**300/303COM Detailed project proposal**

The objective of the detail project proposal is to help you refine your general research question down to a well-focused and achievable piece of practical research work.

The first section: “Defining your research project” focuses on your research question and the plan for conducting your primary method. The second section: “Abstract and Literature Review” is to help you identify current academic sources of literature that are highly relevant to your project and to help you get a head-start in producing your literature review.

Your detailed project proposal will be graded in the second semester – however, it is highly recommended that you submit it by the end of the first semester (04/01/2016) in order to obtain detailed supervisor feedback on your project.

There is no suggested word length for the detailed proposal – although 2000-2500 words would be in order.

The Detailed Project Proposal is worth 20% of the project mark.

**300/303COM Detailed Project Proposal**

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| Supervisor: | Dr. Faiyaz Doctor |

## Section one: Defining your research Project

**1.1 Detailed research question**

**Help:** Your detailed research question is the statement of a problem within the computing domain which you will address in your project. Refining the research question involves narrowing down an initial question until it is answerable using a primary research method(s) that you will conduct during the time of your project. The refined research question must not be so general that it is answerable with a yes or no answer. It must not be so broad that you would be unable to achieve a solution during your project. The key to this is BEING SPECIFIC: Narrow down the method or technology you will use, narrow down the group that the question refers to (localize a general question) If the project is still ‘too big’, can you think of a way to work on a part of the problem? Avoid using words that cannot be measured, by you, without a huge research budget e.g. 'effects on society', 'effects on business'. *Example:* The initial question "Does cloud computing effect business" needs narrowing down *(for a start the answer is yes) W*hat is meant by cloud computing? Or 'effect'? Or 'business', in this question? Refining this first question will involve narrowing it down to something you, personally, can measure. A refined version of this question might be: "Does implementing a cloud based voting system improve the speed of decision making in a small company in Coventry?" This refined question is implementable: You can now identify a small company to work with, document their current decision making processes, implement a cloud based voting system, compare decision making speeds over a limited time period (say 1 month) and evaluate your findings. *A small piece of genuinely new knowledge is produced.*

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| Does developing Android mobile applications in the cross-platform development framework React-Native produce any quantitative benefits in terms of performance, development time, cost, and stability compared to developing applications exclusively in the platform native language (Java)? |

**1.2 Keywords**

**Help:** Include up to 6 keywords separated by a semi-colon; what keywords are appropriate to describe your project in an online database like Google Scholar? Keywords should include the general research area and the specific technologies you will be working with. *Example.* A project that proposes a novel way of visualising large amounts of twitter feed data may have the keywords: Data visualisation; twitter; hashtags; database design; graphics libraries. For further help take a look at the ACM keywords list http://www.computer.org/portal/web/publications/acmtaxonomy

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| react-native; android; performance; development-time; mobile-application; comparison; |

**1.3 Project title**

**Help:** The project title is a statement based on your detailed research question. For example, the research question *'to what extent does a mobile application reduce the number of errors made in class registers at Coventry University in comparison to current paper based registers'* may be stated in the project title*: "A Wi-Fi driven mobile application for large group registers using iBeacons".*

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| A comparative analysis of developing Android mobile applications using the native Android language Java, compared to using the cross-platform development framework React-Native. |

**1.4 Client, Audience and Motivation:**

**Help:** Why is this project important? To whom is this project important? A research project must address a research question that generates a small piece of new knowledge. This new knowledge must be important to a named group or to a specific client (such as a company, an academic audience, policy makers, people with disabilities) to make it worthwhile carrying out. This is the ***motivation*** for your project. In this section you should address who will benefit from your findings and how they will benefit. Example: If you intend to demonstrate that a mobile application that automates class registers at Coventry University will be more efficient than paper based registers - the group who would be interested in knowing/applying these findings would be both academic and administrative staff at Coventry University and they would benefit by time saved and a reduction in their administrative workload. If you are making a business case for an organization explain how the organisation will benefit from your findings.

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| **Motivation**  React-Native is a relatively new cross-platform mobile application development framework for Android and iOS. Its combination of the popular JavaScript-based web-design framework: React, and Platform Native development has gained a huge amount of interest from hobbyists and professionals alike, many of whom believe this new framework to be a superior method of creating mobile applications. However, despite its popularity, very little formal research has been done and almost no quantitative data has been produced to properly compare the two types of development. There is a large amount of uncertainty concerning the performance of React-Native, and whether the performance trade-off is worthwhile when also considering the reduced development time and cross-platform aspects of React-Native.  The goal of this project is to produce accurate, unbiased analytical data and use it to objectively compare the two types of development. This data should be able to alleviate some of the uncertainty surrounding the subject and act as a reliable resource for individuals, businesses, and development companies when assessing the usefulness of the React-Native framework.  **Audience**  This research and the conclusions therein are intended for use by any individual or company who are deciding whether to using Native application development or using React-Native. The data I produce aims to alleviate the ambiguity between the two development techniques.  Specifically, I am looking into the 4 areas of app development which are most relevant to businesses: Performance, Cost, Stability, and Development-Time.  Depending on the application in question and the resources available (time and budget, etc...), the choice between using traditional app development and using React-Native becomes difficult as there is little data supporting either side of the argument. |

**1.5 Primary Research Plan**

**Help:** This is the plan as to how you will go about answering your detailed research question - It must include a primary research method (an extended literature review is not an acceptable primary method). Think and plan logically. Primary methods may include experiments, applications or software demonstrators, process models, surveys, analysis of generated data …  
  
Example: In the class register example above "to what extent does a mobile application reduce the number of errors made in class registers at Coventry University in comparison to current paper based registers" - the research plan may involve: 1) Collecting and analysing paper based registers in a given class on five occasions. 2) Identifying the error rate average on these occasions 3) Designing and implementing a mobile application that automatically records attendance in class. 4) Deploying the application in the class on five occasions. 5) Identifying the error rate average of the mobile application on these occasions. 6) Comparison of data and summary of findings.

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| The primary research plan for this project will be to create two identical mobile applications and then compare them to each other. One of these applications will be developed using the traditional Java method, the other will be using the cross-platform framework React-Native.  Firstly I am going to design the application, then I will reduce this design into a set of *features*, and those features will be broken down into *tasks.* Using this structure I can then proceed to develop the applications, and record my progress and the relevant metrics for each task and feature, thus producing a set of data for each application which can be directly compared to each other.  The following areas will be compared between the two applications:   1. Performance 2. Development-time 3. Stability 4. Cost (Derived)   **Performance**  For most features, a performance metric will be directly measurable. E.g. For measuring the performance of animations, the metric would be average FPS (Frames per Second) over the duration of the animation.  For large list manipulation I.e. (Removing an item from the middle of a large list), the metric would be TTD (Time to Draw) which is the time it took to remove the element from the list and redraw the screen with the new data.  **Development-Time**  For the development-time metric, I will record the time it took to complete a feature. A feature is "Completed" when it passes the set of unit tests that have been created for that feature (Both applications will use the same unit tests, however, they will be implemented using the platform respective unit-testing framework).  Being very familiar with both Java and React-Native, I will be able to efficiently implement both applications.  **Stability**  Stability is of great importance when creating any application, I will measure stability by recording each time a feature implementation cause a previously successful unit test to fail. Any bugs not caught by the unit tests will also be recorded in this metric.  I can produce the following metrics:   1. Bugs (number of reworks) per feature ( **B/F** ). 2. Broken lines of code(SLOC) per feature. 3. Time spent fixing Bugs.   All of the above three metrics will also be produced for the application as a whole, rather than just on a per feature basis. |

This is the end of section one.

## Section Two: abstract and Literature review (1500 words suggested)

**2.1 Abstract**

**Help:** An abstract is a short summary of a research project that enables other researchers to know if your report or research paper is relevant to them without reading the whole report. It is usually written retrospectively so that it can include findings and results. It is fully expected that you will rewrite your abstract when you come to write your final paper. For now, you should write an abstract of about 250 words that define the project described in section one. Before writing your abstract you MUST read some abstracts from conference or journal papers on *Google Scholar* or from *portal.acm.org* (to understand their style) and then provide your own abstract that outlines what your question is and what you 'did' to answer it.

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| React-Native is a cross-platform mobile application development framework created by Facebook in 2015. It allows a developer to simultaneously create mobile applications for both the Android and iOS platforms in JavaScript instead of the platform native language (Java or Objective-C respectively). React-Native’s popularity stems from its intelligent combination of native and non-native code using “Bridges”. Bridges are a way of exposing native APIs to the JavaScript thread, allowing the utilization of the platforms’ high-performance native modules. This allows React-Native to achieve comparable performance to purely native applications whilst using the arguably simpler application design structure of React and JavaScript as well as having the benefit of creating applications for both platforms at once. React-Native operates very differently to other cross-platform technologies such as Cordova and Xamarin, which use an embedded web browser to render the application in HTML and CSS as if it were a normal web application. Whilst this method is considered cross-platform it sacrifices performance and freedom of design. Those who use React-Native claim to have seen reduced development time and cost, whilst sacrificing very little in terms of performance. These claims, however, are backed by very little evidence and almost no statistical data has been produced. Most of the available data comes from blogs that have a little objective evaluation of the development methods, or do not consider any special business requisites for the application, such as high-performance requirements. Businesses and individuals who are deciding which method to use when creating a new mobile application will find it difficult to form an accurate, unbiased decision using the data available, and may waste a large amount of time and money using a development method that is entirely unsuitable for their needs. The primary objective of this research is to fill the substantial gap in the data used to compare the two development methods. Using this data, we can accurately assess if using React-Native to develop mobile applications produces any substantial improvement in performance, development time, cost, and stability compared to using purely platform native development. These are arguably the most important areas of concern for any business looking to develop a mobile application. The research involves creating two identical Android mobile applications and individually assessing each aspect of the application. The measurements will be taken for each feature of the application, so to produce a fine-grained analysis as well as considering the two methods on a broader scale. |

**2.2 Initial/Mini Literature Review (500 words – 750 words)**

**Help:** A literature review is a select analysis of current existing research which is relevant to your topic, showing how it relates to your investigation. It explains and justifies how your investigation may help answer some of the questions or gaps in this area of research. A literature review is not a straightforward summary of everything you have read on the topic and it is not a chronological description of what was discovered in your field. Use your literature review to:

• compare and contrast different authors' views on an issue  
• criticise aspects of methodology, note areas in which authors are in disagreement  
• highlight exemplary studies  
• highlight gaps in research  
• show how your study relates to previous studies

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**2.3 Bibliography (key texts for your literature review)**

**Help:** Please provide references, in correct Harvard style, for at least three key texts that have informed your literature review. If you are implementing an application, select texts which demonstrate how other researchers have tackled similar implementations? The references should be recent and sufficiently technical or academic. Your markers will be looking for you to identify technical reports, conference papers, journal papers, and recent text books. Avoid *Wikipedia* entries, newspaper reports that do not cite sources, and general or introductory texts.

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This is the end of section two.