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HOT POTATOES AND DOUBLE DIAMOND IN A WHIZ: CAN TECHNIQUES AND PROCESSES REALLY LEAD TO INNOVATION?

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ABSTRACT (250 WORDS MAX)
The paper introduces a brief student project that was carried out with a large number of groups of students from engineering and design backgrounds. This was intended to provide the students with an experience of developing innovative ideas from the pre-idea position to the stage of putting forward concrete proposals for action.
The paper relays the experience of running such a project and its benefits, but then asks the questions of how close it came to achieving its goal of getting students involved in an innovation process.
Innovation would seem to require three conditions for it to exist. The first is a significantly different idea: the second is an environment that nurtures the idea and the third is the society that is prepared to take up and disseminate the embodied idea. The small six-week project aims to provide some techniques that make the achievement of these criteria more likely. It resulted in changed behaviour from some students but for significant innovation to take place a longer period needs to be used to develop and nurture it.

Keywords: Innovation, group projects, techniques

1 INTRODUCTION

The paper concerns the implementation of a final year module in innovation and enterprise taught to a large selection of engineering and design students.
During a curriculum development programme it was proposed that a common final year module in innovation and enterprise be written across all engineering and design disciplines at London South Bank University. This meant that a varied group of students took the module from courses as diverse as Product Design, Mechanical Engineering, Electronic Engineering, Computer Systems and Networks Engineering, Petroleum Engineering, Civil Engineering, Architectural Engineering and Chemical Engineering. Some disciplines were focused on technicalities within their area: others took a broader brush approach. Most students were on courses leading to IEng or partial CEng exemption.
Meeting UK Engineering Council requirements meant that the module had to clearly meet a number of specific requirements, namely:

- Knowledge and understanding of the commercial and economic context of engineering processes.
- Understanding of management and business practises to achieve engineering design objectives including finance, law, marketing, personnel and quality.
- Understanding and application of IPR, including patent application and nature of associated legal and contractual issues.
- Ability to use creativity to establish innovative engineering design solutions, justifying the selection of ideas.
- Ability to generate ideas to solve problems and design new products, systems, components or processes, synthesising from those already in existence.

This was to provide students with practical experience and skills in innovation and enterprise by carrying out the processes rather than investigating and researching case studies. This is recommended by people such as David Baume [1] who suggests learning objectives might better be construed as developing ‘doing’ type skills rather than 'writing about' or 'researching' skills. As such, the prime requirements were to do innovation and to do enterprise.

2 MODULE ORGANISATION: THE ASSIGNMENT WORK

Module assessment was split into two parts: the first concentrated on innovation, and was a group piece of work, whilst the second focused on enterprise and was carried out by individual students.
This paper focuses on the first assignment. For this students investigated current 'hot potatoes' – ie current discussion topics for which there was either a lack of consensus of opinion, no easy answer, or several possible and equally plausible responses.

2.1 Hot Potatoes

They were asked to reframe the problem and then come up with a direction for action for resolving the issue. The suggestion was that innovation was required in these areas in order to move the state of the art onwards in a different direction. Typical problems that students chose as hot potatoes were things such as how to generate sufficient alternative energy, how to deal with the issues surrounding the tar sands of Alberta, what's going wrong with religion and why students drop out of university. Some groups were unable to see past the edges of their disciplines: others chose topics that were a significant distance from their specialist areas and stretched the elastic between topic and engineering or design.

2.2 Techniques for Innovation

Students were asked to carry out a number of specific techniques and to apply these to generate innovative answers to the broad question that they were to investigate.
The process included using a number of techniques including 'timeboxing', 'double diamond', 'Innowiz', affinity diagrams, Ideo cards and pecha kucha and to present solutions that demonstrated coherent plans for action.

2.2.1Double Diamond

The first one of these was a 'Double Diamond' technique or process. This splits up a problem solving exercise into two parts, each described as a diamond. The Design Council [2] refers to the four stages as Discover, Define, Develop and Deliver. The first part of each diamond is a broadening phase, and the second an assessment or closing down phase. Two such diamonds make up the problem-solving process: the first identifies and defines the problem and the second solves the problem. A horizontal line was added after the second diamond to indicate the communication of the problem.
Students selected an initial, broad topic, expanding it by describing it in as many different ways as possible. They then took the alternative descriptions and definitions, and assessed them in the second stage of the diamond, to result in a well-defined problem statement that they could then develop in the next stage of the process. This was to find as many different solutions to the problem statement as possible, followed by a closing down stage where the decision is made between the myriad of possibilities. This results in a single proposal for action. The last part (technically outside the Double Diamond) was to communicate the process the group had been through and the action proposal.

2.2.2 Timeboxing

The second technique that was used, and can be seen in the Figure 1, is that of timeboxing. This is a technique developed from a combination of management methods and agile computing methods. The concept is extremely simple, in that a goal is set for a specific time period and a (brief) report given at the end of the time period.
In some cases, timeboxes, as they are known, can be short periods, such as that developed in the 1980s by Francesco Cirillo as the Pomodoro Technique [3] with 25 minute periods, or longer ones such as those given to the students in this example where they were meeting together at weekly intervals. One could argue that such a basic time management tool could never be described as novel: simply that it comes with different names attached to determine a different, perhaps more trendy, incarnation. For instance, the corollary to Parkinson's Law [4] postulates that getting a task successfully completed is done more effectively by delegating the task to someone who is busy. Part of the argument is that they will have successfully carried out timeboxing techniques and will be able determine exactly when the task might be completed, but Parkinson, in his tongue in cheek manner, then goes on to say that the busy person will (successfully) delegate the work to his secretary.

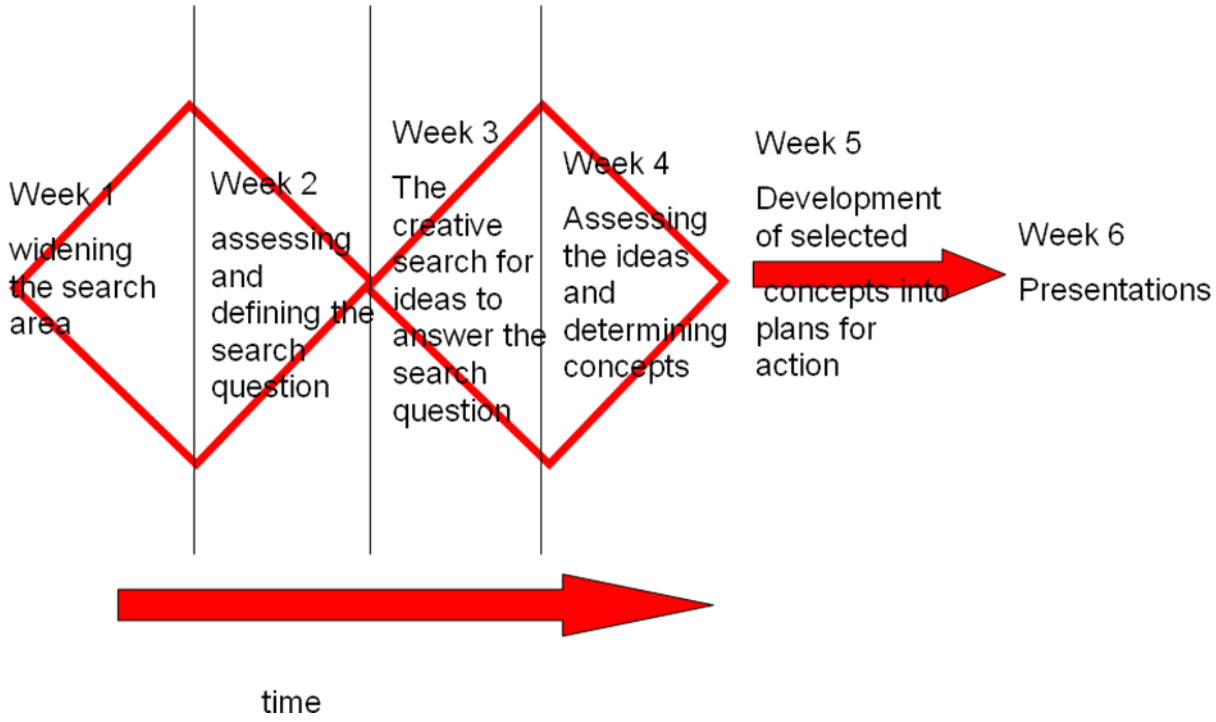

Figure 1: Double diamond and timeboxing

2.2.3 Innowiz

A third technique, or rather series of techniques, is represented by the Innowiz set of methods [5]. The Innowiz website [6] is simply an open-source collection of pointers to proprietary innovation techniques and processes collated into four categories: Problem Definition, Idea Generation, Idea Selection and Idea Communication. Conveniently, these four categories each have separate colour schemes of magenta, yellow, cyan and black.

Under the Problem Definition category there are 23 methods: under the Idea Generation heading as many as 47: Idea Selection has 19 and Idea Communication has 26 – a total of 115 methods altogether. Student groups were asked to use this tool (or any other tool, for that matter) and identify the methods they were using to develop their double diamond processes.

2.2.4Pecha kucha

They were also required to use a particular technique for presenting their work: that of a pecha kucha presentation [7]. This technique utilises a timed PowerPoint presentation, with 20 slides each taking 20 seconds: it is sometimes known by the alternative title of 20/20 presentation as a result. Although the recommendation is that pecha kuchas are based around the use of picture language, this was not a requirement of this particular exercise.

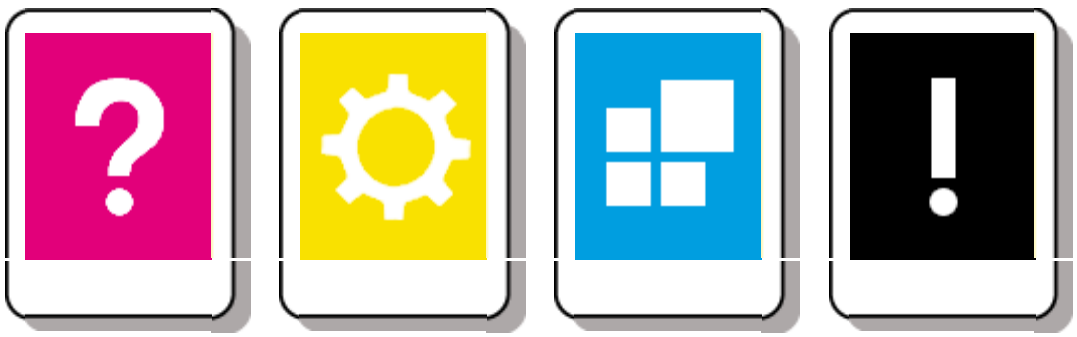

Figure 2: Innowiz.be headline pictures

2.3 Outcomes from groups

An example of the sort of problem tackled is shown in Figure 3. This particular group was tackling the broad topics of energy – current energy usage and the future of energy production. Their more specific search question was "How can renewable energies fill the short to mid-term gap in electricity generation?" Figure 3 shows part of their presentation where they were showing a fact-finding process – simply asking about the current energy position (left) and the British Government's proposals for 2020 on the right. They put forward a specific proposal for the conversion of fossil fuel generation sites into biomass converted sites, particularly where these were due to be closed due to legislation.

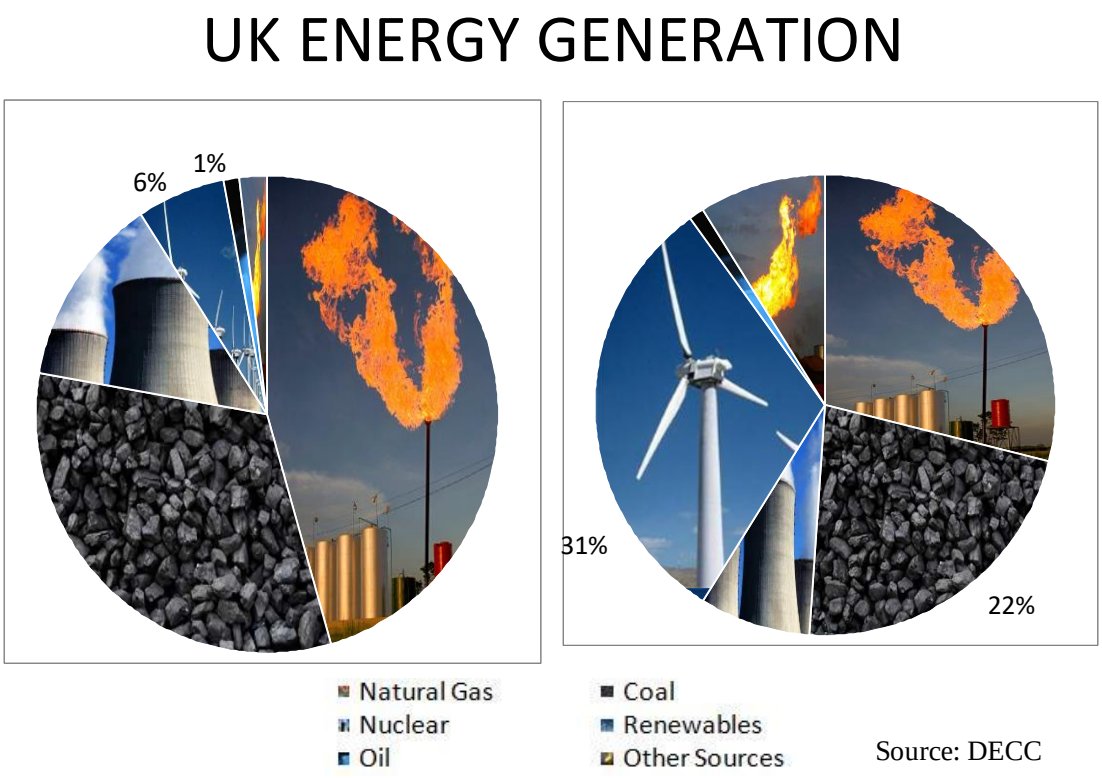

Figure 3: An example of a slide used by one of the groups of students

Of the methods contained within the Innowiz system, those that students found most promising were wordless, Wikimind maps, decision matrices, chart chooser and affinity diagrams.

Figure 4: Students carrying out an affinity diagram exercise [8]

Student groups who performed best said that the processes were fun and useful, giving them sets of methods that could be usefully transferred into a work setting. Industry based students found them particularly useful.

3 CONDITIONS FOR INNOVATION

NESTA produced a report in 2009 that determined that seven wider conditions were necessary for effective innovation. These are public research, openness, entrepreneurship, demand, competition, access to finance and skills[9]. Their model includes four areas and the connections between them and is seen in Figure 5.

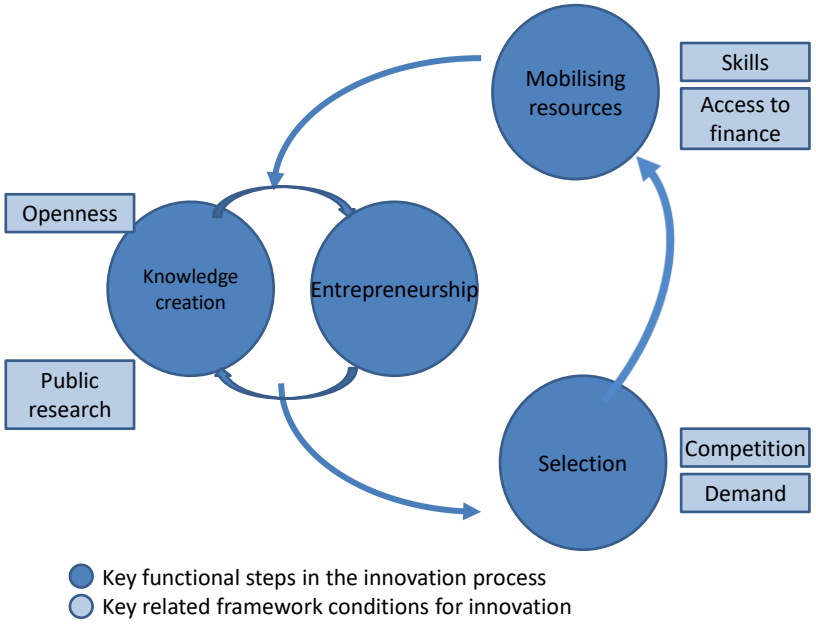

Figure 5: The innovation process as described by NESTA.

However, the descriptions do not read like conditions but might best be described as areas of concern that relate to innovation. A more coherent list might include three conditions, viz:

- an idea that is worthwhile
- an incubation system that can grow, embody, develop and spread the idea and
- a society that is prepared to be changed by the embodiment of the idea.

The NESTA areas can be identified as being within and related to one of these conditions. Thus the worthwhile idea includes the idea generation aspects of entrepreneurship and public research plus the selection processes, the incubation system is found in the access to finance and skills and the society that is prepared to be changed includes the openness, the demand and competition. The NESTA approach tends to presuppose the existence of business systems and a public, whereas the three-part list would function effectively if the innovation consisted of, say, a language change that was promoted via a television commercial or an effective political development.

3.1 Project critique

What would then be needed to help crystalise the innovation evident in this short project might be the inclusion of something like a hothousing process to support and nurture the ideas that were presented and then some means of placing them in such a way that society would be able to benefit from them and be changed. To make this third step more likely, techniques included in the INNOWIZ collection include such things as market research and trend analysis, aimed at the development of questions that could then stand a greater chance of becoming successful innovations. There are also techniques that cover the presentation of the ideas within the techniques and these techniques could enable the best of the concepts to be disseminated beyond the confines of the six-week period and be presented to appropriate parts of society.

3.2 Can innovation be learnt?

In *The myths of innovation* [10] Scott Berkun, states that it is a myth that a method exists for innovation. He looks at the question of how innovations start and describes the stories of several, which are all significantly different.

However, if one were to take the above three conditions for innovation, one can see that techniques can be established that develop ideas and assess them: that fund and encourage incubation systems and that seek to determine in what direction society might be willing to change. Thus in spite of Berkun's assertion and his case studies suggesting otherwise, it should be possible to develop processes and techniques that, whilst they may not inevitably result in innovation, certainly make it more likely. The exercise described in the first part of the paper certainly contributes to providing students with an effective innovation toolbox, in that it covers the first of the criteria and certain parts of the third one, with a relatively small proportion of the middle criterion.

Has anything created an effective change in the students that could be called innovation using the processes in the short project? The answer to that is positive, but anecdotal. Some students, particularly work-based ones, have effectively imported the methods and processes into their work environment and they are changing that in a small way. One student described how he managed to secure graduate employment through using a high-speed timed presentation, others are utilising the processes in later project work and the University would like to look at some of the results to develop ways of preventing student non-attendance and lowering drop-out rates.

4 CONCLUSIONS

It is easier to determine, with the above exercise, that certain of the criteria for developing innovation have been inculcated in the students. To succeed as an innovator may be difficult within a six week period, but to develop part of the way is eminently possible. If these techniques were developed further and through a longer timescale, it is likely that several measurable innovations would result.

Thus the exercise in itself has been useful and productive. Further iterations would probably be necessary to refine the techniques and to include more techniques from the second and third criteria such as market research processes and funding possibilities: what is here described is a significant starter process.

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