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ABSTRACT

Innovation is the current catchcry. It differs from concepts such as knowledge in that it implies action. With innovation, thinking and research are only the start, 'doing' is also important. This sounds like a job for the vocational institutes. This paper reviews the relationships between innovation and the other components of what we do. The paper presents a model for explicitly integrating the innovation process, both as into existing courses and into new courses as a subject in its own right.

1. INTRODUCTION

The Science and Innovation Advisory Council (SIAC 2002) discussed the importance of innovation in the success of New Zealand's economy. They go on to describe an "innovation framework" that will "increase capability to generate wealth from ideas and knowledge". To accomplish this the country needs to "excel globally". The framework is based upon the making advantages of the characteristics of the New Zealand position and economy, with a focus on the development of a "talented nation". The NACCQ sector is already at the forefront of this development. Innovation is about both thinking and doing and Mann and Cowan (2000) identified these characteristics of the vocational IT degrees. SIAC also recognises the importance of an education that mixes practical and theoretical knowledge: "at higher levels of the education system, theoretical knowledge is not enough" (2002, p39).

The Bachelor of Information Technology (BInfoTech) at Otago Polytechnic is identified as a particularly innovative programme (Maharey 2001). The BInfoTech has seen a wide range of developments: from devices for the visually impaired to multidimensional XML parsers. Papers concerned with technical skills are complemented by those of business and communication. Development processes are considered in software engineering and the third year projects.

In 2001 the authors decided to create a new course to explicitly explore the concepts of innovation within the BInfoTech. This new course 'IT213 Innovation and Development' (see http://site.tekotago.ac.nz/) forms a pivot point in the degree. It is hoped that students undertaking this course will have enough technical skills and theoretical knowledge so that this course would 'slingshot' them into the third year and beyond.

Innovation is the implementation of invention. It involves the application of invention to solve problems, take advantage of opportunities and develop existing products.

New Zealand has been recognised as being a nation of innovators, however very few of our innovators succeed in developing their products commercially. This course looks at how we can improve our success rate

Two aims of the course, as expressed in the curriculum documents are:

- To provide an introduction to the history and components of innovation and principles by which businesses create and foster innovation in relation to the information technology industry; and
- To provide students with an understanding of cutting-edge technology with the aim of applying this to economic and industrial productivity problems.

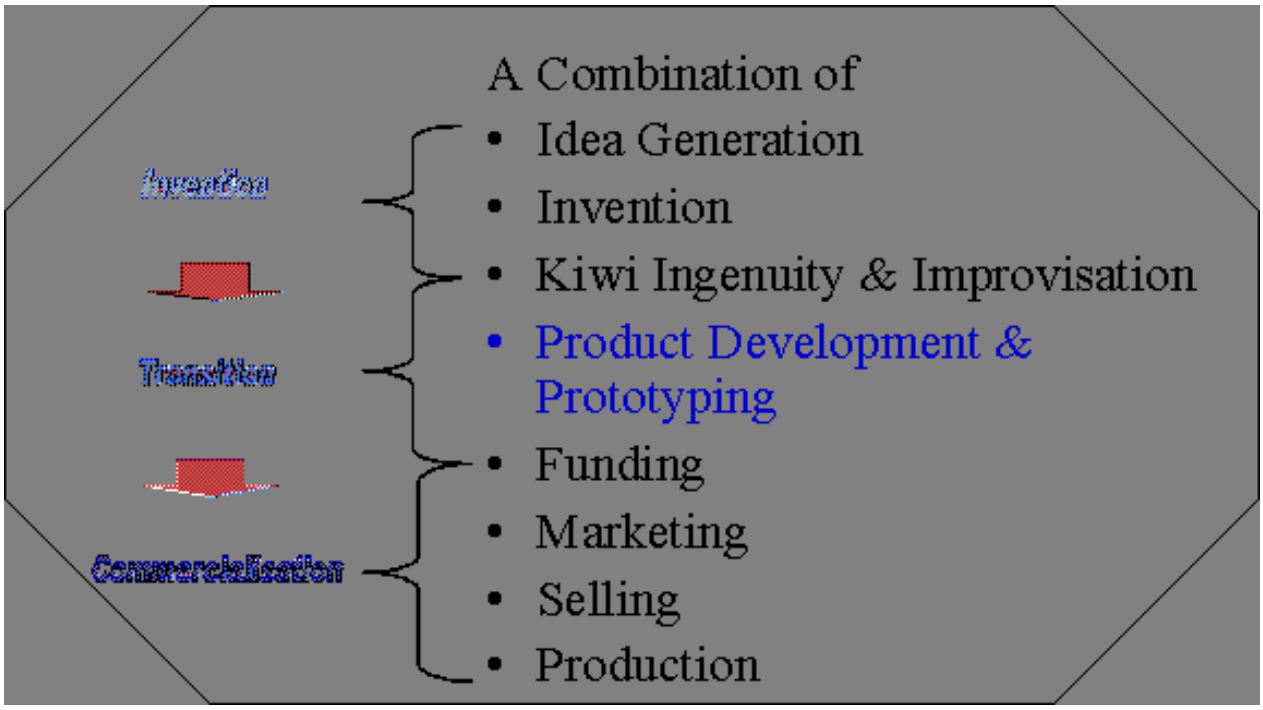
These two statements are not synonymous and highlight a structural issue of innovation itself. There is a conflict between playing with cool new technology and solving problems. The approach adopted combines these elements.

2. INNOVATION SYSTEM: INVENTION IMPLEMENTED

The key message in this course is that innovation is a process: wealth creation is not accidental - a method or system is required (Manley 2002). We called this "Innovation System: Invention Implemented" or "ISII (easy)- when you know how". To reinforce this concept the course was branded with a lightbulb image with ISII as the filament (Figure 1). But what is this system? SIAC (2002 p17) discusses a "vibrant and well integrated innovation system" but identifies a "complex web" rather than a pragmatic system to support processes.

Week Ending	Class One (Monday, Tuesday)	Lecture (Tuesday)	Class Two (Wed, Fri)	Comments
17th May	Handout Course Review Journal Group Selection Intro to Think Tank	IntroductionCreativity & Innovation (PB)	Project Identification Stage 1 - Areas of Interest (SM)	

Figure 1: Innovation System: Invention Implemented. "ISII when you know how"



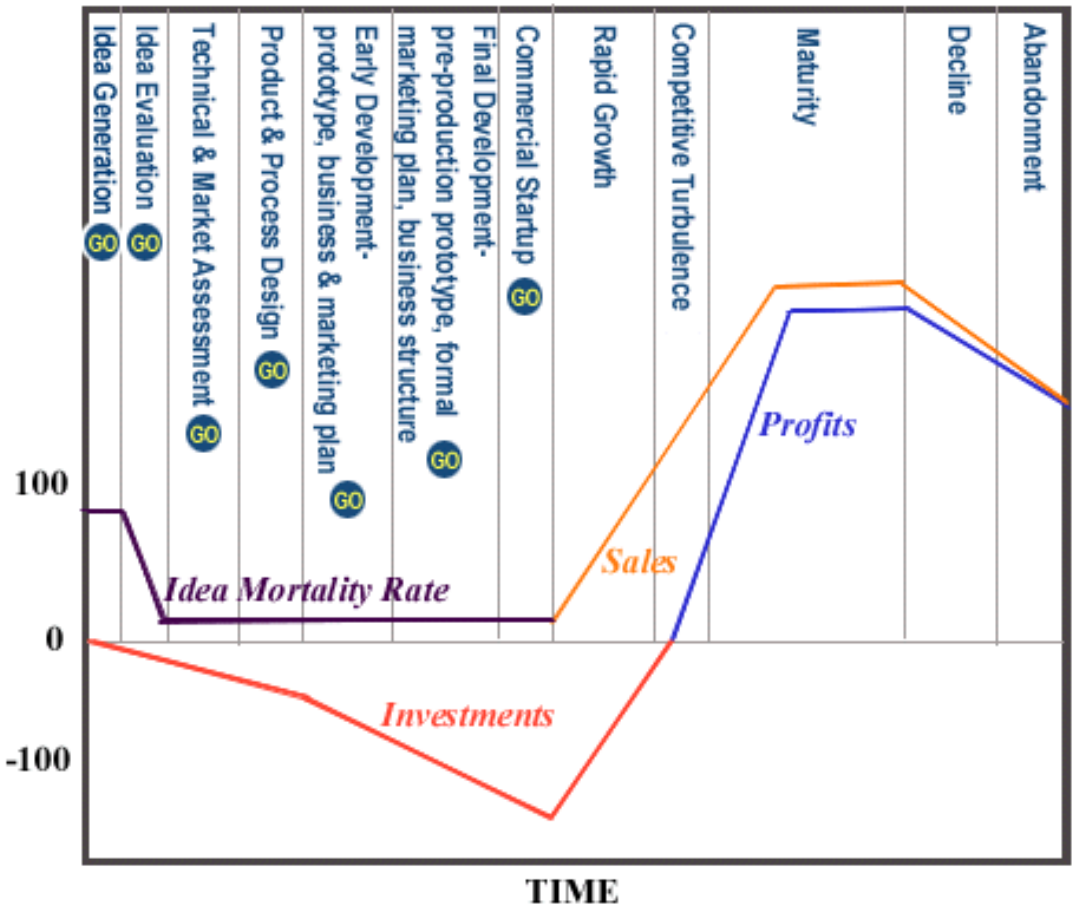


Figure 2: Innovation system and related product cycle

Course Structure

	Weekended 17 May	24 May	31 May	7 June	14 June	21 June
Class 1 Monday, Tuesday	RH Day 1 Handout Course Review Journal Group Selection What is Innovation Innovation Environment Intro to Think Tank Idea Generation Think Tank Exercise	RH Think Tank Part 1 What do we do with a good idea? Idea Evaluation • Market Potential • Risk Assessment • Constraint Analysis Learning to Fail Early Testing	RH Organisation Structure Development Plans Capability Analysis Ethical Consideration Case Study Example?	00 No Classes Monday or Tuesday (Queens Birthday)	RH Idea Valuation Funding Alternatives Strategic Partnerships Investor Identification Funding Application	RH Funding Application Review IndustryNZ Exit Strategies What Next Group Presentations
Lecture Tuesday	PB Introduction Creativity & Innovation Journal	PB Emotional Intelligence	PB Creativity & Innovation Via Emulation	TW Test - 45 min (25%)	RH Guest Lecture IGROW	PB Where to From Here
Class 2 Wednesday, Friday	SM Group Finalisation Problem/Opportunity Identification (Brainstorming) Stage 1 – Areas of Interest Journal	SM, RH Levels of Innovation Innovation & Design Clustering Think Tank Part 2 Product/Solution ID Peer Presentations	LS Group Study – Development Plans No Classes – Lesley Smith to facilitate if required	PB TBA	SM Marketing and Design Case Study Due Friday (25%)	SM, RH, PB Group Presentations and submissions 10 – 15 Minutes per group 5 minute Q&A (40%) Submit Journal incl critical review (10%)

Figure 3: Topics for innovation sessions

3. STRUCTURE

The course was delivered in six weeks, each with two, two-hour practical sessions and a one hour lecture. The lecture series is discussed below. The focus of the practical sessions was a practical implementation of the Innovation System with students generating and idea and developing to the stage of a funding application. Other assessed work included a case study and a short theory exam.

4. LECTURE SERIES

The lecture series for the Innovation and Development course consisted of three major topics, delivered in a lecture style and followed up in class in smaller groups discussing the points made in a less formal way. The first of the three topics was the comparison between artistic endeavour and IT creativity. We have several millennia's worth of evidence of how humans have sought to use the arts as a creative expression in painting, literature, drama and the like. The lectures consisted of outlining how the artistic world has gone about maximising creativity in their specific area and discussing whether parallels could be created in the IT world and the factors that have led to profound artistic creation that may be extrapolated into innovative developments in computing. In our discussions we covered the degree to which artists collaborated and sought input from their peers and from society in general. We found that few artists had actually worked in isolation and had also been able to produce great work. We looked at the degree to which artists could be organised into colonies and the equivalent of IT think tanks and whether you could bring clusters of artists together to produce a series of works more profound that the individuals involved.

We looked at the university as the home of artistic endeavour and found evidence that the immersion in university life increased security but perhaps withdrew the artist from the sources of his inspiration. In some eastern societies and the Middle-Ages of western societies the artist had a specific place in the community not unlike the IT person right now. Various other factors were looked and stimulated discussion on how to maximise output by artificially altering the conditions under which creative people worked.

Figure 4: After some prompting, introspective It students were convinced of the value of thinking creatively and expansively

Further work has to be done on this area and it is drawing a long bow to suggest that literary and artistic endeavour are models to follow for the IT world although some interesting parallels can be found. Perhaps a subject for a later paper.

The second topic in the lecture series was 'Emotional Intelligence'. This is a new catchphrase for a different way of looking at managing groups of people in a business or creative setting. It transcends the usual management techniques and allows one to rummage through the range of emotional responses one has to surrounding institutions and groups and how a prudent IT manager might make use of such responses. We made the assumption that students in the class would one day be leading brainstorming groups that would emerge with real products and the question posed was how do we maximise the output of such groups. The 'Emotional Intelligence' angle came in by presenting new theories concerning people's responses to poor organisational techniques and indeed the overwhelming positive response to basically giving people who work what they want in terms of emotional fulfilment. In order to make this section not look like some new-age encounter group we stressed the sober management papers that are now emerging that see such techniques as tools to maximise innovation and profit.

The third aspect of the lecture series concerned innovation through emulation. This is the deliberate inculcating of a specific person's methodology into one's own techniques for solving IT problems in the innovative domain. The idea here is one studies the biographies and research techniques of a range of people and selects at least one person who has created excellent outputs. Such a person's philosophy and techniques are articulated and crystallized such that when one reaches a nexus in creative endeavour one then says, "how would my mentor go about solving this problem?" While this is not a new technique it is worthwhile formalising it in

that there is a range of books now out on how various eminently "emulatable" people have gone about becoming successful. The specific people we studied in class were Richard Branson, Atilla the Hun, Sir Edmund Hillary, Jean Batten, Michael Hill, Sir Ernest Shackleton and Doug Englebart. The fact that most of these people were not involved in IT does not alter our thesis that the techniques for solving unique problems can be done well or badly. Various people who have gone before have encountered unique situations where they have solved new problems well and such people are worthy of emulation in an IT setting, so long as the techniques are extendable to such problems.

5. PRACTICAL SESSIONS

In the project the major task was to generate a development plan to present to a funding panel. After initial idea generation the groups complete a number of documents as part of the commercialization process and complete a formal 1ten Minute presentation to an Industry New Zealand funding panel outlining details of the problem, their solution, a development plan and funding application for commercialization of the project.

The first task for the students was to generate a large number of ideas for problems to solve. Hargadon and Sutton (2000) stress the importance of new ideas. It was stressed to the students the importance of doing this without evaluating the ideas. It doesn't matter if they are already solved or you think they are impossible or silly. By providing a space to think - both physical and mental (Seely Brown 2001) and a brainstorming process (http://site.tekotago.ac.nz/~sam/teaching/innovation/lectures/practical2/index.html) groups were able to generate 50 ideas within a two hour session. Technology, new and old was used to trigger the brainstorming process, along with a seed word: 'position'.

The groups then filtered the harvested ideas down to five and then one idea. This was done with evaluation models that included interest areas, capabilities, feasibility and market potential. They then prepared development plans that formed the core of an Industry New Zealand funding application (http://www.industrynz.govt.nz/sme/bizenterprise.html#moreinfo). The panel was held in conjunction with Industry New Zealand and they have begun a process of working with some groups to commercialise the innovative products.

While unable to give details here as a result of commercial possibilities, the products developed are most exciting. These include a smartcard for navigation, a remote metering system, a motion sensor, a smart suit for athletes, supermarket trolley management, child wearware, wine growing technology, multi-language and sport ball position tracking.

6. CONCLUSION

The paper "Innovation and Development" has proven that innovation can form a worthwhile addition to an IT degree. Future developments of the course will be to add elements of inter project technology transfer - what do we do with the other 49 great ideas per group? SIAC (2002) writes of "who you know". We want in this course to make better use of networks. Similarly SIAC write of curiosity driven research. We want to integrate new technology to a greater extent. For this course we want to discuss new technology in greater depth than triggers for brainstorming. We did some of this including a discussion on the convergence of augmented reality, wearware and artificial intelligence. This was very successful, but we want to do more. This course was a great innovation - we recommend it.

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