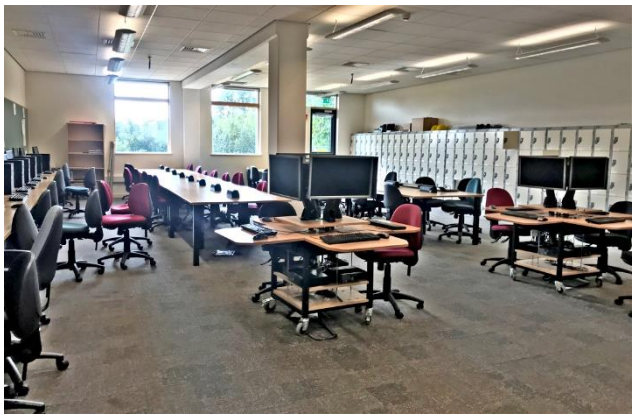
Institute for Manufacturing: flexible design that enables innovative approaches to teaching and learning

Why was the project needed?

The principal drive for the project came from the fact that the Institute for Manufacturing was spread over different areas and required consolidation in a 'home' for manufacturing engineering on the West Cambridge site. The Institute of Manufacturing had expanded three times into different parts of the Mill Lane Press site basement, as well as building a mezzanine floor and taking over a unit on the Science Park. The distributed nature of Institute's activities made it hard to realise one of its major objectives: to achieve collaboration by bringing together research from technology, management, and policy, for example through interdisciplinary groups for research bids. Additionally, bidding for more research funding in technology was constrained by limited space for more equipment. The applied nature of manufacturing research means the best route to create impact is to run workshops and events for industrialists; however, the restriction of space and inaccessibility of the centre of Cambridge did not give a good impression of the Department or the University at these events.

Furthermore, space limitations had an impact on teaching. With only one lecture theatre for two cohorts of undergraduates and a taught Masters programme, there was not enough room for teaching, meaning those on the Masters course could only use the lecture room during vacations and had to travel around central Cambridge during term using college rooms and exam halls.

How was the project run?

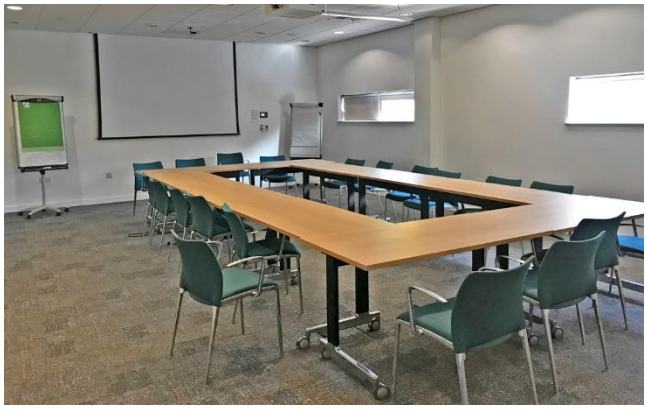


Academic input into the design process was mainly channelled through a small group of very engaged Institute staff, in recognition of the fact that a formal workshop with a large number of academics may produce ideas but wouldn't necessarily facilitate the implementation of those ideas. Having a small number of highly engaged staff regularly feeding back to the design team – a process described by one participant as 'the relentless pursuit of detail' - helped to ensure that the Institute's needs were comprehensively catered for in the final design. The total cost of the building was £15 million, plus an extra £1 million for furnishings.

What was achieved?

Teaching space

The building has teaching space for 80 undergraduates and 80 MPhil students, as well as offices and research space for 106 research students and 145 academics, researchers and support staff. The teaching, research and social space is set up to encourage interaction and to enable flexible use.

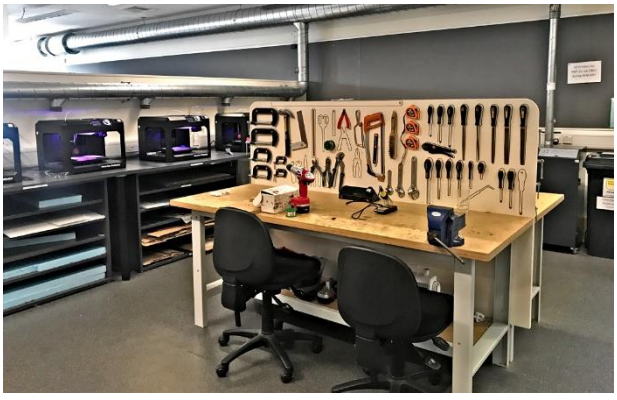


The two main lecture rooms are divided by a folding partition, allowing them to be combined at need into a room with capacity for 100 when seated, or 156 in auditorium mode. Like all the teaching rooms in the Institute, the lecture rooms have small tables on wheels, so the room layout can be rearranged at will both between sessions and during them (for example to enable a group activity after a period of listening to the speaker). The Institute teaches, and in its own teaching also uses, a road-mapping technique with post-it notes and flipcharts, and so all the teaching rooms have large areas of pinboard on the walls to enable display of the roadmapping notes.

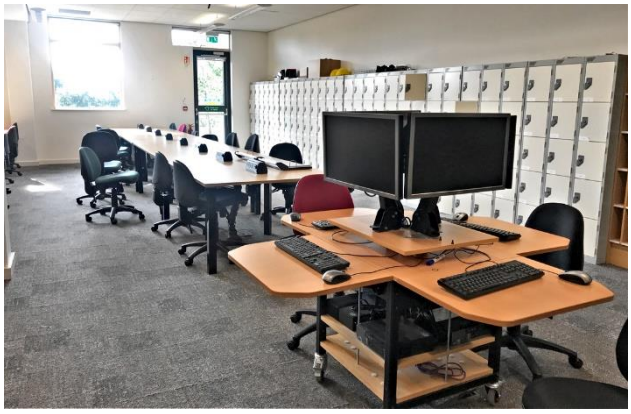
Teaching at the IfM uses both digital and analogue methods according to what is most appropriate for the desired learning outcome, and the rooms are set up to enable this. All lectures are tablet-based, and lecturers and students have worked together over years to optimise the procedure for making these lectures work: lecturers now construct their slides specifically for the tablet format, with enough space for the students to annotate directly onto the slides, while a device called an iClicker allows lecturers to respond to a flipped classroom approach by preparing a range of slides and then calling up appropriate ones depending on the problems or solutions presented by the students during discussion.

The lecture rooms also come equipped with large portable pinboards that groups can use, for example to analyse fulfilment processes, with paper, pins and string – because, as Tom Ridgman, Senior Lecturer in Manufacturing Engineering, explains, mediating through artefacts helps people to learn. There is a visualizer, a device to project whatever is placed on it, whether that be a sheet of text, an object, or the lecturer's hand writing; again, Ridgman explains, this is because research has shown that people remember mathematical information better if they see it being written by hand rather than flashed up complete on a screen.

Study space



As well as lecture- and seminar-style teaching rooms, the Institute has two rooms specifically for group work and self-directed study. The design studio is laid out in 'pods' for the third year MET students, who do a collaborative project, and it also has 3D printers, a laser cutter, and workbenches with traditional tools so the students can hone their production skills. This room was also designed to be flexible enough to use for lecturing if needed, providing extra capacity for peak teaching times and helping to accommodate occasional fluctuations in student numbers within existing space. A study/common room, which provides computers, desks, lockers and printing/photocopying facilities, is used both for collaborative working and quiet study.

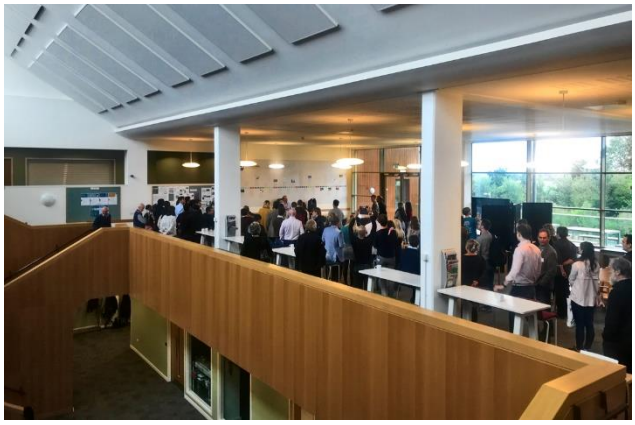


With the Institute's position in West Cambridge, a long way from Colleges or libraries, this room was needed to give students somewhere to work between lectures and practicals.

Smaller meeting rooms and seminar rooms provide for both teaching and external events. The seminar rooms have pinboards and movable tables too, allowing flexibility which paid off for the Institute when they found themselves needing to teach the third year MET students, a need that had not been foreseen when the building was designed. The largest seminar room was flexible enough to accommodate the third year cohort.

Social space

The Institute's social space also doubles as a work space, but a more informal one, with tables and chairs laid out in small groups, café-style. Free tea and coffee and ample light from the huge south-facing windows make it an attractive space for both working and socialising, and there is also a small kitchen to provide hot food and sandwiches in addition to the regular Friday morning round of buns.



The social space was deliberately put at the heart of the building, as a sign of how important the Institute considers interaction to be, and an equal attention to the value of socialising is demonstrated by the attractive outside area, with a pond, benches, and a patio that is used for Institute barbecues in summer. Institute socialising is set up to be non-hierarchical and to encourage interaction, with one space only shared by academics, students and staff. The research space is likewise designed to provide just the right degree of community spirit, with PhD and postdoc desks set up in large open-plan offices off which the private offices of academics open, each academic adjacent to their own research group, and with frosted glass office doors providing some privacy while still encouraging a sense of connection between the private offices and the communal workspace.

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