AUT UNIVERSITY | **COMPUTER +**
MATHEMATICAL SCIENCES

Student Guide

Bachelor of Computer & Information Sciences

Research & Development Project

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1. Introduction to the Research & Development Project

1.1. Aim

Within the Bachelor of Computer & Information Sciences (BCIS) degree the Project course (407008, 407009, 407010, and 407100) is described generically in the following terms:

> *"An investigation into a selected area whether that be a specific problem domain, or an area of business opportunity. The project is typically an original investigation but considerable flexibility is allowed. Typically projects will involve either commercial software development for live clients, commercial research and development projects on behalf of live clients, or supervised research projects into selected areas specific to the major of the student."*

The learning goals associated with this paper are:

By the end of this paper through completion of a significant Research & Development Project students will be able to:

1. *Show the ability to successfully undertake original work.*

2. *Demonstrate a professional attitude.*

3. *Demonstrate the ability to integrate the different disciplines required to bring a project to a successful conclusion.*

4. *Communicate effectively with clients and sponsors.*

5. *Communicate effectively in both written and verbal presentations and in group situations.*

6. *Effectively manage, monitor and control the activities involved in a development project.*

7. *Determine an appropriate process and accompanying set of deliverables for their project.*

8. *Show the ability to document appropriately the deliverables for their project - software specifications, project plans, source code, technical reports, white papers, literature reviews, academic articles for publication etc.*

9. *Select and justify an appropriate methodology for their project.*

 The project aims to bring together the material covered from the many other courses studied as part of a BCIS. These notes are intended to provide students with a guide to the project goals, process and assessment.

1.2. Nature of Projects

The types of projects on offer are very diverse which is in keeping with the variety of majors within the BCIS and the potential range of interests of the students. The majority of the projects will involve a sponsor/client outside of the University (for example a company, an institution or a not for profit organisation) but some may be for sponsors within AUT. While the deliverables for each of the many types of projects will differ, and the time and scope of the project might dictate that not all phases of larger projects can be completed, it is intended that a graduate of the Bachelor of Computer & Information Sciences be equipped with a broad set of capabilities that will equip them for work as an IT professional, or for further study and potential research careers.

Each project therefore will involve the production of professionally designed, constructed and quality assured artefacts and professional quality supporting material, models or prototypes relevant to each phase of the project. It is expected that this supporting material will be appropriate to the project and will be provided to a standard that supports full system operability, usability and maintainability.

Wherever possible students will work in teams, as this is a key capability for an IT professional, and enables larger, more challenging and realistic projects to be undertaken. For more research-oriented projects it is expected that students will also be able to produce either a suitable commercial report or an informative, readable, finished article in a scientific format. Regardless of chosen option, students will be expected to produce a final portfolio demonstrating their work process and artefacts and including a report reflecting upon their experience.

As noted above most projects are team-based. From experience we have found that working in a small team (2 to 4 people) increases the chance of a successful outcome. Projects require a wide range of skills and it is unusual to find all these skills in a single person. Working in a group offers a better skill mix. The second reason relates to motivation. Whatever you do as a project you are going to get problems for which you do not immediately know the solution. Unless you can sustain

your motivation during these periods it may put your project in jeopardy. When a group is involved you have others to discuss your problems with and to assist with motivation.

1.3. Selection of a project

The project management process aims to find sufficient projects to provide students with some element of choice. You may also find your own project and recommend a suitable sponsor. Details of the specific requirements of this process can be found in the Project Prospectus. The suitability of the any potential project must be discussed with the BCIS Research & Development Team prior to making any promises to the company concerned.

Each student enrolled in Part 1 of the BCIS Research and Development Project (407008 or 407100) will receive a prospectus of the projects available before the semester starts. The prospectus will indicate which projects best suit each major. Each student is then required to complete an 'Expression of Interest' application to indicate their project preferences by the specified deadline. The project team will allocate students to projects and teams taking into account both student preferences, majors and the quality and timing of the 'Expression of Interest' applications received. Other constraints (for example the AUT campus on which the student is studying) may also need to be considered during this process.

1.4. Project Supervision

Each project team is assigned an academic supervisor, who will help students to navigate the project itself (for example, give advice and support around client meetings, project proposals etc.) and to understand and meet the academic requirements of the project. Conjoint students will also have an additional supervisor from their other degree.

The project supervisors are allocated contact time for project supervision. In this time they should:-

1. Attend any initial meetings with the client and subsequent meetings as appropriate to support the team.
2. Mark the project proposal/learning agreement.
3. Meet (or be in contact with) the project team to review progress. This would generally happen on a weekly to two weekly basis.
4. Encourage the production and maintenance of project artefacts and supporting material and the progressive building of the project portfolio (project plan, project diaries etc.).
5. Assist and advise students on matters relating to the project.
6. Assist students to identify resources needed by the project team.
7. Assist students to prepare for and participate in mid-project progress reviews, and provide feedback on progress to students.
8. Participate in the assessment of all aspects of the projects they supervise and provide moderation for other projects.
9. Assist colleagues within the project supervision team in the effective conduct of the project course as a whole.

1.5. Incidental Project Costs

Involvement in a project with external or internal clients may cause you to incur some incidental costs (e.g. travel expenses to a client's premises, sundry stationery etc.). These costs should not be substantial and in all but very exceptional circumstances they are considered to be course related costs, similar to any other paper in the BCIS degree. In no circumstances are you to approach external or internal clients to negotiate payment of or a contribution towards these costs.

If you feel the costs you are being asked to cover are significantly material, and that exceptional circumstances apply, then please discuss the matter with the BCIS Project Team.

1.6. Duration and Size of a Project

Most projects are two semesters in duration. This provides time for the team members to understand and achieve the goals and reduces risk that might occur should events outside the team's control impact progress (for example, the client is absent for a period). Occasionally if a project is appropriate and suitable students are available a project may be completed within a single semester.

Projects can be 30 points, 45 points or 60 points depending on the student's programme and major or the actual size of the project. By far the majority of projects are 30 points with the student enrolling in a single 15 point paper in each semester (407008, 407010). Occasionally students choose to do a 45 point project (where the project itself is suitable) with the extra 15 points acting in place of one of the electives in the BCIS. Such students need approval to do this and would enrol in 407008 and 407009. Conjoint students (407100) do a 60 point project as it needs to cover the learning outcomes for their BCIS and their other degree. Each 15 points constitutes around 150 hours of work by the student concerned. You should use this measure as a guide for your planning. A team of 4 students completing 30 point projects will therefore have available 1200 person-hours of work that they can devote to the project.

In your project plan you must identify a completion date for your project. This date is normally determined by the academic calendar. An overview of the cycle for the Research & Development Project is given in this guide and you should make

sure that your plans work to that broad schedule. Research & Development Project scoping and estimating is often a challenging process, and it is difficult to find projects that are an exact match with the time and resources available.

It is important that you meet the deadlines that you set. If you are unable to meet the deadline, then at your final assessment you will need to give convincing reasons for not doing so, and have an agreed set of understandings with your sponsor. Projects that do not complete on time will normally be ineligible for A grade marks.

If the project methodology you adopt does not specifically address issues of scope variation, completion criteria etc., then to avoid any uncertainty about the final status of your project, it may be a good idea to negotiate a "project completion plan" with your client. This plan should include the following points:

- Original project scope
- Significant approved changes
- Remaining budget (person-hours)
- Remaining tasks (yours and the client's)
- Products remaining to be developed
- Completion criteria
- Phase-over plan, where relevant. To cover phase out of the development team and phase-in of user and operational support responsibilities.

Consult your project supervisor if you believe this is needed.

1.7. Handling Project Problems

This is your project. The responsibility for making things work ultimately lies with your team. Support and mentoring are provided by your supervisor and by the BCIS Project Team. You should take advantage of this expertise to ensure you meet your goals.

Should problems arise within your team you should first attempt to solve these as a team. Use the skills you have learnt from papers like Applied Communications and IT Project Management. If, having made an effort to solve the issue yourselves, you are not successful then take the matter up with your supervisor and ask for their advice and help. If for some reason you are unable to get help from your supervisor please contact the BCIS Project Academic Leader.

If you have any issues with your project client, please ensure you involve your supervisor immediately.

2. Project Components and Assessment Processes

2.1. Introduction

This section of the guide will describe the activities and components that are part of a BCIS Research and Development Project and set out the assessment process, expectations and timeline.

Whilst the particular projects are varied in their goals, tasks and expected deliverables, there is a common set of components and assessment processes that apply to all. The main assessment items are designed to be a fundamental part of the project process and to assist in meeting both the goals of the project itself, and the paper learning goals. The remainder of this section will explain each of these items is more detail and identify any additional material that supports each assessment.

2.2. Assessment Summary

Assessment Item	When	%	Associated Learning Goals	Associated Project Goals
Project proposal	S1 Week 4	5	1, 5, 7, 9	Goal identification, Feasibility evaluation, Risk evaluation, Scoping & Planning.
Mid project progress review	S2 Week 3	10	5, 6, 7, 8	Status & Progress Review, Planning & Tracking, Quality Assurance, Risk management
Client feedback	S2 Week 9	5	2, 3, 4, 5	Goal satisfaction, Productivity, Professionalism
Supervisor feedback	Ongoing	10	2, 4, 5, 6	Mentoring, Academic Integrity
Poster	S2 Week 14	10	1, 2, 4, 5	Goal and result Communication, Professionalism
Reflective Report,		15	5	Reflective Practice, Process and Product Evaluation
Portfolio and Final Product		45	1, 2, 3, 6, 7, 8, 9	Activity & Process Evidence Evaluation, Product Evaluation

2.3. Team and Individual Components

Completion of the project is a team-based collaborative activity. Individual contribution to this activity however is assessed within most of the assessment items. Individual marks for collaborative items (eg Project Proposal, Portfolio) may well differ. More details can be found in the specific guides for these project aspects. Client feedback is provided on team level and an individual level where possible. Supervisor feedback is provided for each individual. The Reflective Report is an individual assessment item.

Students **must** therefore be able to **demonstrate that the work presented is their own.** Mechanisms such as personal diaries, weekly logbooks and reports, project plans identifying responsible parties for tasks, meeting minutes and notes, quality and project review notes and peer reviews could all be used to provide evidence of individual work for later assessment. This will be covered in more detail in the separate detailed guides and in the project class sessions.

2.4. Project Class Workshops

Throughout the semester workshops will be scheduled for all project students. A schedule of these workshops will be provided on AUTonline. Unless otherwise specified all students are expected to attend all workshops and attendance will be recorded. You should record these sessions as work towards your project in your diary/logbook. The workshops will address topics that are relevant to the project work you are doing and will be delivered by individuals with expertise in that area. This will provide an excellent opportunity both to understand some of the new tasks or issues you are dealing with and to ask questions and share experiences and advice with other project teams. Make sure you take full advantage of this opportunity.

2.5. Project Proposal (*5%, Due Week 4*)

The first main activity of the project is to prepare a project proposal. This proposal should describe in broad terms, the client or sponsor's goals or set of expectations, (whether they be based upon a problem, need or perceived opportunity) and the proposed approach to achieving an outcome or solution.

The project team must arrange a meeting their project supervisor as soon as possible after the project has been assigned. The supervisor will then assist the team to arrange their initial meeting with the client/sponsor. From this initial meeting, and possibly others, the project team extract sufficient information for them to develop their project proposal. Information about what should be included in your project proposal and the marking guideline can be found in a separate document, '**Project Proposal Requirements & Assessment**' available on AUTonline.

As you develop your proposal ready for presentation, discuss it with your project supervisor and ensure that the final version is shown to your supervisor in time for them to review it for suitability to present. The team is then required to do a short presentation (again additional details are in the separate project proposal guide) of your project proposal to the BCIS Project Team other academic staff and members of the industry advisory committee (IAC). Your project cannot be confirmed to continue without prior approval of this joint committee. The BCIS Project Academic Team will arrange these presentations. They will normally be during the fourth week of the course. When you've completed your presentation hand your proposal to your project supervisor who will mark it and provide you with feedback once the assessment marking has been moderated.

Once your proposal has been approved you can commence work in collaboration with your client and your supervisor. You should expect over the next two semesters that both your understanding of the project and its goals will change and that your plans will need to be adapted to that improved understanding.

2.6. Mid-project Progress Review (*10%, Due Week 3, Semester 2*)

The Mid-project Progress Review is normally scheduled in week 3 of the second semester of your project. This review involves your whole team, your supervisor, and members of BCIS Project Academic Team. The goal of this review is to track your progress and the status of your project and your learning. It should also allow you and the academic team to identify any issues in your project that need to be addressed. Details of what is required and how you will be assessed can be found in the separate document '**Mid-project Progress Review Requirements and Assessment**' on AUTonline.

The result of your mid-project review will be one of the following:

- Your project will be permitted to continue with or without conditions
  - This is the normal and hoped for situation
- It may be recommended that your project be cancelled
  - This is clearly undesirable, but may be the best solution if the project shows a general failure to make headway, or circumstances surrounding the project warrant its cancellation.
  - In this event team members may be reassigned to other projects, with the option of extending the duration of their studies, or may be required to accelerate their contribution to complete within the timeline of the other project team. These decisions will be made by the BCIS project Academic team. However, there is no guaranteed outcome for students in this situation, and each case will need to be individually negotiated.
- It may be recommended that you confer with your client over the state of your project
  - In this situation there may be some problem with the client relationship, availability, expectation from the team, etc. which the team will need to resolve with the client. Your supervisor should help lead these discussions.

2.7. Client Feedback (*5%, Due Week 10, Semester 2*)

Managing client expectations is a key aspect of project success. Feedback from the client is the main means of demonstrating that the team maintained a productive relationship with its client. The Client Feedback for can be found in Appendix A. **Please send this form to your client up to a month and at least two weeks before the scheduled project poster presentation date.** Please notify your client that the form must be returned direct to your supervisor, who will in turn give it back to you.

The team's supervisor will have observed the interactions between the project team and the client throughout the project, and will also contribute to this assessment.

Your own reflections discussing the client's feedback in your reflective report are another form of evidence. For details see the separate '**Reflective Report Requirements and Assessment**' on AUTonline.

2.8. Supervisor Feedback (*10%, Due Week 14, Semester 2*)

The appointed supervisor will work closely with your team over the full period of the project. The responsibilities of the project team supervisor are outline in Section 1.4 of the Guide. As a result of the supervisor's role as a mentor and an academic advisor they will observe the team and individual members closely and provide feedback both orally and in a written form throughout the project. Their summary of this feedback contributes 10% to your overall grade. A summarised comment to support the grade given will be part of the feedback sheet that each student receives on completion of the assessment process.

2.9. Poster (*10%, Due Week 14, Semester 2*)

The final project poster sessions offer an opportunity for students to present their work in the form of a team poster and project deliverables and reflect upon their achievements before an audience. The project deliverables will include artefacts produced during the project and may include a demonstration of software. The assessment team will ask questions and take into account the ability of students to clearly communicate their work in a poster presentation that describes the scope, depth and significance of their work, and critically reflects upon their experience. For details see the separate '**Poster Requirements and Assessment**' on AUTonline.

2.10. Reflective Report (*15%, Due Week 14, Semester 2*)

The formal reflective report offers an opportunity for students to reflect upon the significance of their work, and what they have gained personally and professionally from the experience and where they still have to develop. This report is not merely descriptive of the project, but should include a broader critical dimension as befits a final year degree course. This critical dimension should include reflection upon the project, its significance and the wider context, and reflection upon personal and professional effectiveness in the conduct of the project. This reflective comment should in turn be related to the relevant literature, such as that by Argyris (1996), Argyris & Schon (1974) and Schon (1987) discussing the nature of professionalism and the concept of theories of action.

Fincher and Petre (2001) in their book titled *Computer Science Project Work Principles and Pragmatics* place special emphasis upon the value of reflection: "reflection on experience underpins the process of successful learning and is essential to the success of education." However, not only is reflection on experience educationally valuable, but engaging in reflective practice engenders a mindset that is invaluable for effective professional performance.

The reflective practice model was drawn from the work of Argyris & Schon (1974) and Schon (1987) in which professional work involves an ongoing process of reflective practice involving self-monitoring, continual improvement and action cycles (plan, act, observe, reflect). AUT itself values the concept in its own teaching - "the term 'reflective practitioner' was embraced because it admits a variety of strengths and openness in terms of beliefs about teaching methodologies. The teacher, as reflective practitioner, is committed to evaluating and re-evaluating performance both individually and collegially in order to sustain the never-ending drive to performance improvement. The more we learn the more there is to learn. And the more we improve the more we recognise how much more we can improve" (Hinchcliff, 1997).

For details see the separate '**Reflective Report Requirements and Assessment**' on AUTonline.

2.11. Portfolio & Final Product (45%, Due Week 14, Semester 2)

The outcome of the Research & Development Project will be a product/s of some sort (for example, an installed system, a report or a series of reports on a completed enquiry, a piece of software) that achieves the goals identified by the client. In addition there will be a portfolio that evidences how this product was created. This portfolio provides support for the team and individual work that went into the project. Full details of the requirements for a portfolio and its presentation and assessment can be found in '**Portfolio & Final Product Requirements and Assessment**' on AUTonline.

Throughout the project all students are **required to maintain a project work log or logbook**. This is a day-by-day record of the number of hours worked and what was done during that time. The work log should show a consistent work record for the duration of the project and maintain a running total of the number of hours spent on project work. A work log is also a useful historical tool to track the reasons for design decisions at key points in your project. Many companies require this for costing purposes especially if employees are working on several different projects at the same time. The project supervisor may ask to see student's work logs at any time, to ascertain and indication of progress, effort being dedicating to the project, or the degree of individual contribution and activities.

2.12. Final Results

After submission of your portfolio and product all project work will be assessed by your supervisor and by another academic staff member as a moderator. All moderated assessments are then approved by the Research & Development Project Academic team and finally by the School of Computer & Mathematical Sciences Examination Board. Once this process is complete your marks will be available in the same way that marks for other papers are notified. In addition you will receive separately a set detailed feedback on all aspects of your portfolio, product and supervisor assessment.

2.13. Summary

This guide has outlined the purpose and processes associated with the BCIS Research & Development Project and identified the assessment requirements and goals. Further detail about each of the assessment components is available on AUTonline in the documents identified previously. If you have any additional questions about project requirements that are not covered either in this guide or in the separate material provided then please email the BCIS Research & Development Project Academic Leader, Anne Philpott (anne.philpott@aut.ac.nz).

REFERENCES

Argyris, C. (1996). Unrecognized Defenses of Scholars: Impact on Theory and Research. *Organization Science, 7*(1), 79-87.

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Fincher, S., & Petre, M. (2001). *Computer Science Project Work Principles and Pragmatics*. London: Springer Verlag..

Hinchcliff, J. (1997). *Values Integrating Education*. Pukekohe: Mirilea Press.

Schon, D. (1987). *Educating the Reflective Practitioner*. San Francisco: Jossey Bass.

Appendix A TEAM OR INDIVIDUAL STUDENT - CLIENT FEEDBACK

Name of Client and organisation:

Name of Student/s:

Thank you for acting as client for this Research & Development Project. Now that the project is nearing completion we would like some feedback that will assist the team or students in their future development. It is important that we gain feedback about the aspects of the work that were done well and also suggestions for improvement. Please comment the team as a whole and where it is possible the individual students.

This feedback will be used by the assessors to complete a picture of the student's performance during the project, and by the students to reflect on their performance during the project and in assessing their future development needs.

Please email the completed feedback to the project supervisor.

THE PROJECT

Could you please comment on the results of the project? To what extent did the student/s achieve the agreed outcomes?

How well did they go about completing this work?

What suggestions do you have for improvement?

How did the student/s contribute added value or provide professional expertise to your organisation?

In what ways did the student/s show initiative in learning about the wider aspects of IT professional practice?

PEOPLE SKILLS

In what ways did the student/s adapt to the situation and develop and maintain professional working relationships appropriate to your organisation?

In what ways did the student resolve conflicts and manage and deliver to the sponsor's expectations?

OVERALL SKILLS

How did the students' skills and abilities develop during the project?

What advice would you offer this team or each of these students for their professional development?

Signed: **Date:**

Thank you for taking the time to complete this feedback form