Running Interdisciplinary Engineering MSc Dissertation Projects:
Challenges and How to Address them

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Outline

- What
- Why
- How
- Outcomes
- Challenges & Solutions

What

Run MSc Projects across two departments (Schools at the time)

Chemical Engineering & Electrical Engineering
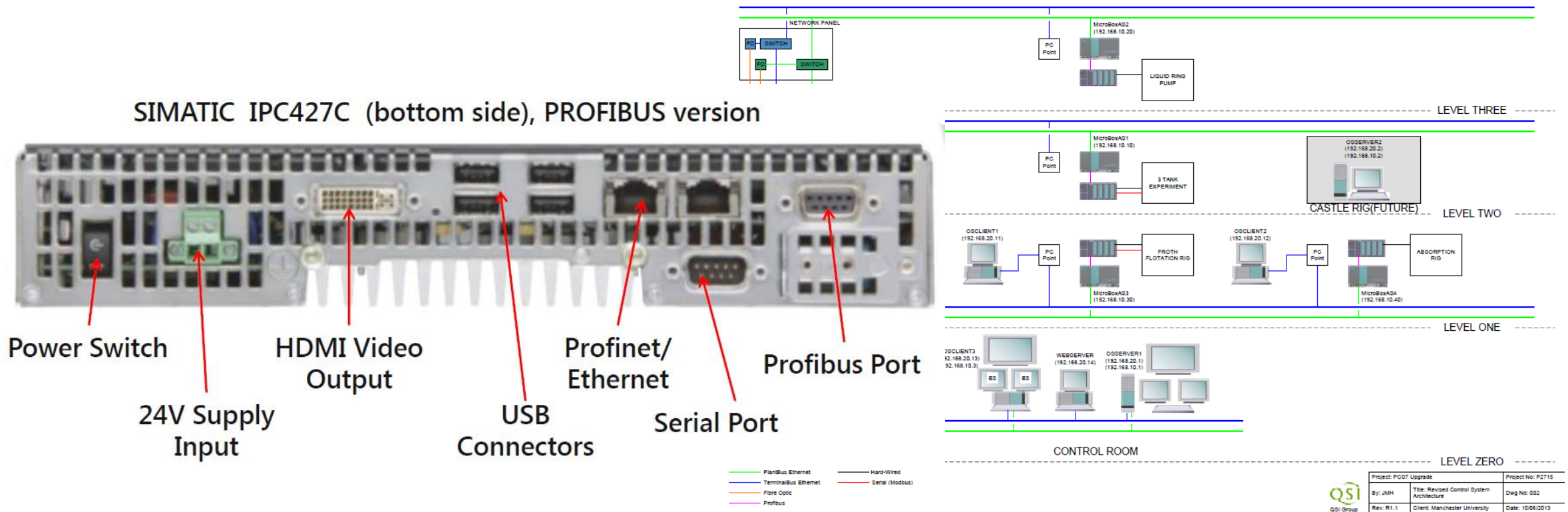
$\rightarrow$ Process Control

Why – 1: Leverage the Facilities

Chemical Engineering: Impressive Pilot Scale Facilities – underutilised during summer because of no teaching

Why – 2: Leverage the Knowledge

Electrical Engineering: A strong Controls group – The Control Systems Centre

Why – 2: Leverage the Knowledge

Chemical Engineering
    → Process Knowledge
Electrical Engineering
    → Control Technology

Marry the two in Process Control projects

ENGINEERS WEDDING RING

Why – 3: Pedagogical

Peer Learning

"Peer learning is an educational practice in which students interact with other students to attain educational goals."

O'Donnell, A. M.; A. King (1999). *Cognitive perspectives on peer learning*.

- Constructivist theory – John Dewey

    Learner construct their own understanding through experience and social interaction

- Zone of Proximal Development – Lev Vygotsky

    Move from *Independent* to *Interdependent*

Zone of proximal development
(Learner can do with guidance)

Learner can do unaided

Learner cannot do
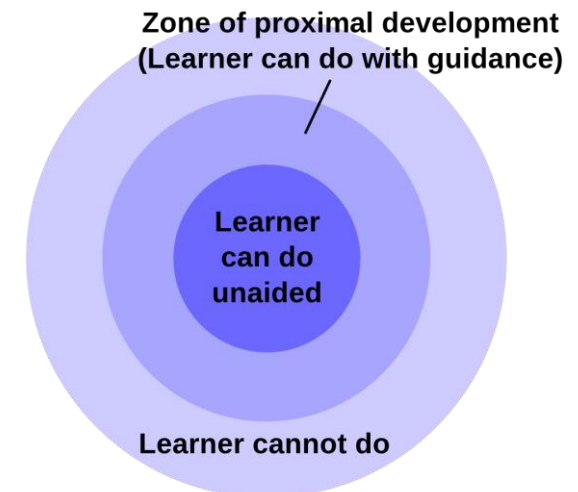
Why – 4: Professional/Employability

Employers require

- Multidisciplinary skills – you may be the only engineer onsite

- Teamwork and communication – ability to communicate across disciplinary boundaries

- Troubleshooting skills on a larger scale than lab

Why – 5: Personal interest & background

Have degrees in EE and in Chem Eng

Worked in Process Control in industry & Academia

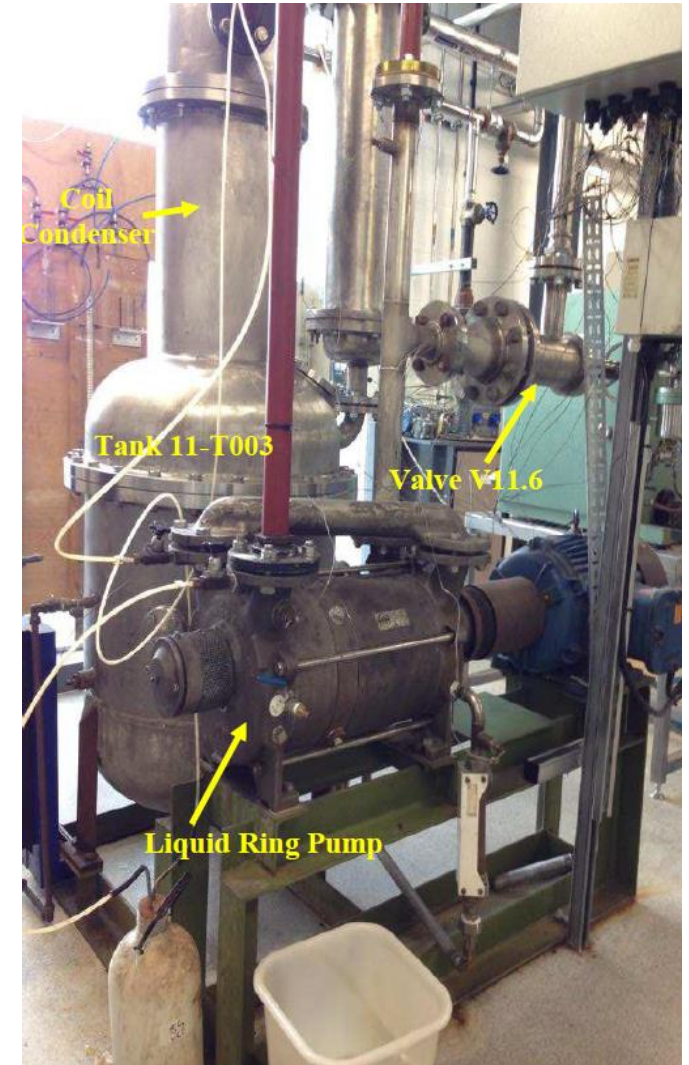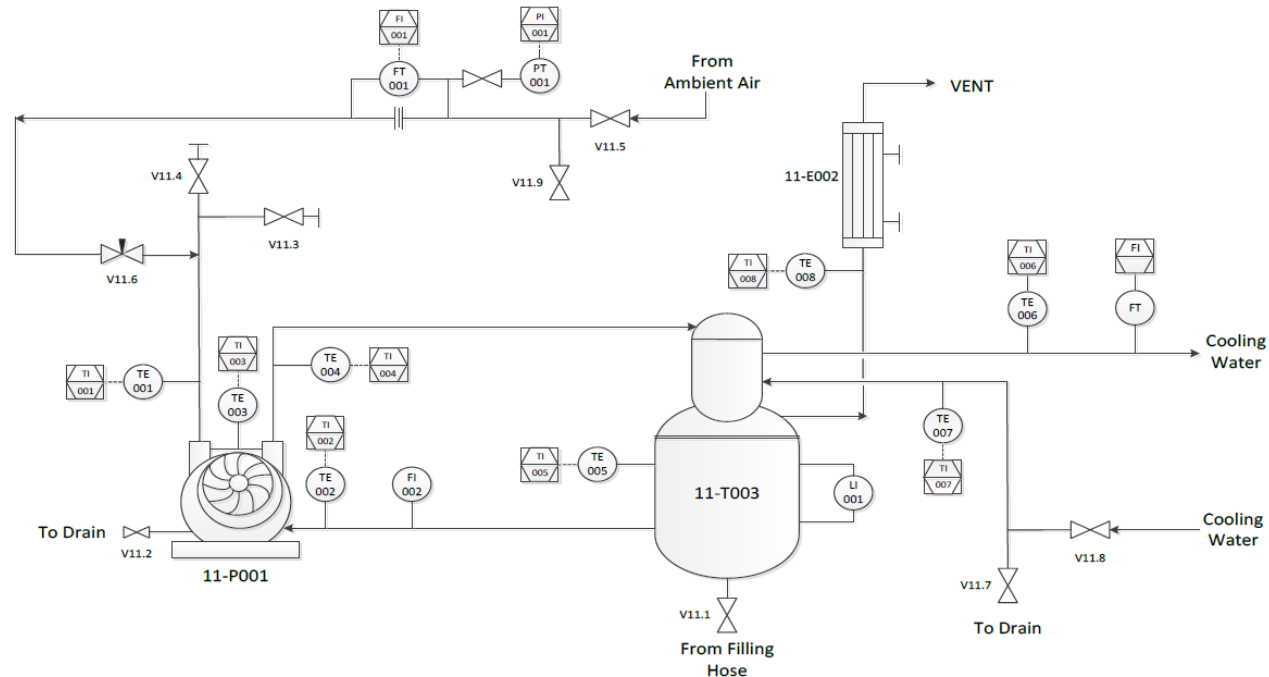Worked in multidisciplinary teams and projects in industry
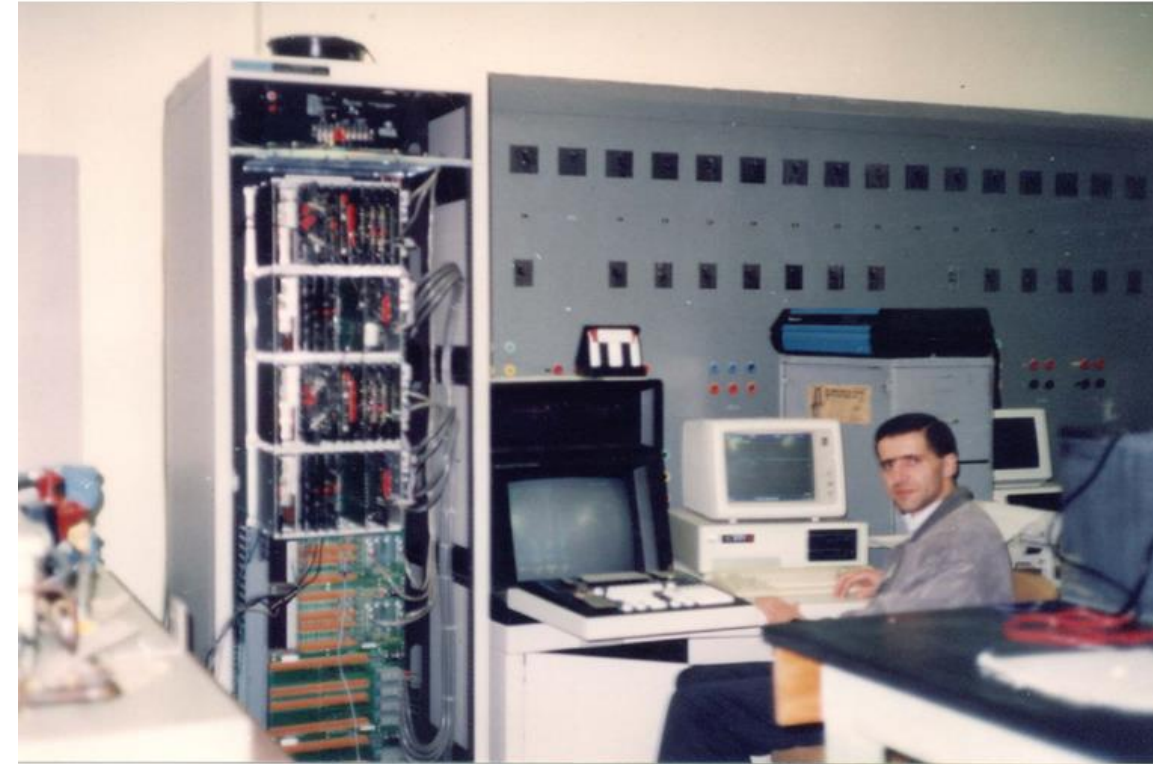
How – 1: Approach

- Approached a colleague in EE
- Brainstormed and discussed some ideas
- Came up with specific project topics
- Recruited students
- Ran the projects
- Both students finished on time and passed

Simples!

Control of a Liquid Ring Pump

How – 2: Implementation – Exp 2

Chemical Reactor – Scaleup

Water Bath

Temperature display

600ml beaker

Thermometer

Hose pipe delivering hot water to the reactor jacket

Conductivity metre

Mechanical agitator stirrer

Mechanical Seal stirrer bearing

Temperature probe

Reactant Inlet

Stopwatch

Temperature metre

Conductivity probe

Two Impellers

PTFE filter base system

Conductivity meter

Water Bath

Drain Valve

How – 2: Implementation – Interactions

Planned
- Both students meet both supervisors together regularly
- Both students work closely together in the lab and exchange knowledge
- Both supervisors mark or at least give meaningful feedback to both students

Outcomes

Success
- Both students finished their projects on time without the need for extensions
- Both students produced a good dissertation, on time

Failures
- The students rarely worked together
- Supervisors never met the students together
- EE regarded CE as a service provider, essentially a source of real life data

Challenges – 1: Students Engagement

Potential Causes:
- Discipline identity of the students
- Cultural background of the students
- Personal nature of the students
- Students were assigned the projects rather than sign-up to them

Solutions:
- Let students select the project
- Let students select their partner

Challenges – 2: Supervisors Engagement

Potential Causes:

- Time!
- Value added to supervisor – not clear
- Departmental requirements not aligned: Different requirements from both departments in terms of expectations, timeline and assessment

Solutions:

- Incentive for supervisors – e.g. time allocation in their CFM (contribution framework model)
- Streamline the requirements across Engineering disciplines. Engineering departments have now been integrated into a single school

Lessons Learned

- Relationship/networking is important in initiating projects
- Buy in from both academics – dedicate time
- Buy in from both students – open mind to different approach to learning and be willing to move out of comfort zone (own discipline)
- Need help from above!

    (management support)

Interdisciplinarity – Integration

Separate disciplines

Disciplines integrated