

# Acquiring Innovation Knowledge

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**Abstract:** There are few possibilities for acquiring knowledge related to innovation. Firstly, acquiring knowledge using machine learning typically requires structured and classified data and/or cases, and lots of them. Secondly, manual acquisition of knowledge requires human expertise. Both approaches seem impractical when it comes to innovation knowledge. While innovation is recognized as a vital part of sustainability within organizations, there is little assistance with how we can acquire, reuse or share the innovation knowledge that may exist. We suggest a technique and present preliminary results of an evaluation study using this approach.

**Keywords:** Innovation knowledge, knowledge acquisition

## 1 Introduction

Many today would accept that the Western organisation is no longer competitive from the point of view of secondary industry. Although both primary and tertiary industry must be conducted onshore, to attain a global advantage at the quaternary and quinary levels requires innovation. Naturally attaining a competitive advantage is easier said than done for “innovation is... a significant and complex dimension of learning in work, involving a mix of rational, intuitive, emotional and social processes embedded in activities of a particular community of practice” [5, p.123]. We too see innovation taking place as a process whereby knowledge may be gained either through self experience over time or by serving in an ‘apprenticeship’ with a more experienced innovator who may pass some of his or her expertise on. Nevertheless innovation is not simply a process of trial-and-error rooted in experience, innovation needs to produce timely and ongoing results “involving a complex mix of tacit knowledge, implicit learning processes and intuition” [5, p.124]. Given the acknowledgement of the connection between tacit knowledge and innovation knowledge [9], we have turned our research using work-place scenarios to capture tacit knowledge toward the capture of related innovation knowledge.

## 2. The approach

The approach carries on and extends our previous work [2, 3, 4] with a narrowing of focus to innovative and creative type knowledge and a change of direction into the

application of personnel recruitment and training. Acknowledging that innovation is a process we will be looking for emerging patterns of behaviour appropriate to each of the various phases of the innovation process and how these responses correspond to our current understanding of innovation including the various psychological models, instruments and approaches which exist.

Similar to our previous work in developing an IT Tacit Knowledge inventory along the lines of Sternberg *et al.* [11], we have established an inventory with twelve randomly assigned ‘innovation’ scenarios. We see an example of scenario 12 with corresponding answer ‘options’ in Fig. 1. For each of these answers respondents select **two** Likert scale values (Extremely Bad through to Extremely Good) for **both** how they would *ideally/ethically* rate the answer option, **and** *realistically* how they feel the answer option is with regard to dealing with the given scenario. We also want our respondents add innovative scenarios and answer options of their own with a view toward extending the inventory for future use. Finally, we ask our sample population to select the stage of innovation of the scenario along the lines of the Novelty Generation Model (NGM) [10].

You work for an internet company whose founder and chief executive routinely abuses and demoralises people. You and your fellow employees dread coming to work with this tyrannical executive, but you know that he has a great idea that can be packaged for a hot initial public offering in the next 12 months.

Do you:

- 1) Wait until the company goes public and its stock options vest then get out of there as quickly as possible.
- 2) Reduce annual leave and join another company. You don't have to take that kind of abuse.
- 3) Steal his idea and make some subtle readjustments to make it better then start your own internet company. With any luck you'll be able to bankrupt him and make a lot of money in the process.
- 4) Stay with the company for as long as they'll have you. Company loyalty is always appreciated, and the executive's ideas have merit even if he is a jerk.
- 5) Approach the chief executive and tell him firmly but politely that you don't appreciate his behaviour towards you and the rest of his staff.
- 6) Don't take his insults lying down, rise to the occasion and return them with interest.
- 7) Try to find out what the executive's real problem is. It may turn out to have nothing to do with you and rather be connected to personal problems. In which case, you won't feel that you are incompetent at your job.

**Fig. 1:** Scenario 12 with associated answers

The NGM is a bio-psycho-social approach, for it recognises that at a genetic level some people are more inclined to look for new problems and able to come up with novel solutions. In the model, the first step is novelty seeking followed by creativity which is broken into novelty-finding and novelty-production. These stages may be divided along the following lines.

*Idea generation:* Typically a technical insight into a product or process or thought about a service.

*Opportunity recognition:* An opportunity is identified for developing an idea into a new product, process or service.

*Development:* Usually involving prototype development and marketing testing.

*Realisation:* Typically realising how to market the product and introduce it to the customer.

These stages relate to novelty seeking with idea generation being a form of novelty seeking, opportunity recognition comprising novelty finding, and the last two stages representing a form of production from a novel idea. We return to these stages shortly.

Whilst we recognize certain psychological approaches such as the Kirton Adaptation-Innovation (KAI) inventory [8] or the Myers-Briggs Type Indicator (MBTI) creativity index [7] also focus on innovators, we choose to focus more so on the behaviour of individuals who have had successful results rather than on character or personality traits that so typically characterise current psychological research. However, we envisage that such psychometric tests will also play a role in a comprehensive instrument that can be used for the recruitment and development of personnel.

### **3. An evaluation study**

As Information and Communication Technology (ICT) is our area of expertise, we will initially focus on innovation in this field. To compare novices with expert innovators, we are using two sample populations. First of all a third year undergraduate ‘management theory’ class of 75 individuals with a median age of 21 forms our novice population, and secondly approximately a dozen recognized innovators varying from 30 to 80 years of age, who will provide a skilled sample data set to compare against. To be recognised as an innovator, as opposed to merely claiming to be one, infers a process of public scrutiny. The individuals we will be approaching will by definition generally fit within the category of people experienced at what they do. With the incorporation of biographical information into the first component of the inventory, we hope to find differences in the answering of the scenarios on the basis of gender, or employment seniority, LOTE (Language Other Than English), highest formal qualification obtained and amount of ICT experience. Naturally the last two factors will not be high for the novice group given the age group we are dealing with.

### **4. Results and findings**

We present only a very small selection of our results here to illustrate our technique. Our novice population is 20 to 26 years of age, largely male (only 5 females), overwhelmingly ethnic (where ethnic in the Australian context refers to non Anglo-Celtic) and more specifically concentrated in the Chinese and to a lesser extent,

the sub-continental ethnic groups. Finally the novices were generally school leavers (highest qualification was typically completion of secondary school) as one would expect. Analysis of the results revealed that all respondents took the innovation knowledge inventory seriously and none took a neutral 'Neither Good nor Bad' Likert scale option all the way through the questionnaire. To maintain concentration and thereby increase data validity, respondents were given only 4 randomly assigned scenarios along with the biographical component of the questionnaire.

Let us briefly examine the results of the answers for part of the inventory, in this case for scenario 12. With regard to answer 1 ("Wait until the company goes public and its stock options vest then get out of there as quickly as possible"), our respondents were ethically generally ambivalent, hovering around neither good nor bad, but realistically this option was considered on the whole to be a good idea.

With regard to answer 2 ("Reduce annual leave and join another company. You don't have to take that kind of abuse"), the respondents were ethically positive, but realistically more negative. In other words whilst this option might seem an okay thing to do, our respondents felt in practice this was not such a good idea.

Answer 3 for Scenario 12 ("Steal his idea and make some subtle readjustments to make it better then start your own internet company. With any luck you'll be able to bankrupt him and make a lot of money in the process") presents the most interesting result. There is clearly a *very* strong skew toward answering this question in the negative from an ideal or ethical point of view, but our undergraduates feel in practice this option is not so bad with a small majority actually considering the idea positive in practice.

With regard to answer 4 ("Stay with the company for as long as they'll have you. Company loyalty is always appreciated, and the executive's ideas have merit even if he is a jerk"), our novice population is evenly spread with regard to this situation from an idealistic point of view. In practice however the novices are inclined toward considering this option a bad idea.

In answering 5 ("Approach the chief executive and tell him firmly but politely that you don't appreciate his behaviour towards you and the rest of his staff"), the undergraduates feel this is a very good idea idyllically speaking. In practice however, they seem a little more reserved, a small minority even considering this an extremely bad idea.

Answer 6 ("Don't take his insults lying down, rise to the occasion and return them with interest") is taken on the whole negatively by our sample students. What is interesting is that a larger than usual group of 'fence sitters' take a neutral stance ('Neither Good nor Bad') for this question. Only a small minority consider this option both ideally and in practice to be a good idea.

Finally answer 7 ("Try to find out what the executive's real problem is. It may turn out to have nothing to do with you and rather be connected to personal problems. In which case, you won't feel that you are incompetent at your job") was interesting insofar as nobody considered this to be an extremely bad idea. People were generally comfortable with answer 7, and while there were some who took a neutral stance on the whole this idea was received positively ideally and in practice.

The actual responses of the novices are not of direct interest to us. We are firstly interested to see if the novices respond like experts, and if not, what is it that the experts do that is different. Scenario 12 used in this example has been developed from

one of the case studies recorded in [1]. It is interesting to note that option 1 was in fact what the innovator historically chose, though he comments that this option was not very innovative. Instead he recommends option 3 as the most innovative option. This is very interesting because our novices revealed a strong tendency toward intellectual property theft being a bad idea ethically, but starting ones own internet company and bankrupting the competition being a good one in practice. Clearly our novices and our expert have very different views.

Remember that an important part of our research using the inventory was identifying the novelty generation stage a given scenario was at. In the case of Scenario 12, our management students were somewhat divided with regard to the Scenario's innovation development stage. Five students felt the scenario was focusing on *idea generation*, with one of these believing the scenario was concerned with *opportunity recognition* at the same time. The majority of novices (10 out of 23) felt scenario 12 was about *opportunity recognition*. Two out of 23 felt the Scenario was dealing with the *development* stage. And finally 5 students felt the scenario was dealing with the *realisation* stage of innovation.

## 5. Conclusion and Future work

What remains to be done next is to extend the results to examine the remaining 11 scenarios with their respective answer options, and then to perform comparisons with that of recognised innovators. More elaborate data analysis techniques such as our use of Formal Concept Analysis [6] should permit us to achieve finer granularity of result analysis than would otherwise be the case with purely statistical approaches.

Most importantly we need to compare the results we have so far with those gained from recognised innovators. A first step in that direction has seen us contact people such as Professor Gordon Bell [1] after whom 'Bells Law of Computer Classes' is named, who was happy to validate our inventory. The next step will be to find other similarly talented individuals who will be identified through innovation awards and ICT organisations specialising in innovative ideas. We seek individuals who are successful both in a technical as well as an entrepreneurial sense.

The benefits of our approach will be best realised in the HR domain. Once we have developed and validated our innovation inventory, we intend to adapt and extend the tool to allow the scenarios to be randomly assigned to potential and existing employees so that it can be used to identify individuals, and to what extent, they behave similarly to the identified innovators. We will need to devise various algorithms to determine acceptable ranges of behaviour and incorporate the use of weightings to allow some scenarios to be more or less important in generating a score. For personnel selection, the goal would be to provide an innovation index/score ranking applicants to assist with the selection process. The tool may be extended to allow other details regarding other selection criteria to be included to make the process more streamlined.

For training purposes, algorithms will be developed which will provide scores indicating what knowledge is currently lacking in the individual and to propose a

training programme for the individual. To achieve this goal we will need to refer to and incorporate other research in the psychology, training and recruitment literature.

We intend to compare our approach to the key psychometric approaches offered for innovation testing. We propose to administer techniques such as MBTI, KAI or other psychology-based techniques in order to correlate our findings with these other approaches and to validate the NGM. For instance, we will test whether certain personality traits and characteristics or motivations correspond to the phases in the NGM.

It can be argued that knowledge only exists when it is inside someone's head. When it comes to tacit knowledge we encounter even greater objections to attempts to capture or measure it as by definition such knowledge is implicit, unspoken and even unspeakable. In seeking to measure and capture innovation type knowledge, we are stepping into even more unchartered and cloudy waters. By building on findings from management and psychology based research, we are hoping to shed light on the nature of innovation knowledge. However, we want to move beyond the debate to look at the behaviour patterns that can be identified in the past successes of innovators and extrapolate from that what it means to be innovative and who has the potential to be so.

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