Case Study in the Application of GRCSE:

Successful Stakeholder Engagement through Surfacing Program Objectives & Outcomes

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Initial Context

- Well-established, employer-sponsored masters program being converted to flexible, on-line delivery format
- Coursework converted following a program review
  - No major issues
- Capstone project conversion remained
  - Capstone project in previous face-to-face version well regarded
  - Comprised a scripted role-playing approach that required industry and academic staff to provide continuous interaction with the student groups
  - Management Committee looking for lower levels of industry and academic effort
  - Significant personal investment by working-level stakeholders evident
The Challenge

- Project Focus Group formed comprising industry and academic stakeholders
  - Met fortnightly but after several meetings convergence some way off

- It was hard to grasp the objectives of the Project
  - Planning publications written from many perspectives
  - Lots of undocumented stakeholder viewpoints
  - Lack of a framework to structure the educational objectives

- The issues
  - Industry concerned that the new academic team failed to appreciate the value of the unique, purpose-designed project format based on role playing against a scripted storyboard
  - New academic members concerned that technical aspects of design and technical de-risking needed to be strengthened
  - Divergent views not being resolved
The Resolution Approach

- Happened to review GRCSE…
- Used the framework to direct the new Systems Integration Project design process
Educational V-Model

(GRCSE v0.25)

The Project Component is 5/12 of the degree and covered 3 courses
Surfacing of Desired Educational Objectives and Outcomes

- Literature review
  - Program business cases
  - Face-to-face program documentation
  - Flexible delivery documentation
  - Course documentation
- Stakeholder workshop
- Synthesis of Objectives and Outcomes
- Stakeholder socialisation
Program Objectives
(Capabilities Expected at Graduation + Five Years)

■ Capacity to effectively analyse, design & implement feasible, suitable, supportable, affordable and integrated solutions to systems of products, services & enterprises
  ■ Have capacity to apply SI/SE coursework in realistic/applied environment
  ■ Develop ability to transform user needs into a quality engineering solution/design
  ■ Be able to formulate a complex ‘systems of systems’ military integration problem
  ■ Understand systems & SoS interactions & evaluate competing design concepts systematically
  ■ Know how to search for capabilities and limitations of military systems in diverse engineering settings
  ■ Understand ways in which integrated system can fail, assess likelihood of failure, and devise mitigation strategies against risk and failure

■ Possess the educational foundation needed for leadership roles
  ■ Effectively lead a project from conception through development to production in a challenging environment
  ■ Communicate effectively in oral, written and newly developing modes and media
  ■ Appreciate professional ethics in decision-making and systems engineering practice
  ■ Demonstrate professionalism and capacity to grow professionally through continued learning

■ Understand the need for cross-disciplinary and cross-organisational collaboration and coordination to define and deliver creative engineering solutions
  ■ Apply evaluation techniques to SoS problems too complex for a single individual
  ■ Successfully assume a variety of roles in multi-disciplinary teams of diverse membership
  ■ Prepare students for assignments related to research, design, development, acquisition, integration, maintenance, and life-cycle management of military systems
High Level Student Outcomes
(At Graduation)

- Demonstrate attributes of leadership and team membership required by a professional systems engineer
  - Comprehend challenges of applying systems engineering to realistic problems as part of a multi-disciplinary team
  - Demonstrate abstract thinking, communication, team work, negotiation/influence, knowing when to ask/stop, etc.
  - Be effective member of multi-disciplinary team and effectively communicate both orally and in writing
  - Lead one area of systems development (e.g. project mgt, req. analysis, architecture, construction, QA)

- Demonstrate mastery of SE necessary to develop current and future product, service or enterprise

- Demonstrate the ability to perform SE activities in Military Systems Integration domain

- Achieve designated levels of competency for each SE topic within core foundation knowledge

- Achieve designated levels of competency for one foci within core extension & domain-specific knowledge
Student Outcomes: Specific Technical Skills

- Demonstrate ability to apply core SE analytical techniques
  - Performance analysis, safety analysis, supportability analysis, failure analysis, testability analysis, mathematical modelling, human factors, technical risk assessment, optimisation, etc.

- Be able to evaluate alternative system solutions and strategies
  - Relate different solutions to the identified problem
  - Identify relevant criteria so solutions are selected against holistic system perspective

- Be able to reconcile conflicting systems requirements within limitations of cost, time, knowledge, risk, existing systems and organisations

- Be able to learn new models, techniques & technologies as they emerge and appreciate necessity of continued professional development

- Comprehend relationships between SE and other disciplines and be able to articulate value proposition

- Demonstrate knowledge of professional ethics and their application in decision-making and SE practice
# Industry Competency Profile

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Curriculum Architecture
(Used to Separate Objectives of Project from Coursework)

- Preparatory Material
  - Recent BEng with little experience
  - Old degree, recent experience
  - Non-engineering BS degree, some experience

- Core Foundation Knowledge
  - Baseline: capabilities of entrants with expected preparatory knowledge and experience

- Core Extension Knowledge
  - Two foci for Core Extension
    - System design & development
    - Technical management

- Domain or Program-Specific Knowledge
  - Entrants with BEng degree & requisite experience

- Capstone Experience
Industry spokesperson:

“This is really good ... This is the first time that I have been able to see how the design of the program, and individual courses and the project, flows down from what industry is wanting to achieve.”

Project design and implementation then proceeded smoothly with solid stakeholder buy-in.
Postscript

- First cohort of Project students now approaching completion
- Stakeholder engagement has remained strong and representatives present at all tutorials
- Project grading to be performed against course objectives and program outcomes
- GRCSE to inform university internal program review process