Waterfall software development methodology to effectively and efficiently develop software that satisfies all the client’s needs. The combined use of Agile and Waterfall will shorten the delivery time and provide the company with the ability to gather feedback during the early stages of development to ensure that the requirements are met successfully.

## A few reasons to use the Agile-Waterfall Hybrid model:

* Creates an environment for enhanced collaboration
* Decreases the time required for design, analysis and planning
* Clearly defines various project frames such as budget and time delivery
* Ensures software follows software standards

## Pros of a hybrid methodology model:

* Deliverables are agreed on by the client and developers at an early stage in the development lifecycle
* Easily track project progression as the entire scope of work is known in advance
* Encourages the project to be divided into smaller delivery segments, referred to as sprints, to allow easier development of a complex system and to provide an overview of progression.

The successful use and implementation of a hybrid design methodology will ensure a smooth design and development during the different stages of the development lifecycle.

## Project Management Methodology to be utilised

NightCore Mech utilises the project management methodology known as MPMM, which stands for Method123 Project Management Methodology. The use of this methodology is to ensure that best practise and standards are met in the workplace.

PMBOK, or Project Management Body of Knowledge, is a compilation of standard terminology and guidelines for project management that is utilised along with MPMM to further support the development lifecycle. MPMM and PBMOK integrate seamlessly as both methodologies attempt to utilise best practices.

PMBOK consists of five different process groups namely: Initiating, planning, execution, monitoring, controlling and closing. These process groups are integrated with each of the different elements of MPMM to boost the effectiveness of both methodologies.

Along with these two methodologies, NightCore Mech makes use of the ISO standard 21500:2012, which guides project management. ISO 21500:2012 provides high-level descriptions of concepts and processes which forms part of good practices in project management.

# **PROJECT PLAN**

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**Link to Project Plan Sheet:** [**Nightcore Mech Project Plan**](https://docs.google.com/spreadsheets/d/1lJ8sX7dRrM4NHevXh1O-MeGcKmyHbm65/edit?usp=sharing&ouid=118385194576115902541&rtpof=true&sd=true)

# **BUDGET**

\*Any documents/page cost covered in miscellaneous

\*Presentations are virtually presented, held on Zoom.

|  |  |
| --- | --- |
| **Phase 1: Initiation Phase** |  |
| Task 1.1: Assemble Project Team | **R0.00** |
| Task 1.2: Review Business Case, Project Scope and Requirements | **R25 000.00** |
| Task 1.3: Edit Tender Response | **R25 000.00** |
| Task 1.4: Edit Feasibility Study | **R80 000.00** |
| Task 1.5: Edit Business Case | **R25 000.00** |
| Task 1.6: Review Phase | **R500.00** |
| **Phase 2: Planning Phase** |  |
| Task 2.1: Edit Project Plan | **R0.00** |
| Task 2.2: Resource Planning | **R0.00** |
| Task 2.3: Financial Planning | **R0.00** |
| Task 2.4: Risk Management Planning | **R30 000.00** |
| Task 2.5: Acceptance Agreement Planning | **R0.00** |
| Task 2.6: Communications Planning and Establishing Communication Channels | **R0.00** |
| Task 2.7: Procurement Planning | **R0.00** |
| Task 2.8: Scope Management Planning | **R0.00** |
| Task 2.9: Functional and Technical Spec | **R0.00** |
| Task 2.10: Manage and Control Development | **R0.00** |
| Task 2.11: Review Phase | **R500.00** |
| **Phase 3: Execution Phase** |  |
| Task 3.1: Design and Develop Software Solution - Hardware (R31 494.00) - Prototyping (R15 000) - API (1500) - Cloud Hosting (R85 000.00) | **R132 994.00** |
| Task 3.2: Testing and Debugging | **R1 000.00** |
| Task 3.3: Create User Manual | **R0.00** |
| Task 3.4: Develop an End User Training Plan | **R0.00** |
| **Phase 4: Project Review and Project Closure Phase** |  |
| Task 4.1: Review of Entire Project | **R0.00** |
| Task 4.2: Perform Project Closure | **R0.00** |
| **Total** | **R319 994.00** |
|  |  |
| Miscellaneous |  |
| Printing | **R3 500.00** |
|  |  |
|  |  |
| **Grand Total:** | **R323 494.00** |

|  |  |  |
| --- | --- | --- |
| **Phase** | **Budget** | **Received Date of Payment** |
| **Phase 1: Initiation Phase** | R155 500.00 | 28/03/2022 |
| **Phase 2: Planning Phase** | R30 500.00 | 11/04/2022 |
| **Phase 3: Execution Phase** | R133 994.00 | 01/07/2022 |
| **Phase 4: Project Review**  **and Project Closure Phase** | R0.00 | 20/10/2022 |
| **Miscellaneous:** |  |  |
| **Printing** | R3 500.00 | 28/03/2022 |
| Salaries: |  |  |
| Ricus Warmenhoven | R51 840.00 | Phase 1 & 2: R18 720.00 Phase 3: R30 960.00 Phase 4: R2 160.00 |
| Hanno Visagie | R65 590.56 | Phase 1 & 2: R23 685.48 Phase 3: R39 172.00 Phase 4: R2 732.94 |
| Hano Strydom | R54 576.00 | Phase 1 & 2: R19 708.00 Phase 3: R32 594.00 Phase 4: R2 274.00 |
| Llewellyn Anthony | R57 628.80 | Phase 1 & 2: R26 847.60 Phase 3: R44 401.80 Phase 4: R3 097.80 |
| Michael Rosin | R74 347.20 | Phase 1 & 2: R20 810.40 Phase 3: R34 417.20 Phase 4: R2 401.20 |
| Annika du Toit | R46 944.00 | Phase 1 & 2: R16 952.00 Phase 3: R28 036.00 Phase 4: R1 956.00 |
| Shené Boshoff | R80 424.00 | Phase 1 & 2: R29 042.00 Phase 3: R48 031.00 Phase 4: R3 351.00 |
| **Total:** | **R754 844.56** |  |

# **INVOICING SCHEDULE**

|  |  |  |
| --- | --- | --- |
| **Phases and Payment** | **Date** | **Amount (R)** |
| **Phase 1:** |  | **R155 500.00** |
| **Phase 2:** |  | **R30 500.20** |
| **Phase 3:** |  | **R133 994.00** |
| **Phase 4:** |  | **R0.00** |
| **Miscellaneous: Printing** |  | **R3500.00** |
| **Total** |  | **R323 494.00** |
| **VAT 15%** |  | **R48 524.10** |
|  |  |  |
| **Total Contractor tariff**  **See Appendix** |  | **R754 844.56** |
|  |  |  |
| **GRAND TOTAL** |  | **R1 126 862.66** |

## 12.1. Terms and Conditions

The terms and conditions are proposed by the subcontractors of NightCore Mech.

The tender response is based on the understanding of NightCore Mech regarding the scope and deliverables of the project. The subcontractors of NightCore Mech work at an hourly rate. The costs are based on deliverables stated in the budget at Section 11: Budget, from page 17. The budget could be subject to change if the clients alter the scope of the project or add additional requirements to the project. The altered budget should be approved by the client. The budget only contains items that the client is responsible for.

## 12.2. Purpose and Context

The client has fully disclosed the contract to NightCore Mech. The client will use the results of the contract work only for the purpose disclosed to NightCore Mech unless otherwise agreed. The client agrees to respect and value NightCore Mech's connection with its suppliers/specialists.

## 12.3. Validity of Submission

The cost estimate is valid for fourteen working days after the submission date.

## 12.4. Contractual Relationship

The parties agree that the Standard Terms and Conditions will govern any contractual agreement between them. When this proposal's approval is contingent on the signature of a Service Level Agreement (SLA), the Standard Terms and Conditions must be considered when creating the SLA. If acceptance of this proposal is contingent on both parties signing a Service Level Agreement (SLA), no work will be undertaken until both parties have signed the SLA.

## 12.5. Duration

The agreement becomes effective after both parties have signed it. The agreement will be valid until the completion date indicated in the scope of the contract work. This is subject to provisions that provide for earlier termination. If the agreement is terminated, the clauses relating to intellectual property and confidentiality will remain in effect.

## 12.6. Client’s Responsibility

Individual full briefings will be provided by client representatives, only by appointment, and access to necessary documents, personnel, and facilities will be permitted.

The customer will provide NightCore Mech with all paperwork and other material (source code) that could be useful in developing the new system.

The client will make their facilities available to NightCore Mech at no cost.

Given the cooperative governance, identified stakeholders should work together. The procedure will be maintained once a chance to engage has been provided and a constructive response has not been obtained promptly.

Comments on draft papers and findings will be delivered to the client within a period that is mutually agreed upon, but not more than seven days.

Draft reports will be given to the client directly, who will receive one set of responses from the bidder. The bidder will include the responses in their final submission and send them to the appropriate authority. Responses have to be received within a week.

## 12.7. Invoicing and payment

NightCore Mech will produce the invoices, and payment will be made directly to them.

Each invoice will be accompanied by proper paperwork for payment.

Within 30 days of receipt of invoices, all accounts will be settled. Interest will be charged at the banking rates set by NightCore Mech.

All sums due under the agreement must be paid by the due date specified in the agreement, or within thirty (30) days after the date of invoice issuance if an invoice is required. Interest will be charged on balances that are past due at prime plus 2%. (2 per cent).

## 12.8. Risk

Intellectual property given to NightCore Mech by or on behalf of the Client according to the agreement will be received, retained, and used at the owner's risk. Unless otherwise specified in the agreement, intellectual property becomes the property of NightCore Mech upon the termination of the agreement.

## 12.9. Confidentiality and publication

All information disclosed to each other during the term of the agreement regarding or arising from the contract work shall be treated as strictly confidential, and the Parties shall not disclose any such information to third parties without each other's written approval, which consent shall not be withheld unreasonably. Consent may not be delayed for longer than two years when the NWU publishes for scholarly purposes. The Parties are not permitted to postpone the submission and examination of theses and dissertations, as well as the conferral of degrees.

## 12.10. Liability

* 1. The Client indemnifies NightCore Mech, and NightCore Mech indemnifies the Client, against any claims that may arise because of the other's negligent act or omission, or non-compliance with any element of the agreement throughout the course and scope of contract work.
  2. Any claim for damages against NightCore Mech based on the agreement is limited to the lesser of the contract price or the amount paid by the Client to NightCore Mech in respect of contract work performed in accordance with the Agreement.

## 12.11. Intellectual property

Unless otherwise indicated in the agreement, intellectual property arising from contract work can be transferred from the Registrar on the terms of an agreement previously signed by the University and NightCore Mech.

## 12.12. Breach

If either party breaches its obligations under the agreement and fails to remedy the breach within seven days of receiving written notice requiring it to do so, the other Party shall have the right, at its option but without prejudice to any other or additional rights or remedies, to cancel the agreement.

## 12.13. Termination

Both parties may mutually choose to dissolve the arrangement. If the client terminates the project for any reason, or by mutual agreement, all direct expenses and professional fees will be billed up to and including the project's termination date.

## 12.13. Waiver

No leniency or exemptions granted to the other party, or a party's failure to exercise its rights as a result of a breach of the agreement, will affect the rights of the first-mentioned party, nor will it be hindered from exercising those rights.

## 12.14. Total Agreement and Amendments

The agreement represents the parties' entire agreement, including any additional restrictions, proposals, or pledges, whether verbal or written. Unless reduced to writing and signed by both parties, no modifications to the agreement will have any validity or effect.

## 12.15. Governing Law

The Republic of South Africa's laws will govern the agreement and will be used to interpret it.

## 12.16. Domicilia Citande et Exencutandi and Notice

For all purposes of and in connection with the agreement, the parties choose the addresses mentioned therein or such other address as may be communicated in writing by one party to the other as their domicilia citandi et executandi. Any notice required by the agreement must be delivered to the applicable party at its domicilium in writing.

## 12.17. Precedence

If these General Conditions and any term or condition in the agreement conflict, the latter will take precedence.

# **RELEVANT EXPERIENCE**

|  |  |  |  |
| --- | --- | --- | --- |
| **Client Name** | **Brief Description** | **Timeframe** | **Members** |
| Janet Liebenberg | Lecturer Leave Day repayment system | 2020: March to April | Hanno Visagie  Michael Rosin  Llewellyn Anthony  Hano Strydom  Annika du Toit  Shené Boshoff |
| Linda Redelinghuis | ATLAS Courier System | 2020: Feb - October | Hanno Visagie  Michael Rosin  Llewellyn Anthony  Hano Strydom  Annika du Toit  Shené Boshoff |
| Rodney Sebopelo | FNAS System/Database | 2021: June - July | Hanno Visagie  Michael Rosin  Llewellyn Anthony  Hano Strydom  Annika du Toit  Shené Boshoff |
| Zander Boonzaaier | Vitality Web App that manages Active Rewards | 2021: August - October | Hanno Visagie  Michael Rosin  Llewellyn Anthony  Hano Strydom  Annika du Toit  Shené Boshoff |
| Zander Boonzaaier | Social Media Web application | 2021: November - November | Hanno Visagie  Michael Rosin  Llewellyn Anthony  Hano Strydom  Annika du Toit  Shené Boshoff |

# **CONTACT DETAILS OF BIDDER**

|  |  |
| --- | --- |
|  | **Zander Janse van Rensburg:**  **Senior Client Representative Agent**  **Office: 018 991332**  **Email: Zander.JanseVanRensburg@nwu.ac.za** |
| A person smiling for the camera  Description automatically generated with medium confidence | **Prof. Neels Kruger:**  **Teaching & Research Focus: IT Management, IT Governance and Knowledge Management at NWU**  **Office: 018 299 2533**  **Email: Neels.Kruger@nwu.ac.za** |

# **ANNEXURE A - CURRICULUM VITAE OF PROJECT MANAGEMENT TEAM**

Llewellyn Anthony:

<https://mega.nz/file/7TZVzBhQ#CbzPHlfV6oLVODK3PrFoFbckQ3tttuKEzYVEeAAFRVk>

Michael Rosin:

<https://drive.google.com/file/d/1_X8QP_H3RFPiL_7yLLWG2OJYNyVxZGPm/view?usp=sharing>

Shené Boshoff:

<https://drive.google.com/file/d/1ciFxdNJw5qj4mSuX9XcG7c0eXrpRto0_/view?usp=sharing>

Hano Strydom

<https://tinyurl.com/HanoStrydomCV>

Annika du Toit

<https://drive.google.com/file/d/1J9Y7Y3yHzVcm6p6LROYVasL_38KFoiet/view?usp=sharing>

Hanno Visagie

<https://drive.google.com/file/d/1456gNARcK6MxcMuv1W0mW8DvSSM6JylD/view?usp=sharing>

# **ANNEXURE B – PROJECT MANAGEMENT**

# **Work Breakdown Structure**

## Phases

|  |  |  |
| --- | --- | --- |
| **Phase Title** | **Phase Description** | **Phase Sequence** |
| Initiation | This is the first phase within project management and will consists of defining the project goals and creating a business case. The project charter needs to be completed which consists of the constraints, goals, appointing of the project manager, budget and expected timeline. The stakeholders of the project also need to be identified. | Phase 1 |
| Planning | The second phase is the planning phase. This phase consists of defining the scope, creating the project plan, set a budget baseline and define the roles and responsibilities. The primary tasks are identifying technical requirements, developing a detailed project schedule, creating a communication plan, and setting up goals/deliverables. | Phase 2 |
| Execution | This phase consists of allocating project resources, managing project resources, the building process of the product and resolve issues that occur, maintain effective collaboration between project stakeholders. | Phase 3 |
| Monitoring/Controlling | This phase tracks the effort and cost, monitor project progress, ensure the process is on schedule and accordance to the plan. This phase ensures the deliverables are met. This phase run simultaneously with project execution. | Phase 4 |
| Project Closure | The fifth and final phase deliver the deliverables, review the project deliverables, get approval on the results, and document the learnings throughout the project. | Phase 5 |

## Activities

### **Initiation Phase**

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase Title** | **Activity Title** | **Activity Description** | **Activity Sequence** |
| Initiation phase | Assemble project team | This activity will focus on identifying all of the roles that will be necessary to accomplish the proposed project and then identifying the members of the project team who are most qualified to fill these responsibilities. This will include a team leader, programmers, database administrators, and those who are proficient in statistics and mathematics. | 1 |
| Initiation phase | Review business case, project scope and requirements | In this activity, the project team will review the business, project scope, and project requirements to make sure they have a good understanding of what the project entails, what is expected of them, and what the stakeholder expects of the final deliverable. | 2 |
| Initiation phase | Edit tender response, feasibility study, and business case | After the completion of the previous activity, the tender response, feasibility study, and business case will be edited to reflect the project team’s understanding of the project. | 3 |
| Initiation phase | Review phase | The project team will review the completed documentation up to this point (the business case, the feasibility study, and the tender response) to have a clear understanding of what exactly the stakeholder expects of the project to take into the next phase. | 4 |

### **Planning Phase**

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase Title** | **Activity Title** | **Activity Description** | **Activity Sequence** |
| Planning phase | Create project plan | This activity will be carried out when the project initiation is complete, and it will define all of the activities that will be carried out inside the project, as well as a resource plan and schedule for these tasks. This assignment will determine all of the different deadlines for all of the different activities that will be completed during the project. | 5 |
| Planning phase | Resource planning | All of the project's needed resources, as well as how they will be handled, will be determined here. The different team members necessary for each task will be thoroughly assessed, and the team will guarantee that enough individuals are available to execute all of the tasks within the project's constraints. | 6 |
| Planning phase | Financial planning | The costs of the different options were calculated during the feasibility review in the previous stage, and this activity will focus on refining those prices and developing a plan for spending the project's money. Some regions may require more funding than anticipated, whilst others may have been underestimated. This strategy is essential for keeping the project on track and on budget, and it is thus critical to the project's overall success. | 7 |
| Planning phase | Risk management planning | The project risk plan is used to identify, classify, and prioritise the numerous risks that may arise throughout the course of a project. Any project confronts a variety of hazards that might cause it to be delayed, and it is critical that the team recognises these risks and has a variety of strategies for dealing with and mitigating them. Along with these hazards, methods for monitoring them, as well as measures to mitigate them, will be explored. | 8 |
| Planning phase | Acceptance agreement planning | This activity will entail drafting a contract between the customer and Nightcore Mech that outlines the basic criteria for the planned deliverables. Both parties will sign the agreement and acknowledge that they have met all of the standards outlined in the above-mentioned agreement. | 9 |
| Planning phase | Communications planning and establishing communication channels | This activity will decide how the development team communicates with each other, as well as how the development team communicates with project stakeholders. This plan will establish the communication channels necessary to execute the project, as well as the information that will be made available to each stakeholder. This plan will go through the ways for ensuring that communication is shared. | 10 |
| Planning phase | Procurement planning | This activity will identify the resources that will need to be obtained from outside sources, as well as where and when they will need to be obtained for the project's completion. These plans are usually revised once a year to ensure that they remain current. | 11 |
| Planning phase | Scope management planning | The scope of the project will be specified, developed, monitored, managed, and validated in this plan. It is critical to make sure that the scope is handled in such a way that all of the project's needs are satisfied and that no time is spent on activities that are not essential. The project leader will be in charge of enforcing the project's scope and ensuring that the project complies to all of the client's criteria. | 12 |
| Planning phase | Functional and technical specifications | In this activity, the functional and technical specifications of the software solution will be established with approval from the stakeholder. | 13 |
| Planning phase | Manage and control development | This activity includes following proper development procedures, performing quality control, and stakeholder management. The project management and team leader must ensure that the project team stays on track, within budget, and within the time constraint. The team must also do regular quality checks to ensure the software being developed is of high quality and meets the stakeholder’s quality expectations. The team should have regular meetings with the stakeholder to receive feedback. | 14 |
| Planning phase | Review phase | The project team should review all of the above-mentioned activities and their related documents to make sure everything is in order and meets the stakeholder’s standards. | 15 |

### **Execution Phase**

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase Title** | **Activity Title** | **Activity Description** | **Activity Sequence** |
| Execution phase | Design and develop software solution | As mentioned in previous documents, this activity comprises the design and development of the physical software solution. This web-based solution will be built from scratch. This includes designing graphical user interfaces, developing backends, and implementing different project management tools. Stakeholders will be involved at every step of the way. Any suggestions made to the project team will be taken into account and included into the final result. | 16 |
| Execution phase | Testing and debugging | This activity will be in charge of testing all of the project team's deliverables to ensure that they are free of serious mistakes and that they meet all of the project stakeholders' and client's constraints and expectations. Any incorrect deliverables discovered may easily be sent back to the project team to be fixed. | 17 |
| Execution phase | Create user manual | This activity entails the preparation of a user manual that provides end-users with extensive instructions and advice on how to use the software solution indicated above. During this phase, end-users will be involved to verify that the instructions offered are relevant and clear. The deliverable resulting from this phase will include the navigation of the interfaces, the functions of all of the components, and how to use each feature in the software solution appropriately. | 18 |
| Execution phase | Develop an end user training plan | The team should create a training plan to train end-users in the deliverable. This training plan will help the team recognise any flaws that end-users identify that they can fix before they implement the solution. | 19 |

### **Monitoring/Controlling Phase**

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase Title** | **Activity Title** | **Activity Description** | **Activity Sequence** |
| Monitoring and controlling phase | Effort and cost tracking | The team leader and project manager should track the effort and cost of the project to ensure the team stays within budget and within scope. | 16 |
| Monitoring and controlling phase | Project progress monitoring | The team leader and project manager should monitor the project’s progress to make sure the team stays on track to complete the project within the allocated time, as well as following the agreed upon scope. | 16 |

### **Project Review/Project Closure Phase**

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase Title** | **Activity Title** | **Activity Description** | **Activity Sequence** |
| Project review and project closure phase | Review of entire project | This is one of the final tasks that the project team will do. After all of the deliverables have been completed, the project team should go over them one last time to make sure they are all listed in the Quality management plan. After that, the team should document all of the project's achievements, failures, and problems to guarantee that the 21mistakes made in this project are not repeated in the future. Because today's difficulties may lead to tomorrow's answers, all of the project teams' experiences must be documented for future project teams. | 20 |
| Project review and project closure phase | Perform project closure | All of the final products will be given to the customer for them to utilise during this activity. Stakeholders will examine the deliverables to verify that they are pleased with the final result, and the project will be formally concluded after it is done. The project will be judged as a success or failure based on the customer's happiness. This phase will also include document signing to verify that all parties are pleased with the findings. | 21 |

## Tasks

Various tasks must be completed in order to fulfil all of the activities listed above. Below is a list of the numerous tasks that must be done for each activity.

As stated in the tables below, all of the jobs are presented in chronological sequence and will be accomplished from top to bottom. It’s possible that several of these jobs will be accomplished at the same time, but the majority of them will be completed in the sequence listed below.

### **Initiation Phase**

|  |  |  |
| --- | --- | --- |
| Activity Title | Task Title | Task Description |
| Assemble Project Team | Consider Interdepartmental Needs | To meet deadlines, projects need collaboration between multiple departments. Within the project team structure, each engaged department should be led by a leader who oversees a group of employees. Decide which departments to include and who will lead them. |
| Create Communication Practices | Because the project team structure involves many tiers of individuals, its crucial to keep communication fluid. Otherwise, the team will begin to feel like multiple, independent departments working towards different goals. The best way to prevent this from happening is by setting a cadence for meetings, requiring status reports, scheduling interdepartmental collaboration time and any number of other ideas. |
| Clearly Define Expectations | Clearly outlining expectations is the greatest method to ensure that communication is successful and that the entire project runs smoothly. |
| Identify the roles that will need to be filled | We’ll need a lot of people with different kinds of skills and knowledge to finish the project successfully. The majority of the people needed to accomplish the project will be gathered at this phase, and they will be further refined when the resource plan is produced. |
| Review Business Case, Project Scope, and Requirements | Review Business Case | We will retrieve the Business Case from the project sponsor and review everything to ensure we have done everything correctly. |
| Review Project Scope | We will review the project scope to ensure we have done everything correctly. If we missed anything we will correct it. |
| Review Requirements | We will review the requirements of the project to ensure we have done everything correctly. If we missed anything we will correct it. |
| Tender Response | Tender Response | Complete Tender Response |
| Conduct Feasibility Study | Conduct Feasibility Study | Conduct a Feasibility Study |
| Conduct Business Case | Conduct Business Case | Conduct a Business Case |
| Review Phase | Review team members and their roles | Review the structure of the team and ensure all team members understand they their responsibilities and roles are. |
| Review Project Scope | Review the project scope for the last time to ensure we don’t miss anything. |
| Review Requirements | Review the project requirements for the last time to ensure we don’t miss anything. |
| Review Tender Response | Review the Tender Response for the last time to ensure we don’t miss anything. |
| Review Business Case | Review the Business Case for the last time to ensure we don’t miss anything. |
| Review Feasibility Study | Review the Feasibility Study for the last time to ensure we don’t miss anything. |

### **Planning Phase**

|  |  |  |
| --- | --- | --- |
| Activity Title | Task Title | Task Description |
| Create Project Plan | Determine all of the steps required to complete the project plan. | Identify all of the tasks that must be completed in order to finish the project. To establish the various duties, the ten knowledge areas of project management will be considered. |
| Create the project plan | After the team has identified all of the project plan’s activities, we must create a project plan that contains all of these tasks as well as the time necessary to execute each of them. The project will be broken down into primary phases, each with its own set of activities to fulfil. |
| Resource Planning | Hold a resource management meeting | A meeting will be held to ensure everyone is on the same page and using the correct metrics. We will also determine what resources are needed for the project. |
| Match resources to tasks | Determine which tasks will use which resources. |
| Set a budget and track time | We will set a budget and track time so determine if we are on schedule and within our budget. |
| Forecast future planning | We will forecast future of the project to determine if any additional resources will be required. |
| Update resource plan | Our resource plan will be updated according to the resources required in the future of the project. |
| Financial Planning | Determine all of the costs that will be accumulated during the project | During the feasibility study, a budget for the suggested solution has been established. This budget will be examined by the team, and all expenditures will be fine-tuned to verify an exact number was anticipated. |
| Create a financial plan | A final budget will be created will considering the budget must be kept to a minimum. |
| Risk Management Planning | Identify possible risks | In order to prepare for risks, we need to identify possible risks. To identify possible risks, we will brainstorm with our team, colleagues or/and stakeholders in determining what the possible risks are. |
| Analyze the risks | We will analyze the risks in our project through quantitative and qualitative risk analysis and determine how these risks are going to impact our schedule and budget. |
| Prioritize the risks | We will need to prioritize certain risks, the reason being risks different from one another. We need to evaluate the risks to determine what resources we are going to assemble towards resolving it when and if it occurs. |
| Assign owners to the risks | We will assign different team member to resolve different types of risks. |
| Respond to the risks | If we have found a risk, we can respond it using the strategy we have developed. |
| Monitor the risks | Whoever owns the risk will be responsible for tracking its progress towards resolution. |
| Communications Planning and Establishing Communication Channels | Identify the project’s stakeholders | It is crucial to identify key stakeholders and assign team members the role of interacting with them. |
| Establish communication channels | Communication channels will be created to communicate with the project’s stakeholders. |
| Procurement Planning | Define Procurement Terms | This entails making a detailed list of what we need to get: how many, what size, for how long, and so on. Then we’ll want to know what kind of service the project receives and why it’s significant. Add a due date to each of these purchases, as well as who in the project team is allowed to make them. |
| Outline Type of Agreement | The contract is the means though which all parties agree on the conditions of service. As a result, the sort of agreement and how it will be administered must be decided. |
| Identify and Mitigate Risks | Risks are inherent at every step of the project development process, and they remain dormant in procurement until they manifest. We need to determine what those risks are and make a list of them. Once a comprehensive list has been compiled, each must have a method for resolving the issues. |
| Define Costs | Determining the costs involved with the project procurements. |
| Identify Constraints | To avoid getting blindsided by unforeseen limitations during the execution phase, it is beneficial to identify any project constraints before beginning the project, such as cost, scope, restricted resources, and technical demands. |
| Get the Contract Approved | Examine the bids and do a service and cost analysis. We will then construct a list of the project group’s decision-makers and send the bids to them for consideration. This procedure ensures that everyone involved in the contract approval process is informed and can provide input. |
| Make a Decision Criteria | We will make a criteria by which we need to decide which bid to go into contract with. |
| Create a Vendor Management Plan | Once a contract is signed, the procurement management plan will segue into a vendor management plan. |
| Scope Management Planning | Review project scope | The project team will look into the scope of the project as described in the business case and feasibility studies, and make sure that the project’s needs are properly defined. |
| Validate and monitor scope | During the preparation of the project deliverables, the project team will keep an eye on the project scope and check that the customer is happy with it before moving on the project execution phase. |
| Functional and Technical Spec | Review Project Requirements, Business case, and Feasibility study | Review the project’s requirements, Business Case, and the Feasibility Study to ensure we know the project’s requirements. |
| Communicate with the client | Communicate with clients and stakeholders to determine the functional and technical specifications. |
| Develop a functional and technical specification document | Write a functional and technical specification document. |
| Review Phase | Review Project Plan | Review the project plan to ensure we don’t miss anything. |
| Review Resource Plan | Review the resource plan to ensure we don’t miss anything. |
| Review Financial Plan | Review the financial plan to ensure we don’t miss anything. |
| Review Risk Management Plan | Review the risk management plan to ensure we don’t miss anything. |
| Review Communications Plan | Review the communications plan to ensure we don’t miss anything. |
| Review Procurement Plan | Review the procurement plan to ensure we don’t miss anything. |
| Review Scope Management Plan | Review the scope management plan to ensure we don’t miss anything. |
| Review Functional and Technical Specification | Review the functional and technical specification to ensure we don’t miss anything. |

### **Execution Phase**

|  |  |  |
| --- | --- | --- |
| Activity Title | Task Title | Task Description |
| Design and Develop Software Solution | Database design and implementation | A database will be designed and implemented to store the information of the report. |
| Application design (full stack) | The GUI and back end of the software solution will be designed and developed. It is then delivered to stakeholders several times until an acceptable variant is discovered. The feedback after each iteration is utilized to improve the mechanics, navigational capabilities, and themes of the GUI. |
| Testing and debugging | Unit testing | During this process the smallest testable parts of an application are individually and independently scrutinized for proper operation. |
| Testing of database | Performing tests to determine if there are any errors that users can encounter when trying to retrieve data from the database. |
| Manage and Control Development | Follow Proper Development Procedures | The project manager and project leader will make sure that the project’s resource restrictions and management techniques are followed at all times. This will allow the project team to create high-quality deliverables while keeping the program on track. |
| Stakeholder Meetings | Stakeholders will be included, and they will be required to offer input on the deliverables based on their experiences or perspectives. This information will be utilized to enhance the deliverables until all parties are pleased. |
| Create User Manual | Specify Interface Instructions | After the end-users and stakeholders have approved the interface prototype, each of the interface’s components and navigation features will be explored in detail. |
| Specify Steps for Functionality Utilization | The manner of usage for each capability will be detailed in the user manual after it has been finalized. To minimize unneeded misunderstandings among user-users, examples of how these features might be utilized will be supplied, as well as any limitations. |
| Proof-Reading and Editing | The user manual will be proofread to ensure that the concepts are communicated properly and simple to end users. Any mistakes in language or spelling will be rectified, and the general quality of the work will be improved. |
| Develop an End User Training Program | Develop User Training Course | The project team will provide learning initiatives to help end-users understand how to use the deliverables efficiently. |
| Make Training Arrangements | End-users are assigned time slots during which they will be instructed later. The project team may teach end-users without causing too much disruption to the business environment by using advance scheduling. The company can also plan ahead of time to work around certain periods. End-user groups are identified, and the training style is tailored to their needs. |

### **Project Review/Project Closure Phase**

|  |  |  |
| --- | --- | --- |
| Activity Title | Task Title | Task Description |
| Review of Entire Project | Perform completion review | This review will assess if the project fulfilled all of the project’s requirements, sign-offs, and deliverables, as well as whether the project management process satisfied all of the needed criteria. The completion review will assess whether all technical, financial, and contract closure events for the project were performed appropriately. |
| Perform Project Closure | Formally transfer all deliverables | Complete and deliver the project deliverables to the customer. Examine our project plan for all deliverables and double-check that they’ve been finished and handed off. |
| Confirm project completion | Confirm that the project is finished. Each person involved needs to agree on the project’s completion before we can formally close it out and move on. |
| Review all contracts and documentation | Examine all project documentation to check that all parties have been paid for their services and that no bills remain unpaid. |
| Release resources | Formally release all project resources, including suppliers, contractors, team members, and any other partners. Notify them of the project’s completion, confirm any final payments or commitments, and release them formally so they may work on other projects. |
| Archive documentation | All documents may be finalized and indexed in the company archives for future reference. |

## Milestones

## Effort

# **Project Plan**

## Schedule

Please note the following:

1. The maintenance phase is not included in the project plan, reason being the client must decide whether he/she wants us to maintain the software solution.
2. The ten project management areas are planned during the planning phase and prior to the execution phase of the project. Throughout the project’s future life cycle phases, these areas are enforced and managed. Although they are not indicated on the Gantt chart, they are all predecessors to the implementation phase.
3. The Gantt chart does not display the project’s stakeholders, schedules, or integrated management tasks since they occur throughout the project life cycle and are not confined to specific timeframes.

The Gantt chart can be found in Appendix A and a full detailed Gantt chart can be found on an excel sheet.

## Dependencies

In this section, a discussion of the various activities and their dependencies during the software development cycle occurs. The following section describes the different types of dependencies that exist:

1. **Finish to start (FS)**

Task B can only start when Task A has finished.

Box and whisker chart

Description automatically generated with medium confidence

1. **Start to Start (SS)**

Task B can only start when Task A has started.

A picture containing diagram

Description automatically generated

1. **Finish to Finish (FF)**

Task B can only finish when Task A has finished.

Shape

Description automatically generated with medium confidence

1. **Start to Finish (SF)**

Task B can only finish when Task A has started.

A picture containing graphical user interface

Description automatically generated

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Phase** | **Activity Number** | **Activity Title** | **Depends on** | **Dependency Type** |
| **Initiation Phase** | 1.1 | Assemble Project Team | - | - |
|  | 1.2 | Review Business Case, Project Scope and Requirements | - | - |
|  | 1.3 | Edit Tender Response | 1.2 | FS |
|  | 1.4 | Edit Feasibility Study | 1.2, 1.3 | FS |
|  | 1.5 | Edit Business Case | 1.2 | FS |
|  | 1.6 | Review Phase | 1.2 - 1.5 | FF |
| **Planning Phase** | 2.1 | Edit Project Plan | 1.5  2.2 - 2.10 | FF |
|  | 2.2 | Resource Planning | 1.1 | FS |
|  | 2.3 | Financial Planning | |  | | --- | | 1.3, 1.4 | | FS |
|  | 2.4 | Risk Management Planning | 1.1, 1.5 | FS |
|  | 2.5 | Communications Planning and Establishing Communication Channels | 1.1, 2.1 | FS |
|  | 2.6 | Procurement Planning | 1.1 | FS |
|  | 2.7 | Scope Management Planning | 1.4, 1.5 | FS |
|  | 2.8 | Functional and Technical Spec | 1.5, 2.7 | FF |
|  | 2.9 | Manage and Control Development | 1.5, 2.7, 2.8  3.1, 3.2 | FF |
|  | 2.10 | Review Phase | 2.1 - 2.9 | FF |
| **Execution Phase** | 3.1 | Design and Develop Software Solution | 2.1 – 2.4  2.7 - 2.9 | FF |
|  | 3.2 | Testing and Debugging | 3.1 | FS |
|  | 3.3 | Create User Manual | 3.1 | FS |
|  | 3.4 | Develop an End User Training Plan | 3.1 | FF |
| **Project Review and Project Closure Phase** | 4.1 | Review of Entire Project | 3.1 - 3.4 | FF |
|  | 4.2 | Perform Project Closure | 1.1 - 4.1 | FF |

## Assumptions

## Constraints

**Time constraint**

The project schedule is hugely influenced by the scope of the project. The development team will strictly follow the proposed schedule in order to finish the project before the deadline. The duration of the project and its deadlines cannot be moved as this project is time sensitive. In the event that the scope of the project is changed during the development cycle, adjustments will have to be made to the schedule. The following deliverables will be dispensed to stakeholders throughout the development cycle:

a) Tender response: 14 March 2022

b) Feasibility study: 11 April 2022

c) Business case: 18 April 2022

d) Project plan: 14 June 2022

e) Continues prototyping throughout the various project phases

f) Presentation of the final solution, in conjunction with the user manual: TBA

**Budget constraints**

The development team should adhere to the proposed budget. Initially, the development team investigated similar projects in order to determine the cost of various generic processes and tasks.

In addition, if the scope is increased during the development cycle, the budget will be readjusted to include the new costs. The budget should not exceed: R754 844.56

**Scope constraint**

The scope of the project is based on the results and feedback generated by the feasibility study and business case. The development team’s main focus will be to ensure that all functionality defined in the scope is implemented. In the event that stakeholders want to increase the scope by adding additional functionality, the development team will first need to approve the request before it is added to the scope and changes are made to the budget and schedule.

**Covid-19**

Since the start of the Covid-19 pandemic, businesses have had to adapt to the various safety rules implemented by their respective governments. This has proven to be quite difficult for some companies as their business practices were directly influenced by the safety measures. Companies were forced to switch from face-to-face meetings to online meetings via zoom or teams. Employees have started working from home which introduced various new risks.

South Africa currently finds itself on a reduced level 1 alert level which means that safety measures are a bit more relaxed. This has allowed the development team to initiate more face-to-face meetings with stakeholders and allowed the development team to work on the project in a communal work environment. Although there is a certain level of uncertainty in terms of the alert levels and their ability to change unannounced, the development team will continue to follow the current safety measures and will reassess the scenario if the alert levels are changed.

# **Project Scope and Goals**

The aim of this project is to design and develop a web-based Python Flask application that will assist the Registrar and lecturers in identifying contract-cheating and original authorship of assignments. The goals of the project are as follow:

* Design and develop a simple yet intuitive interface for users to easily navigate the application, upload source and evidence texts, perform stylometric analysis and text comparisons, generate feedback reports that indicates the level of contract-cheating and authorship
* Increase the accuracy of detected plagiarism levels/authorship attribution.
* Streamline the contract-cheating investigation process of the Registrar/client
* Stylometric functionalities should be implemented within the application. Python statistical libraries should be used to assist those functionalities.
* Stylometric analysis should be based on the following performance metrics:

1. Word, characters and punctuation counts
2. Document metadata
3. Binongo-Analysis and clustering
4. Distance between clusters (Burrow’s Delta)
5. Number of document revisions

* Cross entropy is plausible method to identify the variance in writing styles between authors to identify contract-cheating
* A local corpus should be stored on a device, containing the source text and some additional evidence texts (about ten to eleven documents in total).
* Automation of feedback reports generation. Reports should be generated as soon as possible.
* Automation of identifying text similarities (no manual document comparisons and text highlighting)
* Side-by-side document comparisons in a new window (no manual document comparisons)
* Feedback reports should indicate whether an author’s written piece is an original piece of work, along with the evidence based on the stylometric performance metrics.
* Feedback reports should contain data visualisation methods, such as graphs or charts, to indicate authorship attribution via clustering, and providing the charts with a legend to facilitate comprehension of the charts.
* Use machine learning algorithms (such as n-KK and SMO) to assist the stylometric analysis in order to identify contract-cheating and original authorship of documents.
* The application should be memory-efficient and computing resources should be used sparsely as possible.
* Users should be provided with the option to compare one source document and one evidence text, or one source document and a local corpus on the device.
* The user should be provided with the option to store feedback reports locally on their device or to a cloud service
* Deliver documentation of a high-quality standard that will allow future developers to easily maintain the application

A business case and feasibility study have been conducted to identify the level of viability of the project scope and goals. Should scope changes occur, meetings will be held and documented with the relevant stakeholders. Client satisfaction is part of the Scope Management. The development team will have to re-engineer the previous development team’s application to adhere to user requirements.

# **Deliverables**

The project team strives to provide stakeholders with the highest quality deliverables possible. This section will briefly discuss the deliverables that will be presented to stakeholders during the project lifecycle.

## Documentation Oriented Deliverables

This section offers a list of the project's major documentation deliverables.

|  |  |
| --- | --- |
| **Deliverable** | **Description** |
| Tender Response | This deliverable is a document that provides the necessary information as well as a satisfactory answer to the suggested tender inquiries and/or projects. |
| Feasibility Study | This deliverable is a report that details the viability of the suggested systems/solutions. Various characteristics of various systems and alternatives are examined in this document to identify their applicable strengths and shortcomings. The suggested systems are then evaluated to see if they are viable. |
| Business Case | This deliverable is a detailed and well-structured document that investigates and rationalises the reasons for launching a project. This deliverable is intended to capture both quantitative and non-quantifiable aspects of the proposed project. The project sponsor will choose the best alternative available. |
| Project Plan | This deliverable is a document that will serve as a guide for project execution and control. This deliverable's purpose is to outline the many methodologies and procedures that should be used to successfully and efficiently manage a project through its lifespan, with the end goal of producing appropriate project deliverables. |

## Secondary Documentation Deliverables

Throughout the project's life cycle, the project team will supply all pertinent project documents. This includes:

* The solution's acceptance in the corporate context, as well as how stakeholders and end-users perceive it.
* The solution's versatility. If any of the deliverables need to be improved or become a source of concern, they will be considered and altered as necessary.
* The documentation will reflect the communication channels that are maintained between stakeholders and the project team, as well as any last-minute preparations.
* Processes and procedures for development that will be used throughout the project's life cycle.
* The planned processes and activities will be implemented, and their progress will be documented on a regular basis.
* Any changes in finances or budget that occur during the project, as well as any areas where money was saved.
* Problems that may occur as a result of unanticipated events.
* Obtaining software packages and libraries that will be used in the creation of the software solution.
* Quality standards have been developed. These will be used to guarantee that the deliverables meet the required standards.
* The resources to be used in each phase, activity, and task.
* Risks that must be managed throughout the project's life cycle.
* If any unforeseen circumstances emerge, or if the project sponsor wishes to add more functionality to the deliverables, the schedule may be adjusted.

## Primary Deliverable

The goal of this project is to develop a software solution that will allow end-users to submit documents that will be analysed for plagiarism. In addition, the documents will be subjected to stylometric analysis in order to determine authorship, which will aid in plagiarism detection, and provide feedback on the authors writing ability. The development team at Nightcore Mech aims to satisfy all the business needs established by Zander Janse van Rensburg as much as possible. The solution will greatly reduce the time needed to identify plagiarism as well as provide the University with the ability to help improve the writing ability of its students. The solution aims to utilise APIs to reduce development time, no other secondary applications will be required to use the software. The final solution will be a web-based application in order to allow users to utilise the solution at any place. The solution will only be available to users with the correct authorisation.

## Secondary Deliverables

This section offers a list of deliverables aimed at assisting people in using the project's primary software deliverables properly.

### **User Manuals**

The project team will create a well-rounded user manual that gives step-by-step instructions on how to use the software solution correctly and efficiently. It will include steps to install and operate the solution. It will also include questions that were asked during prototype sessions and questions that the team thinks will be asked by end users.

### **User Training**

The project team will provide training to end users should the need arise.

## Stakeholders

|  |  |  |  |
| --- | --- | --- | --- |
| **Stakeholders** | **Might** | **Interest** | **Concerns** |
| Zander Janse van Rensburg | High | High | * The project lifecycle must be completed within the proposed budget * The project lifecycle will need to be finished within the scheduled time period * The resulting system should cohere to the agreed-upon scope * The resulting system’s results should be accurate * The project deliverables must adhere to the applicable laws |
| Neels Kruger | Medium | High | * Documentation should adequately cover the entire project lifecycle * Utilise frameworks such as Prince and COBIT |
| North-West University: Registrar | Medium | Medium | * The project must be kept confidential * The university should not gain any negative publicity |
| End-Users | Medium | High | * The end-users need to be satisfied with the final deliverable in terms of ease of use and interface design |

# **Critical Success Factors**

The success of a project is determined by several things. The project will be doomed if the team fails to adhere to any one of these factors. The following list attempts to include all essential success criteria.

|  |  |
| --- | --- |
| **Critical success factor** | **Description** |
| Budget | The project budget should be less than the planned budget for the project to be successful. |
| Schedule | The project team should strive to finish the project on time. |
| Stakeholder satisfaction | The end product must satisfy the stakeholder. This can only happen when the project team and the stakeholder interact regularly. |
| Stakeholder time constraints | The project is finished according to the stakeholder's specified timeline. |
| Scope | The project's specified scope should not be modified unless the stakeholder is consulted. |
| Deliverable is on time | The client receives the final version of the deliverable on time. |
| Deliverable quality | The client should be pleased with the project’s quality. |
| Quality standards | The final product's quality is on par with the predetermined quality. |
| Minimum performance specification | The product can run on the client's devices, or it can run with minimal requirements if the client's devices aren't specified. |
| End-user satisfaction | The end-user must use the deliverable and be satisfied with the way it performs. |
| Stakeholder accepts schedule changes | A new schedule must be produced and presented to the stakeholder if any schedule modifications would affect the delivery of the final product. The revised schedule must coincide with the plans of the stakeholders for them to accept it. |
| Stakeholder accepts budget changes | If the budget changes, the stakeholders must be informed, and the team and stakeholders must agree on the new budget. |
| Environment disruptions | To avoid external influence on the project, the working environment must be safe and secure. Precautions should be taken to guarantee that there are no internal interruptions. |
| Major risks do not occur | To avoid big threats from occurring, the environment is adequately safeguarded. |
| Major risks are mitigated | Risks are identified and avoided before they occur. |
| Major risks are well managed | When severe risks do arise, they are carefully addressed and controlled to ensure that they do not jeopardise the project's vital components, such as the team or the devices on which the project is stored. |

# **Risk Plan**

Only a broad range of potential risks will be considered. Because it is impossible to establish a risk strategy for every potential project risk, only the risks that influence the important success elements will be included. The following table assumes the likelihood and impact of the hazards. Because of the nature of the problem, determining the probability and effect of the following risks is extremely challenging, as they may differ for each project. The ratings are on a scale from 1 to 10, with 1 being the lowest and 10 the highest.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Risk description** | **Probability (1-10)** | **Impact (1-10)** | **Priority (1-10)** | **Triggers** | **Response plan** |
| Overspending | 4 | 10 | 10 | Budget items are more expensive than anticipated. | Follow the budget precisely to avoid unnecessary spending. |
| Behind schedule or schedule changes | 7 | 10 | 10 | The project work takes longer than expected or there are changes to the schedule. | Ask the stakeholder for an extended due date. |
| Stakeholder is unsatisfied | 3 | 8 | 9 | The stakeholder is unsatisfied with the deliverable. | Have regular meetings with the stakeholder to receive feedback. |
| Scope creeping | 5 | 7 | 6 | The project scope is changed or increased. | Any changes to the scope should be approved by every team member and stakeholder before they can be implemented. |
| End-user is not satisfied | 3 | 8 | 5 | The end-user is unsatisfied with the deliverable and refuses to use it. | Provide training sessions and a user manual for the end-user. Take note of any feedback the end-user has to improve on the deliverable. |
| Budget changes | 2 | 10 | 4 | The stakeholder changes the budget. | Working with a modular plan will ensure that the budget plans do not interfere with the work that has already been completed. |
| Safety risks | 1 | 4 | 4 | The working environment is hazardous, and accidents might occur, disrupting the schedule. | Check the workplace for any potential health and safety hazards. |
| Bad quality control | 3 | 9 | 8 | The project quality is not monitored during the development of the project. | Do regular quality tests. |
| Bad relationship with the stakeholder | 4 | 6 | 7 | The stakeholder is unsatisfied with the project team, which could mean they are unsatisfied with the deliverable. | Communicate with the stakeholder frequently and attempt to keep them satisfied. |
| External environment: COVID-19 | 4 | 8 | 7 | The South African government introduces new lockdown regulations. A team member is affected by the virus and has to quarantine. | Have measurements in place to hold meetings online, as well as regular communication online to make sure everyone stays informed and up to date with the project. The team should also make use of source control tools, such as Github, to make sure every team member has the most recent version of the software solution and can easily add to it. |

# **Project Plan Gantt Chart**

Chart

Description automatically generated

# **Quality Plan**

# **Financial Plan**

Costs involved in providing the deliverables and managing the project.

## Labour

|  |  |  |
| --- | --- | --- |
| **Name** | **Roles** | **Cost per Hour** |
| Ricus Warmenhoven | Project Manager | R720.00 |
| Hanno Visagie | Project Leader/CTO | R910.98 |
| Hano Strydom | Prototype Lead/Frontend | R758.00 |
| Llewellyn Anthony | Development Lead/Fullstack | R800.40 |
| Michael Rosin | Backend Developer | R1 032.60 |
| Annika du Toit | SQL Developer | R652.00 |
| Shené Boshoff | Cloud Manager/Backend | R1 117.00 |

## Equipment

The development team possess all the necessary hardware and network infrastructure to design and develop the application. There might be additional costs to implement APIs and hosting the web application.

## Schedule

Table

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## Assumptions

The calculations for the Earn Value Management (EVM) technique are based on the assumption that tasks are completed at a consistent rate.

## Financial Processes

An EVM technique is used to properly monitor and control the cost of the project in order to keep it within budget. This method enables project managers to track a project's actual performance. The EVM method gives a snapshot of the project's performance, allowing managers to identify irregularities and take remedial action.

Mathematical equations are utilized by the EMV method to determine a project's true performance. By determining the actual performance of a project, a management can determine whether or not a project is within budget. The EMV extends to the forecasting technique, which is also being implemented by Nightcore Mech. Techniques for forecasting determine the future performance of a project. When these two methods are used, managers can identify existing and prospective deviations.

The EMV Method follows the procedure outlined below. In the computations, the start and finish dates and the budget play a crucial role. The planned worth is established (describes the estimated amount of work that supposed to have been done, expressed in Rand terms), the earned value is calculated (describes the actual amount of work that has been done, also expressed in Rand terms). The calculated planned and actual values are then utilized to compute the schedule and cost variance.

Negative values for the cost schedule and cost variance indicate that the project is behind time and over budget. By determining the schedule and cost variation, managers are able to effectively monitor and control the cost of a project, as they can promptly spot deviations and implement corrective actions.

## Activities

* Implement a formal IT budget, including all expected IT costs of IT-enabled programs, services and assets.
* When creating the budget, consider the following components: alignment with the business, as well as alignment with the sourcing strategy; authorized sources of funding; internal resource costs, including personnel, information assets and accommodations; third-party costs, including outsourcing contracts, consultants and service providers; capital and operational expenses; and cost elements that depends on the workload.
* Document the rationale to justify contingencies and review them regularly.
* Instruct process, service and program owners, as well as project and asset managers, to plan budgets.
* Review the budget plans and make decisions about budget allocations. Compile and adjust the budget based on changing enterprise needs and financial considerations.
* Record, maintain and communicate the current I&T budget, including committed expenditures and current expenditures, considering I&T projects recorded in the I&T-enabled investment portfolios and operation and maintenance of asset and service portfolios.
* Monitor the effectiveness of the different aspects of budgeting
* Use the monitoring results to implement improvements and ensure that future budgets are more accurate, reliable and cost-effective.
* Communicate important changes in the cost/chargeback model principles to key stakeholders and management of user departments.
* Obtain approval of key stakeholders and communicate the I&T costing model to the management of user departments.
* Establish time scales for the operation of the cost management process in line with budgeting and accounting requirements and timeline.
* Ensure that project does not deviate from planned baseline
* The project's cost performance will indicate whether the planned budget will be sufficient to complete the project. The project's schedule performance will indicate whether the planned schedule and dates can be met.
* Changes in a project must be implemented holistically. Because a minor change in one aspect of the project may have an impact on the entire project. An integrated change control evaluates the changes and their effects on the project. Then, to reduce the risk of changes, a proper change implementation is planned.
* Quality control activities inspect the delivered outputs for quality attributes. A project’s deliverables may meet its budget and timeline objectives. However, the quality requirements may not meet the expectations of the customers. In this case, the project will also be considered a failure. As a result, performing quality control is critical.
* Risks can have a significant impact on a project. As a result, each anticipated risk must be documented, and risk response strategies for each risk must be planned in the event that a risk occurs.

## Roles

|  |  |
| --- | --- |
| **Role** | **Responsibility** |
| Project Manager | * Ensure successful completion of project. * NB!!! Ensure the project is completed on time and on budget. * Ensure the project achieve its objectives. * Ensure that enough resources have been allocated to project. * Maintaining the relationships with team members and stakeholders. |
| Team Member | * Successfully complete their assigned deliverables. * Provide their expertise on different matters * Document the different processes * Work with other team members, to set up and meet the business needs * Contribute to the overall completion of the project objectives. |
| Project Sponsor | * NB!!! Approve the budget of the project. * Ensure that resources are available. * Carry out key business decisions regarding the project. |

## Documents

* Project management plan document – This document will go over how the project's costs will be structured, planned, and controlled.
* Cost forecasts – This document will keep track of costs and allow the manager to adjust them as circumstances change.
* Change requests – This document requests that something in a project be changed or adjusted.
* Progress Reporting – Determine whether or not the remaining activities in a project will be completed. This report will be distributed to stakeholders.

# **Procurement Plan**

## Procurement Requirements

## Requirements

## Market Research

## Schedule

## Assumptions

## Constraints

## Activities

## Roles

# **Resource Plan**

## Labour

## Equipment

## Assumptions

## Constraints

# **Communication Plan**

## Stakeholder List

## Stakeholder Requirements

## Assumptions

## Constraints

## Activities

## Roles

## Methods, Documents and Technology

# **Appendix C: Nightcore Mech Meeting Minutes**

|  |  |
| --- | --- |
| Program/Area: | SimiLabs Plagiarism and Stylometry Checker |
| Meeting Purpose: | Initiation Meeting |
| Meeting Date: | 2022/03/31 |
| Meeting Time: | 16:00 – 17:00 |
| Meeting Location: | Distributed Virtual Meeting |
| Meeting Facilitator: | Ricus Warmenhoven  Zander Janse van Rensburg |
| Attendees: | Hanno Visagie  Hano Strydom  Michael Rosin  Llewellyn Anthony  Annika du Toit  Shené Boshoff |
| Minutes Issued By: | NightcoreMech |

| **Next Steps:** (Task, Assigned to, Checkpoint Date) | **Owner** | **Due Date** |
| --- | --- | --- |
| Development Team and Stakeholders introduction:  Similabs Plagiarism and Stylometry checker | Development Team  Ricus Warmenhoven  Zander Janse van Rensburg | 31 March 2022 |
| Initiation of Stakeholder Meeting times | Development Team  Ricus Warmenhoven  Zander Janse van Rensburg | 31 March 2022 |
| Initiation of Stakeholder Meeting venues | Ricus Warmenhoven | 31 March 2022 |
| Access to source code | Zander Janse van Rensburg | 31 March 2022 |
| Plagiarism checker resources | Zander Janse van Rensburg | 31 March 2022 |
| Initiation of Project Scope | Development Team  Zander Janse van Rensburg | 31 March 2022 |
| Meeting Minutes Closure | Development Team  Ricus Warmenhoven  Zander Janse van Rensburg | 31 March 2022 |

| **Decisions Made:** (What, Why, Impacts) |
| --- |
| 1. **Initiation of Project Scope:**    * Limit contract-cheating and academic misconduct on a tertiary level    * Design and develop an application that uses stylometry and provide feedback reports that can accurately identify contract-cheating and academic misconduct    * Text-comparisons and similarity will only be a minimal feature of the application (a plagiarism checker)    * Improve the workflow of the application    * Automate the process of identifying academic misconduct, and attempt to limit manual feedback report editing    * Identify what the client’s requirements are (main objectives) 2. **Initiation of Stakeholder Meeting times**    * The attendees decided on meeting Thursdays from 16:00 to 17:00, unless communicated otherwise in advance by the stakeholders. 3. **Initiation of Stakeholder Meeting venues**  * The attendees decided on meeting at the G4-G15 seminar room, NWU, Potchefstroom Campus  1. **Meeting Closure**  * All attendees agreed to the items discussed in the minutes. |

| **Discussion:** (Items/Knowledge Shared) |
| --- |
| **Stakeholder Meeting Venues:**   * Attendees decided on having physical meetings at the G4-G15 seminar room at the NWU, Potchefstroom Campus. Virtual meeting will only be held when communicated in advance by the stakeholders   **Stakeholder Meeting Times:**   * Thursday mornings was ruled out due to some attendees having Honours classes during that time. Ricus Warmenhoven and Prof. Neels Kruger also had other priorities during that time. Thursdays 14:00 to 15:00 was also ruled out, because the development team has ITRI671 class during that time.   **Access to source code:**   * Zander Janse van Rensburg provided login details to the application and Linode server. The development team needs to contact Mentje Gericke from the BMI school to access source code ([Mentje.Gericke@nwu.ac.za](mailto:Mentje.Gericke@nwu.ac.za)). Contact Robert Maxwell ([Robert.Maxwell@nwu.ac.za](mailto:Robert.Maxwell@nwu.ac.za)), the previous project leader of SimiLabs for access to source code.   **Plagiarism Checker resources:**   * Zander recommended the development team to have a look at the CopyLeaks API to understand how plagiarism checkers and the source code behind it works. The development team must submit a sample document and study the plagiarism detection levels. The development team must compare the results from CopyLeaks to Turnitin to determine the gaps between the respective plagiarism checkers, as to decide how a plagiarism checker’s functionalities ca be improved. The development team must have discussions with the lecturers on what the shortcomings are of Turnitin (the current plagiarism checker used by academic personnel at the NWU). Contact individuals/departments that have a lot of experience in forensic analysis and stylometry to successfully design and implement a plagiarism checker. Prof. Tiny du Toit, Prof. Neels Kruger and Mrs. Susan Campher are potential candidates for contributing expert knowledge to this project.   **Project Scope:**   * The main objective of this project is to allow lecturers to detect academic misconduct accurately, and if possible, provide forensic analysis on how students can improve their academic writing style. The application should enhance the process of detecting academic misconduct while also increasing the ROI for the NWU. The stakeholder/client (Zander Janse van Rensburg) experienced some difficulties with the current software as well as Turnitin. The client still has to compare texts manually a huge portion of the time when analyzing texts to determine the level og academic misconduct. Turnitin doesn’t currently allow for authorship attribution functionalities, and the current software’s (SimiLabs) stylometry features also happens to be buggy. Finding large enough repositories (corpora) that allows one to detect academic misconduct accurately is also one of the main issues of this project. Existing plagiarism checkers highlight different similarities, and as a result detects different levels of plagiarism. Zander also mentioned that a huge issue is when one excludes a similarity, one cannot include the similarity within the source text again to check how many times it occurs within the source text. Thus, the document must be re-uploaded to revise those similarities. The client also has issues with the feedback reports generated by the software. The client must copy and paste text to revise similarities as well as needing to open Turnitin and the current software in separate windows. The client also needs to manually highlight text on the feedback reports to identify similarities in the source text. One of the objectives of this project is to build an open-source plagiarism checker that the NWU can invest in, instead of the Registrar wasting funds on foreign/outsourced plagiarism checkers to detect academic misconduct of students. The project also places emphasis on identifying risks/computing power/gaps with plagiarism checkers currently used in the industry. What will the implications be of hosting this application? How much server overhead will be used to put this application into production? What is the memory/computing constraints regarding forensic analysis? More importantly: how can these issues be resolved? The data transfer rates of the current SimiLabs/plagiarism checkers are also a bit problematic. The application should thus aim to provide the analysis in the form of feedback reports, while using minimum overhead and at the fastest rate possible. The long-term goal (not part of this scope) is to provide the NWU with domestic forensic analysis software, and to make the software scalable. The medium-term goal is to allow lecturers to conduct investigations on academic misconduct via using the SimiLabs software. Use CopyLeaks API to test how to build plagiarism checkers. Zander offered to provide some funding for tools or APIs the development team needs to use to design and develop the application, given that it is an absolute necessity for the success of the project. The project manager (Ricus Warmenhoven) suggested that the development team shouldn’t rebuild the application from scratch, as there is a lot of time constraints involved. He also recommended that the development team shouldn’t attempt to design and develop a database to persist application data, as it would complicate the designing process of the application. The functional and technical specifications of the application will be discussed at a later stage with the client. Ricus suggested that the development start to design and build the application (prototypes) as soon as possible to overcome time constraints and development issues. The development team should contemplate whether it is preferable to design a plagiarism checker, which is frequently used at tertiary instantiations, or a forensic tool to assist lecturers at universities to identify academic misconduct. Should the focus of this project be on text comparisons/similarities or stylometry and forensic functionalities? The client was concerned that the development team would need to conduct a lot of research to grasp the functioning and implementation of stylometry. The client suggested that the team should rather focus on designing a small corpus and use last-mentioned to conduct forensic analysis to detect academic misconduct via comparing to texts. Text similarity and comparisons should be regarded as a minimum functionality of the application. The accuracy of the feedback reports is extremely important, as it forms the backbone of the evidence investigators provide as to why they made a claim that a student committed plagiarism. The client wants a web-based application to prevent users from having to install different versions of software. Fixing the workflow of the current application is a top priority. The development team should research stylometry and how to implement it within a software environment. The project must assist in combatting contract-cheating and academic misconduct.   **PARKING LOT**: *[Describe any items that may have been deferred for a later discussion]*   1. Contact Mentje Gericke from the BMI School for project resources 2. Contact Robert Maxwell (former project leader) for access to source code 3. Compiling SOPS documentation for the NWU Registrar |

| **Miscellaneous Items:** |
| --- |
| N/A |

| **Items for next minute:** |
| --- |
| Finding project resources   * Contact Mentje Gericke from the BMI School for project resources ([Mentje.Gericke@nwu.ac.za](mailto:Mentje.Gericke@nwu.ac.za)) * Contact Robert Maxwell ([Robert.Maxwell@nwu.ac.za](mailto:Robert.Maxwell@nwu.ac.za)) for access to source code. * Compiling SOPS documentation for the NWU Registrar |

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| --- | --- |
| Program/Area: | SimiLabs Plagiarism and Stylometry Checker |
| Meeting Purpose: | Stylometry Meeting Patrick Juola |
| Meeting Date: | 2022/05/25 |
| Meeting Time: | 14:30 – 16:30 |
| Meeting Location: | G4-G15, Potchefstroom Campus, NWU |
| Meeting Facilitator: | Ricus Warmenhoven  Zander Janse van Rensburg |
| Attendees: | Patrick Juola  Hanno Visagie  Hano Strydom  Michael Rosin  Llewellyn Anthony  Annika du Toit  Shené Boshoff |
| Minutes Issued By: | NightcoreMech |

| **Next Steps:** (Task, Assigned to, Checkpoint Date) | **Owner** | **Due Date** |
| --- | --- | --- |
| Meeting Minutes Initiation | Development Team  Ricus Warmenhoven  Zander Janse van Rensburg | 25 May 2022 |
| Development Team Introduction | Development Team | 25 May 2022 |
| Introduction: Stylometry (knowledge on topic): How Stylometry works | Patrick Juola  Llewellyn Anthony | 25 May 2022 |
| COSC 495 (SPTPC: Authorship Attribution) module discussion and material | Hanno Visagie  Patrick Juola | 25 May 2022 |
| Corpora retrieval discussion (preferable to design a database or use a Corpus API) | Hanno Visagie  Patrick Juola | 25 May 2022 |
| Efficient/Effective APIs for implementing Stylometry in Python | Hanno Visagie  Patrick Juola | 25 May 2022 |
| Cross Entropy | Hanno Visagie  Patrick Juola | 25 May 2022 |
| Stylometric Clustering tools: How to implement and data visualization | Hanno Visagie  Patrick Juola | 25 May 2022 |
| Feedback Reports content (essential information that should be displayed on the reports) | Hanno Visagie  Patrick Juola | 25 May 2022 |
| Patrick Article Discussion (Authorship Attribution Using Stylometry and Machine Learning Techniques) | Hanno Visagie  Patrick Juola | 25 May 2022 |
| Parallel Computing for improving application performance | Patrick Juola  Llewellyn Anthony | 25 May 2022 |
| Document Noise Removal | Hano Strydom  Patrick Juola | 25 May 2022 |
| Meeting Minutes Closure | Development Team  Ricus Warmenhoven  Zander Janse van Rensburg | 25 May 2022 |

| **Decisions Made:** (What, Why, Impacts) |
| --- |
| 1. **Stylometry**    * The application will have to be re-engineered to implement the stylometry functionalities.    * Decrease memory overhead of the current application 2. **Corpora retrieval discussion (DB design or Corpus API)**    * The team will not design a database and instead make use of local corpora 3. **Efficient/Effective API implementation for Stylometry in Python**  * The GUI will be simple and user-friendly * The development team will use NumPy and SciPy for the statistical analysis within the application * The application will be developed in Python and relevant libraries will be chosen to provide stylometry functionalities * Text similarity and comparisons will be a minimal feature of the application  1. **Stylometric Clustering tools: Data Visualization**  * The team will make use of the Binongo-Analysis to visualize stylometry data * The team must decide on performance metrics for identifying contract-cheating  1. **Content on Feedback Reports**  * The feedback on reports must be based onperformance metrics for identifying contract-cheating  1. **Cross entropy**  * The team could potentially make use of cross entropy to identify the variance in writing styles between authors to identify contract-cheating  1. **Machine Learning and Algorithms**  * The team will make use of ML techniques and algorithms such as the n-KK and SMO algorithms to detect contract-cheating. Deep Learning will not be implemented in this application.  1. **Parallel computing for improving software performance**  * The team will refrain from using parallel computing as it can become very costly. The team will attempt to write efficient algorithms that are memory efficient.  1. **Meeting Closure**  * All attendees agreed to the items on the minutes and the outcomes thereof |

| **Discussion:** (Items/Knowledge Shared) |
| --- |
| **Stylometry**   * The development team and Patrick introduced themselves. Patrick gave a quick overview on Stylometry: the inner workings and functions thereof. * Stylometry is the statistical examination of discrepancies in literary styles between authors or literary genres. Stylometry is often used in literary studies, historical studies, social studies, information retrieval and a variety of forensic cases and studies. * Stylometry is applicable to implement in this project, as it is a useful tool that can be utilized to detect contract-cheating and academic misconduct on a tertiary level. It can also be applied in computer code and intrinsic plagiarism detection, which detects plagiarism based on changes in writing style within a document.   **COSC 495 (SPTPC: Authorship Attribution) module discussion and material**   * The development team attempted to inquire whether there are resources or textbooks they can acquire on Patrick’s COSC 495 module, to assist them with designing and developing the forensic application. Patrick mentioned that unfortunately he had no resources that the team could use to assist them with the development process.   **Corpora retrieval discussion (preferable to design a database or use a Corpus API)**   * Patrick suggested that the team should develop the application with tools and programming languages that the team are most comfortable with. There appears to be no best practice when designing and developing this application. The team should adopt a similar outlook when comparing documents to detecting contract-cheating. Keeping the size of the corpus as small and the design as simple as possible would be a preferable principle to keep in mind. Patrick proposed that the stylometry application should be developed in Python, since it is a remarkably simple language to learn as well as having numerous statistical and stylometry libraries. Patrick also mentioned that the NLTK Python library was extremely useful for natural language processing functionalities, as well as providing integrated interfaces to most databases. Patrick recommended that the team should not design a database since most of the databases used in forensic cases tends to be exceedingly small, and thus it would be a waste of time and resources to design and build one.   **Efficient/Effective APIs for implementing Stylometry in Python**   * The team should design a basic forensic application that can assist in the process to detect contract-cheating. The application should automate the detection process without an investigator needing to compare text and documents manually. Text comparisons and similarities should be evident immediately and highlighted. Patrick suggested that the team use <https://jalammar.github.io/illustrated-word2vec/> to detect similarities in texts, via making use of vectors. Words with similar meanings would be grouped into the same vector. Zander asked Patrick whether he thought that it would be possible to develop software that detects contract-cheating via the use of basic stylometry packages. * Patrick responded that it is easy to develop an application that compares two documents for text similarity, however, it becomes more complicated to design and develop an application that uses an enormous corpus to detect contract-cheating. Patrick mentioned that an application that uses ten or eleven documents from a corpus to detect text similarity on a single source document would be designed and developed in the same way that comparing only one source and comparison text to each other would be. * Zander mentioned some critiques against Turnitin and why the current software did not fulfil the user requirements. The current Turnitin stylometry functionality is not open-source yet and Zander plans on eventually making the application scalable and managing larger document corpora to improve the accuracy of detecting contract-cheating. * Patrick once again mentioned that the NLTK Python library was a particularly useful tool to use as the primary natural language processor. * NumPy would be the most preferable Python library for doing statistics * SciPy is another useful Python library for mathematics, science, and engineering * Patrick recommended that the development team can use any frontend/GUI technologies that they are comfortable with * The user interface will be standard but intuitive * Patrick suggested that the team design the application to handle a batch mode (a large number of documents should be sent simultaneously instead of a user having to drag and drop each document when trying to upload files) * Patrick notified the team that digital signatures was not a necessary construct within the application to identify documents.   **Cross Entropy**   * Patrick gave a quick overview on Cross entropy. Cross entropy can be characterized as the difference between two probability distributions for a given random variable or set of events. Lower probability events have more information, higher probability events have less information. An event is more surprising the less likely it is to occur, thus lower probability events are surprising, while highly probable events are unsurprising. Because probable events tend to dominate, a skewed probability distribution has less surprise and therefore a low entropy. Events can also be equally likely to occur, thus balanced distributions are more surprising and, as a result, have higher entropy. Cross entropy can be used to predict the probability that an event is going to occur, in comparison to another probability or outcome. Cross entropy can be used to measure and quantify points where two languages or dialects of a language may vary. Cross entropy can thus also be extremely useful in authorship attribution, as it can indicate the differences between two author’s writing styles via the use of probabilities and calculation of entropy. Therefore, stylometry can be used to detect individual differences as well as differences within a populace (age groups, gender, professions, nationalities, education levels etc.).   **Stylometric Clustering tools: How to implement and data visualization**   * Patrick provided one useful resource the team can use to study stylometry: <http://dh.obdurodon.org/Binongo-Chance.pdf>. One can determine authorship attribution by plotting coordinates on a graph, each author’s coordinates having an assorted colour. The x-axis separates the coordinates of the two authors, and their coordinates are clustered together in groups. The first PC clearly distinguishes between the two authors. The second PC lacks additional authorship information. Essentially, this is what the development team should try to develop: to provide clusters of coordinates on a graph as feedback/analysis which can be used to identify contract-cheating via authorship attribution. Patrick explored the number of occurrences of each of the words used in the texts (from Baum and Thompson respectively) using a computer program. The words with the highest frequency of occurrence were chosen. Pronouns, auxiliary verbs, prepositions, conjunctions, determiners, and degree adverbs are examples of function words used in those texts. These parts of speech serve a grammatical rather than a lexical purpose. The books were assigned equal weight after calculating the average rate of occurrence of each word. In a corpus of over a million words, the words at the top of the frequency spectrum were the least context dependent. The words were grouped into a list and their average rate of occurrence within the texts were displayed in parentheses. Auxiliary verbs were conspicuously absent from the list: they are difficult to manage because one root could take more than one derivational suffix.   Personal pronouns were also absent: even a larger variety were present based on case, number, person, and gender. Another reason for their exclusion is that the characters' sex could skew the outcome.  **Feedback Reports content (essential information that should be displayed on the reports)**   * The development team should measure a set of features via using the Binongo-Analysis. The team can compile a list of key words that appears in a document and the average rate of occurrence of each key word. * Based on theaverage rate of occurrence of each key word, the team can assign colours to each level of rate of occurrence, which can determine the significance of the key word occurring in the document (red can for example be used to indicate a higher level of occurrence within a document). * Patrick suggested that the team can use any type of performance metric or grammar class to detect contract-cheating.   **Patrick Article Discussion (Authorship Attribution Using Stylometry and Machine Learning Techniques)**   * Patrick suggested that the team can use ML to detect variations in writing styles between authors, he did mention that the team might experience some difficulties in detecting contract-cheating if the corpus exists of documents that are not relevant by subject. Patrick placed an emphasis on overall similarity as an individual, instead of detecting similarities by group or populace. Patrick made it noticeably clear that the team had to be aware of user requirements and what the software is supposed to do. Therefore, the user input is extremely important to take note of, as it can influence the accuracy of the feedback reports generated by the software. The functionalities of the program should be clearly defined and adhered to. Patrick also hinted that the feedback reports does not have to necessarily indicate who wrote the source text by name, but whether the person who claimed the source text is theirs IS actually the original author. * Patrick discussed an article with the team, Authorship Attribution Using Stylometry and Machine Learning Techniques, written by Hoshiladevi Ramnial, Shireen Panchoo and Sameerchand Pudaruth. Link to the article: [Stylometry and ML](https://d1wqtxts1xzle7.cloudfront.net/54261431/2016_Authorship_Attribution_using_Stylometry_and_Machine_Learning_Techniques-with-cover-page-v2.pdf?Expires=1653836164&Signature=Chvhv7bFb-HbNU1erQ3qvLbsp8bb~9vMUNP6PAIj3T724hTSljPxE2hPEahB3dqCoGRbVWBI8~WGmYMtcwiE7FAZwDFgUIZJF0phVWaadFNXLXi~PQR4Aqw3-SxRdOc11CEN1K~nGxeA5jok3KfQD8JMxORN~nelf-fBk23ppnRTCzQ76wLf~xNE1CkDEIpOesZicdes5783FDCGV~hVuTvSbgENY9Okn~~ljDiw8Jl0Svrirsc5kOjQP4um47MWaH2jhfzxr1CoXIChEoc7zvg8inYPNlZzDs7wCORdJSa8G-nWcTgEJAWMdunk~F13uTC5t-YhgVz2AbQGzl9Pbw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA) * Patrick referred to Figure 1: System Architecture of the Authorship Attribution System and Plagiarism Detection using Stylometry (Ramnial *et al.*, 2016) * Patrick suggested that the team implement ML techniques within the application by using the Figure as a guideline. Pre-processing, feature extraction, and prediction using machine learning classifiers are the three main stages. Each phase includes a number of procedures. * The development team should communicate with the client (Zander) about the features of the application and what he wants the feedback reports to display. * Zander asked Patrick what his thoughts was regarding extracting the metadata from documents to identify contract cheating. Patrick replied that one can refer to Figure 1 from the article, instead having a Metadata analyzer instead of a text analyzer. One can use this functionality to determine what time zones a document was modified in. One can essentially use metadata from time zones to identify whether an author committed contract-cheating: if an author submitted a document within a specific time zone, but the document was modified in a different time zone, this can be a strong indicator of plagiarism. * Metadata such as software versions and the operating systems of devices a document was edited on can also be clear indicators whether contract-cheating occurred. * Metadata differences can thus be used as a set of indicators (features) to detect plagiarism. * Patrick suggested that the Team use k-NN and SMO algorithms to identify authorship attribution. The algorithms are very lightweight and does not consume a lot of memory. * Useful site to read on how to extract document metadata: <https://docs.groupdocs.com/parser/net/extract-text-from-microsoft-office-word-documents/> * Patrick recommended that the team should refrain from using Deep Learning, as it can become incredibly slow and expensive.   **Parallel Computing for improving application performance**   * Patrick suggested that the team should not make use of parallel computing and the HADOOP framework in order to distribute computing time of the application, since one will need more devices in order to parallel compute, which could have cost constraints. Patrick mentioned that writing a data algorithm that processes the data more efficiently might actually solve the problem of memory overhead better than parallel computing. * Patrick also mentioned that memory overhead issues might actually be fixed if one throw some funds in for accessing more computing power (a thoughtful suggestion). * Patrick suggested that the team use Figure 1 from [Stylometry and ML](https://d1wqtxts1xzle7.cloudfront.net/54261431/2016_Authorship_Attribution_using_Stylometry_and_Machine_Learning_Techniques-with-cover-page-v2.pdf?Expires=1653836164&Signature=Chvhv7bFb-HbNU1erQ3qvLbsp8bb~9vMUNP6PAIj3T724hTSljPxE2hPEahB3dqCoGRbVWBI8~WGmYMtcwiE7FAZwDFgUIZJF0phVWaadFNXLXi~PQR4Aqw3-SxRdOc11CEN1K~nGxeA5jok3KfQD8JMxORN~nelf-fBk23ppnRTCzQ76wLf~xNE1CkDEIpOesZicdes5783FDCGV~hVuTvSbgENY9Okn~~ljDiw8Jl0Svrirsc5kOjQP4um47MWaH2jhfzxr1CoXIChEoc7zvg8inYPNlZzDs7wCORdJSa8G-nWcTgEJAWMdunk~F13uTC5t-YhgVz2AbQGzl9Pbw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA) article as a guideline, because it is a lightweight analysis, one only needs to store fifteen pieces of information per document, thus the memory footprint is tiny   **Document Noise Removal**   * Patrick responded that document noise removal might not actually improve the performance of the application. Patrick recommended to refrain from removing citations from documents, as this is an incredibly useful feature to identify plagiarism. * For instance, if one can detect that sources within a document have been referenced by two different referencing styles such as APA and Harvard, it can be a good indication that plagiarism was commited.   **PARKING LOT**: *[Describe any items that may have been deferred for a later discussion]*   1. Project Demo 2. Future Meetings with Patrick Juola 3. Research document noice |
|  |

| **Miscellaneous Items:** |
| --- |
| * Team needs to improve organizational and communication skills * Communicate Agenda items and meeting questions to client in advance |

| **Items for next minute:** |
| --- |
| Project Demo   * Discussion of the project: GUI and data flows * User requirements from client * Feedback reports   Future Meetings with Patrick Juola   * Patrick informed the team that he would be happy to meet again when the team have made further progress and can provide a physical prototype with some basic stylometry functionalities   Discuss document noice |

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| Program/Area: | SimiLabs Plagiarism and Stylometry Checker |
| Meeting Purpose: | Project Demo: User Requirements Meeting |
| Meeting Date: | 2022/05/26 |
| Meeting Time: | 13:00 – 15:00 |
| Meeting Location: | E8-G44, Potchefstroom Campus, NWU |
| Meeting Facilitator: | Prof. Neels Kruger  Ricus Warmenhoven  Zander Janse van Rensburg |
| Attendees: | Hanno Visagie  Hano Strydom  Michael Rosin  Llewellyn Anthony  Annika du Toit |
| Minutes Issued By: | NightcoreMech |

| **Next Steps:** (Task, Assigned to, Checkpoint Date) | **Owner** | **Due Date** |
| --- | --- | --- |
| Meeting Minutes Initiation | Prof. Neels Kruger  Development Team  Ricus Warmenhoven  Zander Janse van Rensburg | 26 May 2022 |
| Application GUI | Hanno Visagie | 26 May 2022 |
| User requirements: Zander Janse van Rensburg | Zander Janse van Rensburg | 26 May 2022 |
| Document Metadata | Zander Janse van Rensburg | 26 May 2022 |
| Performance metrics of application | Zander Janse van Rensburg | 26 May 2022 |
| Feedback Reports | Zander Janse van Rensburg | 26 May 2022 |
| Application Data Flows | Hanno Visagie | 26 May 2022 |
| Application Prototype | Development Team | 28 July – 4 August 2022 |
| Meeting Minutes Closure | Prof. Neels Kruger  Development Team  Ricus Warmenhoven  Zander Janse van Rensburg | 26 May 2022 |

| **Decisions Made:** (What, Why, Impacts) |
| --- |
| 1. **Application GUI**    * The client had no issues with the GUI presentation, so the team will stick to the current GUI layout unless the design needs to change. 2. **User requirements and Application functionalities**  * A web-based application must be developed with Python that implements stylometry to assist the process of authorship attribution. * The process of generating feedback reports must be automated, and the statistics/charts/graphs generated by stylometric functions must be indicated on the feedback reports to support evidence of contract-cheating. * Development team must create a corpus that can be compared against the source texts * The client should be able to view documents side-by-side without the need to open documents manually or via opening new windows * The development team must carefully decide on the performance metrics and metadata that is going to be used to contribute to authorship attribution * The team will make use of machine learning algorithms to detect authorship and generate feedback reports. * The team should attempt to split the corpus into smaller parts to improve application performance and memory consumption (1000 words per section)  1. **Document Metadata**    * The development team will make use of document metadata as an additional performance metric to identify the true authors of a document. 2. **Performance metrics**    * Words, Characters, and Punctuation    * Document metadata    * Binongo-Analysis and clustering    * Distance between clusters (Burrows’ Delta)    * Document revisions    * Abovementioned metrics will be used to determine stylometry features 3. **Feedback Reports**    * Feedback report contents will be based on the performance metrics, indicating whether an author submitted an original text. The feedback reports will contain graphs/charts with a legend. The accuracy of the reports is essential, as it forms the backbone of evidence against students accused of plagiarism. 4. **Application Data Flows**    * The team will build the application as indicated in their data flow diagrams presented, the client had no objections. The team will adapt the data flows as necessary 5. **Application Prototype**    * A functional prototype will be delivered to the client between the 28th of July to 4th of August. 6. **Meeting Closure**  * All attendees agreed to the items on the minute and the outcomes thereof |

| **Discussion:** (Items/Knowledge Shared) |
| --- |
| **Application GUI**   * **Login Screen –** a basic login form. Contains textboxes at the center of the screen allowing users to enter their username and password. If the credentials are valid, the user can navigate to the Home screen. The user will be prompted to enter valid credentials until the username or password is correct. * **Home Screen –** contains a menu/navigation bar at the top of the screen, with buttons that allows the user to navigate back to Home, text comparisons, stylometry analysis, feedback reports and finally a logout button. The center of the screen contains a shortcut list of the most recently accessed/uploaded documents. * **Text Comparisons –** contains the menu/navigation bar at the top, with two buttons below that allows the user to either perform a quick or extensive text comparison. Quick comparisons contain a basic file upload form on the center of the screen: a textbox and button for navigating to the source text as well as a textbox and button for navigating to the comparison text. Once the user selected both documents for comparison, they can click on the submit button and the analysis will start. A new window will open that compares the source and comparison document side-by-side.   At the top of the screen there is a navigation bar with buttons that allows the user to navigate back to home or generate a feedback report. Users will have the option to upload the source document to a cloud service or locally onto their device.  Extensive comparisons contain more or less the same layout: a form on the center of the screen, with a textbox and button for navigating to a corpus/corpora (which contains a list of documents that will be used opposed to the source text to identify contract-cheating) as well as a textbox and button for navigating to the source text. Once the user selected both options for comparison, they can click on the submit button and the analysis will start. A new window will open that displays the source document with a form to the right-hand side that lists all the sources from the corpus/corpora that contains text similarities.  Similar to the Quick Analysis, at the top of the screen there is a navigation bar with buttons that allows the user to navigate back to home or generate a feedback report. Users will also have the option to upload the source document to a cloud service or locally onto their device.   * **Stylometry Analysis –** contains a menu/navigation bar at the top of the screen, with a textbox and button for navigating to a corpus/corpora that will be used to identify authorship attribution as well as a textbox and button for navigating to the source text. Once the user selected both options, they can click on the submit button, the analysis will start and display a new screen. The screen contains a result that indicates whether the source document is indeed original property of the author. The screen will also contain forms at the bottom of the screen that indicates the student’s performance, the analysis as to why the author is not the original owner and a chart containing clustered coordinates that supports the evidence from the analysis feedback. The user will have an option to upload the source document to a cloud service or store the document locally on their device. * **Reports –** contains a menu/navigation bar at the top of the screen, with buttons that allows the user to navigate back to Home, text comparisons, stylometry analysis, feedback reports and finally a logout button. The final feedback report will be displayed on this screen.   **User requirements and Application functionalities**   * The process of identifying academic misconduct committed by a student/contract-cheating is as follow: The client receives the alleged plagiarized documentation from the Registrar or SJS, the client uses a plagiarism checker such as Turnitin to check for text similarities between dissimilar sources. Turnitin does apparently possess some stylometric functionalities, these however are not open-source, and data cannot be accessed via third-party applications without the required licensing or permissions from Turnitin. Finally, the client must generate reports based on the text similarities. * The process of generating the reports is currently laborious and involves a lot of copying and pasting from source documents and the compared documents from which Turnitin detected text similarities. The client must manually highlight text similarities in the feedback reports, and document spacing can also become problematic at times. * Currently there does not exist a corpus of documents which can be used to compare against the source documents for text similarities and plagiarism. Thus, the accuracy of the plagiarism levels identified by this process is questionable, and sometimes the client lacks proof of plagiarism since there is currently few to no released software that provides stylometric functionalities (without licensing at appalling prices that is). * The client wants the development team to design and develop an application that implements stylometric functionalities to increase the accuracy of detected plagiarism levels/authorship attribution. The client wants the application to be able to generate feedback reports that indicates the statistics and charts/graphs generated from the stylometric functions to support the evidence of contract-cheating by a party. The client should be able to compare documents side-by-side without the need to open new windows to compare documents. * The generation of the feedback reports must be automated, and the investigation process must become streamlined as a result. In order to identify the authorship of a document, the client suggested that the team should have a look at document metadata, stylometric performance metrics as well as machine learning algorithms, since these key concepts can assist one in identifying contract-cheating. In order to compare documents, the client suggested that it is not necessary to design and create a database, the development team can create a small corpus (local folder on a device) containing ten to eleven documents that can be compared to the source text.   **Document Metadata**   * Metadata is organized reference data that helps to sort and identify attributes of the information it represents. The data included in metadata can be utilized to create timelines, establish explanations, and even more. Metadata, in the hands of a trained digital forensics experts, might give light on a specific issue in a case or perhaps constitute a case's turning point. This is crucial data that can be used to identify contract-cheating. However, metadata on its own, like any other piece of digital evidence, is rarely sufficient to justify a point. Almost all digital evidence necessitates some form of corroboration using a combination of electronic and non-electronic evidence. Without adequately constructing a foundation for that evidence, relying on a single piece of electronic evidence can result in misunderstandings or misinterpretations. Whish is why the development team needs to identify performance metrics of stylometry. Document metadata includes information about the authorship, editing time, and even the computer on which the document was modified, that is stored within a document. Typical metadata of a document includes, but is not limited to: file name, title, author, app name (software document was edited on), version of the software, date created, last printed and saved. Others include the total editing time, person the document was last saved by, word, page and page counts, file path, date the document was created and last edited, date the document was last accessed, file size, document hash etc. One can speculate from these metadata why it can be useful to identify contract-cheating by detecting discrepancies between different document versions. More on document metadata: [MetaData.](../ARTICLES/ADDITIONAL/Chapter-27---Metadata_2012_Digital-Forensics-for-Legal-Professionals.pdf)   **Feedback Reports**   * The client mentioned that the report-generation process is currently time-consuming and includes a lot of copying and pasting from source documents and other documents where Turnitin discovered text similarities. In the feedback reports, the customer must manually mark language similarities, and document spacing can be troublesome to fix at times. The generation of feedback reports must be automated, and as a result, the investigation procedure must be simplified. The client suggested that in order to improve the feedback from the reports, the development team must focus on stylometry performance metrics to support claims of plagiarism from the Registrar.   **Performance metrics**   * Zander visualized the performance metrics of stylometry as follow:  1. **Words, characters, and punctuation**   Zander mentioned that the team can exclude certain words, characters, or punctuations to identify authors of a document. Individual authors tend to use specific grammar or punctuation, by focusing on a specific style/words/punctuation conventions, it might become easier to identify whether an author did indeed write an original text.   1. **Document Metadata**   As mentioned before, document metadata can be extremely useful to identify contract cheating. Last minute to a small number of edits might be a good indication that plagiarism was committed. Different versions of documents can also be a strong indication. If a document was edited on different operating systems by different version of software, it is also rather apparent that a document was sent around and edited by different individuals, rendering an author’s claim of originality invalid.   1. **Clustering (Binongo-Analysis)**   Zander mentioned that by using the Binongo-Analysis, one can use graphs and charts to identify discrepancies between author styles. In the Binongo case-study, the authors were able to decrease fifty dimensions to two using multivariate statistical techniques of a principal component analysis. The best-fitting plane ensures that the most significant information is kept because the first two PCs (principal components) account for the two highest shares of the overall variation. The clusters that form is natural, and the visual representation is accurate. The lower-dimensional representation's interpoint distances give us a picture of the text blocks' relative affinities in the original hyperspace. The authorial component appeared to be the most significant cause of variation in the data sets. Baum's books differed from Thompson's in that the former's are on one side of the first PC's mean, while the latter's are on the other. The Binongo-Analysis confident accurately identified Thompson as the author of the 15th book because of this unwavering constancy.  When PCA is utilized as a graphical tool, it has an advantage over approaches that offer numerical probabilities: PCA's validity as a technique for identifying authors is not based on unverifiable statistical assumptions. Its application has grown in favor among stylometrists, who frequently adopt a multidimensional method in their research. Surprisingly, the approach may be capable of more than only distinguishing between two authors. It can be utilized to isolate differences in literary genre while analyzing the works of a single author. Oscar Wilde's plays were separated from his essays on the best-fitting plane in a prior analysis (Binongo and Smith 1999b). The team can include a legend to identify all items on a chart/graph. More on the Binongo-Analysis case-study: [Binongo](http://dh.obdurodon.org/Binongo-Chance.pdf)   1. **Distance between clusters**   Zander mentioned that the distance between the clusters in a Binongo-Analysis can also be used to identify authors of specific texts. Burrows' Delta and its variants can be used to identify authorship. Feature scaling (several types of standardization and normalization) and the type of distance measures (notably Manhattan, Euclidean, and Cosine) can be used as independent variables and the correct authorship attributions as the dependent variable indicative of the performance of each of the methods. As a result, one can describe in greater depth how each of these two factors interacts with one another and influences outcomes. More on identifying authorship via using Burrows’ Delta: [Understanding and explaining Delta](https://watermark.silverchair.com/fqx023.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAsYwggLCBgkqhkiG9w0BBwagggKzMIICrwIBADCCAqgGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQMLZ_BO8Qdp239IrA6AgEQgIICeeG4QgIfFt00DTslStK1g5G2Kac5kPMdYuMsFAOnePJWTZxZemQJ1lB1eHN3fH1DbNmpwaz6MZM1J2JOA2wge4NgYWFL3ux8O4ZE7S6NyOa1eRw1OJPssOP1RGCnGQoJGiEmqYIcGSCNHmcKd3uW8LiSAohuMYje7E-E42PLSZ9V27whDXz3q81GeYpCBKYbaBBPEy9PJzme7E43wwjs6COe2f2i7RLmh1YrXHUd4MZYoB6vB0fwWvMOLuxXb97oaA2dX7GCalPJFj6QwcexF8IQKqIQAoGl3rqiq6wB3NY-Yp-uq4k0oo-exIUTbB6uD6MwW35TiQraX6C6AvNQVMnKJbf8AdN0VTjMduxzTTB_gxDz344HU8-afvDZbtEohPnbqT1AJbJSZChvUPRxMS6LGcKBc6f-m0ItW_cyAO2g-KanwwudiVFSutz4WoF2p10H2dT_r9GIx6uTY7xVCLjDNFZSo1GdiFNpB_Bk1USs4gBThFbOBOBixeLqefnkevt9INx3loXDiZYYRHnycvFgjHoEPSUfDIIEGdosUVbWUy6dONQOWbrdGkwWeIPJ5gqYV5evTHF6jdfQIOimq76_XpxYxh97U4dpBydrMulZCNDkQCxz4IrAGqgeiRWsnODpraSMLNrodcyS5xscWeuP3m3I3xb87y44mFUJDy-IaeQDgETfF5IvGVEFMLYr3FVx5RX-jbMzZkTsGixsnv99Gqo55M7IKSgI3-g_94jKBgdMrGK3WBHLZ5Fdya7cq6pXQdNK3rlING52KD7E1vXh656a2mJU8PXWj9Bxmksdz49P4H30XAxbSLSAoeQvVC_WKclE3LmMXg)  [measures for authorship attribution](https://watermark.silverchair.com/fqx023.pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAsYwggLCBgkqhkiG9w0BBwagggKzMIICrwIBADCCAqgGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQMLZ_BO8Qdp239IrA6AgEQgIICeeG4QgIfFt00DTslStK1g5G2Kac5kPMdYuMsFAOnePJWTZxZemQJ1lB1eHN3fH1DbNmpwaz6MZM1J2JOA2wge4NgYWFL3ux8O4ZE7S6NyOa1eRw1OJPssOP1RGCnGQoJGiEmqYIcGSCNHmcKd3uW8LiSAohuMYje7E-E42PLSZ9V27whDXz3q81GeYpCBKYbaBBPEy9PJzme7E43wwjs6COe2f2i7RLmh1YrXHUd4MZYoB6vB0fwWvMOLuxXb97oaA2dX7GCalPJFj6QwcexF8IQKqIQAoGl3rqiq6wB3NY-Yp-uq4k0oo-exIUTbB6uD6MwW35TiQraX6C6AvNQVMnKJbf8AdN0VTjMduxzTTB_gxDz344HU8-afvDZbtEohPnbqT1AJbJSZChvUPRxMS6LGcKBc6f-m0ItW_cyAO2g-KanwwudiVFSutz4WoF2p10H2dT_r9GIx6uTY7xVCLjDNFZSo1GdiFNpB_Bk1USs4gBThFbOBOBixeLqefnkevt9INx3loXDiZYYRHnycvFgjHoEPSUfDIIEGdosUVbWUy6dONQOWbrdGkwWeIPJ5gqYV5evTHF6jdfQIOimq76_XpxYxh97U4dpBydrMulZCNDkQCxz4IrAGqgeiRWsnODpraSMLNrodcyS5xscWeuP3m3I3xb87y44mFUJDy-IaeQDgETfF5IvGVEFMLYr3FVx5RX-jbMzZkTsGixsnv99Gqo55M7IKSgI3-g_94jKBgdMrGK3WBHLZ5Fdya7cq6pXQdNK3rlING52KD7E1vXh656a2mJU8PXWj9Bxmksdz49P4H30XAxbSLSAoeQvVC_WKclE3LmMXg)   1. **Document revisions**   The total number of document revisions can also be a strong indicator whether plagiarism was committed. The number of revisions is indirectly proportional to the level of plagiarism.  **Application Data Flows**   * **Login –** user enters username and password. Valid → go to Home page. Invalid → prompt user to re-enter username or password. * **Home –** when user click on the “Home” button on navigation bar, navigate to Home screen**.** * **Quick Text Analysis –** user uploads source and suspected text → software analyses text → generate feedback report → user can save the report locally or on a cloud service * **Extensive Text Analysis –** user selects a corpus → user uploads a source text → source file gets uploaded to the local corpus **→** software analyses text → generate feedback report → report gets uploaded to cloud service * **Stylometry –** user selects a corpus → user uploads a source text → source file gets uploaded to the local corpus **→** software analyses text → generate feedback report → report gets uploaded to cloud service * **Logout –** when user clicks the “Logout” button on the navigation bar, the user is logged out of the application   **Application Prototype**   * The development team agreed that they would build a functional prototype for the client. The prototype will be delivered to the client between the 28th of July to 4th of August. For the time being, the development team needs to research Stylometry, machine learning algorithms and data visualization. The team also needs to sharpen their Python skills and study Flask architecture.   **PARKING LOT**: *[Describe any items that may have been deferred for a later discussion]*  N/A |
|  |

| **Miscellaneous Items:** |
| --- |
| * Prof. Kruger suggested that the team should look at alternative ways to design flow charts. Prof. Kruger mentioned that it should be worthwhile to look at swimline charts, Raci charts as well as IDEF charts, which are useful for visualizing software engineering systems. * The development team should have a look into scattered charts * The development team should read on Art Schneiderman: an expert on process management * Prof. Neels warned the team about the potential dangers of releasing a fully functional prototype: it can lead to minority reports, as predictions/analysis from the software might automatically predict that an individual that is part of a certain group or populace are more likely to commit plagiarism. |

| **Items for next minute:** |
| --- |
| * Discussion of application prototype * Stylometric functionalities * Data visualization techniques * Feedback report contents * Accuracy of analysis * User requirements satisfaction |

# **Knowledge Areas and COBIT compliance**

The following section consists of the particular knowledge areas and their processes described by the PMBOK guide that relates to our identified constraints. The development team will utilise these processes in order to effectively manage their projects constraints:

**Project Time management/ Project schedule management**

***Planning process group***

* Plan schedule management
* Define activities
* Sequence activities
* Estimate activity durations
* Develop schedule

***Monitoring and controlling process group***

* Control schedule

**Project Cost management**

***Planning process group***

* Plan cost management
* Estimate Costs
* Determine budget

***Monitoring and controlling process group***

* Control costs

**Project Scope management**

***Planning process group***

* Plan scope management
* Collect requirements
* Define scope
* Create WBS

***Monitoring and controlling process group***

* Validate Scope
* Control Scope