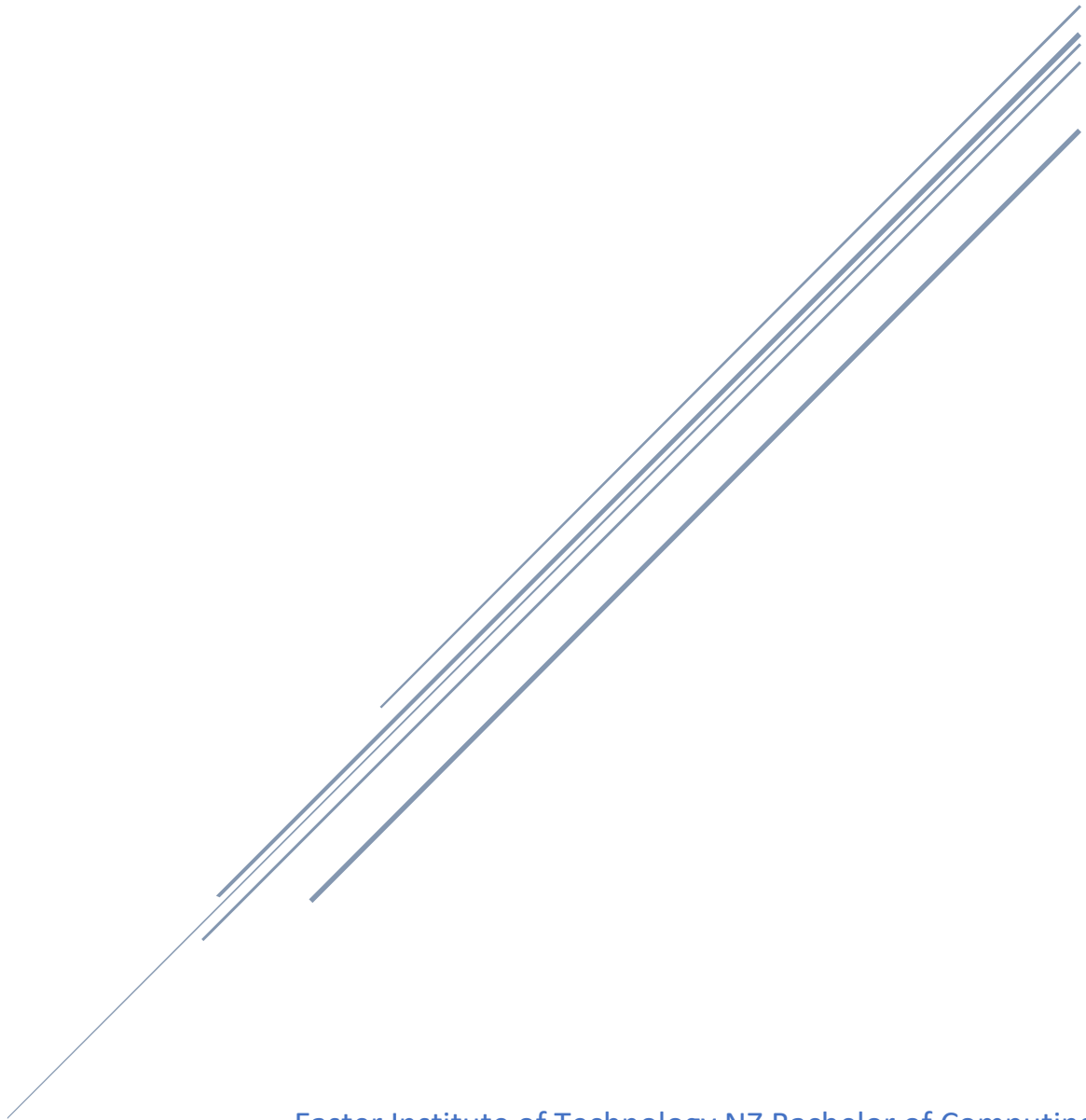


# PROJECT PROPSAL

## Home Loan Monitor



Easter Institute of Technology NZ Bachelor of Computing Systems  
ITPR7.508 Business Application Programming

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# Home Loan Monitor

REVISION DATE: Ongoing

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## Section 1. Overview

### 1.1 Purpose

The purpose of this document is to propose the development of a user-friendly home loan monitor. It aims to simplify mortgage management by providing tools for calculating payments, tracking interest rates, managing multiple mortgages, and planning financial strategies effectively. This monitor will offer intuitive navigation, unobtrusive design, and advanced functionalities to enhance productivity and streamline the mortgage management process for users.

### 1.2 Business Context

In today's changing real estate market, managing mortgages can be complex. Our software aims to simplify this by offering a user-friendly solution tailored to your needs. It helps individuals and businesses effectively handle mortgage obligations despite fluctuating interest rates and evolving financial products.

### 1.3 Scope

Project Include
A mortgage calculator module that allows users to calculate monthly or fortnightly payments based on loan amount, interest rate, and loan term.
Incorporate the ability to compare multiple loan and interest rates.
Enable users to input variable interest rates over specific periods and automatically update mortgage calculations accordingly.
Include a feature to view historical mortgage data.
Support multiple mortgages, allowing users to manage multiple properties simultaneously.
Include a chat to display mortgage data.

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Provide a user-friendly interface webpage.
The project will include the utilized test files.

<b>Project Exclude</b>
The actual deployment of the website onto designated servers.
Extensive SEO services such as keyword research, on-page optimization, or link building.
Custom graphic design services beyond the scope of interface design and layout.
The necessary maintenance and updates for the software. Not post.

### **1.3 User Characteristics**

The target users of the home loan monitor/calculator software are diverse and may include individuals, families, real estate investors, and financial advisors. These users may have varying levels of familiarity with financial concepts and software usage. As such, the software will be designed with an intuitive interface and comprehensive help resources to accommodate users with diverse backgrounds and skill levels.

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## Section 2. Assumptions, Dependencies, Constraints

### 2.1 Assumptions

For this project, we have had to make a few assumptions to ensure an understanding of the project's conditions are understood correctly by all parties. These are listed below:

- **Loan Terms:** We must assume that loan terms are homogenized across all potential loans that utilize the software. This means that we will assume all loans carry the same terms regarding any “hidden” fees such as insurance and tax, which will be excluded from the final product and we will also assume that mortgages run through this software will have a full amortization, meaning that the loan will be paid off in full at the end of the term defined by the user.
- **Calculator Formula:** We also assume that the accuracy of all given formulas is empirically correct, but we will also allow for a margin of error of 0.1% to allow for any minor differences between the calculation from the software when compared to the real world.
- **Regulatory Compliance:** As this software overlaps with areas of personal finances, we assume that all data used is compliant with Privacy laws around customer information. We also assume that all information is also compliant with relevant financial information laws.

### 2.2 Dependencies

We will rely on some dependencies for this project to be able to develop the software that meets the requirements laid out. These are as follows:

- **Data Sources:** This software is reliant on being given accurate and up-to-date information regarding the financial information of a given mortgage case. This information includes but is not limited to, interest rates, repayment periods, loan amounts, and loan terms.

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- **Platform Compatibility:** The software will also require that the platform that it is being run on is compatible with the software's design. This information is flexible until the agreed-upon design is settled, in which the compatible software will be locked in and discussed in the Formal documentation as well as the user documentation at the end of the project.
  - **Mathematical Libraries:** If the software utilized in these projects uses any mathematical libraries, we would then be dependent on the accuracy of these libraries.

## 2.3 Constraints

There are a few key constraints to consider that will impact the project's scope and development. These are:

- **Time:** This project will need to be completed by the 7<sup>th</sup> of June 2024, so it will be important to prioritize the key functionalities of the software to complete the project on schedule.
- **Budget:** The budget for this project will be set before the project's start, meaning that we will need to operate within what the budget allows throughout this project.
- **Legal:** We will need to operate within all relevant laws regarding this project, which may include privacy of data and security as financial data is involved.
- **Technical:** We also need to ensure that we operate that we work within the limitations of the software used and the intended hardware for the software.

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## Section 3. Requirements

### 3.1 Business Requirements

To provide software to simplify the process of mortgage calculations. This software will be delivered in full on or by the 7<sup>th</sup> of June 2024 alongside complete user documentation. This project will cost up to (number).

### 3.2 Functional Requirements

#### Mortgage Calculation:

The mortgage calculator function is the process of estimating mortgage payments.

#### Mortgage Calculation Purpose:

This function is to calculate mortgage payments based on user-provided input, including loan amount, interest rate, and payment frequency.

### 3.3 Mortgage Inputs:

Function input	Definition
Principal	The initial amount of money borrowed for purchasing a home.
Principal Increment	An increasing value of the principle.
Interest	The additional amount charged by the lender for borrowing the principal amount.
Interest Increment	An increasing value of the interest.
Years	The total duration of the loan is in years.
Months	The specific month within the loan term.



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Payment override option	Confirming if a payment override is included.
Payment override amount	The adjustment amount was used instead for mortgage calculation.
payment override format	The repayment timeframe the override applies to.

### 3.4 Mortgage Operations:

- Calculate mortgage payments based on Principal, interest, and term (years and months).
- Calculate payments based on increment amounts to a set value.
- If an override is provided, calculate based on those values.

### 3.5 Mortgage Outputs:

The outputs are presented both on a fortnightly and monthly basis, providing valuable insights into your repayment structure.

There are two categories initial payment breakdown and mortgage maturity and it will give you fortnightly and monthly outcomes.

The initial payment breakdown components include:

- Estimated Repayment  $\pm 0.1\%$ : The estimated repayment amount with a margin of error of  $\pm 0.1\%$ .
- Interest: The portion of the payment allocated towards the interest accrued on the principal amount.
- Principal: The portion of the payment allocated towards reducing the principal amount borrowed.
- Extra Payment: Any additional payment made towards the principal, beyond the required fortnightly payment.

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- Repayment: The total repayment amount for the fortnight or monthly, including interest, principal, and any extra payment made.

In the analysis (mortgage maturity) section components include:

- Payments over full term: Total payments made over the entire duration of the loan term, inclusive of both principal and interest.
- Payments over reduced Term: Total payments made over a reduced loan term, if extra payments are made towards the principal.
- Full term to amortize: The total loan term required to fully amortize the loan.
- Estimated reduced term to amortize: The estimated reduced loan term is required to fully amortize the loan with additional payments towards the principal.
- Interest over full term  $\pm 0.1\%$ : Total interest paid over the full loan term, represented as a percentage of the total loan amount, with a margin of error of  $\pm 0.1\%$ .
- Principal + interest over full term: Total amount paid towards both principal and interest over the full loan term.
- Interest over reduced term  $\pm 0.1\%$ : Total interest paid over the reduced loan term, represented as a percentage of the total loan amount, with a margin of error of  $\pm 0.1\%$ .
- Interest saved over reduced term  $\pm 0.1\%$ : Potential interest savings achieved by making extra payments towards the principal, represented as a percentage of the total loan amount, with a margin of error of  $\pm 0.1\%$ .
- Principal + interest over reduced term: Total amount paid towards both principal and interest over the reduced loan term.

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### 3.6 Mortgage graphing function:

- Fortnightly payment breakdown for the principal amount vs. interest amount
- Monthly payment breakdown
- Total interest paid overtime
- Principal reduction over time
- Estimated repayment vs. actual repayment

### 3.7 User Case:

- User story 1: as a user, I want to input the principal amount, interest rate, and loan term in years and months, and specify whether I want to make payments on a monthly or fortnightly basis so that the system can calculate my repayment structure accordingly.
- User story 2: as a user, I want to specify whether I intend to make extra payments towards the principal beyond the regular repayment amount so that the system can adjust the repayment schedule accordingly.
- User story 3: as a user, I want to view the breakdown of my mortgage repayment, including estimated repayment, interest, principal, and total repayment, based on the input principal, interest rate, loan term, and payment frequency, so that I can understand how my payments are allocated over time.
- User story 4: As a user, I want to analyze the maturity of my mortgage, including the total payments made over the full term, the full term required to fully amortize the loan, the total interest paid over the full term, and the total amount paid towards both principal and interest, based on the input principal, interest rate, loan term, and payment frequency, so that I can assess the overall cost of my mortgage.

### 3.8 Logical Data Requirements

The software will need to utilize the following formulas to calculate all the required values to correctly track the mortgage over time.

First is the equation for calculating the mortgage repayments which is done with the following formula:

Equation for mortgage payments

$$M = P \frac{r(1+r)^n}{(1+r)^n - 1}$$

Symbol

M the total monthly mortgage payment

P the principal loan amount

your monthly interest rate

r Lenders provide you an annual rate so you'll need to divide that figure by 12 (the number of months in a year) to get the monthly rate. If your interest rate is 5 percent, your monthly rate would be 0.004167 (0.05/12=0.004167).

number of payments over the loan's lifetime

n Multiply the number of years in your loan term by 12 (the number of months in a year) to get the number of payments for your loan. For example, a 30-year fixed mortgage would have 360 payments (30x12=360).

We will also need a way to calculate the rate per period which is done with this formula:

#### Calculating the Rate Per Period

When the number of compounding periods matches the number of payment periods, the rate per period ( $r$ ) is easy to calculate. Like the above example, it is just the *nominal annual rate* divided by the periods per year. However, what do you do if you have a Canadian mortgage and the compounding period is semi-annual, but you are making monthly payments? In that case, you can use the following formula, derived from the compound interest formula.

$$r = \left(1 + \frac{i}{n}\right)^{\frac{n}{p}} - 1$$

where

- $r$  = rate per *payment* period
- $i$  = nominal annual interest rate
- $n$  = number of compounding periods per year
- $p$  = number of payment periods per year

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Lastly, we need a formula to calculate the number of periods to repay the loan:

If the Present Value is given then the NPER is calculated using the following equation:

$$N = \frac{-\ln \left(1 - \frac{PV}{PMT} R\right)}{\ln[1 + R]}$$

If the Future Value of the investment is given then NPER is calculated using this equation:

$$N = \frac{\ln \left(1 + \frac{FV}{PMT} R\right)}{\ln[1 + R]}$$

Where:

PV = Present Value

FV = Future Value

R = Rate of Return

PMT = Payment per period

### 3.9 User Requirements

Users require a user-friendly home loan monitor to accurately calculate their mortgage payments. The software should allow users to input all necessary details and display the results, including additional graphical representations.

The mortgage software should enable users to easily input their loan information and view clear repayment details. Accuracy is crucial, with repayment calculations being precise to within a 0.1% margin. Additionally, users should have access to graphical representations of their mortgage data. The software must utilize correct mathematical formulas for precise calculations and Integration with a database system is essential to safeguard user data.

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### **3.10 Information Management Requirements**

We require the data to be held inside a database with access done via user logins to ensure that they can only access data relating to them. We will also have the inclusion of an admin account to access overarching controls. We will also store information in the server that is more sensitive behind an encryption layer to ensure the privacy of more important data such as user's passwords, loan amounts, repayment amounts and what user is associated with each mortgage.

### **3.11 Systems Requirements**

#### **3.6.1 Performance Requirements**

The software will be required to operate with a fast response time as it is operating locally, also scalability issues will not be considered as it is operating locally, and it will not be designed with multiple concurrent users utilizing the software.

#### **3.6.2 Quality Requirements**

The software's function will pass all available unit testing, integration testing and functional testing, with the level of accuracy of the repayments being limited to no greater than 0.1% difference.

### **3.12 Interfaces**

The software will have options to log in and out, create a new user account, update and view their current mortgages and visually see how their mortgages are progressing via a graph.

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## Section 4. Requirements Traceability Matrix

ID	Selection	Requirement Description
RTM1	Mortgage ranges	prevent users from changing the loan term once it has been initially set.
RTM1-1		provide input options for the payment override
RTM1-2		restricting input lengths to prevent buffer overflows.
RTM1-3		perform range checking for numeric input fields to ensure that values fall within predefined minimum and maximum limits.
RTM1-4		if a value exceeds the allowed range, display an error message and prompt the user to enter a valid value within the specified range.
RTM1-5		set the input for payment override as 'y' or 'n' and only interact with this function when it is 'true' for further calculations.
RTM2	Initial payment	displaying estimated repayment, interest, principle, extra payment, and total repayment.
RTM2-1		ensure that the estimated repayment amount is calculated accurately based on the user-provided inputs.
RTM2-2		calculate the interest component of the payment accurately, considering the current interest rate and principal amount.
RTM2-3		calculate the principle component of the payment accurately, reflecting the portion of the payment that goes towards reducing the loan principal.

RTM2-4		include any additional payments made towards the principal as part of the calculation for total repayment.
RTM2-5		implement error handling to handle any calculation errors and display informative error messages to the user.
RTM3	Analysis	showing payments over full term, payments over reduced term, full term to amortize, estimated reduced term to amortize, interest over full term, principal + interest over full term, interest over reduced term, interest saved over reduced term, and principal + interest over reduced term.
RTM3-1		ensure accuracy and precision in all calculations to provide reliable and informative analysis results
RTM3-2		calculate the total payments made over the entire duration of the loan term, inclusive of both principal and interest.
RTM3-3		calculate the total payments made over a reduced loan term if extra payments are made towards the principal.
RTM3-4		calculate the total loan term required to fully amortize the loan.
RTM3-5		estimate the reduced loan term required to fully amortize the loan with additional payments towards the principal.
RTM3-6		calculate the total interest paid over the full loan term, represented as a percentage of the total loan amount.
RTM3-7		calculate the total amount paid towards both principal and interest over the full loan term.
RTM3-8		calculate the total interest paid over the reduced loan term, represented as a percentage of the total loan amount.



RTM3-9		calculate the potential interest savings achieved by making extra payments towards the principal, represented as a percentage of the total loan amount.
RTM3-10		calculate the total amount paid towards both principal and interest over the reduced loan term.
RTM4	Projected payments per month/ fortnight	specifies the format for presenting projected mortgage payments on a monthly or fortnight basis. include details such as interest rates and associated payment amounts for each month or fortnight.
RTM4-1		display projected mortgage payments for each month or fortnight based on the provided inputs and current interest rates.
RTM4-2		ensure that the format for presenting projected payments is clear and easy to understand for the user.
RTM4-3		include the applicable interest rate for each month or fortnight alongside the corresponding payment amount.
RTM4-4		implement error handling to handle any calculation errors and display informative error messages as necessary.
RTM4-5		validate the accuracy of payment projections
RTM5	Other	graphing interface displaying mortgage calculation results.
RTM5-1		validate user input to ensure that only numeric values are accepted for numerical input fields.
RTM5-2		ensure that all user inputs are properly validated to prevent errors and maintain data integrity.
RTM5-3		provide informative error messages to users in case of invalid inputs or errors during mortgage calculation

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RTM5-4		provide comprehensive documentation and help resources to assist users in understanding and using the application
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## Section 5. Budget

The total budget of **\$14000** is allocated for labour costs, with two individuals working for 10 hours per week over 16 weeks. This results in a total of 320 hours of labour. Based on this, the hourly rate is approximately \$43.75. Each person will work for a total of 160 hours, resulting in labour costs of \$7000 per person.

No costs have been allocated for software, hardware, networking or overheads as these are not needed for the completion of the project.