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Final Report

Improving Research Grant Costing in the
School of Computer Science and Informatics

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ABSTRACT

As a research led, Russell Group University, Cardiff University depends heavily on securing research income from funders such as Research Councils UK and EU Horizon 2020. These are highly competitive schemes, and to be successful, the University applications must provide a clear justification that they are costed appropriately. While costing, the university also wants to maximise the funding received by ensuring all eligible costs are covered so nothing is missed that would result in the University having to cover a cost that could have been funded. This can be a complex and time-consuming process including costs such as permanent & fixed term staff, travel and equipment.

The funds for any specific project are mainly received from grants that the University apply for prior to the start of the research. These applications cannot be accepted by the funder until the proposed project costs are calculated and totalled by the Finance department of the School. The applications cannot be sent-off until they have first being approved by the University, which can delay the submission for funding.

This project investigates the costing process and funding approaches employed by universities in general and delves into Cardiff University's current process to highlight a problem that can delay funding applications. The identification of the problem opens up the opportunity for improvement, through the development of a spreadsheet tool to simplify the costing process within the School of Computer Science and Informatics.

It follows common sense that the simpler the costing procedure; the *easier*, *quicker* and more *effective* the costing can be. Ultimately meaning more funding requests of higher accuracy could be sent for (and receive) approval. Documenting and achieving this is the goal of the project.

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Many thanks to my steadfast Supervisor Stuart Allen, who despite having the busiest schedule I have ever seen a member of staff have, still promptly replied to my many emails and took the time to guide my report all the way to its (hopefully!) successful outcome. This project would not have been possible without his excellence as a Supervisor and his commitment to the job.

Many thanks to the School Manager Rob Davies whose in-depth knowledge of the research application process has added some useful insights into how the process works. Without him pointing out some areas that may have otherwise been overlooked, more issues would have been caused later in the project – with his help these problems were avoided.

Many thanks to my ‘client’ Michelle Aked who has been the driving force behind the success of the project. She happily accepted the multiple meetings that have been required to develop not only the project outcome, but also my understanding of the research application process. Without her willingness to help, the project would have been a lot more of a challenge - working alongside her has made it not only bearable, but an overall more enjoyable experience.

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1. INTRODUCTION

1.1. Research at Cardiff University

As a heavily research-based institute, Cardiff University receives research contracts of 100m per year (Cardiff University, 2018) - and is well known for its research excellence. Due to this, Cardiff has established itself as Russell Group University – a prestigious group of 24 UK universities selected for their prowess in the education sector and the quality of their outputted research. This was recognised in the Research Excellence Framework (REF) 2014 research quality study which ranked Cardiff University 5th based on Grade Point Average out of the 154 Universities entered. This boost up from the rankings from 22nd in 2008 has a direct impact on the level of government funding being allocated to Cardiff University.

Research funding is of huge importance to the running and continued success of Cardiff University as it allows investments to be made into research projects and the infrastructure of the university, to build upon their reputation as the ‘Best University in Wales’ and ‘top 50 in the UK’ (Cardiff University, 2018). Cardiff have targeted the continuation of this rise in research success thanks to the increase in funding as one of the five key sub-strategies of their 2018-2023 vision ‘The Way Forward’.

The 2018 Cardiff University strategic plan ‘The Way Forward’ has the goal of increasing the level of funding to ‘£200m per annum from research grants and contracts income’ and of reaching the top 12 in the REF research power assessment, by 2023 (Cardiff University, 2018). In comparison, University of Bath which placed 12th for research quality in REF 2014 (University of Bath, n.d.), so are also a high scoring research university only received research contracts of £36m, and funding council grants of £35m in the 2015/16 academic year (University of Bath, 2016).

The current project aims to help meet these targets by ensuring all applications for research projects are sufficiently funded to cover work, well justified and allow all eligible costs to be taken into consideration and claimed.

1.2. Project Scope

Before the lead academic preparing the research project proposal (the Principal Investigator) applies for funding, a back-and-forth exchange between themselves, the Research Administrator (Senior Finance Officer) and School Manager (SM) occurs before a Cost & Pricing (CAP) form is finalised, ready to be sent as part of the application. This process is part of the School’s internal Pre-Application Process ([Appendix A](#)), and the rest of the process cannot be completed until the CAP form is finalised which can take ‘at least five working days’ (according to the Senior Finance Officer) to perform, slowing the funding request.

There are on average 2 or 3 possible scenarios for staff costs within the research budget identified, e.g. one senior researcher for a year, or two less experienced people for the same length of time. These are investigated during the communications to discover the best way to optimise resources within the cost limit. Staff costs are taken from their 'spine point' which is a scale showing the rates of pay based on the experience of the staff member, the higher the spine point the more they cost.

The main issue currently is the CAP form is a requirement of the formal University procedures that the School has no control of, so it is locked down and not possible to edit the research staff to view the cost change between the various scenarios, meaning it must be calculated manually each time. The outcome is the process is **slowed** and possible funding is **not maximised**, as it is not possible to accurately calculate the best staff costs for the budget meaning that more hours or a higher grade of staff could possibly be charged for, but this is missed due to the current process.

Due to the nature of research within the School of Computer Science & Informatics, large-scale equipment is rarely needed, and so the main research cost is the time of staff. Therefore, most effort is put into this area of the costing when a funding application is created. So, this is the area the project will focus on - as there is the biggest opportunity for time to be saved here.

The scope of the project is to improve the staff scenario calculation of the research costing process with the development of a prototype Costing Tool which will be internal to the School and separate from the CAP form, allowing the various scenarios to be **modelled**. This will provide an improvement to the research application process as it will be a lot more **efficient** to model the scenarios without waiting for a CAP form to be returned, therefore more time can be spent on investigating the costing to maximise the funding received.

1.2.1. Previous Process

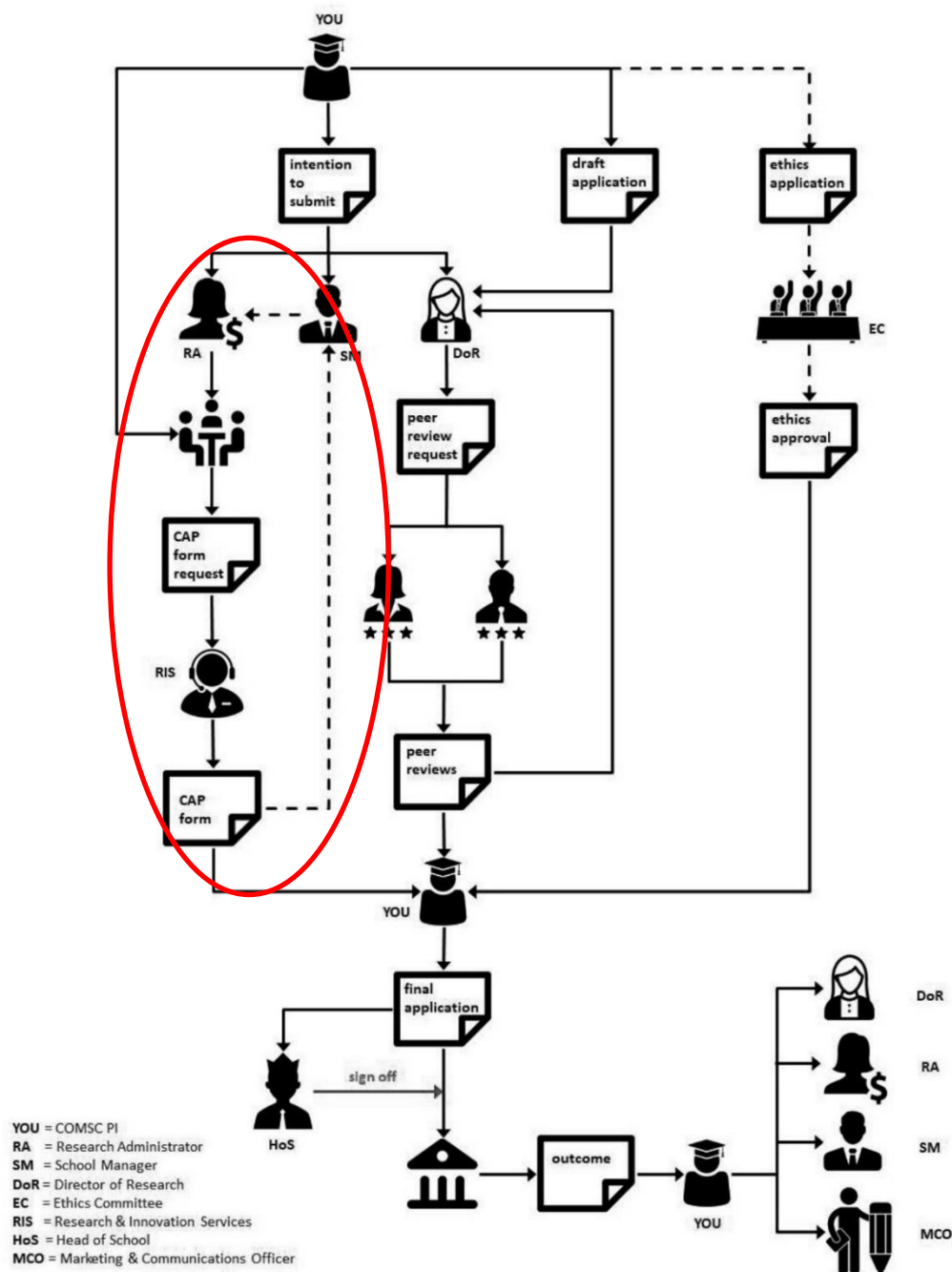


Figure 1 – Current research grant Pre-Application Process

The highlighted section of the process in Figure 1 is where the issue has been identified. A meeting is held to discuss costs, with the information having to be sent off for a CAP form to be created and then returned, where another meeting is then held to examine it and likely make changes now the impact of their costing decisions can actually be seen.

1.2.2. New Process

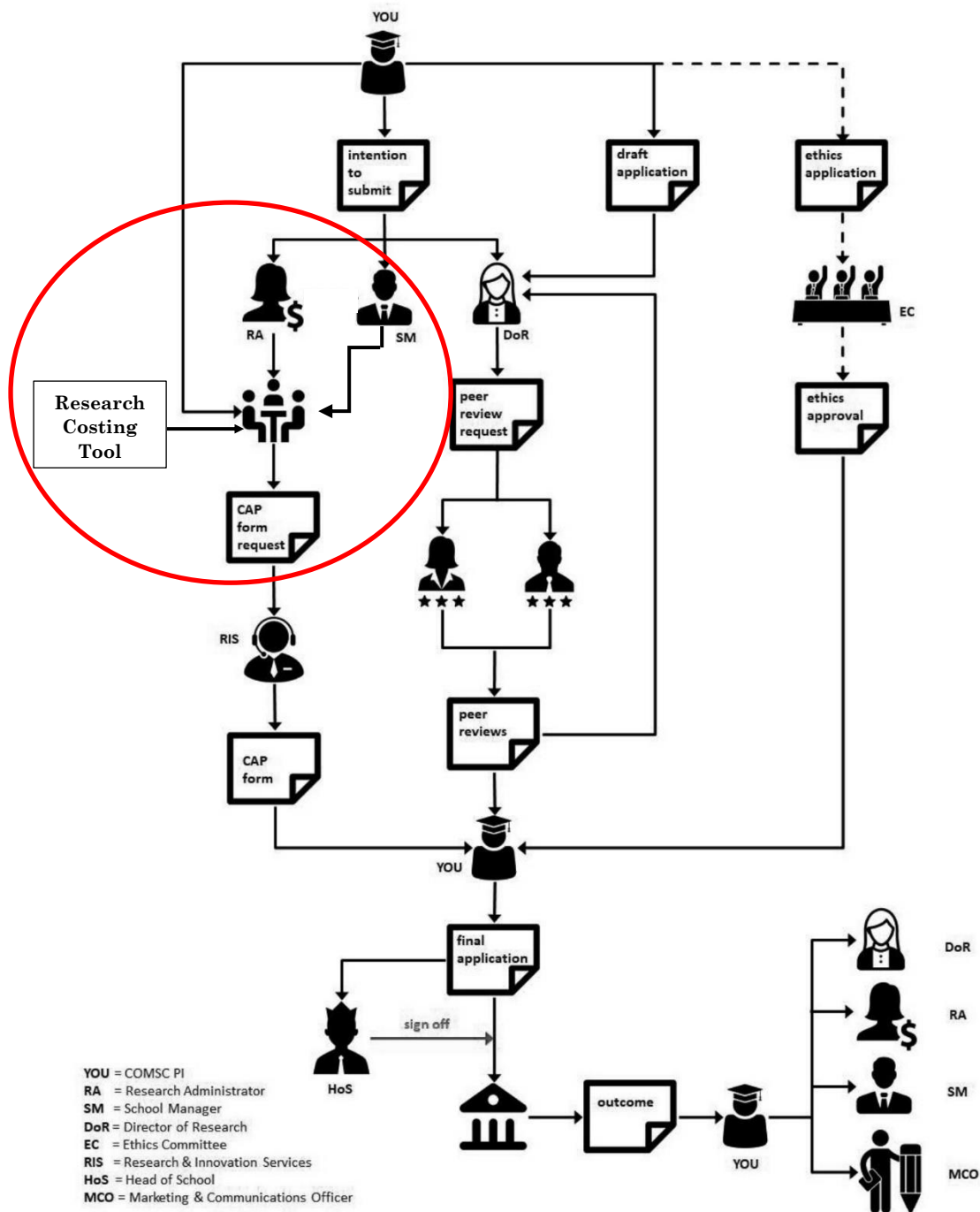


Figure 2 – Improved research grant Pre-Application Process

The Research Costing Tool should remove the time-sink of multiple messages being communicated between the Research Administrator, School Manager and Principal Investigator by simplifying the scenario investigations and showing the cost differences when a change in staff is tested. This will be achieved by the Tool taking User inputs and performing calculations based on known costs, to output Total Values. Multiple different scenarios can be inputted to view the effect on costs, allowing the User to more accurately match their staff resource needs within the set budget. As seen in Figure 2, the usage of the Tool will allow

a single meeting to take place between the aforementioned persons, with the discussion and scenario modifications being applied there-and-then until the final agreement is reached.

1.3. Project Aims

The scope set in the initial plan aimed to meet the following objectives:

- 1) Gaining an understanding of the Research Grant Application process.
 - Assisted by documenting what currently occurs
- 2) A professional correspondence with the Senior Finance Officer will be maintained across the course of the project.
 - Meetings will be conducted to guide the project in the right direction
- 3) A refined, updated Research Grant Application process will be designed and documented.
- 4) A Requirement Specification for the Tools functionality will be created.
 - Outlining the values required for the Tool to work
 - Outlining the functionality performed by the Tool
 - Specifying the Tool outputs
- 5) Costing Rules will be created.
 - What original values are used
 - How figure totals are calculated
 - For ease of viewing and modifying if any rules need to change in future
- 6) A prototype Excel Spreadsheet Tool will be produced.
 - It will provide a base for additions to be made to once the project is finished
 - To aid the development of a complete Tool that Academic Staff can use to calculate funding request costs
- 7) A User Guide explaining the Tools usage will be created.

The aim of the process change is to provide the benefits outlined in the next section.

1.4. Project Beneficiaries

1. The first people who will notice an instant benefit from the *efficiency* of the new costing process will be those involved in the pre-application stage of the funding request: The Research Administrator, School Manager and Principal Investigator. By removing the need for the iterative refinement of the

different cost scenarios, there will be more time available which gives the following benefits.

- i) *The funding application can be completed sooner, which allows for faster processing of the queue of requests. More requests could mean more projects are funded, increasing the quantity of research.*
 - ii) *Time the PI would usually spend refining the CAP form scenario, could be spent on their research plan and Ethical Approval Application if needed (Step 6 and 9 of the Pre-Application Process: [Appendix A](#)). The extra time on these plans could make the difference between a successful and unsuccessful application.*
2. There is more time available to spend on making the costs **accurate**, reducing the chance of under-costing the project. Any under-costing would not be covered by funding, so the financial hit is taken by the University. The statistics for under-costed projects could unfortunately not be provided by the Senior Finance Officer.
3. The more **effective** process means more funding requests will be successful, increasing the grant income. This will increase the money available to the University. With more money, the following benefits will be gained:
- i) *More researchers could be hired, which once again would increase the level of research projects and funding. This is one of the goals of The Way Forward research strategy, to 'build capacity through the recruitment, development and retention of high quality research students and staff at all career stages' (Cardiff University, 2018). The new process would be a factor influencing the achievement of this and would be able to handle more requests than previously because of the faster funding applications.*
 - ii) *More grant income would allow Cardiff University to meet their strategic aim to 'continue to invest in the development of [their] University Research Institutes' (Cardiff University, 2018) to help improve research quality, meeting the REF criteria (REF, 2014) and thus getting a better outcome in the REF 2021 assessment. A better REF outcome means Cardiff will receive more block grant funding, as explained in Section 2.1: [Higher Education Funding Council for Wales](#).*
 - iii) *More lecturers could be hired, which would increase the quality of teaching and the range of experience within the University. Better teaching would improve student learning and go towards the achievement of awards such as the Teaching Excellence Framework (TEF) which is one of the goals of The Way Forward Education Sub-strategy to 'Promote Teaching Excellence' (Cardiff University, 2018). Gaining awards such as TEF will show Cardiff Universities excellence, drawing in more funding and a higher quality of student, which will again allow more investments to be made, further cementing the quality*

of the institute.

4. The increase in successful applications will increase the level of research performed at Cardiff University. Research quantity and impact is one of the assessment criterium evaluated by University league tables such as The Times University Guide, The Complete University Guide and QS World University Rankings. This, along with the benefits described in 3 iii) will raise the ranking of Cardiff in these league tables.
 - i) *A survey of over 60,000 students identified that a University being highly ranked was the third most important factor students look for when choosing where to go for their higher education studies (Bhardwa, 2017). So, an increase in ranking would draw more students to Cardiff University which provides more funding to the university through tuition fees.*
 - ii) *The impact of University ranking would likely be even more significant on International students, as a highly ranked institute instantly draws more attention towards it, influencing the decision to study there. As International students pay a higher rate of tuition fee this is a huge boost to the University funding available.*

1.5. Project Approach

The project will follow a step-by-step approach to guide it towards completion within the time deadline. Each step will make use of an **Agile** approach, taking advantage of the easy access to the client with lots of short meetings to confirm understanding, set the requirements and test the Tool itself. The focus is on **incremental** requirement analysis and development, quickly producing an output (whether document or system functionality) that the client can view and provide feedback on.

Such an approach will allow the client to quickly notice any misdirection with the project, meaning they can point out the mistake with a minimal amount of time being wasted. This is a huge advantage because if the client was not able to have multiple meetings then the requirements would have to be set in stone a lot earlier, with no chance for corrections until a large portion of project time had passed when they next saw the progress – meaning there could be a lot of time used on irrelevant or incorrect functions.

1.5.1. Step 1. Identify Process Inefficiency

The research funding Pre-Application Process will be examined to find the most significant area where it is slowed due to an inefficiency. This will be aided by the Senior Finance Officer with her in-depth knowledge of it, as she is regularly part of funding applications and therefore knows where the main process slowing occurs.

The process was documented (Section 1.2.1: Project Scope – [Previous Process](#)) to outline the issue.

1.5.2. Step 2. Identify Process Improvement

Once the target of the project is identified, a plan to improve it is needed. The idea of the Costing Tool being the fix to the inefficiency was developed, with the way the process would be altered documented to highlight what would be changed from the previous (Section 1.2.2: Project Scope – [New Process](#)).

1.5.3. Step 3. Requirements Capture

The requirements for the Costing Tool were captured through meetings with the client, with them verbally detailing what functions they would like the tool to perform. The requirements are documented (Section 3.1: [Requirements Specification](#)) and shown to the client for them to confirm and sign-off.

User Stories were selected to document these requirements, the main reason for this decision was simplicity. The simplicity offers a variety of benefits:

1. Easier conversation with the client (Senior Finance Officer / School Manager).
 - The use of User Stories allowed the requirements to be written in similar terms to how they were described, meaning there is less chance of a variation to what they meant being documented.
 - The simplicity allowed the client to read the requirements in simple English, so they could easily spot any miscommunication and rectify the error, ensuring the requirements were properly understood.
 - User Stories are written unambiguously, so there is a reduced risk of the requirement being read as one thing, when its meant to mean something different (Cohn, 2004). Again, this helped any errors and misunderstood areas to be fixed.
2. Project is not overly technical
 - The reason Use Cases were not selected as the technique to document the requirements is there is not a need for that level of detail, due to the aims of the project being of a more User-oriented basis with the client knowing what they want. The main difficulty with the project is the understanding of **what** the tool is required to do, as opposed to **how** it needs to be done.
3. Quick to write
 - The lowered level of detail allowed the User Stories to be quickly documented and then accepted by the client. This means the project could be undertaken sooner, allowing more time for design to meet the requirements.
4. Can be used as Test Cases
 - The User Stories can be used to test the tool once it is complete, as they are very simple to follow and easy to understand. For example,

Requirement ADMIN_02 ([Appendix B](#)) can be marked as implemented and working if the value specified can be edited by an administrator.

- If all the requirements are tested and met, then the tool should be fully functional and meet the client's expectations.

5. Written from User's perspective

- Putting the requirements into first person allows that mindset to be taken. The advantage of this is it puts the focus on meeting what the User actually wants; writing it out this way makes it easier to spot if a requirement is not actually needed, stopping effort being put into creating a redundant functionality.

The main disadvantage of User Stories is that they do not describe the way the stories will be implemented, which can make it hard to picture the outcome of the system, so the User Interface (UI) could end up vastly different to what the User expected (Ferolen, 2008). This will be countered by discussing the design with the client within a meeting to get a shared view of how the UI will look, and document this to give a plan to follow while implementing the tool.

Another disadvantage is that User Stories only focus on what outcome the case will achieve but ignore the performance aspect of reaching it, for example how easy it will be for the User. To counter this, non-functional requirements will be documented to outline the performance-based side of the tool.

The other option for requirements documentation is Use Cases. Use Cases cover a lot more of the possible system paths, offering a more complete view of how the tool could be used and covering every conceivable way the User could interact with it, so it could be designed to account for every possibility (Sharma, n.d.). The added detail allows the design to be more targeted towards the User's usage as every outcome has been considered, giving a more obvious path of system interactions. However, this option was discounted due to the complexity of writing them, meaning the advantages of User Stories described in benefit 1, 2 and 3 would be lost.

1.5.4. Step 4. Design

After the requirements are documented, they can be transformed into a plan for how the Costing Tool will meet them. The design will identify:

- The inputs from the User required
- The outputs required
- The process to calculate the outputs
- The validation required
- The User Interface
- The guidance given to Users

This is documented in *Section 4: [Design](#)*.

1.5.5. Step 5. Build

The creation of the Tool will follow the design, with the actual functions being entered into Excel to create the spreadsheet.

The build will follow an Agile approach known as ‘**Minimum Viable Product**’ (Agile Alliance, n.d.). The Minimum Viable Product involves creating a small section of the software functionality - just enough to make it usable - and then showing this to the client to see if it satisfies their requirements. The benefit of this is that by allowing them to interact with the software it will highlight where the functionality may need to be altered, while sparking their mind to understand the output being delivered - meaning they can better target it to their needs.

The downside to the chosen build approach is the better understanding of the output can lead to the client changing their mind about which requirements they really value or make them realise more functionalities are required than originally planned for, meaning more time needs to be spent on making changes. However, this is somewhat of a benefit as it means the output will fully satisfy the client as they were fully involved in its creation. Knowing the impact this approach could have, time was left spare during the project schedule to capture and implement these added requirements. They can be viewed in [Appendix B](#)

The functions built can be viewed in *Section 5: [Implementation](#)*.

1.5.6. Step 6. Test

Using the User Story requirements as acceptance criteria, each will be tested to ensure it is met.

The client will also have access to the Tool to use as they are planning to in reality, which should catch any errors in the calculations as it would not provide the outcome they were expecting.

The testing plan and outcomes can be viewed in *Section 6: [Testing](#)*.

1.5.7. Step 7. Hand Over

After testing is completed and the client is happy with the Costing Tool, they will be able to take control of it and use it in real situations.

The project will be complete.

1.6. Project Assumptions

There is the assumption that the process change being introduced will be accepted by all those who are affected by it. This is a strong certainty, as the Senior Finance Officer and School Manager - the ones who know the most about the process area affected – are the ones who suggested this project to improve it and have the authority to insist the process is followed.

The Prototype Tool being developed is not for usage outside the Cardiff School of Computer Science and Informatics. Other Schools within the University may follow different processes that are not easily changed to match the introduction of the Tool, or the information required by the tool is not readily available.

The Prototype Tool will only be used for UK Research Funding applications, as other types of applications (e.g. EU Horizon 2020) follow a different process with additional costing rules and requirements that would overcomplicate the project scope, increasing the risk of project failure beyond an acceptable level.

There are a few different pensions pay schemes staff could potentially be costed at (USS, CUPF, LGPS, NHS, No Pension), but to begin with only USS pensions for staff will be taken into consideration, as the vast majority of calculations will be using this value. If there is time or a straightforward way to include an option for type of pension, this will be considered. The Senior Finance Officer and School Manager agreed with this.

1.7. Project Outcomes

The output of the project is a Prototype Excel Spreadsheet Tool that will give the outcome of simplifying the current iterative process, reducing the time and staff resources needed to generate accurate costs – while increasing the *efficiency* and success rate (*effectiveness*) of the funding application.

It is only a prototype because the project will not fully implement it as a working part of the process yet. The reason for this is it will still require more testing and changes by the Research Officer and School Manager before it will become complete and a true part of the process, used to cost all research projects within the School.

2. BACKGROUND

To understand the context of the project, it is necessary to give a summary of the system used to assign funding to UK Higher Education Institutes (Universities), as this will help with the understanding of the project goals. As well as this, the internal process currently used in the Computer Science School to create applications for funding is covered in this section.

Welsh Universities such as Cardiff receive research funding under the Dual Support System, which allocates funds in two ways:

1. Annual Block Grant funding - provided by the HEFCW
2. Research specific funding based on proposed costs - provided by the RCUK
 - Costing performed using the Transparent Approach to Costing (TRAC) Process

Alternatively, any research of interest to a charity can also be funded by them to help cover some of the costs.

Point 2 is most relevant for the project, as the specific project costs process is the area being investigated and improved.

2.1. Higher Education Funding Council for Wales

Every year, the HEFCW provide a block of funding to each University in Wales based on the volume and quality of research outputted by the institute, this is known as ‘Quality Research’ funding. The level of funding provided is calculated based on the result of the REF 2014 study which assessed the quality of research produced by every UK University on a list of criteria (REF, 2014), and ranked the institutes accordingly. The higher the quality of research, the higher the Universities allocated Block Grant for the year (HEFCW, n.d.).

2.2. Research Councils UK

RCUK is a ‘strategic partnership of the UK’s seven Research Councils’ (RCUK, n.d.) who supply universities with the funds required to undertake **specific** research projects, by investing around £3 billion per annum into innovative UK research. Each Research Council covers certain topics of study, and fund research within this domain.

The Seven Research Councils:

- Arts & Humanities Research Council (AHRC)
- Biotechnology & Biological Sciences Research Council (BBSRC)
- Economic & Social Research Council (ESRC)
- Engineering & Physical Sciences Research Council (EPSRC)
- Medical Research Council (MRC)
- Natural Environment Research Council (NERC)
- Science & Technology Facilities Council (STFC)

Prior to the 31st March 2018:

Universities gain extra funding for a specific research project by submitting a cost-based request to RCUK through their Joint Electronic Submission (Je-S) system (RCUK, n.d.) or with a paper copy via the post. The request is evaluated by other researchers, based on the potential importance of the research following the 'Haldane Principle' (Parliament, 2009), to determine if a grant will be supplied to cover the costs of the upcoming project.

A Full Economic Costing (fEC) method of research costing following the TRAC Methodology has been the agreed approach by UK based Universities and RCUK for request applications, since it was finalised by the Joint Costing and Pricing Steering Group in 2005 (HEFCE, 2015). Following TRAC allows Universities to calculate the total cost - fEC - of a research project with accurate estimations, which the RCUK fund 80% of if the grant request is accepted.

Following the 1st April 2018:

The seven RCUK will be combined with Innovate UK and Research England to create a new organisation named 'UK Research and Innovation', who will take over from RCUK in funding specific research projects with a budget of £6billion per annum (UK Research and Innovation, 2018).

2.2.1. TRAC Process (Full Economic Costing)

The TRAC Process is a flexible approach that allows Universities to implement the methodology in their own way, to best suit their needs while still calculating the fEC required by the RCUK. The Higher Education Regulation Review Group (HERRG) estimated that the bonus funding given to a University will be 10-20 times higher than the cost of the initial set-up, making it a highly beneficial process to follow (JCPSG, 2018).

The fEC is calculated from the three main sections of the TRAC methodology; Directly Incurred Costs, Directly Allocated Costs and Indirect Costs. (Vitae, n.d.)

2.2.1.1. *Directly Incurred Costs*

Directly Incurred Costs are anything that is purchased specifically for usage during the research project and can be measured by the money spent on it. For example: if £200 worth of paper is going to be used within a year, then this would be a Directly Incurred Cost as it is purely being consumed due to the research project itself. Other examples include any travel required within that year.

The most important Directly Incurred Cost for this project are the 'Recruited Staff'. The Recruited Staff are hired from outside the University to work specifically on the research project. Because the cost of unknown staff only occurs because of the research project being undertaken, they are a **directly incurred cost**.

2.2.1.2. *Directly Allocated Costs*

Directly Allocated Costs are the estimated costs of shared resources used during the research, known as overhead costs. These cannot be measured from purchases themselves, as they aren't specific to the project, but are shared between others. For example: estate costs of renting out a building that an area of is used during the project. The estimate is gained by multiplying the Full Time Equivalent (BusinessDictionary, n.d.) of research staff by the default cost for that overhead type, as set by the Research Administrator. So, if there is one full time staff (or two half-time staff) on the research project for a year, then the overhead costs would be x1.

The most important Directly Allocated Cost for this project are the 'Named Staff'. These are the staff members already employed by the University, meaning their names and salaries are known. Because their salary is going to be paid regardless of the research project, they are a **directly allocated cost**.

2.2.1.3. *Indirect Costs*

Indirect Costs are any costs that aren't related to the project but still need to be paid for. For example: HR costs, or library resources. In the same way as Directly Allocated Costs, Indirect Costs are calculated by multiplying FTE by a pre-set overhead cost.

2.2.1.4. *Total Costs*

These three sections of costs (Directly Incurred, Directly Allocated, Indirect) are totalled to output the fEC, which is the Total Cost of the proposed research. Not all this total cost will be covered, the amount received from the funder is known as the 'price' of the research.

2.3. Current School Costing Process

The complete pre-application process can be viewed in [Appendix A](#).
To summarise:

1. Funding Application is created and reviewed internally
 - a) The PI wishing to undertake a research project works with the Research Administrator, Research & Innovation Services and School Manager to create a *CAP Form* across multiple meetings.
 - b) The PI creates a *Funding Application* justifying their research project and the reason for the costs that are being applied for. This is sent to the Director of Research and two other academics for peer review. It is then finalized based on the feedback.
 - c) The *CAP Form* and *Funding Application* is sent to the Head of Research for review and sign-off.

2. Funding Application sent to external funding body for acceptance
 - a) The outcome of the application is received and sent to Research Administrator, School Manager and Director of Research.
 - b) If successful, PI drafts a news item and sends it to the Marketing and Communications Officer to publicise on the website and social media.

3. SPECIFICATION

3.1. Requirements Specification

3.1.1. Actors

The Tool will be used differently depending on the needs of the person (Actor) interacting with it.

The Actors within this project are defined as:

- **User**
The majority of the people interacting with the Tool will be those within the funding meeting, who are calculating the optimum scenario.
- **Administrator**
There is a need to occasionally alter some of the Tool inputs, to keep the calculations accurate and up-to-date. Administrators take responsibility for this.

An example requirement from each section is shown here, the rest of the requirements can be viewed in [Appendix B](#).

3.1.2. Essential Functional Requirements

These are the requirements that are vital to the system performing its objective and therefore must be met. They are split into the different sections of the tool to cover every area.

3.1.2.1. General Requirements

ID	Description
GENRL_01	As a User, I want to be able to enter a Start and End date of the research grant, so that the 'Hours in Project' can be calculated

3.1.2.2. Staff Cost Requirements

ID	Description
STAFF_01	As a User, I want a Staff Member's cost to be split across the years they are required, so I can view their cost per year

3.1.2.3. Named Staff Requirements

ID	Description
KNWN_01	As a User, I want to be able to select a Named Staff Member from their ID, so that I can add their time to the scenario for costing

3.1.2.4. Recruited Staff Requirements

ID	Description
UNKNWN_01	As a User, I want to be able to enter the Pay Spine of a Recruited Staff Member, so that their salary can be retrieved

3.1.2.5. Directly Allocated Costs Requirements

ID	Description
DIR_ALC_01	As a User, I want the 'Investigators' Costs to be calculated and displayed, so I can view how much the Staff will cost

3.1.2.6. Administration Requirements

ID	Description
ADMIN_01	As an Administrator, I want to be able to modify the yearly inflation increment percentage, so that Staff salaries are accurately calculated

3.1.2.7. Costing Summary Requirements

ID	Description
SUM_01	As a User, I want a summary of all the costs for each scenario to be visible, so I can compare the different scenario costs

3.1.3. Desirable Functional Requirements

These add more functionality to the Tool and will be added if possible but are not the key target of the system and will therefore be considered once the Essential Requirements are met.

3.1.3.1. Directly Incurred Costs Requirements

ID	Description
DIR_INC_01	As a User, I want the 'Salaries' Costs to be totalled and shown, so I can see the value that is added to the Directly Incurred Costs

3.1.3.2. Exception Cost Requirements

ID	Description
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EX_01	As a User, I want to be able to manually enter 'Staff – Student Stipend' Costs, so these are added to the Total Cost
--------------	--

3.1.4. Non-Functional Requirements

These cover the requirements of the system not linked to functionalities, instead they provide a view of what is required for the performance of the tool to be acceptable.

ID	Description
NON_01	<p><i>Accuracy</i></p> <p>The tool is being created to try out scenarios before they are more deeply investigated and finalised. Because of this, the accuracy of the tool does not have to meet a specific metric, it only needs to be close enough that the difference between scenarios can be viewed to make a choice which to examine further. If the tool is not absolutely accurate, it is still usable for its task, so this is acceptable.</p>

3.1.5. Added Requirements

These are requirements that have been discovered or asked for during meetings (meeting notes can be viewed in [Appendix G](#)) with the client, after the original requirements were documented and agreed. They can be described as the project scope creep, as they were not originally asked for but still needed to be added, which extended the length of this development project.

ID	Description
GENRL_07	<p>As a User, I want to be able to enter an overhead cap percentage, so the overhead costs can be correctly calculated for the research project</p> <p><i>Added after Meeting 5</i></p>

3.2. Costing Rules

The costing rules are an outline of how the values to meet requirements will be calculated. They are linked to the requirement that they help meet. They will be used as a guide to ensure the calculations and values have been correctly understood, by showing them to the client who will have the opportunity to explain the required output of the function, as a result the rule will reflect it correctly. They can then help guide the implementation of the formulas to follow the rules.

As well as this, the rules will help any future administrators of the Tool understand how the values are calculated, as the rules are simpler to view than the complex Excel formulas.

An example can be seen here; the rest can be viewed in [Appendix C](#).

RULE ID	Requirement ID	Rule
RULE_01	GENRL_02	FTE = Staff1 FTE + Staff2 FTE + Staff3 FTE.....
RULE_02	GENRL_03	Total Cost = Named Staff Total + Recruited Staff Total + Directly Allocated Costs + (Directly Incurred Costs) + (Exception Costs)

4. DESIGN

4.1. Design Justifications

4.1.1. Microsoft Excel Usage

The first design decision made was which software would be used to create the tool. This was an important choice as it would affect how the tool would be created and how the User would interact with it. If the wrong decision was made, the implementation would be a lot more complex than it needed to be and the client could be dissatisfied with the result.

The decision had a clear and obvious result of Microsoft Excel, there was little need to look deeply into other alternatives as the outcome was already decided by the client. This decision did not need to be contested as there was a wealth of benefits that come with Excel.

1. Excel is a very User-friendly interface for entering formulas to perform calculations like the ones required to create the tool. There are useful wizards such as 'Insert Function' to help guide the creation of the tool that allow for a step-by-step walkthrough to make the formula required. Using this Excel User interface is far easier than coding the tool from scratch.
2. I have experience with Excel and have frequently used it to perform similar data calculation tasks. This includes creating a complex costing spreadsheet while working at a company, to help managers decide the best option for their Cloud Computing needs. The premise of the current task is very similar to what was created to solve the Cloud situation, so I can make use of my previously learnt knowledge to aid the tool creation.
3. As Excel is the industry standard spreadsheet software, it is widely used by the majority of people (Robarts, 2014). Due to this, there is a plethora of tutorials available online to help with the usage of the software, making it very easy to find guidance on how to perform the functions required. This makes the creation of the tool a lot simpler as any Excel usage questions are probably already answered somewhere.
4. All the data required for the tool to function is stored in other Excel worksheets, so using the same software makes it easy to bring the data needed for the calculations together.
5. The target audience of the tool are accustomed to regularly using Excel in their work, meaning they already have access to the Excel software. The User will already understand Excel so will find the tool easier to use than if it was a new piece of software. The Administrator / client already has knowledge of Excel functions so will understand the calculations, to spot any potential mistakes and know how to edit or add to it in future.

If there were the opportunity to investigate other possible solutions, for example if there were competent developers available to code the tool from scratch, then this could possibly produce a better output than using Excel. Such as, there would be a lot more flexibility, so more could be investigated during the design to tailor it to exactly what the client would like, rather than being limited to the Excel UI.

However, all this extra development would massively extend the project length and complexity beyond feasibility. It would also limit the scope for future scalability as it would require competency in the chosen program to add new functionalities – Excel is far simpler so does not have this issue. Regardless of if the competent developers were available, the decision to use Excel would remain the same as the project does not require such advanced software.

4.1.2. No Macros/Visual Basic

Excel allows Visual Basic code to be added which can improve the usability of the software. For example, it can be used to automate some sections of the system with Macros to reduce the steps a User has to follow to perform a task, or to create a form-like User interface to aid with data entry. However, not every Excel file needs these additions (Oz du Soleil , 2012), for the tool being developed no Visual Basic code will be used for the following reasons:

1. Visual Basic code is a complex language that myself and the Users do not have experience with. This gives the following drawbacks:
 - a) Extra time would be needed to learn Visual Basic which would extend the project length.
 - b) Complicates the tool which makes it harder for the client to maintain, edit or add functionalities to.
2. Any Excel files that make use of Visual Basic have a warning popup when opening the file:
 - a) Could confuse Users or scare them away from using it.
 - b) Means there is a vulnerability for a malicious macro to be added as Users would be used to accepting the security warning, so they would not be worried by the popup. If there is no warning normally, they would be aware of a potential virus when the warning suddenly started appearing.
3. The chosen design means that locked cells will guide Users to the data entry points already, so a Visual Basic form would add very little bonus usability.
4. The main reason is that the Visual Basic is not needed as all the required functionalities can be performed with standard Excel formulas.

4.2. The User Interface

The Tool will take the form of a single Cost Excel workbook comprised of six sheets, with one of them (Scenario Cost Calculation sheet) created and then duplicated. The User will not need access to all of them, so they will be hidden or locked to only allow the Administrator(s) access. This design was agreed with the client as it best allows the User to have a simple experience, with any non-vital areas hidden from their view and control while allowing freedom to edit the costing scenarios.

There is a total of six sheets, listed below. The description and justification of each will be detailed in later sections.

- Scenario Cost Calculation sheets
- Costs Summary (*Locked*)
- Notes
- Admin (*Hidden*)
- Core Report (*Hidden*)
- Pay Grades (*Hidden*)

As there is enough available time planned within the project schedule, the desirable requirements will also be designed. If time becomes an issue during implementation then the fields relating to desirable requirements will not be developed, but this should not be the case.

Some of the key design choices considered were:

1. Colour to help the User identify what they are looking at, with a consistent use throughout the tool, so the User knows what to expect when they see that colour.
2. Block the User from selecting areas they do not need, which will help guide them to data entry in the correct cells.
3. Guidance given for functions that the User might struggle with, so they never become blocked from using the tool.
4. Useful error messages displayed to the User when they are stopped from performing an action, so they know the reason why.

4.2.1. Tool Colours

For usability purposes, each scenario will be allocated its own colour to help the User distinguish between which scenario sheet or scenario costs summary they are looking at:

Scenario 1: Blue
Scenario 2: Green
Scenario 3: Orange

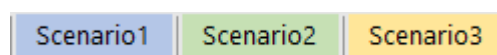


Figure 3 - Excel Sheet Tabs

Within each scenario sheet the cells will have set colours to distinguish between the functions and guide the User to enter data in the correct cells.

White: User data entry cell

Light Blue: Calculated value (Locked)

Light Orange: Calculated cost total value (Locked)

Light Grey: Calculated overall total value (Locked)

4.2.2. Scenario Cost Calculation Sheet

The scenario cost calculation sheet will calculate all the costs for the scenario entered. The first costing sheet will be created, and then duplicated to allow multiple blank sheets for the User to fill with the different scenarios.

The sheet will be made up of four key sections. The detailed design for these areas, with more information about the fields within them, and the validation used can be viewed in [Appendix D](#).

4.2.2.1. Project Definition Area

This area will capture all the details about the research project being costed, with the values being entered by the User. There is also guidance available for the User's benefit.

These values are needed to run the cost calculations based on the date and type of project.

An example field:

Field Name	Description	Validation
i. 'Project Start Date'	Manually entered by User Runs the Staff increment calculations	DD/MM/YYYY format

Mock-up:

SCENARIO 1			
Project Start Date		Total Budget	
Project End Date		Budget Left	
Overhead Type	<input checked="" type="radio"/> Generic <input type="radio"/> Laboratory <input type="radio"/> Capped	Hours in Project	
Overhead Cap (%)	0		

Calculator			Full Time Equivalent
	Required for	Hours	
No. of months		0.00	7.5 hours per day
No. of weeks		0.00	37.5 hours per week
No. of days		0.00	220 days per annum
		0.00	44 weeks per annum
			1,650 hours per annum

4.2.2.2. Named Staff Area

This area will be used to calculate the Named Staff costs. As they are employed by the University there is a list of every staff member, identified by their staff ID

and containing data such as their name and salary. The User will enter the values they want costed (the staff member and their time), which the calculations will be performed on.

An example field:

Field Name	Description	Validation
i. 'Staff ID'	Manually entered by User OR Select from dropdown list Used to retrieve the specified Staff data	Restricted to dropdown list retrieved from Core Report

Mock-up:

Known Staff													
ID	Name	Hours Yr1	Hours Yr2	Hours Yr3	Hours Yr4	Hours Yr5	FTE	Cost Yr1	Cost Yr2	Cost Yr3	Cost Yr4	Cost Yr5	Total Cost
							0						
							0						
							0						
							0						

4.2.2.3. Recruited Staff Area

This area will be used to calculate the Recruited Staff costs. The staff members are chosen for the research project based on their skill level, shown by their spine point, as the details of the individual are not known at this stage of the costing. The User will enter the values they want costed (the spine point of the staff and how long they are required for), which the calculations will be performed on.

An example field:

Field Name	Description	Validation
i. 'Spine Point'	Manually entered by User Used to retrieve the salary for the specified spine point Has been agreed with client that Recruited Staff will only be on a USS pay grade, and only between these pay spines. So, do not need to calculate costs for other pension types	Must be a number between 23-51 Reason: USS Pay Grade cannot be below 23 or over 51

Mock-up:

Unknown Staff													
Spine Point	Note	Hours Yr1	Hours Yr2	Hours Yr3	Hours Yr4	Hours Yr5	FTE	Cost Yr1	Cost Yr2	Cost Yr3	Cost Yr4	Cost Yr5	Total Cost
							0						
							0						
							0						
							0						
							0						

4.2.2.4. Scenario Costs Area

This area will allow the User to enter any more costs that are needed for the scenario, as well as summing up the calculations of the Named and Recruited staff costs to give a total cost for the scenario.

An example field:

Field Name	Description	Validation
i. 'FTE Total'	<p>Summed from the FTE of all entered staff</p> <p>Used to calculate overhead costs</p> <p>Shows User the FTE of all staff</p> <p>Split into Year 1, Year 2, Year 3</p>	Locked

Mock-up:

	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
FTE	0	0	0	0	0	0
Directly Incurred						
Salaries	0.00	0.00	0.00	0.00	0.00	£ -
Travel & Subsistence (UK)	0.00	0.00	0.00	0.00	0.00	£ -
Travel & Subsistence (Overseas)	0.00	0.00	0.00	0.00	0.00	£ -
New Equipment Costs	0.00	0.00	0.00	0.00	0.00	£ -
Recruitment / Advertising	0.00	0.00	0.00	0.00	0.00	£ -
Consumables		0.00	0.00	0.00	0.00	£ -
Other	0.00	0.00	0.00	0.00	0.00	£ -
Publication	0.00	0.00	0.00	0.00	0.00	£ -
Relocation		0.00	0.00	0.00	0.00	£ -
Audit	0.00	0.00	0.00	0.00	0.00	£ -
Subcontractor	0.00	0.00	0.00	0.00	0.00	£ -
DI Major Research Facilities	0.00	0.00	0.00	0.00	0.00	£ -
Exceptions						
Stipend	0.00	0.00	0.00	0.00	0.00	£ -
Student Fees	0.00	0.00	0.00	0.00	0.00	£ -
Directly Allocated						
Investigator Costs	0.00	0.00	0.00	0.00	0.00	£ -
Estates Costs	0.00	0.00	0.00	0.00	0.00	£ -
Other Directly Allocated Costs (Staff)	0.00	0.00	0.00	0.00	0.00	£ -
Infrastructure Technician	0.00	0.00	0.00	0.00	0.00	£ -
Indirect Costs	0.00	0.00	0.00	0.00	0.00	£ -
OS Overheads	0.00	0.00	0.00	0.00	0.00	£ -
Total Cost	£ -	£ -	£ -	£ -	£ -	£ -

4.2.3. Costs Summary Sheet

The Costs Summary will take the results from each scenario calculation sheet and display them side by side to allow the User to view the differences between the scenarios. It will be locked, with the changes being made on the scenario sheets being reflected in the summary so the User does not need to be able to edit the summary directly. There is guidance available to explain to the User how to use the sheet.

Each scenario summary will show:

4.2.3.1. Summarised Scenario Costs

- i. **'FTE'**: Allows the User to see the FTE used in the scenario.
- ii. **'Directly Incurred Cost Total'**: A summation of all the Directly Incurred Costs for the scenario.
- iii. **'Exception Cost Total'**: A summation of all the Exception Costs for the scenario.
- iv. **'Directly Allocated Cost Total'**: A summation of all the Directly Allocated Costs for the scenario.
- v. **'Total Scenario Cost'**: A summation of the above costs for the scenario.

Mock-up:

Click 'Data' on the toolbar and then 'Refresh All' to update Staff Summaries


Scenario 1		Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
	FTE	0	0	0	0	0	0
	Directly Incurred	0.00	0.00	0.00	0.00	0.00	£ -
	Exceptions	0.00	0.00	0.00	0.00	0.00	£ -
	Directly Allocated	0.00	0.00	0.00	0.00	0.00	£ -
	Total Scenario Cost	£ -	£ -	£ -	£ -	£ -	£ -

4.2.3.2. Named Staff Summary

- i. **'Name'**: The name of the staff entered within the scenario.
- ii. **'Summary Hours Year 1', 'Summary Hours Year 2', 'Summary Hours Year 3', 'Summary Hours Year 4', 'Summary Hours Year 5'**: The hours the staff member is costed for.

- iii. **‘Total Cost’:** The total cost of the staff member entered.
- iv. **‘Grand Total’:** The overall totals for the Named Staff in the scenario.

Mock-up:

Known Staff							
Name		Sum Hours Yr1	Sum Hours Yr2	Sum Hours Yr3	Sum Hours Yr4	Sum Hours Yr5	Total Costs
Grand Total							

4.2.3.3. Recruited Staff Summary

- i. **‘Spine Point’:** The spine point of the entered staff member.
- ii. **‘Summary Hours Year 1’, ‘Summary Hours Year 2’, ‘Summary Hours Year 3’, ‘Summary Hours Year 4’, ‘Summary Hours Year 5’:** The hours the staff member is costed for.
- iii. **‘Total Cost’:** The total cost of the staff member entered.
- iv. **‘Grand Total’:** The overall totals for the Named Staff in the scenario.

4.2.4. Notes Sheet

A blank sheet will be available for the User to write any notes about the costing, to allow them to be used for future reference. This will keep all information about the costing within the spreadsheet, so there is nothing separate that could be lost. There will be enough lines for the User to make a considerable number of notes if required.

4.2.5. Admin Sheet (Hidden)

There are a lot of calculations performed to achieve the cost values for the scenarios. The Administrator needs to be able to view these to ensure they are correct and edit them to keep the variables used in the calculations up to date. All the needed variables will be stored on the Admin sheet.

To save the normal User from having to view these, which may lessen the User experience by confusing them, the sheet will be hidden. The sheet will only be accessible to Administrators by entering a password - as there is no reason the User needs access to the sheet.

4.2.6. Core Report Sheet (Hidden)

The Core Report contains all the data about Named Staff members who may be used in the scenarios. As this will be referenced to calculate costs it needs to be available within the Tool, to allow the values to be accessed. The data will be pulled from the Core Report and stored in this sheet to allow easy access to it

without having to consistently reference an external file, the reason for this is described in *Section 4.3: [Importing Data](#)*.

During the creation of the Tool, dummy data will be used in place of the true values, but as it is in the same format as the true report, it will be a simple task for the Administrator to import the real data when the time comes.

As normal Users will not need access to this data - and for confidentiality reasons – the sheet containing it will be hidden and protected by a password.

4.2.7. Pay Grades Sheet (Hidden)

The pay grades contain the data required to calculate the costs for Recruited Staff members. For the same reasons as the Core Report data, it is simpler for this to be within the Tool as opposed to externally, so this sheet will contain the imported data.

As normal Users will not need access to this data, the sheet containing it will be hidden and protected by a password.

4.3. Importing Data

The data required for the Tool calculations is stored in two separate Excel spreadsheets The Core Report and Pay Grades data workbooks, examples of these can be viewed in [Appendix H](#). To access the data in these workbooks for usage in the Tool, there are a few options, with the advantages (+) and disadvantages (-) of each shown below:

1. Every User saves the Core Report and Pay Grades workbooks on their computer, with the Tool externally referencing the files to pull specific values for use in the formulas.
 - + If the source data is up to date, the values in the spreadsheet will be too as they will automatically pull the newest data.
 - The User must ensure both their saved files are maintained with the up to date data. This is an unnecessary annoyance to Users and may mean old data is accidentally used.
 - Every User must have the file saved with same file path or no formulas will work. Alternatively, everyone must change the file path in every formula to where on their computer they have saved the workbooks before they can use the tool, which may be beyond the technical capabilities of some Users and adds frustration even if a guide is supplied.
 - If the file path is not valid, the Tool will not work at all. For example, if the file is renamed or moved, the connection between the workbooks will be broken. This may confuse and frustrate Users.
 - The Users likely would not be allowed access to the Core Report for confidentiality reasons.

2. Store the Core Report and Pay Grades workbooks in a repository accessible to all Users, with the Tool externally referencing the files to pull specific values for use in the formulas.
 - + If the source data is up to date, the values in the spreadsheet will be too as they will automatically pull the newest data.
 - + Only the files in the repository would need to be maintained and updated for all Users to have the up to date data.
 - + The same file path would be valid for every User, so no changes would need to be made to formulas.
 - + The User only needs to download the Tool once and it will always be up to date.
 - A connection to the repository would always be required for the Tool to function.
 - The file path would be required in every formula for them to reference the values to work. This complicates the formulas and makes them harder to understand and edit.
 - Requires more complex implementation and increased access to School systems to set up.
3. Pull all the data from the workbooks and store it in the tool spreadsheet, allowing it to be referenced internally. The Tool is then saved in a repository with the up to date data already imported within it. The Administrator refreshes the data in the spreadsheet whenever needed and updates the repository with the new Tool.
 - + No connection is required for the Tool to work.
 - + No external references are required, making the formulas simpler.
 - + If the newest version of the Tool is used, all data will be current.
 - + The User does not need to access or save the other workbooks.
 - + Once the data connection is set up and the workbooks have been overwritten with the newest data it is simple to refresh the data in the Tool with one button click.
 - The Administrator must remember to refresh the data and reupload every quarter.
 - The User must download the Tool from the repository every time they need to use it, to ensure it is up to date.

Based on the benefits and drawbacks of each option, and after discussion with the client it was decided that option 3 is the best approach for accessing the data from the external workbooks. The main advantage is the ***simplicity*** for the prototype being created, in future they may look at a more robust solution.

5. IMPLEMENTATION

Within this section, the process behind the calculations in each field in the Tool is described, as well as the inputs and any extra information about the data such as validation.

The formulas to complete the process are stated, to show how the calculations are implemented.

5.1. Scenario Cost Calculation

The formulas were all implemented on one sheet, which was then duplicated to create the other two scenarios to ensure they are identical and to save time.

5.1.1. Project Definition Area

Most of the cells within this area are places for the User to manually enter information about the research project, to be used as inputs for the other calculations throughout the Tool. There is also some guidance which is only used within this area and not referenced by any other areas of the tool, for example the Calculator.

5.1.1.1. Project Start Date

- **Input:** Manual entry
- **Validation:** Date format after 01/01/1990

Scenario 2 and 3 – copied from Scenario 1 and locked

5.1.1.2. Project End Date

- **Input:** Manual Entry
- **Validation:** Date format after 'Project Start Date'

Scenario 2 and 3 – copied from Scenario 1 and locked

5.1.1.3. Overhead Type

- **Input:** Excel Form Control - Option Button
Required Developer mode to be activated in Excel
- **Output:** Linked to cell B6 and changes value within it(behind the control)
Generic = 1
Laboratory = 2
Capped = 3

The value is in white font so invisible to the User

5.1.1.4. Overhead Cap (%)

- **Input option 1:** Manual entry
- **Input option 2:** Excel Form Control: Spin Button
Required Developer mode to be activated in Excel
Allows User to increment value by 1 instead of using manual entry
- **Validation:** Must be a number between 0-100

5.1.1.5. Total Budget

- **Input:** Manual entry

Scenario 2 and 3 – copied from Scenario 1 but can be overwritten

5.1.1.6. Budget Left

Calculating the budget remaining after costs have been entered

- **Process:**
Total Budget – Total Cost
- **Input:** 'Total Budget', 'Total Cost'
- **Formula:**
=SUM(E2-G54)

5.1.1.7. Hours in Project

Calculating the number of hours within the project, between the start and end of the project

- **Process:**
 1. Divides the number of days between 'Start Project Date' and 'End Project Date' by 365 and multiplies by 220 to get the number of FTE days
 2. Multiplies number of FTE days by 7.5 to get the number of FTE hours between the two dates
 3. Remove the extra day added by a Leap Year.
The formula to ignore leap years was taken from:
<https://www.excelforum.com/excel-general/746315-date-differences-and-ignoring-leap-years.html>
- **Input:** 'Start Project Date', 'End Project Date'
- **Formula:**
=SUM((((SUMPRODUCT((TEXT(ROW(INDIRECT(B2&":"&B4)),"ddmmm")<>"29Feb")+0)-1))/365)*220)*7.5
Ignores leap years as they are not required for costing

5.1.1.8. Calculator

- **Process:**
 1. Number of months entered * 137.5
 2. Number of weeks entered * 37.5
 3. Number of days entered * 7.5

- **Input:** Manual entry
- **Formula:**
 - a) =SUM(I5*137.5)
 - b) =SUM(I6*37.5)
 - c) =SUM(I7*7.5)

5.1.2. Named Staff Area

Within the Tool this has been renamed to 'Directly Allocated' staff.

The calculations for the Named (and Recruited) staff are all performed within one long table, with the calculation areas locked and hidden from the User. The reason for this is that it allows the calculations to be targeted at the staff being added into that row, for example referencing the spine point of that specific staff member. It also means the calculations expand with the table to allow more rows to be added, if the default number of rows is not sufficient for the scenario. Any out-of-table cells targeted in the formulas make use of Excel absolute referencing (using \$) to ensure the reference does not move when a new row is added.

The issue with locking the sheet as stated in *Section 4.2: [Design](#)*, is that Excel blocks tables from being expanded if there are locked cells within them. As a result, the table rows must remain unlocked to allow the table to expand. The User can now right click to add a row to the table, as standard in Excel. The problem is that this opens the possibility that the User can delete the formulas in the light blue calculation cells which would break the Tool. However, this is an acceptable risk because the Users will be trained before using it so would know to only enter data in the white data entry cells and would have no reason to alter the other areas.

A fix to this issue, if more time was available, is described in *Section 7.4: [Future Work](#)*.

5.1.2.1. Staff ID

Allows the User to manually enter an ID, or select an ID from a drop-down list

- **Process:**
 1. Created a named range called 'StaffID' that covers the Core Report Sheet 'Staff ID' column (minus the heading)
 - =Sheet4!\$A\$2:\$A\$1048576

The named range means blanks are not shown in the drop-down list
 2. Added data validation to the 'Staff ID' cell, only allowing a list from the 'StaffID' named range to create a drop-down list
- **Input option 1:** Manual entry
- **Input option 2:** Drop-down list selection
- **Validation:** Must be in the 'StaffID' named range

5.1.2.2. Name

Retrieves the Staff Name from the 'Staff ID'

- **Process:**
 1. Retrieves the First and Last name from the Core Report, based on the Staff ID
 2. Concatenates them together to display both names in one field
- **Formula:**
`=CONCATENATE(VLOOKUP(A14,Sheet4!$A:$AL,4,FALSE)," ",VLOOKUP(A14,Sheet4!$A:$AL,3,FALSE))`
- **Conditional Formatting:**
 Applied to entire sheet to change any errors to the same colour as the background
Hides the error displayed when no Staff ID selection has been made

5.1.2.3. Hours Yr1 – Yr5

- **Input:** Manual entry
- **Validation:**
 - a) All five years totalled must be less than the Hours in Project
 And each field must be less than 1650
 - `=AND(SUM(C14:G14)<=D9,C14<=1650)`
 - b) For Year 2 onwards also -
 Limit the value available to be the Hours in Project, minus any previous years' worth of hours
Prevents the User entering the hours in the wrong years
E.g. 2000 Hours in Project and User entering 1650 hours in Year 2 (which would be beyond the end of the project)
 - `=AND(SUM(C14:G14)<=D9,D14<=1650,D14<=MAX(0,D9-1650))`
 - `=AND(SUM(C14:G14)<=D9,E14<=1650,E14<=MAX(0,D9-3300))`
 - `=AND(SUM(C14:G14)<=D9,F14<=1650,F14<=MAX(0,D9-4950))`
 - `=AND(SUM(C14:G14)<=D9,G14<=1650,G14<=MAX(0,D9-6600))`
- **Conditional formatting:**
 Depending on how many Hours in Project, changes the Hours fields red to guide the User which fields are available

Formula: <code>=D\$9<=1650</code>	AaBbCcYyZz	<code>=D\$14:G\$17</code>	↑
Formula: <code>=D\$9<=3300</code>	AaBbCcYyZz	<code>=E\$14:G\$17</code>	↑
Formula: <code>=D\$9<=4950</code>	AaBbCcYyZz	<code>=F\$14:G\$17</code>	↑
Formula: <code>=D\$9<=6600</code>	AaBbCcYyZz	<code>=G\$14:G\$17</code>	↑

Figure 4 - Hours Conditional Formatting

5.1.2.4. FTE

Totals the FTE for the staff member

- **Process:**
 1. Sums up the staff member's hours
 2. Divides by a years' worth of hours
- **Formula:**
 $=\text{SUM}(\text{C14}:\text{G14})/1650$

5.1.2.5. Costs

- **Process:**
 - 1) Sums the years' Pre-Increment Cost and Post-Increment Cost
 - 2) Calculates the Allowances for the number of hours in the year
 - 3) Adds them together to get total yearly cost
- **Input:** 'Yr1 Pre-Inc', 'Year1 Post-Inc', 'Allowances', 'Hrs Yr1'
- **Formula:**
 $=\text{SUM}(\text{AO14}+\text{AP14})+((\text{Z14}/1650)*\text{C14})$
(*'Yr1 Pre-Inc' + 'Year1 Post-Inc' + (('Allowances' / 1650)) * 'Hrs Yr1'*)

a) Yr1 Pre-Inc.

- **Process:**
Multiplies the hourly salary rate by the number of hours before the increment date
- **Input:**
'1+Start Inc', 'Yr1 Hrs Pre-Inc.'
- **Formula:**
 $=\text{AD14}*\text{AM14}$

❖ 1+Start Inc.

- **Process:**
 - 1) Check if inflation needs to be added to the Yr1 hourly salary base
 - 2) Check if two lots of inflation (2*inflation increment) needs to be added to the Yr1 hourly salary base
 - 3) Check if three lots of inflation (3*inflation increment) needs to be added to the Yr1 hourly salary base
 - 4) If none of the above are true, 'Yr1' hourly salary base

Starting Increment Calculation described in [Admin Sheet Implementation Section](#)

- **Input:** 'Starting Increment', 'Yr1 Base', 'Inflation Increment'
- **Formula:**
 $=\text{IFS}(\text{)}$

Admin!\$E\$12=TRUE,AC14*(1+Admin!\$C\$3),
Admin!\$E\$13=TRUE,AC14*(1+(2*Admin!\$C\$3))
Admin!\$E\$14=TRUE,AC14*(1+(3*Admin!\$C\$3))
Admin!\$E\$1106="",AC14)

❖ Yr1 Hrs Pre-Inc.

- **Process:**
Multiplies number of hours in year 1 by the percentage of the hours that occur before the increment date
Percent Pre-Inc described in [Admin Sheet Implementation Section](#)
- **Input:** 'Hrs Yr1', 'Percent Pre-Inc'
- **Formula:**
=C14*Admin!\$H\$6

b) Yr1 Post-Inc.

STAFF_03, KNWN_04

- **Process:**
1) Uses the hourly salary AFTER Pay Spine increment
Either has incremented or has not.
Based on: [Pay Spine Increment](#)
2) Adds the inflation value to the hourly salary rate
3) Multiplies by the number of hours after the increment date
- **Input:** '2+Start Inc', 'Inflation Increment', 'Yr1 Hrs Post-Inc.'
- **Formula:**
=(AF14*(1+Admin!\$C\$3))*AN14
('2+Start Inc' + inflation increment) * 'Yr1 Hrs Post-Inc.'

❖ Yr1 Hrs Post-Inc.

- **Process:**
Minus the number of hours pre-increment from the number of hours in Year 1
Percent Post-Inc described in [Admin Sheet section](#)
- **Input:** 'Hrs Yr1', 'Yr1 Hrs Pre-Inc'
- **Formula:**
=SUM(C14-AM14)

c) Allowances

- **Process:**
1) Retrieves 'Salary Including Allowances', 'Basic Pay' from Core Report based on Staff ID
2) Subtracts Basic Pay from Salary Including Allowances to get Allowances value
- **Input:** 'StaffID', 'Salary Including Allowances', 'Basic Pay'

- **Formula:**
=SUM(VLOOKUP(A14,Sheet4!\$A:AL,32,FALSE)-
VLOOKUP(A14,Sheet4!\$A:\$AL,31,FALSE))

Every other year's costs are calculated the same, but for each increment, another inflation increment is added.

For example, 'Yr2 Pre-Inc' already has the inflation increment added, then the 'Yr2 Post Inc' has inflation increment*2 added.

'Yr3 Pre-Inc' has inflation increment*2 added. Yr3 Post-Inc. has inflation increment*3 added.

This accounts for the salaries increasing by the inflation factor every 1st August

5.1.2.6. Pay Spine Increment

Calculating the yearly salary base, taking into account the Pay Spines increasing at the increment date. The Pay Spine does not increase beyond a Pay Grade, which added another level of complexity of stopping the increase if this occurs.

This value is used as the base to add the starting increment, and then the yearly increments; to calculate the hourly cost of the staff member.

1. Yr1 Base

- **Process:**
Retrieves the salary for the staff member's Pay Spine and divides by a year's worth of hours to make it hourly
- **Input:** 'Total USS'
- **Formula:**
=SUM(VLOOKUP(O14,Sheet5!\$A\$2:\$P\$69,14,FALSE)/1650)

2. Yr2 Base

- **Process:**
 - 1) Checks the outcome of the Grade comparison to see if the Pay Grade of the current year is the same as last year's, and retrieves the relevant Pay Spine salary
Pay Spine does not increase if a Grade boundary is crossed
 - a) If the Year 2 Pay Grade is the same as Year 1, then retrieve the salary of the spine point +1 to account for the pay spine increment
 - b) Else retrieve the salary of the Year 1 spine point, as it will not have incremented
 - 2) Divide the retrieved salary by a year's worth of hours to make it hourly
- **Input:** 'Grade Year 1', 'Total USS'
- **Formula:**
=SUM(
IF(R14="Yes",
VLOOKUP((O14+1),Sheet5!\$A\$2:\$P\$61,14,FALSE),

VLOOKUP((O14),Sheet5!\$A\$2:\$P\$61,14,FALSE))
/1650)

a) 'Grade Yr1' check

- **Process:**

Compares the staff member's Spine Point to the Pay Grades (described in the [Admin Sheet](#) section), to calculate which Pay Grade the Spine Point is

If the formula returns an error (when there is no Grade to return) then set the value to "DISC"

For the other year's the same check is performed, the difference is +1 is added to the spine point each year to account for the increment

- **Input:** 'Spine Point', 'Low Spine', 'High Spine'

- **Formula:**

=IFERROR(
IFS(
AND(O14>=Admin!\$C\$34,O14<=Admin!\$D\$34),"Grade 1",
AND(O14>=Admin!\$C\$35,O14<=Admin!\$D\$35),"Grade 2",
AND(O14>=Admin!\$C\$36,O14<=Admin!\$D\$36),"Grade 3",
AND(O14>=Admin!\$C\$37,O14<=Admin!\$D\$37),"Grade 4",
AND(O14>=Admin!\$C\$38,O14<=Admin!\$D\$38),"Grade 5",
AND(O14>=Admin!\$C\$40,O14<=Admin!\$D\$40),"Grade 6",
AND(O14>=Admin!\$C\$42,O14<=Admin!\$D\$42),"Grade 7",
AND(O14>=Admin!\$C\$43,O14<=Admin!\$D\$43),"Grade 8"),
"DISC")

b) 'Yr2 + 1?'

Grade Comparison – increment or not?

- **Process:**

1) If the Grade of the previous year is "Disc" then value is set to "No"

2) If the 'Increment' field is "NoInc" then value is set to "No"

3) If the Year 1 and Year 2 grade are different then value is set to "No"

4) If the Year 1 and Year 2 grade are the same then value is set to "Yes"

- **Input:** 'Grade Yr1', 'Grade Yr2', 'Increment'

- **Formula:**

=IFS(
P14="DISC","No",
AB14="NoInc","No",
P14<>Q14,"No",
P14=Q14,"Yes")

- **Output:** "Yes" or "No"

❖ 'Increment'

- **Process:**
Retrieves the Increment Date of the selected staff from their Staff ID
If there is no date, then value is set to “NoInc”
Else the date is shown
- **Input:**
‘StaffID’
- **Formula:**
=IF(VLOOKUP(A14,Sheet4!\$A:\$AL,33,FALSE)
="", "NoInc", VLOOKUP(A14,Sheet4!\$A:\$AL,33,F
ALSE))

3. Yr3 Base (and onwards)

- **Process:**
 - 1) Checks whether the Pay Grade of the current year is the same as last year’s and retrieves the relevant Pay Spine salary
 - a) If the Year 3 Pay Grade is the same as Year 2, then retrieve the salary of the spine point +2 to account for two years of incrementing
 - b) If the Year 2 Pay Grade is the same as Year 1, then retrieve the salary of the spine point +1 to account for the pay spine increment
 - c) Else retrieve the salary of the Year 1 spine point, as it will not have incremented
 - 2) Divide the retrieved salary by a year’s worth of hours to make it hourly

This pattern of checking the grade change continues for the remaining Year 4 and Year 5, each time adding a check of the previous year’s Grade

- **Input:** ‘Yr3 +1?’, ‘Yr2 +1?’
- **Formula:**
=SUM(
IF(T14="Yes", VLOOKUP((O14+2),Sheet5!\$A\$2:\$P\$61,14,FALSE),
IF(R14="Yes",VLOOKUP((O14+1),Sheet5!\$A\$2:\$P\$61,14,FALSE),
VLOOKUP((O14),Sheet5!\$A\$2:\$P\$61,14,FALSE)))
/1650)

a) ‘Yr3 +1?’ (and onwards)

Grade Comparison

- **Process:**
 - 1) If ‘Yr2+1’ is “No” then set value to “No” (if it did not increment previously, it would never increment again)
 - 2) If the Year 2 and Year 3 grade are the same, then set value to “Yes”
 - 3) Else set to “No”
- **Formula:**
=IF(
OR(R14="No", R14="DISC"), "No",
IF(Q14=S14,"Yes","No"))

- **Output:** “Yes” or “No”

5.1.2.7. *Total Cost*

- **Process:**
Totals the yearly costs for the staff member
- **Input:** ‘Cost Yr1’ : ‘Cost Yr5’
- **Formula:**
=SUM(I14:M14)

5.1.3. Recruited Staff Area

Within the Tool this has been renamed to ‘Directly Incurred’ staff.

The implementation was performed using the same approach as Named Staff, using tables. It also performs the same calculations to check whether the spine point of the staff member is incremented for the next year.

5.1.3.1. *Spine Point*

- **Input:** Manual entry
- **Validation:** Must be a whole number between 23-51

5.1.3.2. *Hours Yr1 – Yr5*

See Named Staff [Hours Yr1-Yr5](#) Implementation

5.1.3.3. *FTE*

Totals the FTE for the staff member

- **Process:**
 1. Sums up the staff member’s hours
 2. Divides by a years’ worth of hours
- **Input:** ‘Hours Yr1’ : ‘Hours Yr5’
- **Formula:**
=SUM(C22:G22)/1650

5.1.3.4. *Costs*

- **Process:**
 - 1) Sums the years’ Pre-Increment Cost and Post-Increment Cost
 - 2) Adds them together to get total yearly cost
- **Input:** ‘Yr1 Pre-Inc’, ‘Year1 Post-Inc’
- **Formula:**
=SUM(AJ22+AK22)

d) Yr1 Pre-Inc.

- **Process:**
Multiplies the hourly salary rate by the number of hours before the increment date

- **Input:** '1+Start Inc', 'Yr1 Hrs Pre-Inc.'
- **Formula:**
= Y22*AH22

❖ 1+Start Inc.

- **Process:**
 - 1) Check if inflation needs to be added to the Yr1 hourly salary base
 - 2) Check if two lots of inflation (2*inflation increment) needs to be added to the Yr1 hourly salary base
 - 3) Check if three lots of inflation (3*inflation increment) needs to be added to the Yr1 hourly salary base
 - 4) If none of the above are true, 'Yr1' hourly salary base

Starting Increment Calculation described in [Admin Sheet](#) Section

- **Input:** 'Starting Increment', 'Yr1 Base', 'Inflation Increment'
- **Formula:**
=IFS(
Admin!\$E\$12=TRUE,X22*(1+Admin!\$C\$3),
Admin!\$E\$13=TRUE,X22*(1+(2*Admin!\$C\$3))
Admin!\$E\$14=TRUE,X22*(1+(3*Admin!\$C\$3))
Admin!\$E\$1106="",X22)

❖ Yr1 Hrs Pre-Inc.

- **Process:**
Multiplies number of hours in year 1 by the percentage of the hours that occur before the increment date
Percent Pre-Inc described in [Admin Sheet](#) section
- **Input:** 'Hrs Yr1', 'Percent Pre-Inc'
- **Formula:**
=C2*Admin!\$H\$6

e) Yr1 Post-Inc.

- **Process:**
 - 1) Adds the inflation value to the hourly salary rate
 - 2) Multiplies by the number of hours after the increment date
- **Input:** '1+Start Inc', 'Inflation Increment', 'Yr1 Hrs Post-Inc.'
- **Formula:**
=(Y22*(1+Admin!\$C\$3))*AI22

*(1+Start Inc' + inflation increment) * 'Yr1 Hrs Post-Inc.'*

❖ **Yr1 Hrs Post-Inc.**

- **Process:**
Minus the number of hours pre-increment from the number of hours in Year 1
Percent Post-Inc described in [Admin Sheet](#) section
- **Input:** 'Hrs Yr1', 'Yr1 Hrs Pre-Inc'
- **Formula:**
=SUM(C22-AH22)

5.1.3.5. Total Cost

- **Process:**
Totals the yearly costs for the staff member
- **Input:** 'Cost Yr1' : 'Cost Yr5'
- **Formula:**
=SUM(I22:M22)

5.1.4. Scenario Costs Area

The costs are calculated for each year, then totalled in the 'Total' column. Year 1 is used as an example, but each year calculation follows the same pattern. For Scenario 2 and 3, the manually entered costs are copied across as most scenarios have the same costs, with only the staff changing. The costs can be easily overwritten and changed.

Each Named and Recruited staff table has a unique name assigned to it that matches the scenario it is part of, to make the formulas easier to understand. For example, 'KNOWN1' is the name of the Named Staff table in Scenario 1.

5.1.4.1. FTE

The total FTE of all staff member's combined

- **Process:**
 1. Calculates the FTE for all Recruited Staff
 2. Calculates the FTE for all Named Staff
 3. Adds them together
- **Input:** Recruited Staff 'Hours Yr1', Named Staff 'Hours Yr1'
- **Formula:**
=SUM(SUBTOTAL(109,UNKNOWN1[Hours Yr1])/1650+SUBTOTAL(109,KNOWN1[Hours Yr1])/1650)

5.1.4.2. Salaries

- **Process:**
Sums the Recruited Staff costs if the cell value is greater than zero
- **Input:** Recruited Staff 'Cost Yr1'

- **Formula:**
=SUMIF(UNKNOWN1[Cost Yr1],">0")
Must use a SUMIF to stop summing of any blank costs, which would return an error

5.1.4.3. Investigator Costs

- **Process:**
Sums the Named Staff costs if they are Academic staff
- **Input:** Named Staff 'StaffType', Named Staff 'Cost Year1'
- **Formula:**
=SUMIF(KNOWN1[StaffType],"ACADEMIC",KNOWN1[Cost Yr1])

5.1.4.4. Other Directly Allocated Costs (Staff)

- **Process:**
Sums the Named Staff costs if they are Non-Academic staff
- **Input:** Named Staff 'StaffType', Named Staff 'Cost Year1'
- **Formula:**
=SUMIF(KNOWN1[StaffType],"NON-ACADEMIC",KNOWN1[Cost Yr1])

5.1.4.5. Estates, Infrastructure Technician, Indirect Costs

Calculates the overhead costs based on the 'Project Type' and the FTE of all staff

- **Process:**
 - 1) Check cell B6 for the outcome of User selection of Overhead Type
 - 2) If overhead type is capped, value equals zero
 - 3) If overhead type is generic, multiply the generic overhead value by the FTE
 - 4) If overhead type is laboratory based, multiply the lab based overheard value by FTE
- **Input:** 'Overhead Type', 'FTE', Overhead Rate
- **Formula:**
=IF(\$B\$6=3,0,IF(\$B\$6=1,SUM(B31*Admin!\$F\$22),SUM(B31*Admin!\$C\$22)))

5.1.4.6. OS Overheads

- **Process:**
If the Overhead Type is capped, the OS Overheads in calculated instead of the normal overheads
 - 1) Check cell B6 for the outcome of User selection of Overhead Type
 - 2) If overhead type is capped, sum the Directly Allocated costs and Investigator costs
 - 3) Overhead Cap (%) / 100 to make a percentage, multiply by the sum result
 - 4) If overhead type is not capped, value equals zero
- **Formula:**
=IF(\$B\$6=3,SUM(B33:B44,B49)*(\$B\$9/100),0)

5.1.4.7. Totals Column

- **Process:**
Sums the total of every year
- **Formula:**
=SUM(B33:F33)

5.1.4.8. Total Cost

- **Process:**
Sums the Totals Column to get overall total
- **Formula:**
=SUM(G33:G54)

5.2. Costs Summary

5.2.1. Summarised Scenario Costs

The Summary is made of simple formulas that either copy the value of a cell or sum up the value of multiple cells.

The costs are summarised for each year, then totalled in the 'Total' column.

5.2.1.1. FTE

- **Process:**
Directly copies the FTE from the corresponding scenario
- **Input:** Scenario FTE values
- **Formula:**
=Scenario1!B31

5.2.1.2. Directly Incurred

- **Process:**
Sums up the twelve directly incurred costs from the corresponding scenario
- **Input:** Scenario Directly Incurred Costs
- **Formula:**
=SUM(Scenario1!B33:B44)

5.2.1.3. Exceptions

- **Process:**
Sums up the two exceptions costs from the corresponding scenario
- **Input:** Scenario Exceptions Costs
- **Formula:**
=SUM(Scenario1!B46:B47)

5.2.1.4. *Directly Allocated*

- **Process:**
Sums up the five directly allocated costs from the corresponding scenario
- **Input:** Scenario Directly Allocated Costs
- **Formula:**
=SUM(Scenario1!B49:B53)

5.2.1.5. *Total Scenario Cost*

- **Process:**
Sums up the costs for the year
- **Input:** Total Scenario Costs
- **Formula:**
=SUM(C5:C7)

5.2.2. Staff Summaries

The staff summaries were implemented using the Microsoft Excel Pivot Table (Microsoft Office, n.d.) functionality. Pivot Tables take data from a table and summarise it in a clear format.

The reason Pivot Tables were chosen to implement the staff summary is that they expand and retract to match the original data table, which is the exact function they are required for in this situation.

The main drawback is that they do not automatically update to replicate the original data, instead the 'Refresh All' button needs to be clicked – there is guidance added to make the User aware of this. This is acceptable because it refreshes all the Pivot Tables at the same time, so is not a big enough to issue to detract from the User experience.

Another issue is that they cannot be refreshed on a locked sheet for some reason, so the Costs Summary Sheet must remain unlocked, meaning the summations can be changed by the User. This goes against what was stated in *Section 4.2.3: Design* which was the sheet would be locked, but is not an issue because the tool is only used for guidance not for submitting a costing, so the User would not gain anything by changing the cost summaries.

A fix to these issues if more time was available, is described in *Section 7.3: Future Work*.

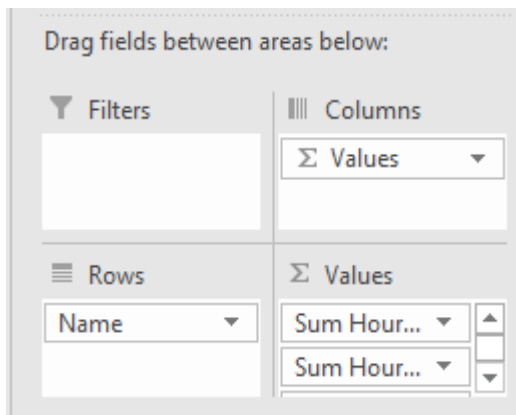


Figure 5 - Named Staff Pivot Table Set-up

The Name (Named Staff) or Spine Point (Recruited Staff) is set as the rows, so each new staff entry in a scenario adds a new row to the summary.

The columns are the summary fields 'Summary Hours Year []' for all five years and the Total Cost for these hours.

The Grand Total sums the total number of hours per year, and the overall cost of the staff entered in the scenario.

To remove the (blank) row that appears due to the empty rows in the original data table, a filter is added to the Pivot Tables. The filter sets it to only allow rows to appear that 'Does not equal (blank)'.

Spine Point ▾	Sum Hours Yr1	Sum Hours Yr2	Sum Hours Yr3	Sum Hours Yr4	Sum Hours Yr5	Total Costs
(blank)						#N/A
Grand Total						#N/A

Figure 6 - Example of (blank) row

5.3. Notes

The notes sheet was simple to implement and is made of two columns.

Column A was merged down the rows and has the title of the page 'Notes'
Column B was extended across the screen and widened, this gives plenty of space for the notes to be entered.

There was multiple rows added that are available for the User to enter notes into.

5.4. Admin

5.4.1. Increments

The incrementations were the biggest obstacle in the development of the Tool, and required a lot of thought into how to implement them due to the following challenges that needed solving:

- 1) How to calculate each staff members individual costs pre and post incrementation?
 - The calculations had to be individually targeted for each new staff member added to the Tool, solved by referencing the incrementation calculations within the row of each staff member added to the tables
- 2) As the Excel workbook is time-static, how to let the calculations know when the incrementation date has occurred?

- The hours between the Project Start Date and increment date needed to be calculated, and then the hours from the increment date to the completion of the year
 - These hours then needed to be costed using the correct cost and combined to create the total
- 3) How to work out how many times the increment date had been passed from the current date to the Project Start Date?
- Calculate if the current date is before the current year's increment date
 - Calculate if the Project Start Date is past the current year's increment date
 - Continue to calculate how many times the increment date has been passed
- 4) Stacking the costing increments to ensure the right value is used to cost the staff hours
- First calculate the base cost using the spine point given
 - Then calculate the number of increment dates already passed from between the current date and Project Start date and add that many inflation increments to the base cost
 - Then add that year's inflation increment (e.g., 2%) to cost the post-increment hours with
 - Next the spine point increase must be taken into account for the next year to find the base cost after the spine point had (or had not) incremented, this is the pre-increment hours for the next year
 - These calculations can then be used as inputs to cost the pre and post increment hours against

5.4.1.1. Inflation Increment

Referenced by the [Costs](#) (*Section 5.1.2.5, Section 5.1.3.4: Costs*) calculations to calculate the salaries post-increment

- **Input:** Manual entry by Administrator

5.4.1.2. Starting Increment Calculation

Compares the Project Start Date to the current date to decide how much inflation increment should be added to the staff salaries due to the project starting in the future, past an increment date

Starting increment calculation				
1. →	Today's date before inc?	Yes		
3. →	Between	No	01/08/2018	01/08/2019 → 2.
	Between	Yes	01/08/2019	01/08/2020
	Between	No	01/08/2020	01/08/2021
	Between	No	01/08/2021	01/08/2022
	2%	FALSE	FALSE	FALSE → 4.
	4%	TRUE	FALSE	TRUE
	6%	FALSE	FALSE	FALSE

a) b) c)

1. Today's Date before Inc?

- **Process:**
Checks whether the current date is before or after August 1st of the current year (the increment date)
Updates with the current date to keep the calculations correct over time
Requires computer date to be correct (Safe assumption)
- **Input:** Today's date
- **Formula:**
=IF(TODAY()<DATE(YEAR(TODAY()),8,1),"Yes","No")
- **Output:** "Yes" or "No"

2. Dates

- **Process:**
Sets the two dates to compare the Project Start Date against. The increment date of the current year, and of the next year.
Updates with the current date to keep the calculations correct over time
- **Input:** Today's Date
- **Formula:**
a) =DATE(YEAR(TODAY()),8,1)
b) =DATE(YEAR(TODAY())+1,8,1)
- **Output:**
a) 01/08 of this year
b) 01/08 of next year

3. Between Dates?

- **Process:**
Checks if the 'Project Start Date' is between the two dates
- **Input:** 'Project Start Date'
- **Formula:**
=IF(AND(Scenario1!B2>=D8,Scenario1!B2<E8),"Yes", "No")
- **Output:** "Yes" or "No"

4. Inflation percentage value

- **Process:**
Referenced by the Named and Recruited Staff costs calculations

(Section 5.1.2.5, Section 5.1.3.4: [1+Start Inc](#)) to check whether a starting increment must be added to the salaries, and how many times (once, twice or three times)

- a) Checks if current date is before the increment and the Project Start Date is between the two dates
 - *If current date is before August 1st and Project Start Date is **after** the August 1st, then the increment needs to be applied, so = TRUE*
 - *If current date is before August 1st and Project Start Date is also **before** August 1st, then the increment does not need to be applied, so = FALSE*
- b) Checks if current date is after the increment and the Project Start Date is between the two dates of the next year
 - *If current date is after August 1st and Project Start Date is **after** the next 1st August increment, then the increment needs to be applied so = TRUE*
 - *If current date is after August 1st and Project Start Date is **before** the next 1st August increment, then the increment does not need to be applied so = FALSE*
- c) Checks if either of the two checks are TRUE
 - If they are, then that percentage of increment must be added to the base salary calculations*
- **Input:**
 - a) Before Increment?, Between this year's increment Dates?
 - b) Before Increment?, Between next year's increment Dates?
 - c) Output of a, Output of b
- **Formula:**
 - a) =IF(AND(C6="Yes",C7="Yes"),"TRUE","FALSE")
 - b) =IF(AND(C6="No",C8="Yes"),"TRUE","FALSE")
 - c) =OR(C12="TRUE",D12="TRUE")
- **Output:**
 - a) 'TRUE' or 'FALSE'
 - b) 'TRUE' or 'FALSE'
 - c) 'TRUE' or 'FALSE'

5.4.1.3. August Inflation Increment Calculation

Calculates how much of the year is costed pre-increment, and how much is costed post-increment after the inflation percentage has been added

The diagram shows a table with the following data:

	Year 1		Year 2	
Start	pre inc.	post inc.	pre inc.	post inc.
01/09/2019	01/08/2020	01/09/2020	01/08/2021	01/09/2021
Hrs.	1514.383562	135.616438	1509.863	140.13699
Percent	91.78%	8.22%	91.51%	8.49%

Numbered arrows in the diagram point to the following cells:

- 1. Start Date (01/09/2019)
- 2. Pre-Increment Date (01/08/2020)
- 3. Post-Increment Date (01/09/2020)
- 4. Pre-Increment Hours (1509.863)
- 5. Post-Increment Hours (140.13699)
- 6. Pre-Increment Percent (91.78%)

1. Start Date

The project start date

- **Input:** 'Project Start Date'

2. Pre-Increment Date

- **Process:**

Checks if the project start date is before or after the increment date (1st August) and sets the value to the next increment date based on this

- **Input:** 'Project Start Date'

- **Formula:**

=IF(MONTH(G4)<8,DATE(YEAR(G4),8,1),DATE(YEAR(G4)+1,8,1))

- **Output:**

01/08/ Year of 'Project Start Date'

01/08 Year of 'Project Start Date' +1

3. Post-Increment Date

- **Process:**

Sets the value to one year after the Project Start Date

- **Input:** 'Project Start Date'

- **Formula:**

=DATE(YEAR(G4)+1,MONTH(G4),DAY(G4))

- **Output:** 'Project Start Date' +1

4. Hours Pre-Increment

Calculates how many hours are before the increment date

- **Process:**

1) The number of days between the pre-increment date and Project Start Date

2) Divide by 365, multiply by 220 to get FTE days

3) Multiply by 7.5 to get FTE hours

- **Input:** 'Pre-Increment Date', 'Project Start Date'

- **Formula:**

=SUM((((H4-Scenario1!B2)/365)*220)*7.5)

5. Hours Post-Increment

Calculates how many hours are after the increment date

- **Process:**
Number of hours in a full year minus the number of hours before the increment
- **Input:** 'Hours Pre-Increment'
- **Formula:**
=SUM(1650-H5)

6. Percent Pre/Post Increment

- **Process:**
 - a) Converts the hours into what percentage of the year is costed pre-increment
 - b) And what percentage is costed post-increment
- **Input:** 'Hours Pre-Increment', 'Hours Post-Increment'
- **Formula:**
 - a) =H5/1650
 - b) =I5/1650

5.4.1.4. Overheads

The overhead rates in Figure 7 were supplied by the client and manually entered into the Admin sheet. They are referenced by the calculations that cost the overheads for the staff time. They need to be updated by the administrators if the overhead rates change.

Lab Based	2018/19	Generic	2018/19
Lab Estates Rate	£ 13,234	Estates	£ 7,465
Indirect Costs	£ 49,056	Indirect	£ 49,056
Lab RIT Rate	£ 519		
Pool Tech Rate	£17.00	Infrastruct. Tech	£ 366
	£ 62,826.00		£56,887.00

Figure 7 - Overhead Rates

5.4.1.5. Pay Grades

Grades	Low Spine	High Spine
1	2	5
2	6	10
3	11	15
4	16	22
5	23	28
DISC	29	
6	30	36
DISC	37	
7	38	43
8	44	49
DISC	50, 51	

The Grades were copied from the Pay Scales sheet and entered into the table shown in Figure 8, which is referenced by the calculations that increment staff salaries to the next pay spine.

The grades were manually entered meaning they need to be updated by the administrators if the Pay Grades change, but this change rarely happens so it is not an issue.

Figure 8 - Pay Grades

5.5. Core Report and Pay Scales

The Core Report and Pay Scales will be saved on the Administrator's computer as Excel files. The format remains the same every time, so it is simple to overwrite the data within them whenever an update is required.

The Administrator will need to update the connection to follow the file path required to find the files on their computer, this only needs to be done the first time as the file will be overwritten each time, not moved.

As the Tool is locked to prevent the User accessing the hidden pages, only an Administrator can unlock and import the data. The workbook can then be locked and given to the User for usage, without the need for the data connection – as described in *Section 4: [Design](#)*.

A guide to how the importation was implemented can be viewed in *[Appendix E](#)*.

6. TESTING

6.1. Testing Approach

The User stories give an overview of the User's behaviour when using the tool and what they want to achieve when they follow this behaviour. This is the acceptance criteria for the tests and can be simplified down to: if this behaviour is possible, then the test is passed.

The way to test these acceptance criteria is by breaking them down into acceptance tests which are based on the following template

Given [input | preconditions],
when [actions | triggers],
then [output | consequences].
(Nyman, 2011)

The acceptance criteria are built of multiple test cases that cover all possible paths available when performing the User story behaviour. Once the acceptance tests are passed, the acceptance criteria is passed. This is known as **Behaviour Driven Development** (Agile Alliance, n.d.) and has the User story benefits described in the earlier *Section 1.5.3: [Approach](#)*, while also allowing for automatic testing.

Automatic testing is possible because the inputs and actions can be coded into a test, which runs then checks whether the output has occurred. Automatic testing will not be implemented during this project, because of limited time and no available testing team resources, so the tests will be a higher, less detailed level.

6.2. Acceptance Tests

Some example Acceptance Tests are shown here, the rest can be viewed in [Appendix F](#).

6.2.1. Essential Requirements

6.2.1.1. General Requirements

ID	Test Cases	Pass?						
GENRL_10	<p>Enter a Total Budget and some costs, check the Budget Left is correctly calculated</p> <p><i>In this example, the Total Cost of £150,000 leaves £350,000 of the Budget</i></p> <table><tr><td>Total Budget</td><td>£ 500,000.00</td></tr><tr><td></td><td></td></tr><tr><td>Budget Left</td><td>£ 350,000.00</td></tr></table>	Total Budget	£ 500,000.00			Budget Left	£ 350,000.00	Y
Total Budget	£ 500,000.00							
Budget Left	£ 350,000.00							

	<table><tr><td>Total Cost</td><td>£</td><td>150,000.00</td><td>£</td><td>-</td><td>£</td><td>-</td><td>£</td><td>-</td><td>£</td><td>-</td><td>£</td><td>150,000.00</td></tr></table>	Total Cost	£	150,000.00	£	-	£	-	£	-	£	-	£	150,000.00	
Total Cost	£	150,000.00	£	-	£	-	£	-	£	-	£	150,000.00			
GENRL_13	<p>Enter a Project Start Date and Project End Date, check the Hours in Project are calculated</p> <p><i>In this example, a project between 01/01/2019 and 05/05/2022 has 5510.55 hours available</i></p> <table><tr><td>Project Start Date</td><td>01/01/2019</td></tr><tr><td></td><td></td></tr><tr><td>Project End Date</td><td>05/05/2022</td></tr></table> <table><tr><td>Hours in Project</td></tr><tr><td>5510.55</td></tr></table>	Project Start Date	01/01/2019			Project End Date	05/05/2022	Hours in Project	5510.55	Y					
Project Start Date	01/01/2019														
Project End Date	05/05/2022														
Hours in Project															
5510.55															

6.2.1.2. Staff Cost Requirements

ID	Test Cases	Pass?						
STAFF_06	<p>Enter more hours than Hours in Project, check a popup appears to stop the User</p> <p>Enter less hours than Hours in Project, check no popup appears</p> <p><i>In this example, there is only 2762.05 hours available in the project</i></p> <div><div>Hours in Project</div><div>2762.05</div></div> <p><i>So, when the User tries to cost a staff member for 3050 hours they are blocked from doing it</i></p> <div><div>Invalid Hours</div><div><div><div></div></div><div>Total no. of hours must be less than Hours in Project Annual no. of hours must be between 0 - 1650</div><div><div>Retry</div><div>Cancel</div><div>Help</div></div></div><table><thead><tr><th>Name</th><th>Hours Yr1</th><th>Hours Yr2</th></tr></thead><tbody><tr><td>JAMES CARTER</td><td>1650</td><td>1400</td></tr></tbody></table></div>	Name	Hours Yr1	Hours Yr2	JAMES CARTER	1650	1400	Y
Name	Hours Yr1	Hours Yr2						
JAMES CARTER	1650	1400						
STAFF_07	a) Enter a Project Start Date and Project End Date that crosses the increment dates, check the increment is added to the salaries							

b) Enter a Project Start Date and Project End Date that does not cross the increment dates, check the increment is not added to the salaries

*Using the same example used in the requirement description:
When the current date is 01/01/2019*

20:25

01/01/2019

And the Project Start Date is 01/09/2019

Project Start Date	01/09/2019
---------------------------	-------------------

Then the hourly starting salary calculated is already including the inflation increment (example using a staff member at spine point 40)

Yr1 Base	1+Start Inc
£ 34.34	£ 35.03

All calculations use the value with the increment applied

6.2.1.3. Named Staff Requirements

ID	Test Cases	Pass?						
KNWN_04	<p>Enter a Named Staff member with an increment date and check their salary is incremented at their increment date</p> <p>Enter a Named Staff member without an increment date and check their salary is not incremented</p> <p><i>No Increment Date</i></p> <p><i>There is a field named 'Increment' that checks whether there is an implement date</i></p> <p><i>If there is no increment date for the selected staff member then the field value is set to 'NoInc'</i></p> <div><div>Increment</div><div>NoInc</div></div> <p><i>The field that decides whether to increment the staff member's pay spine checks the 'Increment' field and if its value is 'NoInc' then their salary does not increase by a Pay Spine, even if it is within the same Pay Grade</i></p> <table><tr><th>Grade Yr1</th><th>New Yr2</th><th>Yr2 +1?</th></tr><tr><td>Grade 8</td><td>Grade 8</td><td>No</td></tr></table> <p><i>Increment Date</i></p>	Grade Yr1	New Yr2	Yr2 +1?	Grade 8	Grade 8	No	N
Grade Yr1	New Yr2	Yr2 +1?						
Grade 8	Grade 8	No						

	<p><i>If there is an increment date, then the Pay Spine follows the usual rules of incrementing if within the same Pay Grade</i></p> <table><tr><th>Increment</th></tr><tr><td>01/08/2018</td></tr></table> <table><tr><th>Grade Yr1</th><th>New Yr2</th><th>Yr2 +1?</th></tr><tr><td>Grade 7</td><td>Grade 7</td><td>Yes</td></tr></table>	Increment	01/08/2018	Grade Yr1	New Yr2	Yr2 +1?	Grade 7	Grade 7	Yes	
Increment										
01/08/2018										
Grade Yr1	New Yr2	Yr2 +1?								
Grade 7	Grade 7	Yes								

6.2.1.4. Recruited Staff Requirements

ID	Test Cases	Pass?								
UNKNWN_03	<p>Enter a spine point, check the spine point is increased for the next year if within a Pay Grade</p> <p>Enter a spine point, check the spine point is not increased for the next year if not within the same Pay Grade</p> <p><i>The current years spine point is compared to the spine point of the next year (which is current years +1) to check if they are within the same pay grade</i></p> <p><i>If they are the same pay grade, then the spine point for the next year is previous year spine point +1</i></p> <p><i>If they are not the same pay grade then the spine point remains the same</i></p> <p><i>This is used to retrieve the salary for that year's calculations</i></p> <p>1. <i>In this example, the Spine Point of the staff member increased while remaining within their pay grade</i></p> <table><tr><th>Yr1 Base</th><th>Yr2 Base</th></tr><tr><td>£ 39.90</td><td>£ 41.12</td></tr></table> <p><i>(Hourly is higher in year 2 due to the spine point increase)</i></p> <p>2. <i>In this example, the spine point of the staff member did not increase as it would cross into a new Pay Grade</i></p> <table><tr><th>Yr1 Base</th><th>Yr2 Base</th></tr><tr><td>£ 47.76</td><td>£ 47.76</td></tr></table>	Yr1 Base	Yr2 Base	£ 39.90	£ 41.12	Yr1 Base	Yr2 Base	£ 47.76	£ 47.76	Y
Yr1 Base	Yr2 Base									
£ 39.90	£ 41.12									
Yr1 Base	Yr2 Base									
£ 47.76	£ 47.76									

6.2.1.5. Directly Allocated Costs Requirements

ID	Test Cases	Pass?
DIR_ALC_01	Enter staff costs for Academic and Non-Academic Staff, check only the Academic staff are taken	

	<i>Three Named Staff are costed for: One Non-Academic Staff for 1650 hours in Year 1 Two Academic Staff for 1650 each in Year 2</i>	<table><tr><th>Total Cost</th></tr><tr><td>£ 71,392.98</td></tr><tr><td>£ 60,056.57</td></tr><tr><td>£ 44,444.68</td></tr></table>						Total Cost	£ 71,392.98	£ 60,056.57	£ 44,444.68	Y
		Total Cost										
		£ 71,392.98										
		£ 60,056.57										
		£ 44,444.68										
<i>Only the Academic Staff in Year 2 are shown under Investigator costs</i>												
<table><tr><td>Investigator Costs</td><td>0.00</td><td>104501.25</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 104,501.25</td></tr></table>						Investigator Costs	0.00	104501.25	0.00	0.00	0.00	£ 104,501.25
Investigator Costs	0.00	104501.25	0.00	0.00	0.00	£ 104,501.25						

6.2.1.6. Administration Requirements

ID	Test Cases	Pass?		
ADMIN_01	<p>The Administrator can change the inflation increment by accessing the hidden ‘Admin’ sheet - by entering the password known only to them</p> <p>The change made to the value will affect all calculations that use it, as they reference the cell rather than a fixed value</p> <table><tr><td>Inflation Increment</td><td>2.00%</td></tr></table>	Inflation Increment	2.00%	Y
Inflation Increment	2.00%			

6.2.1.7. Costing Summary Requirements

ID	Test Cases	Pass?																																																																																																		
SUM_01	<div>The costs for each scenario are summarised</div> <div><table><tr><th colspan="7">Scenario 1</th></tr><tr><th></th><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Year 4</th><th>Year 5</th><th>TOTAL</th></tr><tr><td>FTE</td><td>1.303030303</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1.303030303</td></tr><tr><td>Directly Incurred</td><td>13070.39</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 13,070.39</td></tr><tr><td>Exceptions</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ -</td></tr><tr><td>Directly Allocated</td><td>74125.48</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 74,125.48</td></tr><tr><td>Total Scenario Cost</td><td>£ 87,195.88</td><td>£ -</td><td>£ -</td><td>£ -</td><td>£ -</td><td>£ 87,195.88</td></tr></table><table><tr><th colspan="7">Scenario 2</th></tr><tr><th></th><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Year 4</th><th>Year 5</th><th>TOTAL</th></tr><tr><td>FTE</td><td>1.606060606</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1.606060606</td></tr><tr><td>Directly Incurred</td><td>86053.71</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 86,053.71</td></tr><tr><td>Exceptions</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ -</td></tr><tr><td>Directly Allocated</td><td>91363.97</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 91,363.97</td></tr><tr><td>Total Scenario Cost</td><td>£ 177,417.68</td><td>£ -</td><td>£ -</td><td>£ -</td><td>£ -</td><td>£ 177,417.68</td></tr></table></div>	Scenario 1								Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL	FTE	1.303030303	0	0	0	0	1.303030303	Directly Incurred	13070.39	0.00	0.00	0.00	0.00	£ 13,070.39	Exceptions	0.00	0.00	0.00	0.00	0.00	£ -	Directly Allocated	74125.48	0.00	0.00	0.00	0.00	£ 74,125.48	Total Scenario Cost	£ 87,195.88	£ -	£ -	£ -	£ -	£ 87,195.88	Scenario 2								Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL	FTE	1.606060606	0	0	0	0	1.606060606	Directly Incurred	86053.71	0.00	0.00	0.00	0.00	£ 86,053.71	Exceptions	0.00	0.00	0.00	0.00	0.00	£ -	Directly Allocated	91363.97	0.00	0.00	0.00	0.00	£ 91,363.97	Total Scenario Cost	£ 177,417.68	£ -	£ -	£ -	£ -	£ 177,417.68	Y
Scenario 1																																																																																																				
	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL																																																																																														
FTE	1.303030303	0	0	0	0	1.303030303																																																																																														
Directly Incurred	13070.39	0.00	0.00	0.00	0.00	£ 13,070.39																																																																																														
Exceptions	0.00	0.00	0.00	0.00	0.00	£ -																																																																																														
Directly Allocated	74125.48	0.00	0.00	0.00	0.00	£ 74,125.48																																																																																														
Total Scenario Cost	£ 87,195.88	£ -	£ -	£ -	£ -	£ 87,195.88																																																																																														
Scenario 2																																																																																																				
	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL																																																																																														
FTE	1.606060606	0	0	0	0	1.606060606																																																																																														
Directly Incurred	86053.71	0.00	0.00	0.00	0.00	£ 86,053.71																																																																																														
Exceptions	0.00	0.00	0.00	0.00	0.00	£ -																																																																																														
Directly Allocated	91363.97	0.00	0.00	0.00	0.00	£ 91,363.97																																																																																														
Total Scenario Cost	£ 177,417.68	£ -	£ -	£ -	£ -	£ 177,417.68																																																																																														
SUM_02	<div>The staff hours and costs for each scenario are summarised</div> <div><table><tr><th colspan="7">Directly Allocated Staff</th></tr><tr><th>Name</th><th>Sum Hours Yr1</th><th>Sum Hours Yr2</th><th>Sum Hours Yr3</th><th>Sum Hours Yr4</th><th>Sum Hours Yr5</th><th>Total Costs</th></tr><tr><td>Grand Total</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></div>	Directly Allocated Staff							Name	Sum Hours Yr1	Sum Hours Yr2	Sum Hours Yr3	Sum Hours Yr4	Sum Hours Yr5	Total Costs	Grand Total							Y																																																																													
Directly Allocated Staff																																																																																																				
Name	Sum Hours Yr1	Sum Hours Yr2	Sum Hours Yr3	Sum Hours Yr4	Sum Hours Yr5	Total Costs																																																																																														
Grand Total																																																																																																				

	Directly Incurred Staff						
	Spine Point	Sum Hours Yr1	Sum Hours Yr2	Sum Hours Yr3	Sum Hours Yr4	Sum Hours Yr5	
	Grand Total						

6.2.2. Desirable Requirements

6.2.2.1. Directly Incurred Costs Requirements

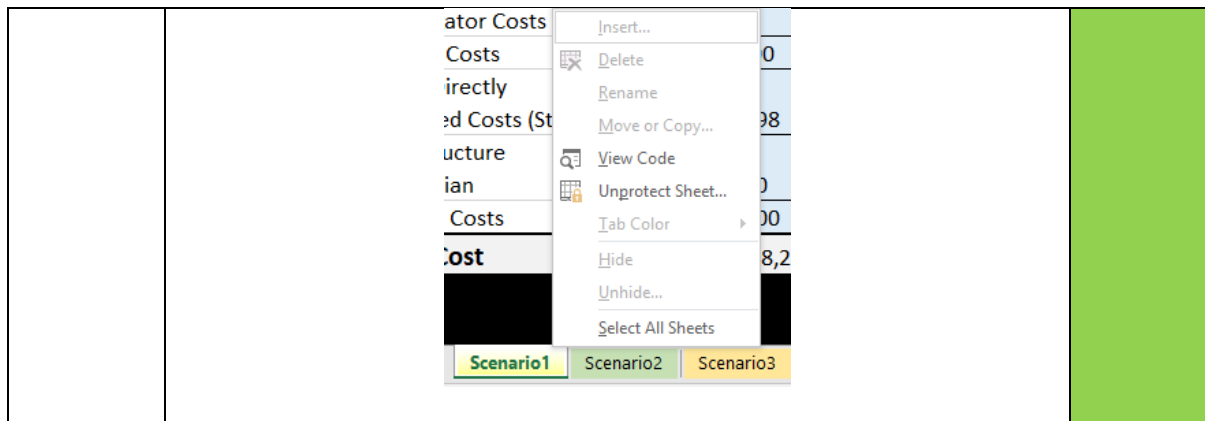
ID	Test Cases	Pass?			
DIR_INC_01	Enter Recruited Staff members and check salaries cells correctly sums up <table border="1"> <tr> <td>Salaries</td><td>3751.16</td><td>65043.05</td></tr> </table>	Salaries	3751.16	65043.05	Y
Salaries	3751.16	65043.05			
DIR_INC_12	Enter a value and check conditional formatting is triggered <table border="1"> <tr> <td>£</td><td>1,000.00</td><td>Equipment Req.</td></tr> </table>	£	1,000.00	Equipment Req.	Y
£	1,000.00	Equipment Req.			
DIR_INC_13	""	Y			

6.2.2.2. Exception Cost Requirements

ID	Test Cases	Pass?
EX_01	Enter values into each year and check yearly total is correct	Y

6.2.3. Non-Functional Requirements

ID	Proof	Pass?
NON_05	<div>The Core Report and Pay Grades sheets are hidden from the User</div> <div><div>Scenario1</div><div>Scenario2</div><div>Scenario3</div><div>Costs Summary</div><div>Notes</div></div> <div>The sheets cannot be unhidden as the worksheet is locked and protected by a password</div>	Y



6.3. Evaluation

6.3.1. Test Acceptance

The tests show that the Tool satisfies almost every Acceptance Criteria of the requirements, by passing the Test Cases that make up the Criteria. Reasonably, one partly failed test within a prototype is not a huge upset, especially as the rest of the tests have passed and a plan to fix the issue before full roll-out is given, so the testing is overall successful.

The one Acceptance Criteria that does not quite pass is Requirement ID KNWN_04. The Requirement states:

As a User, I want the salary of the Named Staff Member to increase by a pay spine at their increment date – up to their maximum pay grade, so that their total cost can be accurately calculated

The reason the test has been failed is because the requirement states the Pay Spine must increment at the staff member's increment date. However, this does not occur as the increment occurs (if there is an increment date) at the 1st August regardless of the date of incrementation. This is not a massive issue as most staff WILL increment on the 1st August, but nevertheless the requirement is not fully met.

If more time was available, the way to implement the functionality to pass the Acceptance Criteria is described in *Section 7.5: [Future Work](#)*.

6.3.2. User Evaluation

The client was given the Tool to test for two weeks and during this time managed to use it in real situations, to give a true evaluation of its usage. They have provided a summary of the project:

'The aim of this project was to create a standard research costing tool that will enable us to create full economic costings within pre-application meetings; this excel model achieves this.'

There have been several constraints with this project; sensitivity of data, complexity of funder requirements and the need for the tool to operate in Excel easily maintained by the finance team. Implementation of the real data has been more time consuming than anticipated due to the structure of live data and although not in the scope of the project, has been fully supported. Full implementation notes were provided to integrate 'real' data with guidance on how this could be achieved.

This project has achieved the brief and has given us a tool that can be developed further to incorporate EU grants costing, person month calculations and currency conversions. The tool is currently in use and is enabling all discussions around resources to be achieved in the initial meeting, reducing the number of CAP requests completed and ensuring that we maximise funds available.

The project has been extremely well run and our expectations have been well managed to what would be achievable within time available.'

The 'implementation of the real data' mentioned is that when the client received the Tool for testing, they discovered an issue when they tried to import the real Core report data. When the Staff ID was selected in the Directly Allocated Staff table, the Name was retrieved but every other calculation cell only showed an error. The issue was discovered with the data itself rather than a bug within the Tool. When the Core report was run, the figures were outputted in the wrong format, meaning Excel could not recognise them as numbers. Once the data was correctly formatted, the issue was fixed.

As evidenced in the User's Evaluation, the client has been fully satisfied by the outcome of the project and how the development has been handled throughout the project's life.

7. FUTURE WORK

Despite the scope of the project being accomplished, there is a few areas that were left out because either there was not time to implement or that were avoided due to higher levels of complexity that is not currently needed within the prototype Tool. This includes the different processes used within other schools in the university and for different funding applications such as EU Horizon 2020, as seen in *Section 1.6: [Project Assumptions](#)*. In future these restrictions could be removed, and the Tool expanded to include an improvement to these processes too.

The areas of the Tool that could potentially be added have been stated within this section, and an implementation plan given to describe how they could be added in the future.

7.1. US Conversion

Something discussed in Meeting 4 ([Appendix G](#)) was that US research projects are costed similarly to the UK equivalent that the tool was created for. The same costs are entered and calculated but are done using dollars instead of pounds.

A straightforward way to account for this would be to remove the currency signs from the tool, but that would make it look less professional and may confuse the User which values are the actual total costs, so it was decided against.

Another way would be to have a separate tool that is identical in every way but has dollars as the currency symbol, however this would not work as it would then require two files to be kept up to date meaning there is more room for error. The best option is a button the User can click to select that the costing being done is for a US project, which will convert all the '£' into '\$' using conditional formatting. Like how the Overhead Type selection (*Section 5.1.1.3: [Implementation](#)*) was implemented with a cell value being changed based on a selection, the conditional formatting would check that cell and change the currency based on it.

An issue with this is that all staff salaries are given in pounds, so only changing the currency symbol would make the calculations incorrect and invalidate the costing. For the costings to be accurate, the tool would need to use the £/\$ exchange rate to convert the salaries to the correct value. Implementing that would require the use of Visual Basic to extract the conversion rate from the internet and apply it to all salary values when the currency selection button is selected.

7.2. Tool Auto-expansion

Currently the tool is restricted to a maximum of three scenarios, each with a maximum project length of five years (as set in the requirements). However, there might be some cases where this is not sufficient for the needs of the User.

7.2.1. Adding Scenarios

A useful function would be the ability to add more scenarios whenever the User needs to, allowing them to enter another separate set of staff to view the costs difference.

Adding another Scenario Costs sheet would involve creating a macro to right-click on the Scenario 1 tab and select copy, to duplicate the entire sheet. Visual Basic would then be required to ensure the sheet is correctly named 'Scenario 4' or 'Scenario 5', dependent on how many sheets currently existed. Including the hidden sheets, the three current scenarios equals eight sheets in total; so, nine sheets would equal 'Scenario 4'.

The next challenge would be updating the Costs Summary Sheet with the summary of the new scenario. Following on from the creation of the new scenario, the macro could be recorded with the action to create the new summary on the Costs Summary Sheet, such as typing in the formulas and inserting the Pivot Tables. Again, Visual Basic could be used to check the name of the sheet that was just added and reference that sheet in the formulas.

7.2.2. Adding Years

Although it is unlikely, there is a chance a User would require the ability to cost a project with a timeframe of longer than the five years currently available. A macro would need to be added that records another year being manually added to all the relevant areas where it is required, such as: the staff costing tables, the scenario costs area and the costing summary sheet. Once the macro has been recorded Visual Basic would need to be added to ensure the new formulas are entered into the right place, for example if a new year is added to Scenario 3 then the correct costing summary table needs to be added to as well.

7.3. Staff Summary Auto-refresh

The Staff Summary Pivot Tables on the Costs Summary sheet do not automatically refresh with the new data that has been entered into the scenarios. Currently guidance has been added to the sheet informing them how to refresh the tables, but this is still an annoyance for Users. There is also the issue described in *Section 5.2.2: [Implementation](#)*, that the sheet cannot be locked due to an Excel Pivot Table limitation.

To improve the User experience, it would be better if the Pivot Tables automatically updated whenever the User switched to the Costs Summary sheet, so the up-to-date summaries were always available. A macro that activates whenever a User clicks on the sheet could be added to fix these issues. It would work in the background, so the User would not be aware of it happening.

This macro would:

1. Unlock the sheet using the password

2. Refresh the sheet
3. Lock the sheet with the same password

7.4. Locking Scenario Calculation Tables

As described in the Scenario Cost Calculation Sheet implementation (*Section 5.1.2: [Implementation](#)*), the Named and Recruited Staff tables cannot be locked due to an Excel limitation.

To enable the tables to be locked, while still allowing Users to add new rows if needed, a macro could be implemented that activates when an 'Add Rows' button is clicked. To make it even more automated, the macro could activate when the User added data to the cell beneath the bottom of the table, like how a standard (unlocked) table functions.

The macro would:

1. Unlock the sheet using the password
2. Add a new table row
3. Lock the sheet with the same password

7.5. Incrementing Pay Spine

As described in *Section 6.3.1: [Evaluation](#)*, the Test Case for Requirement ID KNWN_04 fails due to the Named Staff member's pay not incrementing on their increment date, but instead occurs on the 1st August.

The issue is that the Pay Spine increment is linked to the August Inflation Increment Calculation, instead of using the 'Increment' date within the Core Report. The calculations for the hours in the year that are pre and post increment needs to be done again but based off the 'Increment' date of the staff member, instead of the 1st August. These calculations would compare the Project Start Date to the 'Increment' date, to find the pre-increment hours, then calculate the remaining hours of the year left, the post-increment. The pre-increment hours would be multiplied by the original spine point salary, and the post-increment hours multiplied by the salary of the original spine point+1.

The difficulty comes because the inflation increment would still need to be applied at the 1st August, on top of the increase in spine point salary. So, the hours between the staff 'Increment' date and the 1st August would also need to be calculated, to allow the salary pre and post inflation increment to be calculated.

For example:

The Project Start date is 01/01/2019

The staff 'Increment' date is 01/07/2019

The inflation increment date is 01/08/2019

The hours between 01/01/2019 and 01/07/2019 are costed from the original salary.

The pay spine increments at 01/07/2019 so the hours between that date and

01/08/2019 are costed at the salary of original spine point+1
Then the inflation increment is added at 01/08/2019 so the hours between that date and 01/01/2020 (end of Year 1) are costed at original spine point+1 AND +inflation increment.

7.6. Professorial Staff

At present, the tool only covers normal Academic/Non-Academic Directly Allocated Staff, using the Pay Scale data related to them. There is also another type of staff that would need to be costed in future, 'Professorial'.

The differences with Professorial staff:

- a) They do not increment Pay Spines.
- b) They are on a separate set of Pay Scales to normal staff

To implement these new requirements would require the Directly Allocated 'Named' Staff table to be altered to account for the new staff type.

First, a new column would be added to the calculations table which would pull the 'Job Title' from the Core Report using a VLOOKUP formula, e.g. 'Lecturer' or 'Professor'.

- a) Another bit of logic would be added to the 'Yr2+1?' formula, this decides whether the staff member's Pay Spine needs to be incremented.

This logic would check IF the staff member's 'Job Title' is Professor, then set the cell value to 'No'. This will stop the Pay Spine from incrementing.

- b) The Professorial Pay Scales sheet would be added to the Tool in the same way as the normal Pay Scales described in *Section 5.5: [Implementation](#)*.

Then the formulas for the yearly base salary (Yr1 base and onwards) would have another bit of logic added which checks the 'Job Title' of the staff member.

IF the Job Title is Professor, then retrieve the cost from the Professorial Pay Scales sheet instead of the normal Pay Scales.

8. CONCLUSIONS

8.1. Achievement of Aims

8.1.1. Aim 1

Gaining an understanding of the Research Grant Application process

- *Assisted by documenting what currently occurs*

8.1.1.1. Internal Process

The current school Research Grant Application process is viewable in [Appendix A](#) and has been summarised in *Section 2.3: [Background](#)*.

From researching the process to gain an understanding of it, the inefficiencies within the process were discovered. The key discovery was the multiple meetings required to create the CAP form which the project was then aimed towards improving. Without this understanding of the process, it would not have been possible to improve it.

8.1.1.2. External Process

The fundamental areas of the Research Grant Application have been researched and then documented in *Section: 2.2: [Background](#)*, which allowed an understanding of how the costs needed to be calculated to be gained. This research was important to the development of the Tool as it allowed the Costing Rules to be built upon the knowledge obtained, steering the Tool's functionalities.

8.1.2. Aim 2

A professional correspondence with the Senior Finance Officer will be maintained across the course of the project

- *Meetings will be conducted to guide the project in the right direction*

A total of seven meetings were held with the Senior Finance Officer (and occasionally other staff) across the course of the project, these were vital to the success of the project as they allowed it to stay on target through the feedback given and meant the developed Tool outcome was as expected.

These meetings were organised through email correspondence and held when all attendees were available so there was no disruption to any schedules. Notes were taken in every meeting ([Appendix G](#)) in a professional manner to ensure nothing was forgotten, and to limit the amount of questions required.

8.1.3. Aim 3

A refined, updated Research Grant Application process will be designed and documented

The new process was documented in *Section 1.2.2: [Project Scope](#)* and means the benefits of the change can be visualised, so the people affected by the change are more likely to understand why the change has been implemented.

8.1.4. Aim 4

A Requirement Specification for the Tools functionality will be created

- *Outlining the values required for the Tool to work*
- *Outlining the functionality performed by the Tool*
- *Specifying the Tool outputs*

The requirements in *Section 3.1: [Requirements Specification](#)* cover every functionality within the Tool and were used to ensure everything the client needed was implemented. The User Stories approach to documentation was extremely useful for the testing later in the project to check these functionalities worked.

An area that could have been improved was these requirements were split into Essential and Desirable groups, but this probably did not need to be done because the desirable functionalities did not take very long to implement and were always going to be added to the Tool anyway. It would have been more beneficial to rank the requirements based on importance and the expected difficulty of implementation, so the main parts where issues may rise could have been prioritised.

8.1.5. Aim 5

Costing Rules will be created

- *What original values are used*
- *How figure totals are calculated*
- *For ease of viewing and modifying if any rules need to change in future*

The Costing Rules in *Section 3.2: [Costing Rules](#)* were a huge help with guiding the implementation of the formulas and by ensuring the core logic of the calculations was correct a large chunk of wasted time was saved as the client used them to point out areas where the calculation that was about to be implemented was incorrect. If the implementation was continued based on the error, then the function created would be useless.

8.1.6. Aim 6

A prototype Excel Spreadsheet Tool will be produced

- *It will provide a base for additions to be made to once the project is finished*
- *To aid the development of a complete Tool that Academic Staff can use to calculate funding request costs*

The prototype Tool was developed and passed to the client to use within the areas of the pre-application process it covers, and to allow them to add the minor additions to make it fit the other processes within the School funding applications. The prototype covers every area required of it.

8.1.7. Aim 7

A User Guide explaining the Tools usage will be created

This aim was abandoned due to the User Guide not being required, so producing it would have been useless documentation and wasted effort that could be used in more critical areas of the project.

The reason it is not required is because the Tool was developed in a way that made it user friendly and its usage self-explanatory, with any small guidance being added into the tool itself. For example, requirement GENRL_12 was implemented into spare space on the Scenario Cost Calculation, rather than in external documentation which would be an annoyance for Users to find.

There is a User Guide to help Users with importing the data such as the Core Report, however this is only required once to set up the sheet and is then no longer needed.

8.2. Project Schedule

The original project schedule was quite conservative to allow plenty of time for any unexpected issues to be fixed, as well as allowing work to be completed without a rush being needed. All the milestones were met either ahead of schedule, or by the deadline at latest which gave plenty of time to test and fix any bugs with the Tool. The fact the project was planned so well, with reasonable milestones that outlined when work needed to be completed, really helped guide the completion of the project within the time limit.

There were a few times where requirements were altered or added ([*Section 3.1.5: Added Requirements*](#)) during meetings with the client as the project went on, which meant unplanned changes had to be made to the Tool. However, this was expected due to the agile approach used, so did not cause the project to overrun.

8.3. Process Efficiency Increase

The **speed**, **efficiency** and **effectiveness** of the pre-application process will be increased once the Prototype Tool has been implemented fully into the process. The reason for the improvement is because instead of the calculations having to be totalled manually on a calculator, which takes time, the values can be entered and modelled on the Tool which reduces the time needed to see the impact of a variation in scenario tested. As well as this, the previous process required multiple meetings with a waiting period between them as a CAP form needed to be created to know for sure if the costs that had been entered were viable. If they were not, then another meeting had to take place to alter them. With the Tool, it

can all be performed quickly within one meeting and when the optimum scenario has been decided upon, the CAP form can be finalised at once.

The client has tested the Tool in a true meeting and confirmed the success of the process improvement: ‘The tool is currently in use and is enabling all discussions around resources to be achieved in the initial meeting, reducing the number of CAP requests completed and ensuring that we maximise funds available.’ (Section 6.3.2: [User Evaluation](#)).

8.4. Tool Summary

The Tool implementation has been an enormous success, with development being so ahead of schedule that there was time available to add in all the desirable requirements and to even allow the client to extend the functionality with new requirements. Because of this, there is functionality to satisfy the original scope of entering and modelling up to three different scenarios of staff costs. Additionally, the non-staff related costs can also be added to the scenarios, giving the User an idea of the total project cost. There is an added sheet to summarise these costs for each scenario, making it even more useful for the User as it simplifies the scenario decision for them.

One missed opportunity is the Tool is only used to compare the possible scenarios available within the budget, but then the decided costs still need to be entered into a CAP Request Form and sent to RIS for a CAP form to be created. It would be more beneficial if the output of the Tool was in the format of the CAP Request form, so it would remove the duplication of data and make the process even more efficient, which in turn saves more time. Any further functionalities that would be useful within the Tool have been planned in *Section 7: [Future Work](#)* to help the client extend it themselves.

Overall, the project has been exceedingly well received by the client, as seen in *Section 6.3.2: [User Evaluation](#)* where their view of the project outcome is summarised, highlighting the success of the Tool implementation and the resulting process improvement. In conclusion, the project has had an exceptionally good outcome, as proved by the points given throughout this section.

9. REFLECTION ON LEARNING

9.1. Report Writing

Research costing was not something I had any previous experience of, so the first challenge was understanding the topic to gain some background knowledge before I could start development of the tool. My approach to this was a meeting with the client to gain a run-through of the project aims and note the primary areas that needed to be researched and understood. This is where one of the key techniques I used throughout the project was started: *Bullet pointing sections before beginning work to ensure everything was covered*. I added the areas mentioned by the client to the report and was able to research them to gain the required knowledge while simultaneously filling the sections of the report. The advantages of this were it made sure I covered everything, because I could see a broad overview to check nothing else was needed, while giving me a guide of how much work needed to be completed and acted as a brainstorming activity to spark new ideas.

Because this was such a large project - bigger than anything I have undertaken before - there was a lot of research needed to gain the background which meant I had to view a wide variety of resources online to back-up my points and ensure what I was writing was correct. This meant there was *a lot of references that needed to be added to the report*. To keep track of these resources and save myself time and effort when it came to reference the report, whenever a useful source was found it was added to the Microsoft Word Source Manager. The advantage of this is that the references could be auto-generated quickly from the saved sources at the click of a button, and because they were entered using the Source Manager Wizard they are correctly and consistently formatted. Any research-intensive projects undertaken in future will follow the same protocol after the advantages found this time.

An issue I found with the report writing was *I could not write the report while creating the tool*, as the Build Approach (Section 1.5.5: [Approach](#)) taken meant I needed to be working on the tool to create functionalities, to be able get feedback on it and guide the development. I also wanted to get the tool created as quickly as possible to give more time for testing and alterations, so I did not take many notes during the development. This meant the implementation section write-up in particular was more of a challenge than it should have been, because by the time I got around to beginning writing (worsened by a week break after development) I had forgotten some areas of the development and had to retrace my steps and re-learn the method of how it was done. To minimise the impact of this I should have taken notes during the development, describing the formulas as I added them, so when it came to the write-up I would already have the notes available making it easier to expand upon them quickly.

The biggest take away from the report writing is that writing a report alongside a development project is difficult, as every point and decision had to be justified and backed up which is something I have not had to do before. However, the experience has made me notice the number of errors or poor decisions that were avoided by considering the method before going through with it, meaning a better approach was chosen instead. Learning from this, in future (although not going to the same lengths as during the writing of the current report) I will try to consider all options by making a list of notes about each choice, weighing up the pros and cons before making the decision, which will save time from working on a poor path.

9.2. Development

The next challenge was the development of the tool once the majority of the requirements had been agreed and the background understood.

My tactic for the development was very trial and error oriented, entering lots of different formulas and editing them repeatedly until they performed correctly. At the start I was simply trying to make the functions work without being too concerned about look, this worked well because meant I could produce working functionalities to show to the client who could then make the decision on how they wanted to use these functions in the tool, meaning it worked how a User would actually use it. The reason this was possible was because the client was open to lots of short meetings whenever they were needed, these *meetings were extremely useful* for the development feedback, but also allowed me to perform research in between them to deepen my knowledge and ask questions to confirm any confusions. The alternative would have been longer meetings early on, which would have needed everything to be covered in or I could miss an important part, regardless it would have been difficult to get anywhere near the level of quality as the short meetings throughout development. So, this good working relationship with the client is something I will aim to achieve whenever possible as it really impacts on the success of the project.

The part of development which slowed the completion of the tool most was a time when I *deviated from the requirements* to implement a function that I thought would be useful, without affirming with the client that it was needed. This was a difficult functionality that took a lot of effort to create but when I demoed it, was quickly told it should be removed. This risk of 'gold plating' is something I was not aware of and looking back now, it would have been so simple to send a quick email asking the client whether to implement the function (or to even not consider straying from the requirements in the first place!) which would have saved so much time - this mistake is something I will watch out for and avoid in future projects.

From my previous time at university the module content that was most useful in the development stage of this project was Human Computer Interaction, which helps develop User friendly interfaces from a User's perspective to improve their

experience of the system. This meant I already knew about Shneiderman's "Eight Golden Rules of Interface Design" and could implement them easily without having to perform any UI design research, which saved time. The design choices aided by HCI can be viewed in *Section 4.2 [The User Interface](#)*.

9.3. Project Scheduling

As this was a long project that required work to be performed consistently across three months to prevent a build-up that would have to be rushed towards the end of the project, the scheduling of the project was integral to the project success.

The Project and Change Management module being taken alongside the project could have been useful for setting up the project plan at the start, as it covers useful techniques such as PRINCE2 project management and agile methodologies. Even so, I was still able to take inspiration from some of the lectures to decide upon my agile development plan before starting the implementation which was vital to the success of the project. In some ways it may have been advantageous that the module had not already been taught, because it may have caused overcomplications in the planning by trying to make use all the new skills that had been learnt in one go. The fact that the project was being completed alongside the module also made it more interesting because it was possible to see the advantages of the material being taught and relate it to the real project being completed, which meant it was easier to learn.

During my placement year I was part of quite a few projects which has allowed me to notice some differences between them and this project. In reality, projects are managed more strictly, with change management procedures for adding and altering requirements which can minimise the scope creep, meaning the project schedule can be more closely followed. This is possible because the change process is already a known routine to follow and due to it being contracted work there is more control of what the client can change once everything is signed off. For a smaller project like this there was no change process, so it was more difficult to keep track of changes which could have led to some redundant functionalities. To avoid this, I should have kept a change log, so I could justify if the project overran and allow me to keep requirements in the report up to date and accurate.

The experience with this project will be exceptionally useful in proving to potential employers I have the skills to manage a successful project from start to end, and the knowledge gained will aid me throughout any future projects undertaken.

10. ACRONYMS

TRAC	Transparent Approach to Costing
fEC	Full Economic Cost(ing)
REF	Research Excellence Framework
UI	User Interface
HEFCW	Higher Education Funding Council for Wales
RCUK	Research Councils UK
Je-S	Joint Electronic Submission
CAP form	Cost and Pricing Form
TEF	Teaching Excellence Framework
RA	Research Administrator
SM	School Manager
PI	Principal Investigator

11. APPENDICIES

11.1. Appendix A – Pre-Application Process

Pre-application process

1. **PI** e-mails a completed "intention to submit a funding application" form to **RA**, **SM** and **DoR** at least **2 weeks** before submission.
2. **RA** organises a face-to-face meeting with **PI** to create a CAP (costing & pricing) request form.
3. **RA** e-mails the CAP request form to **RIS**.
4. **RIS** returns an initial CAP form to **RA**.
5. The CAP form is iteratively refined by **RA** in collaboration with **PI** and **SM**.
6. Meanwhile, **PI** continues to work on the funding application and sends a draft version (including all relevant documents, e.g. case for support, justification of resources, impact summary, etc.) to the **DoR**.
7. The **DoR** sends the draft application to two academics for peer review.
8. Peer reviewers send their reviews to both **PI** and **DoR**.
9. If needed, **PI** applies for ethical approval. Details on this procedure are available here:
<http://www.cs.cf.ac.uk/ethics/>
10. **PI** finalises the application taking into account the peer reviews and sends the final version together with the CAP form and response to peer reviews to **RA** for signing by the **HoS**.
11. Once the **HoS** has signed off the CAP form, **PI** submits the application to the funding body.
12. **PI** receives the outcome and forwards it to **RA**, **SM** and **DoR**.
13. If successful, **PI** drafts a news item and sends it to **MCO** to publicise on the web site and social media.

NOTE: Please allow at least **5 working days** for completion of each task.
Some tasks can be run in parallel (see overleaf).

Acronym	Definition	Role holder	Contact
DoR	Director of Research	Irena Spasić	goasici@cardiff.ac.uk
EC	Ethics Committee	Federico Cerutti Liam Turner	comsc-ethics@cardiff.ac.uk
HoS	Head of School	Stuart Allen	allensm@cardiff.ac.uk
MCO	Marketing & Communications Officer	Sarah Morgan	morgans54@cardiff.ac.uk
PI	principal investigator in COMSC		
RA	Research Administrator	Michelle Aked	comsc-research@cardiff.ac.uk
RIS	Research & Innovation Services	N/A	Will be contacted by the RA on your behalf.
SM	School Manager	Rob Davies	daviesjr@cardiff.ac.uk

11.2. Appendix B – Requirements

11.2.1. Functional Requirements

11.2.1.1. General Requirements

ID	Description
GENRL_01	As a User, I want to be able to enter a Start and End date of the research grant, so that the 'Hours in Project' can be calculated
GENRL_02	As a User, I want a total Full Time Equivalent to be calculated that sums up all the Staff FTEs, so that overheads can be accurately calculated
GENRL_03	As a User, I want a 'Total Cost' to be calculated that sums up all the costs entered, so I can view the final value of the costs
GENRL_04	As a User, I want to be able to select whether the project I am costing is desk or lab based, so the correct overhead values can be used for calculations
GENRL_05	As a User, I want to be able to enter notes, so I can add any notes about the costing and view them later
GENRL_06	As a User, I want to be able to enter the costs for three scenarios, so I can compare the differences and select the best

11.2.1.2. Staff Cost Requirements

ID	Description
STAFF_01	As a User, I want a Staff Member's cost to be split across the years they are required, so I can view their cost per year
STAFF_02	As a User, I want the Full Time Equivalent of the selected Staff Member to be calculated, so overheads can be accurately estimated
STAFF_03	As a User, I want the salary of a Staff Member to increase by an inflation increment at the 1 st August every year they are required, so that the costs accurately take into account the increase
STAFF_04	As a User, I want to be stopped from entering more than 1650 hours in a year for a staff member, so I cannot accidentally enter more hours than are available in a year

STAFF_05	As a User, I want the staff member's cost for their time to be calculated from their salary, so that I can see how much their time will cost
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11.2.1.3. Named Staff Requirements

ID	Description
KNWN_01	As a User, I want to be able to select a Named Staff Member from their ID, so that I can add their time to the scenario for costing
KNWN_02	As a User, I want the salary of the Named Staff Member I select to be retrieved, so that it can be used to calculate their hourly cost
KNWN_03	As a User, I want to be able to enter the number of hours per year a Named Staff Member is required for, so the cost of their time can be calculated
KNWN_04	As a User, I want the salary of the Named Staff Member to increase by a pay spine at their increment date – up to their maximum pay grade, so that their total cost can be accurately calculated

11.2.1.4. Recruited Staff Requirements

ID	Description
UNKNWN_01	As a User, I want to be able to enter the Pay Spine of a Recruited Staff Member, so that their salary can be retrieved
UNKNWN_02	As a User, I want to be able to enter the number of hours per year a Recruited Staff Member is required for, so that their time can be costed
UNKNWN_03	As a User, I want the salary of the Recruited Staff Member to increase by a pay spine every year they are required – up to the top of that pay grade, so that their total cost can be accurately calculated

11.2.1.5. Directly Allocated Costs Requirements

ID	Description
DIR_ALC_01	As a User, I want the 'Investigators' Costs to be calculated and displayed, so I can view how much the Staff will cost

DIR_ALC_02	As a User, I want the 'Estates' Costs to be calculated and displayed, so I can view how much the Estates will cost
DIR_ALC_03	As a User, I want the 'Other Directly Allocated Staff' Costs to be calculated and displayed, so I can view the other costs
DIR_ALC_04	As a User, I want the 'Infrastructure Technician' Cost to be calculated and displayed, so I can view how much the Infrastructure Technician will cost
DIR_ALC_05	As a User, I want the 'Indirect' Costs to be calculated and displayed, so I can view how much the Staff will cost

11.2.1.6. Administration Requirements

ID	Description
ADMIN_01	As an Administrator, I want to be able to modify the yearly inflation increment percentage, so that Staff salaries are accurately calculated
ADMIN_02	As an Administrator, I want to be able to modify the overhead rates, so that the Directly Allocated Costs are accurately calculated

11.2.1.7. Costing Summary Requirements

ID	Description
SUM_01	As a User, I want a summary of all the costs for each scenario to be visible, so I can compare the different scenario costs
SUM_02	As a User, I want a summary of the staff for each scenario to be visible, so I can compare the different staff used

11.2.1.8. Directly Incurred Costs Requirements

ID	Description
DIR_INC_01	As a User, I want the 'Salaries' Costs to be totalled and shown, so I can see the value that is added to the Directly Incurred Costs
DIR_INC_02	As a User, I want to be able to manually enter 'Travel & Subsistence (UK)' Costs, so these are added to the Directly Incurred Costs

DIR_INC_03	As a User, I want to be able to manually enter 'Travel & Sustenance (Overseas)' Costs, so these are added to the Directly Incurred Costs
DIR_INC_04	As a User, I want to be able to manually enter 'New' Costs, so these are added to the Directly Incurred Costs
DIR_INC_05	As a User, I want to be able to manually enter 'Recruitment/Advertising' Costs, so these are added to the Directly Incurred Costs
DIR_INC_06	As a User, I want to be able to manually enter 'Consumables' Costs, so these are added to the Directly Incurred Costs
DIR_INC_07	As a User, I want to be able to manually enter 'Other' Costs, so these are added to the Directly Incurred Costs
DIR_INC_08	As a User, I want to be able to manually enter 'Publication' Costs, so these are added to the Directly Incurred Costs
DIR_INC_09	As a User, I want to be able to manually enter 'Relocation' Costs, so these are added to the Directly Incurred Costs
DIR_INC_10	As a User, I want to be able to manually enter 'Audit' Costs, so these are added to the Directly Incurred Costs
DIR_INC_11	As a User, I want to be able to manually enter 'Subcontractor Costs', so these are added to the Directly Incurred Costs
DIR_INC_12	As a User, I want it to be visually flagged up if 'New Equipment' Costs have been entered, so I am aware that it will not all be funded, or I entered a number into the box in error
DIR_INC_13	As a User, I want to be able to manually enter a 'DI Major Research Facilities (MRF)' value, so these are added to the Directly Incurred Costs

11.2.1.9. Exception Cost Requirements

ID	Description
EX_01	As a User, I want to be able to manually enter 'Staff – Student Stipend' Costs, so these are added to the Total Cost

EX_02	As a User, I want to be able to manually enter 'Student Fees', so these are added to the Total Cost
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11.2.2. Non-Functional Requirements

ID	Description
NON_01	<p><i>Accuracy</i></p> <p>The tool is being created to try out scenarios before they are more deeply investigated and finalised. Because of this, the accuracy of the tool does not have to meet a specific metric, it only needs to be close enough that the difference between scenarios can be viewed to make a choice which to examine further. If the tool is not absolutely accurate, it is still usable for its task, so this is acceptable.</p>
NON_02	<p><i>Usability</i></p> <p>The tool will follow standard usability guidelines to make it a User-friendly system. As it will be made with guidance from the Users themselves it will inevitably be altered throughout the creation to meet what is expected by them. At the point where the tool is finished, it can be assumed the usability requirement is met because the client is happy and has had a suitable chance to make changes.</p>
NON_03	<p><i>Maintainability</i></p> <p>The tool is expected to be maintained with as up to date data as possible.</p> <p>The Pay Grades are updated every year around the 1st of August, so the tool must be able to accept this new data to update the calculations.</p> <p>The Core Report containing the named staff is updated whenever a new staff member is added, but as they most likely will not be instantly assigned to a research project, the data within the tool only needs to be updated every quarter. This was agreed by the client.</p>
NON_04	<p><i>Serviceability</i></p> <p>The functions within the tool must be visible to the administrator, to allow them to understand how the totals are calculated. No part of the tool should be locked from the Administrator (one of the key issues of the current CAP form process). Wherever possible the functions should be split into</p>

	<p>parts to make them easier to follow.</p> <p>The reason for these is so the Administrator can update and service the tool whenever they need to, they need to be able to understand the tool before this is possible.</p>
NON_05	<p><i>Security</i></p> <p>When the tool is used in reality, it will make use of some data that may be confidential – such as the Core Report data. To maintain security, this data should be hidden from the normal User.</p> <p>The Administrator needs to be able to limit what parts of this data the User can see.</p>
NON_06	<p><i>Scalability</i></p> <p>The client wishes to use the tool as a base to scale up and keep adding to in future, to cover more costing needs (Covered in Future Work). To meet this, the tool must allow additions to be made without breaking the current functionalities in any way.</p>

11.2.3. Added Requirements

ID	Description
GENRL_07	<p>As a User, I want to be able to enter an overhead cap percentage, so the overhead costs can be correctly calculated for the project</p> <p><i>Added after Meeting 5</i></p>
GENRL_08	<p>As a User, I want to be able to enter costs for a project length of up to five years</p> <p><i>Had assumed that it would be the same as the CAP form – three years</i></p> <p><i>Added after Meeting 4</i></p>
GENRL_09	<p>As a User, I want to be able to enter a project budget, so the budget left can be calculated</p> <p><i>Added after Meeting 4</i></p>
GENRL_10	<p>As a User, I want the budget remaining to be calculated from how much the costs are, so I can see the value of costs I can still add</p>

	<i>Added after Meeting 4</i>
GENRL_11	<p>As a User, I want to be able to enter how long (months/weeks/hours) I require a staff member for, into a calculator that converts it to FTE hours, so I know what value to enter into the Tool</p> <p><i>Added after Meeting 4</i></p>
GENRL_12	<p>As a User, I want guidance for the Full Time Equivalent to be visible, so it helps me understand how it works</p> <p><i>Added after Meeting 4</i></p>
GENRL_13	<p>As a User, I want the number of hours in the project to be calculated, so I am limited to this and do not over-allocate time</p> <p><i>Added after Meeting 5</i></p>
STAFF_06	<p>As a User, I want to be stopped from entering more hours for a staff member than are available in the project, so I do not over-allocate time to a staff member</p> <p><i>Added after Meeting 5</i></p>
STAFF_07	<p>As a User, I want the starting salaries for staff members to already have the inflation increment applied if the Project Start date is past the next increment date, so the costing accurately takes it into account</p> <p><i>Clarification:</i> <i>For example if current date is 01/01/2019</i> <i>and project start date is 01/09/2019</i> <i>Then the salaries will already have the inflation increment applied once.</i> <i>If the project start date was 01/09/2020 then the inflation increment would be applied twice as it goes past two increment dates</i></p> <p><i>Added after Meeting 5</i></p>
KNWN_05	<p>As a User, I want the name of the named staff member I select to be retrieved from their ID, so I can be sure I have selected the right person</p> <p><i>Added after Meeting 3</i></p>

DIR_ALC_06	<p>As a User, I want the Overseas Overheads to be calculated based on the entered Overhead Cap (%), so the overheads are correctly calculated</p> <p><i>Added after Meeting 6</i></p>
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11.3. Appendix C - Costing Rules

RULE ID	Requirement ID	Rule
RULE_01	GENRL_02	FTE = Staff1 FTE + Staff2 FTE + Staff3 FTE.....
RULE_02	GENRL_03	Total Cost = Named Staff Total + Recruited Staff Total + Directly Allocated Costs + (Directly Incurred Costs) + (Exception Costs)
RULE_03	STAFF_01	<p>Year 1 = Year starting salary until increment date + salary after increment until year completion</p> <p>Year 2 = Year starting salary until increment date + salary after increment until year completion</p> <p>.....</p>
RULE_04	STAFF_02	<p>Staff1 FTE = Staff 1, Hours per year / 1650</p> <p>Staff2 FTE = Staff 2, Hours per year / 1650</p> <p>.....</p>
RULE_05	STAFF_03	Salary after 1st August = Total USS * inflation variable
RULE_06	STAFF_05	Cost = Hourly Cost*Hours
RULE_07	KNWN_04	<p>Allowances = ‘Salary including Allowances’ – ‘Basic Pay’</p> <p>Salary after increment = (Spine point + 1, ‘Total USS’) + Allowances</p> <p>Exception: Cannot cross a Grade Point</p>
RULE_08	UNKNWN_03	<p>Salary after increment = Spine point + 1, ‘Total USS’</p> <p>Exception: Cannot cross a Grade Point</p>
RULE_09	DIR_ALC_01	Investigator Costs = Total Named Academic type staff salary across all years

RULE _10	DIR_ALC_0 2	Estates Costs = Estates overhead rate * Total FTE Different rate used if Generic / Laboratory
RULE _11	DIR_ALC_0 3	Other Directly Allocated Staff Costs = Total Named Non-Academic type staff salary across year
RULE _12	DIR_ALC_0 4	Infrastructure Costs = Infrastructure overhead rate * Total FTE Different rate used if Generic / Laboratory
RULE _13	DIR_ALC_0 5	Indirect Costs = Indirect overhead rate * Total FTE Different rate used if Generic / Laboratory
RULE _14	DIR_INC_0 1	Salaries = Total Recruited Staff Costs
RULE _15	GENRL_10	Budget Left = Total Budget – Budget Left
RULE _16	GENRL_11	Months = Input * FTE hours per month Weeks = Input * FTE hours per week Days = Input * FTE hours per day
RULE _17	GENRL_13	Hours in Project = Days between Project Start and Project End Date * FTE hours per day
RULE _18	STAFF_07	Inflation x1 = If Project Start date is after first increment date from current date Inflation x2 = If Project Start date is after second increment date from current date
RULE _19	DIR_ALC_0 6	OS Overheads = Total Directly Incurred costs * overhead cap

11.4. Appendix D – Scenario Cost Sheet Fields

Area	Field Name	Description	Validation
1. The Project Definition area			
	i. 'Project Start Date'	Manually entered by User	DD/MM/YYYY format

		Runs the Staff increment calculations	
	ii. 'Project End Date'	Manually entered by User Used to calculate number of hours in project	DD/MM/YYYY format Must be after 'Project Start Date'
	iii. 'Overhead Type'	Runs the directly allocated costs calculations	User selects from Radio buttons (Generic OR Laboratory OR Capped) Reason: Can only be one of the three, cannot be all
	iv. Overhead Cap (%)	Allows User to enter a cap on the overheads	Can be manually entered, or incremented using buttons Greyed out if 'Overhead Type' is not capped
	v. Total Budget	Manually entered by User Used to calculate Budget Left	
	vi. Budget Left	Shows User the remaining amount of budget left of the total	Locked Total Cost minus Total Budget
	vii. Hours in Project	Shows User how many hours are available	Locked

		Number of hours between 'Project Start Date' and 'Project End Date' converted to FTE hours	
	viii. Calculator	Allows User to convert time into FTE hours Helps User know how many hours to enter in the tool Months / Weeks / Days converted to FTE hours	Locked
	ix. Full Time Equivalent Guidance	Guidance to help User understand the FTE hours	
2. The Named Staff area			
	i. 'Staff ID'	Manually entered by User OR Select from dropdown list Used to retrieve the specified Staff data	Restricted to dropdown list retrieved from Core Report
	ii. 'Staff Name'	Ensures User can confirm correct Staff ID was entered Staff ID retrieves 'Forename' and 'Surname': Concatenate together to form 'Staff Name'	Locked

	iii. 'Hours Year 1', 'Hours Year 2', 'Hours Year 3', 'Hours Year 4', 'Hours Year 5'	Manually entered by User Runs calculation of the yearly cost of the entered staff time	Must be number between 0-1650 Reason: A staff member cannot work for more than 1650 hours a year Total of all years cannot be greater than 'Hours in Project' Years greyed out if number of 'Hours in Project' does not cover that year
	iv. 'FTE'	Calculated by dividing the staff members total hours by 1650 Reason: lets User know FTE of the entered Staff	Locked
	v. 'Cost Year 1', 'Cost Year 2', 'Cost Year 3', 'Cost Year 4', 'Cost Year 5' - -	Calculated from year hours multiplied by cost per hour Shows User the estimated annual cost of the entered Staff time	Locked
	vi. 'Total Cost'	Sums up the annual costs Shows the User the overall cost of the specified staff	Locked

		member for the project	
3. The Recruited Staff area			
	i. 'Spine Point'	<p>Manually entered by User</p> <p>Used to retrieve the salary for the specified spine point</p> <p>Has been agreed with client that recruited staff will only be on a USS pay grade, and only between these pay spines. So, do not need to calculate costs for other pension types</p>	<p>Must be a number between 23-51</p> <p>Reason: USS Pay Grade cannot be below 23 or over 51</p>
	ii. 'Note'	<p>Free text area for the User to enter a note about the staff member who has been entered</p> <p>Helps the User remember the different scenarios they have entered</p> <p>Was not a requirement, but the client can easily remove if they decide it is not needed, due to the ease of editing the Tool</p>	Optional

	iii. 'Hours Year 1', 'Hours Year 2', 'Hours Year 3', 'Hours Year 4', 'Hours Year 5'	Manually entered by User Runs calculation of the yearly cost of the entered staff time	Must be number between 0-1650 Total of all years cannot be greater than 'Hours in Project' Years greyed out if number of 'Hours in Project' does not cover that year
	iv. 'FTE'	Calculated by dividing the staff members total hours by 1650	Locked
	v. 'Cost Year 1', 'Cost Year 2', 'Cost Year 3', 'Cost Year 4', 'Cost Year 5' - -	Calculated from year hours multiplied by cost per hour Shows User the estimated annual cost of the entered Staff time	Locked
	vi. 'Total Cost'	Sums up the annual costs Shows the User the overall cost of the specified staff member for the project	Locked
4. The Scenario Costs area			
a) FTE	i. 'FTE Total'	Summed from the FTE of all entered staff	Locked

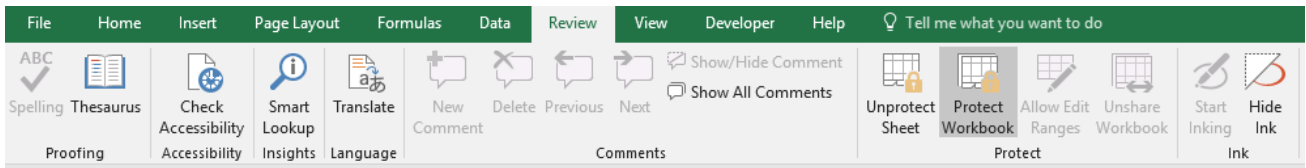
		Used to calculate overhead costs Shows User the FTE of all staff Split into Year 1, Year 2, Year 3	
b) Directly Incurred Costs	i. 'Salaries'	Calculated from summing all recruited staff costs	Locked
	ii. 'Travel & Subsistence (UK)'	Manually entered by the User	
	iii. 'Travel & Subsistence (Overseas)'	Manually entered by the User	
	iv. 'New Equipment Costs'	Manually entered by the User	Flag appears if value entered into field
	v. 'Recruitment / Advertising'	Manually entered by the User	
	vi. 'Consumables'	Manually entered by the User	
	vii. 'Other'	Manually entered by the User	
	viii. 'Publication'	Manually entered by the User	
	ix. 'Relocation'	Manually entered by the User	
	x. 'Audit'	Manually entered by the User	
	xi. 'Subcontractor'	Manually entered by the User	
	xii. 'DI Major Research Facilities'	Manually entered by the User	

c) Exceptions	i. 'Stipend'	Manually entered by the User	
	ii. 'Student Fees'	Manually entered by the User	
d) Directly Allocated Costs	i. 'Investigator'	Calculated from summing all Named 'Academic Type' staff costs	Locked
	ii. Estates	Calculated by multiplying yearly FTE by Estates overhead cost	Locked
	iii. 'Other directly allocated costs (staff)'	Calculated from summing all Named 'Non-Academic Type' staff costs	Locked
	iv. 'Infrastructure Technician'	Calculated by multiplying yearly FTE by Infrastructure Technician overhead cost	Locked
	v. 'Indirect'	Calculated by multiplying yearly FTE by Indirect overhead cost	Locked
	vi. 'OS Overheads'	Calculated by multiplying the total Directly Incurred cost by the Overhead Cap (%)	Locked
	vii. 'Total Cost'	Sums up all the scenario costs Shows User the total cost of the entered scenario	Locked

11.5. Appendix E - Importing Data Guide

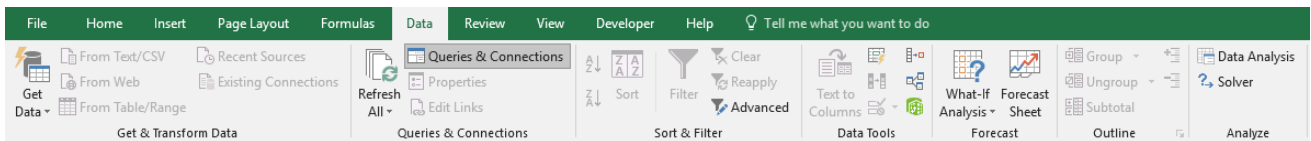
1. The Tool may need to be unlocked to update the Data Connection.

- **Review → Protect → Protect Workbook → Enter Password**



2. Access the Queries and Connections

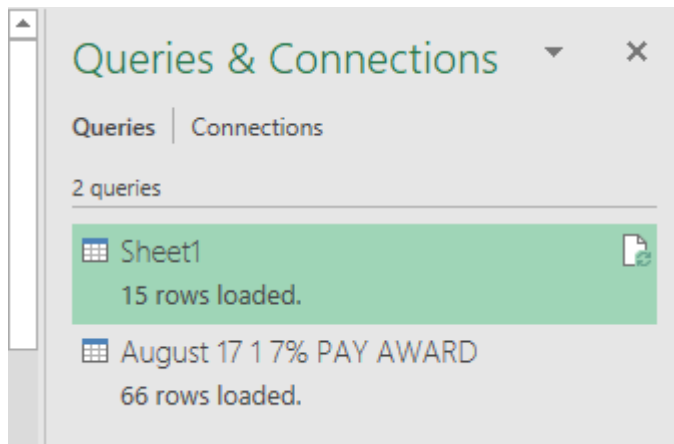
- **Data → Queries and Connections → Queries and Connections**



- ‘Queries and Connections’ popup will appear to the side

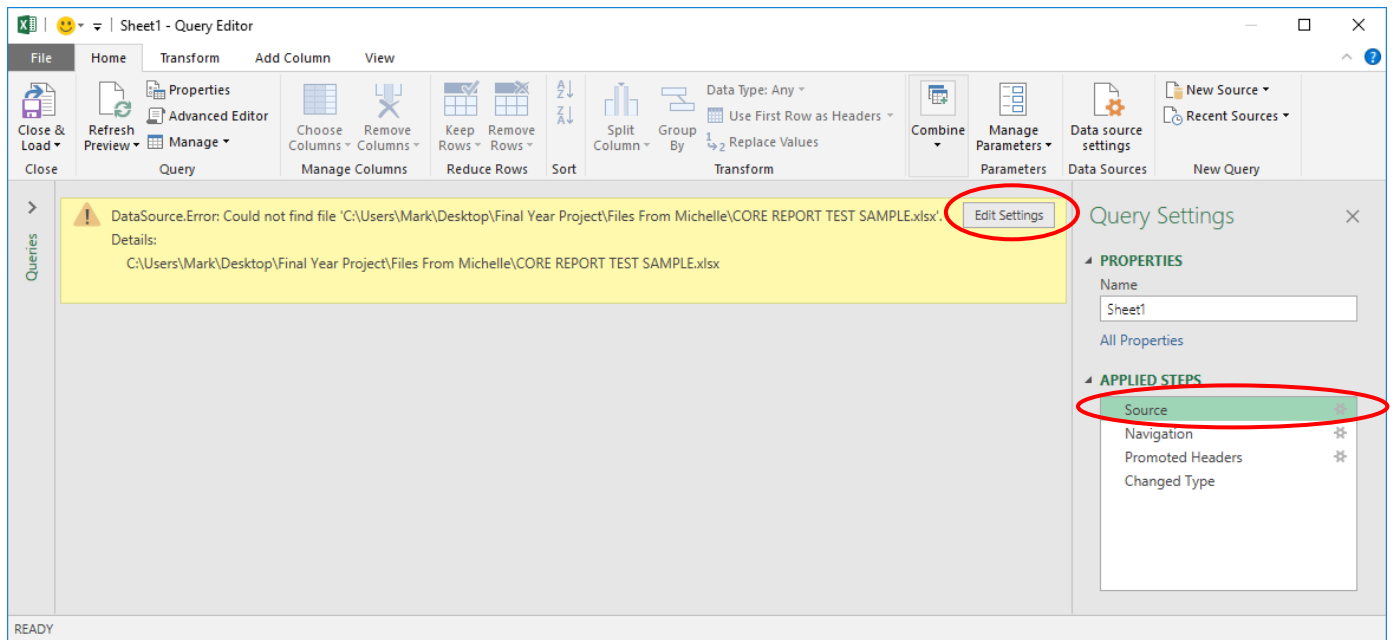
3. Access the Data Connection Source

- Right-click Sheet 1 and ‘Edit’



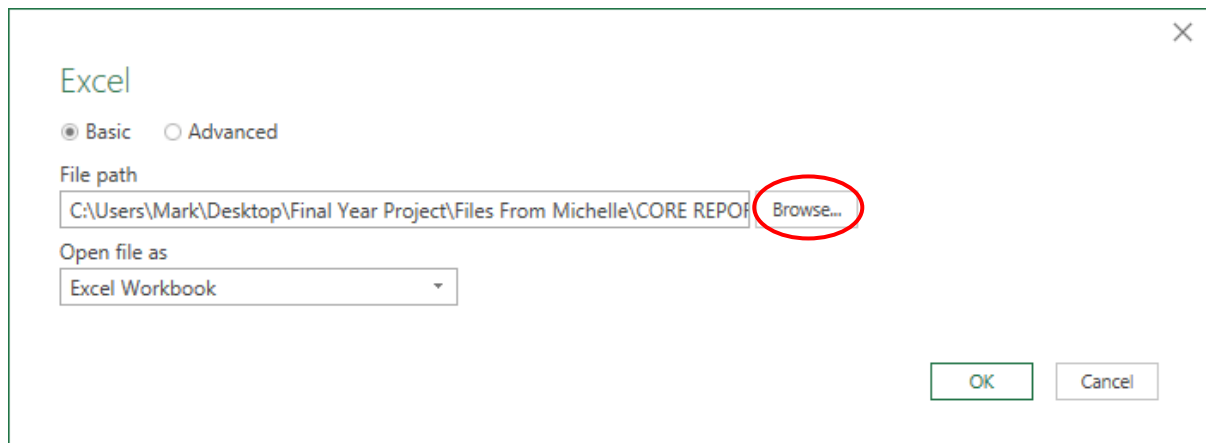
- ‘Query Editor’ Popup appears
- Right-Click ‘Source’
(under ‘Applied Steps’ over to the right)

- Click **‘Edit Settings’**

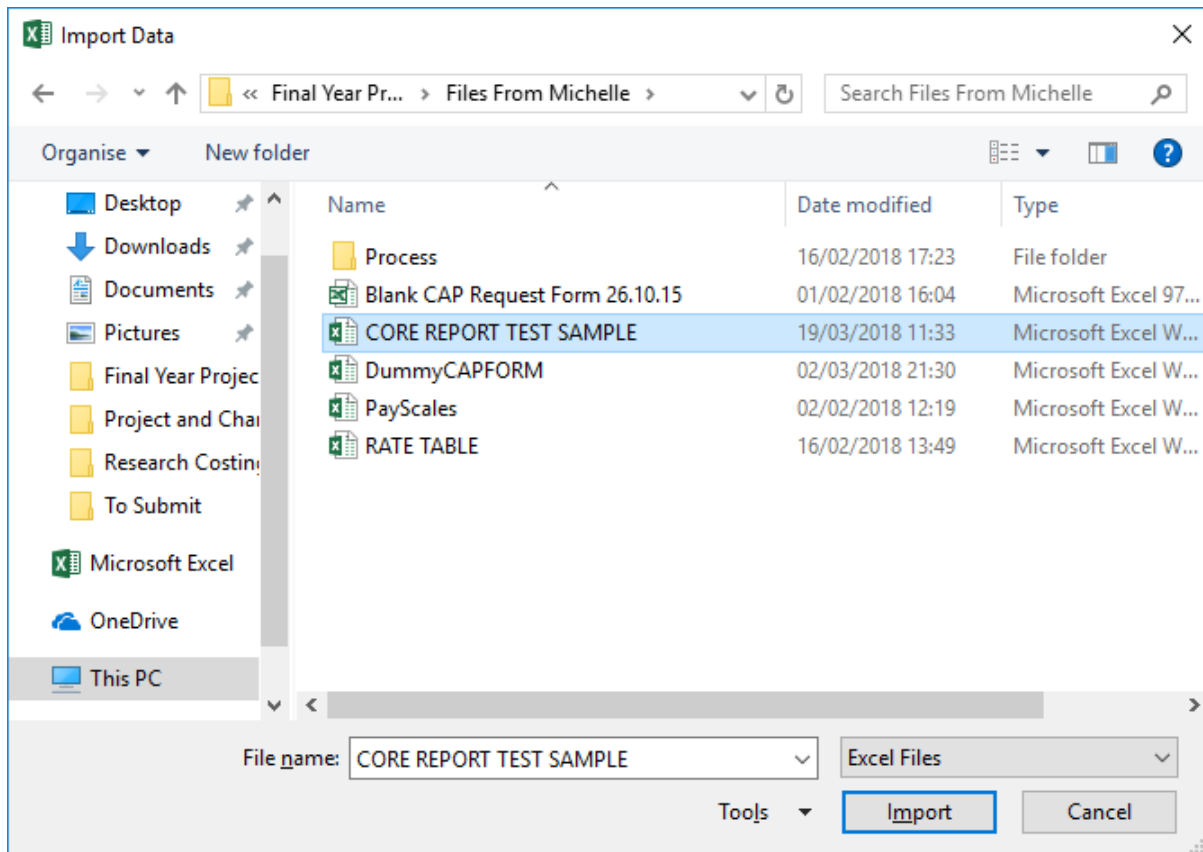


4. Edit the Data Connection Source

- Click **‘Browse’**



- File Explorer opens
- Navigate to the Core Report file



- Click **'Import'**
5. Repeat for Pay Scales files
 - Repeat steps 2-4 for August Pay Scales
 6. Shut 'Queries and Connections' popup
 7. Lock the workbook
 - **Review** → **Protect** → **Protect Workbook** → Enter Password

11.6. Appendix F – Test Cases

11.6.1. Functional Requirements

11.6.1.1. General Requirements

ID	Test Cases	Pass?								
GENRL_01	a) Enter a value into the ‘Project Start Date’ and ‘Project End Date’ fields	Y								
	<table><tr><th colspan="2">SCENARIO 1</th></tr><tr><td>Project Start Date</td><td>01/01/2019</td></tr><tr><td></td><td></td></tr><tr><td>Project End Date</td><td>05/05/2022</td></tr></table>	SCENARIO 1		Project Start Date	01/01/2019			Project End Date	05/05/2022	
SCENARIO 1										
Project Start Date	01/01/2019									
Project End Date	05/05/2022									

GENRL_07	<p>a) Enter a vaue between 0-100 into the field, and check the increment buttons work to increment up or down by 1</p> <p>b) Enter a value outside the accepted range 0-100, check the action is stopped</p> <div><div>Overhead Cap (%)</div><div>0</div><div><div>▲</div><div>▼</div></div></div> <td>Y</td>	Y												
GENRL_08	<p>a) Enter costs for all five years and check they are shown</p> <table><tr><td>Cost Yr1</td><td>Cost Yr2</td><td>Cost Yr3</td><td>Cost Yr4</td><td>Cost Yr5</td><td>Total Cost</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Cost Yr1	Cost Yr2	Cost Yr3	Cost Yr4	Cost Yr5	Total Cost							Y
Cost Yr1	Cost Yr2	Cost Yr3	Cost Yr4	Cost Yr5	Total Cost									
GENRL_09	<p>a) Enter any number for the project budget</p> <div><div>Total Budget</div><div>£ 500,000.00</div></div>	Y												
GENRL_10	<p>a) Enter a Total Budget and some costs, check the Budget Left is calculated</p> <p><i>In this example, the Total Cost of £150,000 leaves £350,000 of the Budget</i></p> <div><div><div>Total Budget</div><div>£ 500,000.00</div></div><div><div></div><div></div></div><div><div>Budget Left</div><div>£ 350,000.00</div></div></div> <table><tr><td>Total Cost</td><td>£ 150,000.00</td><td>£ -</td><td>£ -</td><td>£ -</td><td>£ -</td><td>£ 150,000.00</td></tr></table>	Total Cost	£ 150,000.00	£ -	£ -	£ -	£ -	£ 150,000.00	Y					
Total Cost	£ 150,000.00	£ -	£ -	£ -	£ -	£ 150,000.00								
GENRL_11	<p>a) Enter values into the white boxes, check the hours are calculated</p> <p><i>In this example, the User wants to know how many hours 1 month, 2 weeks, and 4 days is</i> <i>It equals 242.50 hours so they now know to enter these hours for the staff member required for this length of time</i></p>	Y												

	<table><tr><td></td><td>Calculator</td><td></td></tr><tr><td></td><td>Required for</td><td>Hours</td></tr><tr><td>No. of months</td><td>1</td><td>137.50</td></tr><tr><td>No. of weeks:</td><td>2</td><td>75.00</td></tr><tr><td>No. of days:</td><td>4</td><td>30.00</td></tr><tr><td></td><td></td><td>242.50</td></tr></table>		Calculator			Required for	Hours	No. of months	1	137.50	No. of weeks:	2	75.00	No. of days:	4	30.00			242.50	
	Calculator																			
	Required for	Hours																		
No. of months	1	137.50																		
No. of weeks:	2	75.00																		
No. of days:	4	30.00																		
		242.50																		
GENRL_12	<p>a) The guidance for Full Time Equivalent is clearly shown</p> <table><tr><td>Full Time Equivalent</td></tr><tr><td>7.5 hours per day</td></tr><tr><td>37.5 hours per week</td></tr><tr><td>220 days per annum</td></tr><tr><td>44 weeks per annum</td></tr><tr><td>1,650 hours per annum</td></tr></table>	Full Time Equivalent	7.5 hours per day	37.5 hours per week	220 days per annum	44 weeks per annum	1,650 hours per annum	Y												
Full Time Equivalent																				
7.5 hours per day																				
37.5 hours per week																				
220 days per annum																				
44 weeks per annum																				
1,650 hours per annum																				
GENRL_13	<p>a) Enter a Project Start Date and Project End Date, check the Hours in Project are calculated</p> <p><i>In this example, a project between 01/01/2019 and 05/05/2022 has 5510.55 hours available</i></p> <table><tr><td>Project Start Date</td><td>01/01/2019</td></tr><tr><td></td><td></td></tr><tr><td>Project End Date</td><td>05/05/2022</td></tr></table> <table><tr><td>Hours in Project</td></tr><tr><td>5510.55</td></tr></table>	Project Start Date	01/01/2019			Project End Date	05/05/2022	Hours in Project	5510.55	Y										
Project Start Date	01/01/2019																			
Project End Date	05/05/2022																			
Hours in Project																				
5510.55																				

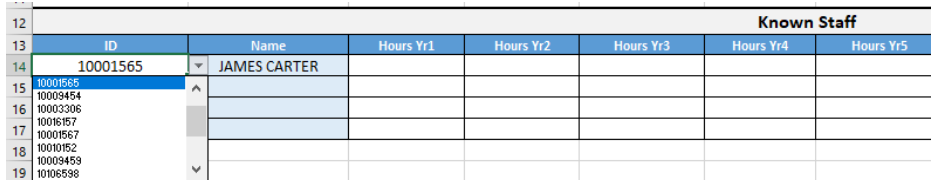
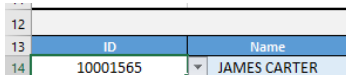
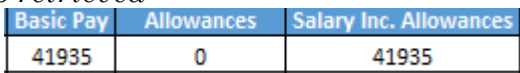
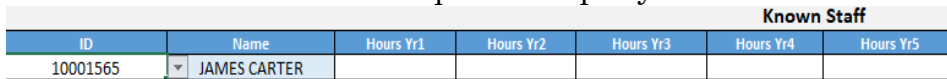
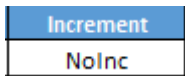
11.6.1.2. Staff Cost Requirements

ID	Test Cases	Pass?												
STAFF_01	<div>a) The cost for each entered staff member is calculated and split into the different years</div> <table><tr><th>Cost Yr1</th><th>Cost Yr2</th><th>Cost Yr3</th><th>Cost Yr4</th><th>Cost Yr5</th><th>Total Cost</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Cost Yr1	Cost Yr2	Cost Yr3	Cost Yr4	Cost Yr5	Total Cost							Y
Cost Yr1	Cost Yr2	Cost Yr3	Cost Yr4	Cost Yr5	Total Cost									
STAFF_02	<div>a) Enter staff hours, check the FTE is calculated</div>	Y												

	<table><tr><th>FTE</th></tr><tr><td>2</td></tr><tr><td>0</td></tr><tr><td>0</td></tr><tr><td>0</td></tr><tr><td>0</td></tr></table>	FTE	2	0	0	0	0			
FTE										
2										
0										
0										
0										
0										
STAFF_03	<p>a) Enter a staff member's hours The hours pre-increment and post-increment for the entered staff members are calculated Then the pre-increment cost and post-increment cost for the staff is calculated based on these hours</p> <p><i>For example:</i> <i>958 hours * pre-increment hourly cost</i> <i>+</i> <i>691 hours * post-increment hourly cost (pre-increment cost + increment)</i> <i>=</i> <i>Yearly cost</i></p> <table><tr><th>Yr1 hrs pre-inc.</th><th>Yr1 hrs post-inc.</th></tr><tr><td>958.3561644</td><td>691.6438356</td></tr></table> <table><tr><th>Yr1 pre-inc</th><th>Yr1 post-inc.</th></tr><tr><td>£ 38,241.90</td><td>£ 28,151.09</td></tr></table>	Yr1 hrs pre-inc.	Yr1 hrs post-inc.	958.3561644	691.6438356	Yr1 pre-inc	Yr1 post-inc.	£ 38,241.90	£ 28,151.09	Y
Yr1 hrs pre-inc.	Yr1 hrs post-inc.									
958.3561644	691.6438356									
Yr1 pre-inc	Yr1 post-inc.									
£ 38,241.90	£ 28,151.09									
STAFF_04	<p>a) Try to enter a value above 1650 into the yearly hours field, check that a popup appears saying why it was blocked</p> <div><table><tr><th>Hours Yr1</th></tr><tr><td>1700</td></tr><tr><td></td></tr><tr><td></td></tr><tr><td></td></tr><tr><td></td></tr><tr><td></td></tr></table><div><div>Invalid Hours</div><div><div></div><div>Total no. of hours must be less than Hours in Project</div><div>Annual no. of hours must be between 0 - 1650</div><div><div>Retry</div><div>Cancel</div><div>Help</div></div></div></div></div>	Hours Yr1	1700						Y	
Hours Yr1										
1700										
STAFF_05	<p>a) Enter a staff member and their hours requires, check the cost is calculated</p> <p><i>In this example, one year of a staff member at spine point 40</i></p> <table><tr><th>Spine Point</th><th>Note</th><th>Hours Yr1</th></tr><tr><td>40</td><td></td><td>1650</td></tr></table> <p><i>will cost £57,143.08 (taking to account the inflation increment)</i></p> <table><tr><th>Total Cost</th></tr><tr><td>£ 57,143.08</td></tr></table>	Spine Point	Note	Hours Yr1	40		1650	Total Cost	£ 57,143.08	Y
Spine Point	Note	Hours Yr1								
40		1650								
Total Cost										
£ 57,143.08										

STAFF_06	<p>a) Enter more hours than Hours in Project, check a popup appears to stop the User</p> <p>b) Enter less hours than Hours in Project, check no popup appears</p> <p><i>In this example, there is only 2762.05 hours available in the project</i></p> <div><div>Hours in Project</div><div>2762.05</div></div> <p><i>So, when the User tries to cost a staff member for 3050 hours they are blocked from doing it</i></p> <div><div>Invalid Hours</div><div><div><div></div></div><div>Total no. of hours must be less than Hours in Project</div><div>Annual no. of hours must be between 0 - 1650</div><div><div>Retry</div><div>Cancel</div><div>Help</div></div></div><table><tr><th></th><th>Name</th><th>Hours Yr1</th><th>Hours Yr2</th></tr><tr><td></td><td>JAMES CARTER</td><td>1650</td><td>1400</td></tr></table></div> <div>Y</div>		Name	Hours Yr1	Hours Yr2		JAMES CARTER	1650	1400
	Name	Hours Yr1	Hours Yr2						
	JAMES CARTER	1650	1400						
STAFF_07	<p>a) Enter a Project Start Date and Project End Date that crosses the increment dates, check the increment is added to the salaries</p> <p>b) Enter a Project Start Date and Project End Date that does not cross the increment dates, check the increment is not added to the salaries</p> <p><i>Using the same example used in the requirement description: When the current date is 01/01/2019</i></p> <div><div>20:25</div><div>01/01/2019</div></div> <p><i>And the Project Start Date is 01/09/2019</i></p> <div><div>Project Start Date</div><div>01/09/2019</div></div> <p><i>Then the hourly starting salary calculated is already including the inflation increment (example using a staff member at spine point 40)</i></p> <table><tr><th>Yr1 Base</th><th>1+Start Inc</th></tr><tr><td>£ 34.34</td><td>£ 35.03</td></tr></table> <p><i>All calculations use the value with the increment applied</i></p>	Yr1 Base	1+Start Inc	£ 34.34	£ 35.03				
Yr1 Base	1+Start Inc								
£ 34.34	£ 35.03								

11.6.1.3. Named Staff Requirements

ID	Test Cases	Pass?
KNWN_01	<p>a) Select the ID of the staff member from a dropdown list or enter it manually</p> 	Y
KNWN_02	<p>a) Select a named staff member by their ID, check their basic pay and allowances are retrieved</p> <p><i>In this example, 'James Carter' is selected</i></p>  <p><i>Their salary is retrieved</i></p> 	Y
KNWN_03	<p>a) There is fields available for the User to manually enter the hours the staff member is required for per year</p> 	Y
KNWN_04	<p>a) Enter a named staff member with an increment date and check their salary is incremented at their increment date</p> <p>b) Enter a named staff member without an increment date and check their salary is not incremented</p> <p><i>No Increment Date</i></p> <p><i>There is a field named 'Increment' that checks whether there is an implement date</i></p> <p><i>If there is no increment date for the selected staff member then the field value is set to 'NoInc'</i></p>  <p><i>The field that decides whether to increment the staff member's pay spine checks the 'Increment' field and if its value is 'NoInc' then their salary does not increase by a Pay Spine, even if it is within the same Pay Grade</i></p>	N

Grade Yr1	New Yr2	Yr2 +1?
Grade 8	Grade 8	No

Increment Date
If there is an increment date, then the Pay Spine follows the usual rules of incrementing if within the same Pay Grade

Increment
01/08/2018

Grade Yr1	New Yr2	Yr2 +1?
Grade 7	Grade 7	Yes

Why test failed
The test has failed because the requirement states the Pay Spine must increment at the staff member's increment date
However, this does not occur as the increment occurs (if there is an increment date) at the 1st August regardless of the date of incrementation
This is not a massive issue as the majority of staff WILL increment on the 1st August, but nevertheless the requirement is not fully met

11.6.1.4. Recruited Staff Requirements

ID	Test Cases	Pass?																					
UNKNWN_01	a) Enter a pay spine into the Spine Point field <table> <tr><th>Spine Point</th></tr> <tr><td>50</td></tr> <tr><td></td></tr> <tr><td></td></tr> <tr><td></td></tr> </table>	Spine Point	50				Y																
Spine Point																							
50																							
UNKNWN_02	a) Enter the hours the recruited staff is required for per year <table> <tr><th colspan="7">Unknown Staff</th></tr> <tr> <th>Spine Point</th> <th>Note</th> <th>Hours Yr1</th> <th>Hours Yr2</th> <th>Hours Yr3</th> <th>Hours Yr4</th> <th>Hours Yr5</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Unknown Staff							Spine Point	Note	Hours Yr1	Hours Yr2	Hours Yr3	Hours Yr4	Hours Yr5								Y
Unknown Staff																							
Spine Point	Note	Hours Yr1	Hours Yr2	Hours Yr3	Hours Yr4	Hours Yr5																	
UNKNWN_03	a) Enter a spine point, check the spine point is increased for the next year if within a Pay Grade b) Enter a spine point, check the spine point is not increased for the next year if not within the same Pay Grade <i>The current years spine point is compared to the spine point of the next year (which is current years +1) to check if they are within the same pay grade</i>	Y																					

If they are the same pay grade, then the spine point for the next year is previous year spine point +1

If they are not the same pay grade then the spine point remains the same

This is used to retrieve the salary for that year's calculations

3. *In this example, the spine point of the staff member increased while remaining within their pay grade*

Yr1 Base	Yr2 Base
£ 39.90	£ 41.12

(Hourly is higher in year 2 due to the spine point increase)

4. *In this example, the spine point of the staff member did not increase as it would cross into a new Pay Grade*

Yr1 Base	Yr2 Base
£ 47.76	£ 47.76

11.6.1.5. Directly Allocated Costs Requirements

ID	Test Cases	Pass?											
DIR_ALC_01	<p>a) Enter staff costs for Academic and Non-Academic Staff, check only the Academic staff are taken</p> <p><i>Three named staff are costed for:</i></p> <table><tr><td>Total Cost</td></tr><tr><td>£ 71,392.98</td></tr><tr><td>£ 60,056.57</td></tr><tr><td>£ 44,444.68</td></tr></table> <p><i>One Non-Academic Staff for 1650 hours in Year 1</i></p> <p><i>Two Academic Staff for 1650 each in Year 2</i></p> <p><i>Only the Academic Staff in Year 2 are shown under Investigator costs</i></p> <table><tr><td>Investigator Costs</td><td>0.00</td><td>104501.25</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 104,501.25</td></tr></table>	Total Cost	£ 71,392.98	£ 60,056.57	£ 44,444.68	Investigator Costs	0.00	104501.25	0.00	0.00	0.00	£ 104,501.25	Y
Total Cost													
£ 71,392.98													
£ 60,056.57													
£ 44,444.68													
Investigator Costs	0.00	104501.25	0.00	0.00	0.00	£ 104,501.25							
DIR_ALC_02	<p>a) Enter staff to get an FTE, check the overhead is calculated based on the FTE</p> <p><i>Three staff are costed for a Generic type project</i></p> <p><i>1FTE in Year 1</i></p> <p><i>2 FTE in Year 2</i></p> <p><i>The current Generic Estates rate is 7465.00 for 1FTE</i></p> <table><tr><td>Estates Costs</td><td>7465.00</td><td>14930.00</td></tr></table>	Estates Costs	7465.00	14930.00	Y								
Estates Costs	7465.00	14930.00											
DIR_ALC_03	<p>a) Enter staff costs for Academic and Non-Academic Staff, check only the Non-Academic staff costs are taken</p>												

	<p>Three named staff are costed for: One Non-Academic Staff for 1650 hours in Year 1 Two Academic Staff for 1650 each in Year 2</p> <table><tr><td>Total Cost</td></tr><tr><td>£ 71,392.98</td></tr><tr><td>£ 60,056.57</td></tr><tr><td>£ 44,444.68</td></tr></table> <p>Only the Non-Academic Staff in Year 1 are shown under Other Directly Allocated Costs (Staff)</p> <table><tr><td>Other Directly Allocated Costs (Staff)</td><td>71392.98</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 71,392.98</td></tr></table>	Total Cost	£ 71,392.98	£ 60,056.57	£ 44,444.68	Other Directly Allocated Costs (Staff)	71392.98	0.00	0.00	0.00	0.00	£ 71,392.98	Y
Total Cost													
£ 71,392.98													
£ 60,056.57													
£ 44,444.68													
Other Directly Allocated Costs (Staff)	71392.98	0.00	0.00	0.00	0.00	£ 71,392.98							
DIR_ALC_04	<p>a) Enter staff to get an FTE, check the overhead is calculated based on the FTE</p> <p>Three staff are costed for a Generic type project 1FTE in Year 1 2 FTE in Year 2</p> <p>The current Generic Infrastructure Technician rate is 366.00 for 1FTE</p> <table><tr><td>Infrastructure Technician</td><td>366.00</td><td>732.00</td></tr></table>	Infrastructure Technician	366.00	732.00	Y								
Infrastructure Technician	366.00	732.00											
DIR_ALC_05	<p>a) Enter staff to get an FTE, check the overhead is calculated based on the FTE</p> <p>Three staff are costed for a Generic type project 1FTE in Year 1 2 FTE in Year 2</p> <p>The current Generic Indirect costs rate is 49056.00 for 1FTE</p> <table><tr><td>Indirect Costs</td><td>49056.00</td><td>98112.00</td></tr></table>	Indirect Costs	49056.00	98112.00	Y								
Indirect Costs	49056.00	98112.00											
DIR_ALC_06	<p>a) Select Capped Project Type Enter Overhead Cap (%) Enter Directly Allocated costs Check OS Overheads are correctly calculated</p> <p>b) Select Generic Project Type Enter Directly Allocated costs Check OS Overheads are not calculated</p>	Y											

11.6.1.6. Administration Requirements

ID	Test Cases	Pass?																																																
ADMIN_01	<p>The Administrator can change the inflation increment by accessing the hidden 'Admin' sheet - by entering the password known only to them</p> <p>The change made to the value will affect all calculations that use it, as they reference the cell rather than a fixed value</p> <table><tr><td>Inflation Increment</td><td>2.00%</td></tr></table>	Inflation Increment	2.00%	Y																																														
Inflation Increment	2.00%																																																	
ADMIN_02	<p>The Administrator can change the overhead rates by accessing the hidden 'Admin' sheet - by entering the password known only to them</p> <p>The change made to the value will affect all calculations that use it, as they reference the cell rather than a fixed value</p> <table><tr><th colspan="6">Overheads</th></tr><tr><td>Lab Based</td><td></td><td>2018/19</td><td></td><td>Generic</td><td>2018/19</td></tr><tr><td>Lab Estates Rate</td><td>£</td><td>13,234</td><td></td><td>Estates</td><td>£ 7,465</td></tr><tr><td>Indirect Costs</td><td>£</td><td>49,056</td><td></td><td>Indirect</td><td>£ 49,056</td></tr><tr><td>Lab RIT Rate</td><td>£</td><td>519</td><td></td><td></td><td></td></tr><tr><td>Pool Tech Rate</td><td></td><td>£17.00</td><td></td><td>Infrastruct. Tech</td><td>£ 366</td></tr><tr><td></td><td></td><td>£ 62,826.00</td><td></td><td></td><td>£56,887.00</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Overheads						Lab Based		2018/19		Generic	2018/19	Lab Estates Rate	£	13,234		Estates	£ 7,465	Indirect Costs	£	49,056		Indirect	£ 49,056	Lab RIT Rate	£	519				Pool Tech Rate		£17.00		Infrastruct. Tech	£ 366			£ 62,826.00			£56,887.00							Y
Overheads																																																		
Lab Based		2018/19		Generic	2018/19																																													
Lab Estates Rate	£	13,234		Estates	£ 7,465																																													
Indirect Costs	£	49,056		Indirect	£ 49,056																																													
Lab RIT Rate	£	519																																																
Pool Tech Rate		£17.00		Infrastruct. Tech	£ 366																																													
		£ 62,826.00			£56,887.00																																													

11.6.1.7. Costing Summary Requirements

ID	Test Cases	Pass?																																																																																																				
SUM_01	<p>The costs for each scenario are summarised</p> <table><tr><td rowspan="7">Scenario 1</td><td></td><td>Year 1</td><td>Year 2</td><td>Year 3</td><td>Year 4</td><td>Year 5</td><td>TOTAL</td></tr><tr><td>FTE</td><td>1.242424242</td><td>0.242424242</td><td>0</td><td>0</td><td>0</td><td>1.484848485</td></tr><tr><td>Directly Incurred</td><td>150000.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 150,000.00</td></tr><tr><td>Exceptions</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ -</td></tr><tr><td>Directly Allocated</td><td>80929.08</td><td>24565.26</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 105,494.33</td></tr><tr><td>Total Scenario Cost</td><td>£ 230,929.08</td><td>£ 24,565.26</td><td>£ -</td><td>£ -</td><td>£ -</td><td>£ 255,494.33</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="7">Scenario 2</td><td></td><td>Year 1</td><td>Year 2</td><td>Year 3</td><td>Year 4</td><td>Year 5</td><td>TOTAL</td></tr><tr><td>FTE</td><td>1.818181818</td><td>0.666666667</td><td>0</td><td>0</td><td>0</td><td>2.484848485</td></tr><tr><td>Directly Incurred</td><td>30000.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 30,000.00</td></tr><tr><td>Exceptions</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ -</td></tr><tr><td>Directly Allocated</td><td>113682.20</td><td>48699.13</td><td>0.00</td><td>0.00</td><td>0.00</td><td>£ 162,381.33</td></tr><tr><td>Total Scenario Cost</td><td>£ 143,682.20</td><td>£ 48,699.13</td><td>£ -</td><td>£ -</td><td>£ -</td><td>£ 192,381.33</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Scenario 1		Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL	FTE	1.242424242	0.242424242	0	0	0	1.484848485	Directly Incurred	150000.00	0.00	0.00	0.00	0.00	£ 150,000.00	Exceptions	0.00	0.00	0.00	0.00	0.00	£ -	Directly Allocated	80929.08	24565.26	0.00	0.00	0.00	£ 105,494.33	Total Scenario Cost	£ 230,929.08	£ 24,565.26	£ -	£ -	£ -	£ 255,494.33								Scenario 2		Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL	FTE	1.818181818	0.666666667	0	0	0	2.484848485	Directly Incurred	30000.00	0.00	0.00	0.00	0.00	£ 30,000.00	Exceptions	0.00	0.00	0.00	0.00	0.00	£ -	Directly Allocated	113682.20	48699.13	0.00	0.00	0.00	£ 162,381.33	Total Scenario Cost	£ 143,682.20	£ 48,699.13	£ -	£ -	£ -	£ 192,381.33								Y
Scenario 1			Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL																																																																																														
	FTE		1.242424242	0.242424242	0	0	0	1.484848485																																																																																														
	Directly Incurred		150000.00	0.00	0.00	0.00	0.00	£ 150,000.00																																																																																														
	Exceptions		0.00	0.00	0.00	0.00	0.00	£ -																																																																																														
	Directly Allocated		80929.08	24565.26	0.00	0.00	0.00	£ 105,494.33																																																																																														
	Total Scenario Cost		£ 230,929.08	£ 24,565.26	£ -	£ -	£ -	£ 255,494.33																																																																																														
Scenario 2		Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL																																																																																															
	FTE	1.818181818	0.666666667	0	0	0	2.484848485																																																																																															
	Directly Incurred	30000.00	0.00	0.00	0.00	0.00	£ 30,000.00																																																																																															
	Exceptions	0.00	0.00	0.00	0.00	0.00	£ -																																																																																															
	Directly Allocated	113682.20	48699.13	0.00	0.00	0.00	£ 162,381.33																																																																																															
	Total Scenario Cost	£ 143,682.20	£ 48,699.13	£ -	£ -	£ -	£ 192,381.33																																																																																															
SUM_02	<p>The staff hours and costs for each scenario are summarised</p>	Y																																																																																																				

	Known Staff								
	Name	<input type="button" value="▼"/>	Sum Hours Yr1	Sum Hours Yr2	Sum Hours Yr3	Sum Hours Yr4	Sum Hours Yr5		Total Costs
	Grand Total								
	Unknown Staff								
	Spine Point	<input type="button" value="▼"/>	Sum Hours Yr1	Sum Hours Yr2	Sum Hours Yr3	Sum Hours Yr4	Sum Hours Yr5		Total Costs
	Grand Total								

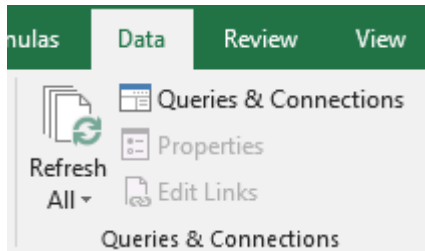
11.6.1.8. Directly Incurred Costs Requirements

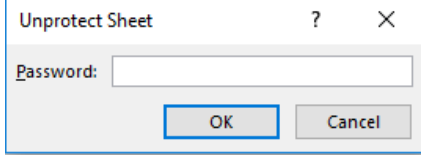
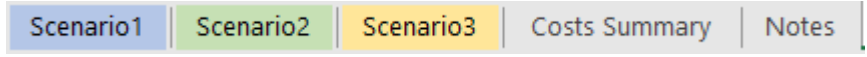
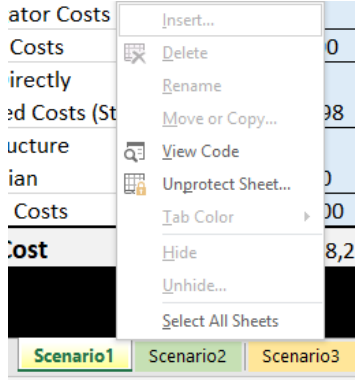
ID	Test Cases	Pass?			
DIR_INC_01	a) Enter recruited staff members and check salaries cells correctly sums up <table> <tr> <td>Salaries</td><td>3751.16</td><td>65043.05</td></tr> </table>	Salaries	3751.16	65043.05	Y
Salaries	3751.16	65043.05			
DIR_INC_02	a) Enter values into each year and check yearly total is correct	Y			
DIR_INC_03	“”	Y			
DIR_INC_04	“”	Y			
DIR_INC_05	“”	Y			
DIR_INC_06	“”	Y			
DIR_INC_07	“”	Y			
DIR_INC_08	“”	Y			
DIR_INC_09	“”	Y			
DIR_INC_10	“”	Y			
DIR_INC_11	“”	Y			
DIR_INC_12	a) Enter a value and check conditional formatting is triggered <table> <tr> <td>£</td><td>1,000.00</td><td>Equipment Req.</td></tr> </table>	£	1,000.00	Equipment Req.	Y
£	1,000.00	Equipment Req.			
DIR_INC_13	“”	Y			

11.6.1.9. Exception Cost Requirements

ID	Test Cases	Pass?
EX_01	a) Enter values into each year and check yearly total is correct	Y
EX_02	“”	Y

11.6.2. Non-Functional Requirements

ID	Proof	Pass?
NON_01	<p>The calculations used within the formulas have been checked and signed-off by the client, in the form of the Costing Rules. This ensures the logic that produces the outcome should be correct and give the right result.</p> <p>The client has tested the Tool and found no big discrepancies between the expected and actual results.</p>	Y
NON_02	<p>There is data validation in place to prevent the User from entering invalid data.</p> <p>All the error messages have useful messages to identify the issue</p> <p>Most non-required cells are locked, preventing the User accidentally breaking the tool, while guiding them to the correct cells to enter data.</p> <p>The scenarios are colour coded so the User can quickly distinguish where in the tool they are</p> <p>There is guidance to help Users in areas that could potentially be confusing</p>	Y
NON_03	<p>Once the data connections have been linked to the files on the administrator's computer, the Administrator only has to overwrite with the new data and click the 'Refresh All' button to load the tool with the updated data</p> 	Y

	<p>The values in the Admin sheet can be edited by the Administrator once they have unlocked the workbook with the password</p> <p>This includes the inflation percentage and overhead rates</p>	
NON_04	<p>The administrators have the password so can unlock the worksheet to reveal the hidden formulas and sheets</p> 	Y
NON_05	<p>The Core Report and Pay Grades sheets are hidden from the User</p>  <p>The sheets cannot be unhidden as the worksheet is locked and protected by a password</p> 	Y
NON_06	<p>The administrators have the password to unlock the worksheet, meaning they can add new sheets or edit the current data as required</p>	Y

11.7. Appendix G – Meeting Notes

11.7.1. Meeting 1 – January 31st

Attendees: Michelle (Senior Finance Officer)

Gain an understanding of the potential project (Prior to project start)

Want to apply for grant

Brief overview of resource – staff time, travel etc

Some cases: Know they want a sum of money, try different scenarios, send it off

Aims: Tool to calculate full cost of a project Staff times for different type of staff
Research week 37.5hours for 44 weeks a year = 1650 hours a year
Outside researcher – E.g. Grade 3 at medium pay for set hours (RECRUITED) RECRUITED people cost will go up by inflation over time – cost goes up by a percent (+ 2% per year for living costs) OR internal person, know how much they cost (NAMED)
Must look different to CAP form
Overhead charge based on FTE (Full Time Equivalent) Known overhead charge will be applied to this (covers universities costs)
One person for year 1 = Cost of year 1 then stops, second person comes in = Cost of year 2 third year has both people = Cost of year 3 SUM UP TOTAL
Transport etc can just be a box to throw a number in

11.7.2. Meeting 2 - February 5th

Attendees: Michelle (Senior Finance Officer)

Questions about CAP form and other supplied files

Page?	Questions	Answers/Notes
Page 2	<i>Why does project 'require cash contribution' as soon as equipment is added – other costs can be as high as like and still financially viable</i>	Only 50% of equipment funded, so flag up when ANY is added
	<i>Proposed price = All costs BUT NOT DIRECTLY ALLOCATED Contribution to fEC = Full cost of project – Directly allocated costs</i>	No, directly allocated costs can be charged if it's a staff project. Example given was a transport CAP form which is not funded and is unusual – only given that example because only one without private staff data which I cannot view
	<i>How are directly allocated costs calculated? (Guessing to do with 0.09 Overhead costs)</i>	Based on FTE of staff Percentage based on how many staff and how long they work So 1 year project with 2 people would have double the overheads

	<p><i>Is the financial summary the bit that's done manually? (All stays at £0)</i></p> <p><i>How is this calculated?</i></p> <p><i>School Contribution to DI costs is just the cost of equipment</i></p>	<p>Normally a summary of all the costs from early that are incurred by school</p> <p>Not available in this CAP form as it's a transport one which isn't incurred</p>
Page 3	<p><i>Where does the 150 come from? = 1-month work</i></p> <p><i>Where are other numbers taken from? All remain at 0 (Entered manually?)</i></p> <p><i>Where was the £4669 taken from?</i></p>	<p>This is the calculations Tool will perform</p>
Salary Breakdown	<p><i>What is this for?</i></p> <p><i>Where are numbers taken from?</i></p>	<p>Does not matter for the project</p>
CORE REPORT TEST SAMPLE	<p><i>This will be full list of named peoples?</i></p>	<p>Yes</p>
	<p><i>How do I make the spreadsheet reference this?</i></p>	<p>Match staff ID entered to 'Named persons list' to autofill data</p> <p>Can't be static in template because then will need to be updated by individuals each time</p> <p>1. Could have spreadsheet template maintained centrally in repository (list kept on a hidden sheet) – PI must download from there to work each time</p> <p>RISK – Doesn't download and works from old template so data is invalid</p> <p>Who keeps main spreadsheet up to date?</p> <p>Where would it be stored?</p> <p>2. Have spreadsheet make a call to a</p>

		<p>database containing the named staff list</p> <p>Risk – Managing security of database</p> <p>Who maintains it?</p> <p>Not sure I have the technical capabilities or time to do this</p> <p>Will discuss with Rob Davies (School Manager). Probably have a spreadsheet that is updated when a report is run on database data, so reference this</p>
General Questions	<i>Increments – named person salary goes up after a certain date? By how much?</i>	<p>Goes up by one spine point each increment, cannot go beyond a grade though</p> <p>How to take this into account???</p> <p>Calculate chargeable hours between start+increment (standard pay)</p> <p>Calculate chargeable hours between increment+end (standard pay+increase)</p> <p>Must also take into account 2% increase every year August 1st</p> <p>– Have to be able to alter the 2%</p> <p>Total = annual cost</p>
	<p><i>Cannot view data in protected cells – such as formulas</i></p> <p><i>Also cannot view conditional formatting currently in place</i></p>	Cannot be helped, Michelle given me all calculations required instead
	<i>Is there a confidentiality problem with selecting Named people from the dropdown list? Doesn't this mean you can view everyone's salaries?</i>	Not an issue, can hide the data

11.7.3. Meeting 3 – February 14th

Attendees: Michelle (Senior Finance Officer) and Rob (School Manager)

Learn about on costs – pensions, NI etc – what is charged?

Questions	Answers/Notes
<i>Which cost to take for recruited person? Include pensions?</i>	The pension (e.g. USS) Total column
<i>Named person, basic pay = total column of pension they have So go up spine point Then add the same amount of allowances again?</i>	Yes
<i>Why is there a different FTE for staff and estates in CAP form?</i>	Depending on funder, some of the costs aren't calculated off 100% of FTE
<i>Is recruited persons FTE manually entered? or is it calculated from their hours needed? or is it always 1?</i>	Calculated same as Named: hours needed/1650
<i>As a User, I want the salary of the Named Staff Member I select to be retrieved, so that it can be used to calculate their hourly cost Which value is this: Salary including allowances? What about pensions?</i>	Salary including allowances – already takes into account pensions Basic pay = USS total
<i>As a User, I want to be able to manually enter 'Salaries' Costs, so these are added to the Directly Incurred Costs Where is this calculated from? Is it required?</i>	Taken from page 3 of CAP form, total of the salaries taken from there
<i>As a User, I want it to be visually flagged up if 'New Equipment' Costs have been entered, so I am aware that it will not all be funded Is it required? Who cares about this? Is it someone reviewing later, in which case they would be a new actor e.g. 'Costs Reviewer' Currently put it in as its in the CAP form, but may not actually be needed and so can be removed</i>	Those in meeting (User) so they can see if project may not all be funded, or if number entered in the wrong place Is required
<i>DI Major Research Facilities (MRF) Charity Only</i>	Allow number to be manually entered into

<i>Costs required or should be left out? Could just copy what currently in CAP form</i>	
<i>Exceptions costs</i>	Allow to be manually entered. But keep in separate area
<i>How accurate is the Core Report example?</i>	CORE Report is outputted same as example and can be accepted as accurate Can reference for salaries etc
<i>Do overhead charges need to change across years?</i>	Overhead charges are costed as their value as start of project, don't change over the years
<i>How is the increment calculated for Named staff? They are on a pay spine but how much do they go up by? - May be getting confused by the anonymised staff costs I've been given as they don't seem to match pay spines given</i>	Increment added to Basic Pay, then add the allowances again
	Add a notes section New requirement
	Show staff name when ID chosen New requirement
	Overhead based on lab/desk project Drop down (?) to select this New requirement

11.7.4. Meeting 4 – March 6th

Attendees: Michelle (Senior Finance Officer), Federico (Principal Investigator), Rob (School Manager)

Real research costing meeting – viewing what happens in reality to notice anything missed or useful

Questions	Answers/Notes
	Know how much overhead rate can be used – for example 10% of total Need option of generic or lab-based, then an additional option to cap it at specific amount.
<i>How long can a research project be? Is three years long enough?</i>	Make continue up to 5 years New requirement
	UK and US based projects are treated the same, so allow dollars too Maybe option to convert £ to \$ at current exchange rate

	<p>What's left calculate as much of named staff time as possible that is left</p> <p>Needs to take into account overheads too</p> <p>E.g. Total budget 500k, already used 400k – how much time is available of the known time</p> <p>NOT POSSIBLE</p> <p>Instead simply calculate budget left and allow User to alter costs to maximise it manually</p> <p>New requirement</p>
	<p>Difficult to work out how many hours to enter, as most work in months / weeks</p> <p>Create a calculator to help get hours</p> <p>New requirement</p>

11.7.5. Meeting 5 – March 15th

Attendees: Michelle (Senior Finance Officer)

Questions about implementing functionalities

Questions	Answers/Notes
<p><i>How to cap overheads?</i></p> <p><i>E.g. if 10% does it all total up then multiply by 10%?</i></p>	<p>All directly incurred costs + investigator costs = TOTAL</p> <p>Total * % = Overhead cap</p>
<p><i>Have a first page to fill in all the details like project start / type / cap / budget?</i></p> <p><i>Or could this change per scenario so just copy across to each page but be changeable if need?</i></p> <p><i>Same for manually entered costs, would these change per scenario?</i></p>	<p>No, leave as is</p>
<p><i>Should project end limit number of hours available or not matter?</i></p>	<p>If possible</p> <p>New requirement</p>
<p><i>The Core Report for non-USS people, what does it look like?</i></p> <p><i>Currently it always looks at USS costs, how to make it change to others</i></p>	<p>Always USS</p>
	<p>Non academic = other directly allocated staff</p>
<p><i>Which values are infrastructure tech?</i></p>	<p>519 + 17 = Infrastructure tech</p>

	Move guidance to the scenario sheet Does not require separate sheet
<i>Is the CORE Report overwritten each time or renamed to something new?</i>	Overwritten
<i>When putting in hours, do these need to be spread across the whole year. E.g. 500 hours = 350 pre inc. and 150 post inc. Instead of 500 pre inc.?</i>	Former
<i>Named person 1st August + 2% Does named person always increment pay spine? And only says 01/08/2018 in example – would this be same year on year?</i>	Increment Date Some are different (very few) Same date year on year
<i>Do the paygrade salaries always go up by 2% every year? So a project starting after 1st August 2018 would already need to have a 2% increase applied to the costs?</i>	Yes New Requirement

11.7.6. Meeting 6 – April 9th

Attendees: Michelle (Senior Finance Officer)

Quick catch-up meeting after supervisor meeting

Question about Tool

<i>Importing data not working</i>	Spent a while trying to fix but could not find bug in Tool
	Overhead cap calculation was wrong Update to calculate one row called OS Overheads Total directly allocated costs * cap New requirement

11.7.7. Meeting 7 – April 12th

Attendees: Michelle (Senior Finance Officer)

Testing functionalities on real scenarios and discussing Future Work

<i>Future Work</i>	Professorial staff Don't increment spines Different pay grades IMPLEMENT: IF Professorial then YR2+1? = NO
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	IF Professorial then YR1 Base pulls data from different range
<i>Overhead functionality</i>	Tested against real CAP form Works accurately
<i>Understanding the Admin increment calculations</i>	Run-through of how they are calculated Explained how they update with current date How to edit it to fit new scenarios
<i>Importing data issue</i>	Discovered reason Core report output formatted wrong, Excel could not understand it

11.8. Appendix H – Supplied Files

11.8.1. Core Report



CORE REPORT TEST
SAMPLE.xlsx

11.8.2. Pay Scales



PayScales.xlsx

11.8.3. CAP Form



DummyCAPFORM.xlsx

11.8.4. Rate Table



RATE TABLE.xlsx

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