

**GRIFFITH COLLEGE LIMERICK**

**Group Project Proposal Cover Sheet**

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| **Students names:** | **Paula Carine Oehme & Sarah Narayamy Tavares Silva** | | | | | |
| **Students numbers:** | **2957903 & 2960992** | | |  | | |
| **Faculty:** | **Engineering, Computing & IT** | | |  | | |
| **Course:** | **BSCO** | | | **Stage/year:** | **3** | |
| **Subject:** | **Group Project (GP)** | | | | | |
| **Study Mode:** | Full time | **X** |  | Part-time |  |  |
| **Lecturer Name:** | **Sonia Zheleva** | | | | | |
| **Assignment Title:** | ***Project Proposal*** | | | | | |
| **No. of pages:** | **17** | | |  | | |
| **No. of words:** | **3824** | | |  | | |
| **Disk included?** | Yes |  |  | No | **X** |  |
| **Additional Information:** | (ie. number of pieces submitted, size of assignment, A2, A3 etc) | | | | | |
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| **Date due:** | **05/03/2020** | | |  | | |
| **Date submitted:** | **05/03/2020** | | |  | | |
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## Please note: Students MUST retain a hard / soft copy of ALL assignments as well as a receipt issued and signed by a member of Faculty as proof of submission.



**GRIFFITH COLLEGE LIMERICK**

# Bachelor Degree in Computing Science

***Mobile Application associated with IoT Device for potential Animal Adopters to find their Pet to love***

**Project Proposal Form**

The form, fully completed, must be returned to:

**Sonia Zheleva**

Faculty of Engineering, IT & Computing

Griffith College Limerick

O’Connell Avenue

Limerick

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| **PROJECT TITLE:** | **Mobile Application associated with IoT device for potential animal adopters to find their pet to love** |
| **STUDENT NAMES & IDs:** | 1) Paula Carine Oehme  2) Sarah Narayamy Tavares Silva |
| **NAME OF DEPARTMENT:** | Engineering, IT & Computing |
| **PROGRAMME** | Bachelor Degree (Ordinary) in Computing Science |
| **CONTACT/MOBILE TELEPHONE NO:** | 1) +353 83 834 0734  2) +353 83 847 8897 |
| **EMAIL ADDRESS:** | 1) [paula.oehme@gmail.com](about:blank)  2) [sarahnarayamy@gmail.com](about:blank) |
| **PROJECT SUMMARY**:  The current Project will research into the topic of use of Internet of Things today and animal adoption from Shelters in Ireland in order to develop an Android Mobile Application that will assist potential animal adopters by providing a search for a desirable pet through Animal Shelter’s database, using an IoT home device. The information on the database will be provided and managed by shelters across Ireland and it will be updated as an animal enters the shelter or is adopted and taken by the new owner. The application will interact with an IoT device’s interface, such as *Google Home*, and through voice command the smart home device will do the search through the database, with results presented on the application’s interface. The application will also have features to assist communication between shelters and potential adopters and filling forms of Intent of Adopting. | |

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| **OTHER INSTITUTIONS / DEPARTMENTS / PERSONNEL ASSOCIATED WITH THE PROJECT:** |
| Limerick Animal Welfare (LAW) |

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| **FULL DESCRIPTION OF THE PROJECT:**  **Problem Definition & Background Information:**  Over the years, animals have gained more and more importance in the relationship with their owners, from being considered only in a role to protect houses or help with the day-to-day labour in the fields in the early years, to becoming loved and cherished pets, and even friends and family members, in more recent years. This is the case for most pet owners in Ireland, where 91% recognise pets as members of their families (Independent, 2016). However, even with all this affection towards animals, every year millions of them are abandoned worldwide, which has a major impact on animal welfare, public and private organizations’ finances (Houpt, et al., 2007).  In Ireland, the Department of Rural and Community Development (DRCD) is the governmental organization, responsible for dog control and regulations, as well as dog-related statistics. According to their publications, from 2010 to 2018 over 132 thousand dogs entered pounds all over Ireland, of which more than 29 thousand were euthanized due to the inability of finding them a new home, which means an average of 21% per year. These numbers have been dropping along the years, but it still shows the need for tools and campaigns to help increase the adoption rate, following the animal welfare standard (Department of Rural and Community Development, 2018).  The animal welfare standard is a challenge, in terms of reuniting stray animals with owners and finding suitable homes for stray and unwanted animals. Entities, like the Irish Society for Prevention of Cruelty to Animals (ISPCA), work in partnership with affiliated members and other animal welfare groups, in order to reach these goals, however, this is not a simple task. According to the ISPCA annual report from 2018, they were granted only by the Government a total of €439,716, which corresponds to just 14% of their yearly income, while the majority of their yearly income comes from other trading activities, such as dog warden services (The Irish Society for the Prevention of Cruelty to Animals, 2019). In the same year, the DRCD had a deficit of €2.463.273,17 only with expenditures for local authorities across Ireland under the Control of Dogs Acts (Department of Rural and Community Development, 2018). There are no statistics disclosed, regarding expenditures with other animals, e.g. cats, horses, rabbits, but they should also be taken in consideration when thinking of the importance of minimizing the abandonment rate, or at least, increasing the adoption rate.  This project is intended specifically to help increase the adoption rate by making use of Internet of Things technology to help potential adopters to find their desired pet more easily, while helping shelters and local authorities, by having an interconnected animal information and by allowing the potential adopters to initiate the adoption process.  Internet of Things (IoT) is also called Internet of Everything, or the Industrial Internet (Lee & Lee, 2015). It stands for an idea in which supposedly ordinary objects stop being just ordinary, by adding connectedness into them. For example, a so-called watch nowadays can track your heartbeat, how many steps you have walked in a day, week, month or year, among other attributes. Thus, the IoT idea is about all the physical devices, or “things” that connect to the internet and are able to collect and share data (Ranger, 2020).  It is also important to understand what fuels the use of such devices: Wireless technology, like Bluetooth, Radio Frequency Identification (RFID), Wi-Fi, telephonic data services and embedded sensor and actuator nodes, allow the wide range of connectedness. Hardware, Middleware, and Presentation are the three components to enable IoT. Hardware is made up of sensors, such as Wireless Sensor Networks (WSN), controllers, embedded communication hardware, RFIDs, which allow the automatic identification and data capture by using radio waves, or a tag and a reader; middleware involves on-demand storage and computing tools for data analytics; and Presentation represents the visualization and interpretation tools, which can be accessed and designed on different platforms for different platforms (Gubbi, et al., 2013). Cloud computing is another important component in IoT, since it allows enormous amount of data to be generated from each device, connected to the Internet (Lee & Lee, 2015).  These devices are being widely used in retail, in order to manage inventory, improve customer experience, optimize supply chain, and reduce operational costs. Manufacturing companies are using IoT to gain competitive advantage by using sensors that can measure when production output is compromised, check equipment for accuracy, thus, it can reduce operating costs, improve uptime and asset performance management. The automotive industry is implementing sensors that can detect and alert the driver of any malfunction or equipment failure in vehicles. It can also be used in Transportation and logistics, public sectors, healthcare and general safety across industries (Oracle, 2020).  The best example of an IoT device is the *Smart Home* device, in which you can voice control, or remotely control the things connected to it, such as a bulb, or the thermostat of your house, and smoke detectors. You can even see from work what is being delivered to your house through a sensor at your doorstep, or if someone is nearby. There is no limit to what can be done, using these objects. It is possible to pay a bill, using a smartwatch.  The abilities of the Internet of Things are explored by the use of Raspberry Pi, which is a very important tool, composed by a set of General Purpose Input-Output (GPIO) pins, which allow the control of electronic components for physical computing (Open Source, 2019). The idea of Raspberry Pi started with Eben Upton, a British engineer, who wanted to provide more accessible computing science knowledge at a low cost for students, since there was a high price of computers in the UK in 2012, which was when Raspberry Pi was launched (Fromaget, 2020).  Raspberry Pi is nothing but a single boarded computer, but it does not mean it is not challenging. Its GPIO pins can vary from a 3V3, which is a constant supply of 3.3 volts, or a 5V, which is a constant supply of 5 volts, or a GND, which is a ground pin (0 volts), or a Serial Peripheral Interface (SPI), or an Inter-integrated circuit (I2C), or even a Universal Asynchronous Receiver/Transmitter (UART) (Nuttal, 2017).  Still, according to Nuttal (2017), these pins can be controlled by using Linux Operating System and Python as a programming language. Although other languages can be used, Python seems to be the simplest and the most popular. Also, simple components can be connected to the board by the use of jumper wires, or add-on boards that can be added to provide embedded components on a Printed Circuit Board (PCB). |
| **Project Goal:**  The Goal of the current Project is to research in the field of animal adoption in Ireland and the use of IoT devices, to create a mobile application with specific functionality, which can be integrated with a *Google Home Assistant* to facilitate the access to animal shelters’ information about animals, available for adoption in sanctuaries within specified area. Through voice commands, the user will be able to easily filter information and find desired pet of their interest of specified type and breed, in specified location, by accessing current and relevant information, provided by the animal shelters. |
| **Project Objectives:**  The objectives of this Project are as follows:   * Prepare Project Proposal, based on performed initial Secondary research on the topic about:   + the importance of IoT today, as well as its components and accessibility   + the use of Raspberry Pi and Arduino   + pet adoption policies in Ireland   + pet adoption issues within government authorities, as well as statistics and public policies to minimize the number of abandoned animals in sanctuaries   + similar existing applications * Perform Primary research on the topic, following *Mixed* Research methodology: * Apply a *Quantitative* research method to design and distribute a Survey questionnaire to gather information from potential adopters about the accessibility of accurate and up to date information on animals, available for adoption from shelters * Apply a *Qualitative* research by preparing a Structured Interview questions to gather opinions of Sanctuary workers on the proposed application and process of passing on the information, related to the animals available for adoption within the shelter * Perform analysis of the results gathered from the Survey and Structured Interviews to critically evaluate the need of and feasibility for the proposed project * Prepare a Conceptual Model, based on the results of the Primary and Secondary research performed * Design, Code and Test the application * Integrate the application with *Google Home Assistant*, test and making it available for *smart home* users * User-evaluate the developed application, critically analyse the results of the user feedback, both from potential adopters and shelter workers, in order to assess and reflect on the project achievements, provide conclusions and make suitable recommendations for scope of improvements, alterations or additions to the project * Complete the Thesis and present the Project. |
| **Project Description:**  The proposed for development application would be an easy and helpful finder of pets to adopt by animal lovers. Through a database, integrated with a *smart home* device, such as *Alexa* or *Google Home*, the user will be able to search and filter for a desired animal, using keywords, such as animal “Type”, “Breed”, “Size”, “Gender”, “Colour” and “Age” as criteria.  The application will act as a platform to connect animal shelter workers from one side, who will input and frequently update information in the database about animals available for adoption, and potential adopters from the other side, who will actually perform the search within specified location and own criteria to find animal to adopt. It is imperative that the shelters provide frequent update on the database to keep it current.  ***Key Features:***  Good Interface Design  Easy navigation  Robust application  Security of sensitive personal information  ***Functionalities:***  Animal Shelter Workers Interface:   * Create a Shelter profile with the application (Registration performed offline for security measures to prevent impersonation) * Login * Add information & images for new animal, available for adoption * Archive information about animal that has been already adopted * Receive Adoption Intent forms from Potential Adopters * Reply to Potential Adopters with scheduled date & time to visit the sanctuary   Potential Adopters Interface:   * Register online & create User profile with the application * Login * Initialize the search, according to own specified criteria, using voice commands to *Google Home Assistant* * Browse animals of specified type, breed, etc. own criteria for shelter(s) in specified location * Select animal for adoption * Fill in the *Adoption Intent Form* * Reply to the Shelter’s notification of scheduled date & time for visiting the shelter |
| **Project Research Methodology:**  The Project will use a *Mixed* Research method, which relies on both, *Quantitative* and *Qualitative* studies to gain further insight into the target audiences’ opinion of feasibility and viability of the application to be developed, based on the results of the completed research in the current project.  *Quantitative* research is a method, in which variables are measured, using a numerical system. By doing so, it is possible to understand, describe, and predict the nature of a problem. It is usually done by using the *Survey* technique.  On the other hand, a *Qualitative* research will be performed, that involves the use of a Structured Interview. This type of research involves small sample of participants (does not represent the general population), who provide their own experiences and opinions, that are assessed by researchers. The questions that are used in such research are questions that allow answers about experience, meaning, and perspective of the interviewed. These opinions cannot be counted or measured (Hammarberg, et al., 2016).  Constraints must be taken into consideration when dealing with projects like the current one, thus an Agile approach, such as Rapid Application Development (RAD) in Object Oriented environment may be selected as appropriate, in order to meet the Project’s objectives. According to (Lucidchart Content Team, 2020) in a study made by PWC in 2017, Agile projects are 28% more successful than traditional projects. By using the RAD methodology, projects have a fast turnaround by minimizing the planning phase and maximizing the prototyping phase. It usually has four phases: Requirements planning, User design, Rapid Construction and Cutover.  During the Analysis phase, Use Case, Sequence and Object Class diagrams are created in order to structure the functional requirements of the application into a Conceptual Model.  During the Rapid Construction phase the prototype is created, according to the results of the Quantitative and Qualitative research made, and the requirements specified in the Conceptual model.  **Evaluation Criteria:**  When developed, the mobile application will be available in *Google Play* Store and with it an online Evaluation Survey is conducted in order to get feedback from target users. The feedback will help the developers to produce a more robust, fully functional application, based on the user needs and requirements as analysed. The Evaluation Survey addresses the following key factors, based on user feedback and comments:   * *Accessibility* - evaluates the application availability to users, cross Android devices compatibility. Current and future ability to access the application. * *Navigation* - evaluates how easy and intuitive the app is to navigate through, with clear indication of navigation menu defined where user can easily anchor to different topics * *Design* - evaluates the general aesthetic value of the application’s graphical interface, the use of appropriate colours, fonts & size, and logical use of buttons. * *Content* – evaluates presented information that has been promised as purpose of the application. Intention of the project is clearly provided under different topics. Appropriate formatting and styling for ease of readability. * *Security* - evaluates how personal information is protected in the application against any threats and hacks, with strict provision of measures against security flaws |
| **Project Milestones:**  The Project milestones include the following:   * Research on potential topics & brainstorming ideas for suitable project * Perform preliminary Literature Review for the Project Proposal Draft * Amend Proposal according to Supervisor’s feedback * Identify suitable samples of participants for Survey and Structured interviews * Design and distribute Survey questionnaire & Structured Interviews to participants * Gather and analyse data from Survey & Interview and complete Thesis Ch.1 * Perform comprehensive Literature review to complete Thesis Ch.2 * Perform System Analysis and structure the system requirements in Conceptual model; complete Thesis Ch.3; * Submit Thesis First draft (Ch.1, 2 & 3) * Undertake Design and Coding of the application; Interface the application with *Google Home*; complete Thesis Ch.4 * Choose appropriate Testing method and perform application Testing; complete Thesis Ch.5; * Perform User Evaluation, analyse results, reflect on project achievements, conclude and provide scope for future work on the project in Thesis Ch.6 * Submit Thesis Second draft (Ch.4, 5 & 6) * Prepare PowerPoint presentation slides * Submit 3 printed & bound Thesis copies and present the Project.   **Project Deliverables:**   * Project Proposal draft * Completed Project Proposal * Thesis First Draft * Thesis Second Draft * 3 printed and bound Thesis copies * Application Source Code * Project Presentation slides |

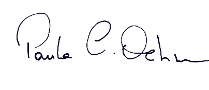
**Project Timeframe:**

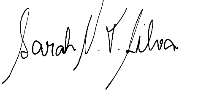
*Include key timeframe, milestones, grant chart, identify risk and an RMMM matrix (Risk, Measurement, Monitor, Mitigation)*

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| **#** | **Milestone** | **Deliverables** | **Duration** |
| 1 | Research on potential topics & brainstorming ideas for project | Appropriate project topic & Research method identified | 1 week |
| 2 | Perform preliminary Literature Review; Define project goal, objectives and scope; Milestones, deliverables, risks; Gantt Chart | Project Proposal draft | 2 weeks |
| 3 | Amend proposal according to Supervisor’s feedback | Completed Project Proposal | 0.5 week |
| 4 | Identify participants for Survey and Structured interviews | Suitable samples of participants for the study | 0.5 week |
| 5 | Design Survey & Structured Interview questions | Survey Questionnaire & Structured Interview questions | 1 week |
| 6 | Distribute Survey questionnaire & Structured Interview to gather and analyse data; write Thesis Ch.1 | Results of Survey & Interviews analysis; Completed Thesis Ch.1 | 1 week |
| 7 | Perform comprehensive Literature Review; write Thesis Ch.2 | Thesis Ch.2 completed | 1 week |
| 8 | Perform system Analysis and create system’s Conceptual model; choose appropriate Development method; write Thesis Ch.3 | Thesis Ch.3 completed | 2 weeks |
| 9 | Submit Thesis First draft | Thesis Ch.1, 2 and 3 completed and submitted | 1 day |
| 10 | Undertake Design and Coding of the application; Interface the application with *Google Home*; Write Thesis Ch.4 | Design & Coding completed, Application interfaced with *Google Home;* Thesis Ch.4 completed | 3 weeks |
| 11 | Choose appropriate Testing method and perform application testing; Write Thesis Ch.5 | Fully tested application and Thesis Ch.5 completed | 1 week |
| 12 | Perform User Evaluation, analyse results, reflect on Project achievements, conclude and provide scope for future work on the project; Write Thesis Ch.6 | Thesis Ch.6 completed | 1 week |
| 13 | Submit Thesis second draft | Thesis Ch.4, 5 and 6 completed and submitted | 1 day |
| 14 | Prepare PowerPoint presentation slides; complete and print Thesis | Project presentation completed; 3 printed and bound Thesis copies | 2 days |
| 15 | Submit Thesis and present the project | Thesis submitted and project presented | 1 day |

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| **No** | **Risk Description** | **Impact** | **Action** |
| 1 | Need to learn new programming languages | Critical | Manage time to learn the programming languages early |
| 2 | Time organization | Critical | Good time management in order to complete the deliverables on time |
| 3 | Loss of data | Critical | Frequent data backups, storage on the cloud |
| 4 | Authorization to interface with *Google Home* | Critical | Contact Google beforehand to find the appropriate steps to follow |

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| **Project Gantt Chart:** |
| **Technical and Non-Technical Resources Required:**  **Hardware:**   * PCs * Laptops * Android devices * Printer * Projector * Google Nest Hub   **Operating System:**   * Windows 10 * Android OS   **Software:**   * Google Firebase * Android Studio * HTML5, XML, Java, JavaScript * Microsoft Office (Word, Excel and PowerPoint)   **Tools, equipment and other sources:**   * Lynda.com * Google Forms * Android Emulator * Internet * Creately.com   **People involved in the project:**   * Project Supervisor * Limerick Animal Welfare Manager and Directors * Irish Society for the Prevention of Cruelty to Animals managers |
| **References:**  Department of Rural and Community Development, (2018). *Gov. ie* [Online]  Available at: https://www.gov.ie/en/collection/879d4c-dog-control-statistics/ [Accessed 01 March 2020].  Independent.ie. (2016). *Ireland's largest pet ownership study: here's all the facts you need to know.* [Online]  Available at: https://www.independent.ie/life/family/irelands-largest-pet-ownership-study-heres-all-the-facts-you-need-to-know-34505427.html [Accessed 01 March 2020].  Fromaget, P. (2020). *Raspberry Tips.* [Online]  Available at: https://raspberrytips.com/raspberry-pi-history/ [Accessed 27 February 2020].  Gubbi, J., Buyya, R., Marusic, S. & Palaniswami, M. (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems,* 29(7), pp. 1645-16660. [Online]  Available at: [https://www.sciencedirect.com/science/article/abs/pii/S0167739X13000241](about:blank)  Hammarberg, K., Kirkman, M. & de Lacey, S. (2016). Qualitative research methods: when to use them and how to judge them. *Human Reproduction,* 31(3), pp. 498-501. [Online]  Available at: [https://academic.oup.com/humrep/article/31/3/498/2384737](about:blank)  Houpt, K. A., Goodwin, D., Uchida, Y., Baranyiova, E., Fatjó, J. Kakuma, Y. (2007). Proceedings of a workshop to identify dog welfare issues in the US, Japan, Czech Republic, Spain and the UK. *In:* Fatjó, J., Bowen, J., Garcia, E., Calvo, P., Rueda, S., Amblas, S., Lalanza, J. F., 2015. Epidemiology of dog and cat abandonment in Spain (2008–2013). *Animals,* 5(2), pp. 426-441. [Online]  Available at: [https://www.mdpi.com/2076-2615/5/2/364/htm](about:blank)  Lee, I. & Lee, K. (2015). The Internet of Things (IoT): Applications, investments, and challenges for enterprises. *Elsevier,* 4(58), pp. 431-440. [Online]  Available at: [https://www.sciencedirect.com/science/article/pii/S0007681315000373](about:blank)  Lucidchart Content Team (2020). *Lucidchart.* [Online]  Available at: https://www.lucidchart.com/blog/rapid-application-development-methodology [Accessed 03 March 2020].  Nuttal, B. (2017). *Opensource.* [Online]  Available at: https://opensource.com/article/17/3/physical-computing-raspberry-pi [Accessed 01 March 2020].  Open Source, (2019). *Open Source.* [Online]  Available at: https://opensource.com/resources/raspberry-pi [Accessed 01 March 2020].  Oracle (2020). *Oracle.* [Online]  Available at: https://www.oracle.com/ie/internet-of-things/what-is-iot.html [Accessed 29 February 2020].  Ranger, S. (2020). *ZDNet.* [Online]  Available at: https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/ [Accessed 28 February 2020].  The Irish Society for the Prevention of Cruelty to Animals (2019). *ISPCA - Caring for all animals.* [Online]  Available at: https://www.ispca.ie/images/pages/Annual\_Report.pdf [Accessed 02 March 2020]. |

Student 1 Signature: **** Date: \_\_05/03/2020

Student 2 Signature: **** Date: \_\_05/03/2020

Supervisor’s Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_