**Two week, industrial placements for Masters students – what do they, and should they do?**

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**Introduction**

The Institute for Manufacturing, part of the Department of Engineering at University of Cambridge, has been using short industrial placements (SIPs) as part of its programmes related to manufacturing and management for 47 years.

The key features of these SIPs, as used in the Industrial Systems, Manufacturing and Management (ISMM) MPhil Programme, are as follows

* Placement duration is 2 working weeks
* Students work in groups of two
* Students are based at a company
* They work on a real issue of some significance to the company
* The students are supported by a tutor
* Each student completes 4 SIPs during and SIP assessment is a significant part of the programme assessment
* Each SIP is themed to facilitate the use of recently taught material
* Students make a formal presentation to the company on the last day of their placement and produce a report.

The following evidence-based SIP activity framework has been developed as part of doctoral research and builds on earlier work[[1]](#footnote-1) that developed a provisional framework for developing workplace and professional skills during an Engineering Masters programme.

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**SHORT INDUSTRIAL PLACEMENTS – ACTIVITY GROUP FRAMEWORK**

**13. Manage relationship with client**

**6. Interpret**

**results and refine**

**the project**

**9. Prepare**

**proposals**

**8. Evaluate**

**solutions**

**7. Find solutions**

**12. Complete**

**project**

**report**

**11. Presentation**

**to company**

**5. Analyse the**

**data**

**10. Implement**

**solution**

**(if time)**

**4. Gather the**

**data**

**3. Design the**

**analysis**

**2. Frame the**

**project**

**1. Make**

**sense of the**

**project**

**14. Project and task management**

**17. Working with**

**and managing**

**information**

**16. Managing self**

**15. Working**

**with others**

**SHORT INDUSTRIAL PLACEMENTS – Activity Framework**

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| **Process Stage** | **Description** | **Ref** | **Activity** | **Manage the relationship with the client**  Keep the client informed of planned actions and progress. Ask for access to information and contacts. Discussion and resolution of issues as they arise.  *In the early stages of the project it is essential to agree communication methods, frequency, timing and with who. Don’t forget to confirm the project brief with client i.e. activity 2.4* | **Project and task management**  Develop an overall project plan as well as detailed plans per stage. Activelymanage the project including, monitor progress and priorities against plan and, make refinements as required.  *It is essential to develop an understanding of each other’s strengths and weaknesses to assist with task allocation. Don’t forget to prepare for your interim tutorial and keep in touch with your tutor on matters that could have significant impact on the project outcome.* |
| **1 - Make sense of project** | Assimilate company and project context. Develop a clear understanding of the project brief, key stakeholders and their expectations. | 1.1 | Discuss project brief with tutor and project partner |
| 1.2 | Identify key technical knowledge and/or tools/techniques likely to be required and ensure relevant resources are accessible |
| 1.3 | Assimilate publically available company information |
| 1.4 | Assimilate market/industry information |
| 1.5 | Assimilate information about company challenges/issues |
| 1.6 | Dissecting a problem brief to determine areas to question |
| 1.7 | Discuss project brief with company and determine expectations and key stakeholders |
| **2 - Frame the project** | Generate a picture of the project and its component parts. Identify what questions need to be addressed and any hypothesis to be tested | 2.1 | Define project scope and boundaries |
| 2.2 | Break down problem /design /investigation into component parts |
| 2.3 | Identify the questions / hypotheses for each component |
| 2.4 | Verify project framing and deliverables with key stakeholder/s and rewrite project brief if required ensuring project objectives are SMART. |
| **3 - Design the Analysis** | Select the tools/methods to be used, define the output required from the analysis and identify data requirements. | 3.1 | Identify analysis tools/methods suitable to answer 2.3 |
| 3.2 | Select most appropriate tools/methods |
| 3.3 | Define outputs and ensure they are consistent with formats used by the Company for decision making |
| 3.4 | Identify what data is needed – qualitative and quantitative |
| 3.5 | Identify sources of data |
| **4 - Gather the data** | Gather qualitative and or quantitative data from a range of sources internal or external to the company | 4.1 | Arrange interviews / meetings |
| 4.2 | Conduct structured / semi structure interviews face to face |
| 4.3 | Conduct telephone interviews / enquiries |
| 4.4 | Extract data from company / industry / research reports |
| 4.5 | Extract data from company systems |
| 4.6 | Extract data from public sources – internet |
| 4.7 | Capture new data e.g. take measurements, instrument readings etc. |
| 4.8 | Design, distribute and collate data via survey/questionnaire |

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| **Process Stage** | **Description** | **Ref** | **Activity** | **Manage the relationship with the client**  Keep the client informed of planned actions and progress. Ask for access to information and contacts. Discussion and resolution of issues as they arise.  *In the mid stages of the project it is essential to discuss your findings, their implications for the project and proposed solutions. This enables you to gage reaction and build support.* | **Project and task management**  Develop an overall project plan as well as detailed plans per stage. Activelymanage the project including monitor progress and priorities against plan and make refinements as required  *In the mid stages of the project, monitoring progress against plan and reviewing priorities is critical. Some later stages can happen in parallel e.g. presentation preparation and report writing.* |
| **5 - Analyse the data** | Critical and rigorous analysis of the data. Generation of visualisations useful to interpret results | 5.1 | Sort and structure data to enable analysis |
| 5.2 | Deal with incomplete or inconsistent data – make assumptions |
| 5.3 | Assess reliability/validity of data and assumptions |
| 5.4 | Deal with large data sets e.g. those requiring use of macro's |
| 5.5 | Analyse qualitative data |
| 5.6 | Analyse quantitative data |
| 5.7 | Develop visualisations of data |
| **6 - Interpret results and refine the project** | Determine results and consider what these might mean for different stakeholders. Validate results. Refine project specification and objectives if required | 6.1 | Identify anomalies in data |
| 6.2 | Consider results in relation to hypotheses / questions posed in 2.3 |
| 6.3 | Draw insights from results and identify further questions or issues. |
| 6.4 | Validate results from different stakeholder perspectives |
| 6.5 | Refine project definition, boundary, scope, deliverables etc. as required |
| **7 - Find solutions** | Identifyfeasible solutions | 7.1 | Generate ideas using creative (divergent) thinking |
| 7.2 | Collect ideas of potential solutions from company sources |
| 7.3 | Search for potential solutions from outside the company |
| 7.4 | Identify resource, operational and technical constraints |
| 7.5 | Shortlist feasible solutions / options |
| **8 - Evaluate Solutions** | Select preferred solution/s using a logical and relevant selection procedure. Test suitability and acceptability with stakeholders | 8.1 | Identify appropriate selection criteria |
| 8.2 | Test different options to generate performance data |
| 8.3 | Apply a logical methodology for ranking options |
| 8.4 | Identify a preferred solution |
| 8.5 | Discuss with stakeholder/s to validate evaluation and test suitability and acceptability of preferred solution |

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| **Process Stage** | **Description** | **Ref** | **Activity** | **Manage the relationship with the client**  Keep the client informed of planned actions and progress. Ask for access to information and contacts. Discussion and resolution of issues as they arise.  *In the final stages of the project it is essential to discuss your proposals to build client buy in prior to the presentation* | **Project and task management**  Develop an overall project plan as well as detailed plans per stage. Activelymanage the project including monitor progress and priorities against plan and make refinements as required.  *In the final stages of the project, monitoring progress against plan and regularly reviewing priorities is critical to ensure all essential activities are complete on time.* |
| **9 - Prepare Proposals** | Prepare a clearly argued and comprehensive business case to support your recommendations | 9.1 | Develop supporting arguments |
| 9.2 | Develop a detailed actionable implementation plan identifying key resources required |
| 9.3 | Develop financial business case |
| 9.4 | Identify and quantify (where possible) benefits, risks and resource requirements |
| 9.5 | Discuss proposals with stakeholders to test recommendations |
| **10 - Implement Agreed Project Solution** | Get agreement to implement solution/s and work with appropriate people to make changes and evaluate their success. | 10.1 | Obtain agreement by appropriate people |
| 10.2 | Make agreed changes |
| 10.3 | Monitor progress of implementation and deal with issues as they arise |
| 10.4 | On completion check changes are fully operational and delivering benefits anticipated |
| **11 - Prepare and deliver project presentation** | Prepare and deliver a presentation to the company and tutor to a high professional standard | 11.1 | Prepare the presentation |
| 11.2 | Practice the presentation |
| 11.3 | Identify likely questions and prepare answers |
| 11.4 | Deliver the presentation |
| 11.5 | Capture key points, questions and reactions to the presentation |
| **12 - Complete project report** | Prepare and submit project report consistent with report guidelines and make corrections required for company submission | 12.1 | Agree report structure, format and responsibilities |
| 12.2 | Prepare draft report sections |
| 12.3 | Collate and edit report then submit by deadline |
| 12.4 | Assimilate feedback from tutor and make required corrections to report |

Notes

1. The model only captures student activities.
2. The purpose of the model is to provide a common reference guide for both students and tutors. Not all activities will be required in every project and it is not guaranteed that all possible project activities have been identified.
3. The model only captures activities of a general nature – some projects will require additional activities that are specifically related to a particular project.
4. Initial project selection activities are not included i.e. activities start once project allocations have been made
5. Activities extend beyond the initial submission of the project and include taking on board tutor feedback and making required corrections prior to sending the report to the company.
6. Activities are grouped together either in one of 12 ‘project stage’s or in one of 5 groups of ‘through project activities’.
7. There may be significant interaction between different project stages and some project stages can progress in parallel. It is up to the students to be aware of this and manage their projects effectively.
8. Through project activities have proven less easy to capture in a way that does not generate overlaps or significant repetition. Two groups of these activities have been incorporated into the model i.e. ‘Manage the relationship with the company’ and ‘Project and task management’ by including process stage related items and providing general guidance depending on the stage of the project.
9. The remaining three ‘through project activity’ groups are not captured in detail. Other methods for capturing key activities in the following groupings ‘working with others’, ‘managing information’ and ‘managing self’ will be the subject of further research.

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1. Shawcross, J. K. and Ridgman, T. W. (2013) Manufacturing Excellent Engineers; skill development in a Masters programme, Engineering Education: a Journal of the Higher Education Academy, Volume 7, Issue 2 [↑](#footnote-ref-1)