Towards a University Design School. Restoring the value of tacit knowledge through assessment

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Abstract: A ‘University Design School’ may in itself appear a contradictory expression, as traditionally the university model of education has been far removed from the design school approach. As the Irish National Strategy for Higher Education (Hunt, 2011) aspires to achieve knowledge creation in tandem with the development of Technological Universities; design sits precisely in the centre of this debate for achieving balance between the existing dichotomies of objectives. The research has mapped the theorists view on how knowledge creation occurs within an educational context. The findings from this research to date highlight that knowledge creation requires a process of tacit and explicit conversions within a shared context or place. Tacit knowledge is significantly over looked in an educational context because it is difficult to communicate, assess and grade. The gap in the knowledge appears to be ‘how’ to assess tacit knowledge in a transparent, measurable and comparable way.

Keywords: Education, Tacit, Knowledge, Assessment, Design

1. Introduction

In Ireland, a national strategy to 2030 (Hunt, 2011), has been issued by the Higher Education Authority. The context of the report is for Irelands need to meet the demands of a changing national and global economy. Past educational methods met the needs of a production-based economy where it could be said, knowledge was consumed or acquired rather than created. Today’s education strategy is to meet the needs of what is described as a knowledge based economy, which demands innovation and where new knowledge is created.

“Ireland’s higher education system has a critical role to play in the coming decades as we seek to rebuild an innovative knowledge based economy” (Hunt, 2011)

Design, by nature is an innovative and creative process. This national strategy therefore is an opportunity to promote design education within the emerging framework. It also explains why it is...
unsurprising that we see design thinking and the design process embraced by industry, policy makers and educational providers alike in this infonomic era. It is however often misunderstood or misapplied as design practitioners themselves struggle to communicate the tacit and subjective nature of the process. This may be the reason design has traditionally been marginalised by the university structure that we now appear to be moving towards. As Wang (2010) explains “many teachers of design believe that their discipline is marginalised, and they appear to yearn for greater academic respectability”. Included in the Hunt strategy is the transition of Institutes of Technology to Technological Universities. The aim is to amalgamate regional Institutions in order to develop better efficiencies and collaboration and ultimately provide university level offering.

“Together, the Institutions will form coherent and inter related systems and collectively will have the requisite critical mass for optimal quality and efficiency.” (Hunt, 2011)

It would appear that a new educational model is required that provides a form of rigour while embraces subjective creativity; it is yet unclear how to provide both.

“In order for design education to become more rigorous – and more academically respectable – it must embrace a new paradigm that values creative experience” (Wang, 2010)

There is a risk of hurtling design into a positivist framework in a bid to excel the intellectual rigour and fortify the traditional university model. As Wang puts it “design is focused on subjective creativity, but the positivist university paradigm is focused on objective rationality” (Wang, 2010). This route would risk the demise of the design school studio, risk the erosion of the subjective creativity and ultimately fail in achieving the desired outcome for innovation and knowledge creation.

This paper begins by defining knowledge in this research context. An important contributor to the subject of knowledge creation is the Japanese theorist Ikujiro Nonaka’s (Nonaka, 1995). Nonaka’s theory of how knowledge is created is used as a framework to view the process in a design education context. The results identify knowledge creation as a cycle of tacit and explicit exchanges. In a design education context, the importance of the design studio in providing the platform and environment for enabling knowledge creation is recognised. Most interestingly however is the uncovering of how the design process itself mirrors Nonaka’s model as a cycle of tacit and explicit conversions, resulting in knowledge creation.

The difficulty identified for design education, as we progress towards a university model is that explicit knowledge has traditionally been what is graded and therefore valued. Tacit knowledge is based on the interpersonal and experiential learning, which is difficult to communicate and measure. Finding a method of assessing such a vital component may restore the value of tacit knowledge as a gradable achievement and ultimately serve to the national strategy purpose of innovation and knowledge creation.
2. Knowledge

2.1 Defining Knowledge

In order to address the research questions we must first explore and define ‘knowledge’ in the context of this project.

Knowledge can be seen as contextual. In other words, knowledge can mean different things to different people in different environments. As Nonaka put it, “knowledge is in the eye of the beholder” (cited in Krogh 2000). Knowledge therefore cannot be stored and moved and necessarily retain the same meaning in every context. “Knowledge itself is mutable’ (Krogh, 2000). Each individual has an inherent viewpoint and experience and therefore open to using and interpreting knowledge in many ways. Under Nonaka’s definition, knowledge is a construct of reality and not merely data compiled that can be memorised and consumed to be regurgitated at a later interval. “the creation of knowledge is not simply a compilation of facts” (Krogh, 2000). This method of compiling facts and memorising content, is reminiscent of educational methods based around the needs of a production economy where it could be said knowledge was consumed or acquired rather than created. Students may memorise information but have difficulty when asked to make meaning of the information by applying it in a different context. Guillot discusses and describes examples of how in the past students simply acquired knowledge without making meaning. “when a student is making meaning, he is struggling with the new learning and attempting to own it and evaluate his own ideas” (Guillot, 2012). This suggests that in an educational context, making meaning or knowledge creation is about learning for understanding and is difficult to define or possibly assign as a teaching and learning method. It would appear to require tacit knowledge as well as explicit knowledge. Michael Polanyi classified human knowledge in this way describing explicit knowledge as;

“Codified knowledge that can be transmitted in formal, systematic language….. It can be expressed in words and numbers and shared in the form of data, scientific formulate, specifications, manuals and the like.” (Polanyi, 1966)

Tacit knowledge on the other hand is described as;

‘highly personal and hard to formalize, making it difficult to communicate or share with others........ It is deeply rooted in an individuals’ actions and experience as well as in the ideals, values, or emotions he or she embraces” (Polanyi, 1966).

Similar to Blooms taxonomy of learning objectives being described as cognitive, affective and psychomotor, the knowing head, the feeling heart and doing hands. It is the combination of these elements which inform tacit knowledge. Krogh would also define knowledge as being both tacit and explicit;

“knowledge can be on paper, formulated in sentences, captured in drawings .... yet other kinds of knowledge are tied to senses, skills in body movement, individual perception, physical experiences, rules of thumb, intuition.” (Nonaka, 1995)

Nonaka is clear in stating however that it is precisely this shifting, context specific quality which makes tacit knowledge a powerful tool for innovation and knowledge creation.
2.2 Knowledge Creation

Nonaka, attributes three elements, which when brought together, enable knowledge creation. (Nonaka, 1995)

The first element, the knowledge assets are the resources available. These are broken down into four categories of assets; conceptual, systematic, experiential and routine. In a design studio environment these assets are the prior learning of the design students, the inherent knowledge they bring, the physical skills they have acquired and the experience of mentors & teachers.

The second element of Nonaka’s theory is based on the Japanese element of ‘ba’ (or place) as integral to knowledge creation. This is what Nonaka is referring to when describing ‘enabling knowledge’. The provision of a shared space that fosters emerging relationships. By providing this space, it creates a shared context “the idea of ‘ba’ or place….context can be physical, virtual, mental or more likely all three.

In a design education context, the ba (or place) may be viewed as the design school studio. It is also part of the knowledge assets, as it provides the physical space and tools to conduct the work. As Nonaka states “knowledge is embedded in ba, and that supporting the whole process of knowledge creation requires the necessary context or ‘knowledge space’” (Nonaka as cited in Krogh 200).

Figure 1. Design studio, providing creative space, enabling free movement and informal discussions  (Designthinking.org, 2016)
The third element is a process of Socialisation, Externalisation, Combination, and Internalisation known as the SECI model (Figure 2). This sees knowledge move through a series of tacit and explicit interactions. Tacit to tacit knowledge converted through socialisation, tacit to explicit knowledge converted through externalisation, explicit to explicit conversion is created through combination and explicit to tacit conversion is created through internalisation.

This third element, the SECI model is of particular interest to the research in design education, as it mirrors the process of knowledge creation in design practice. The ‘Irish National Strategy for Higher Education to 2030’ (Hunt, 2011) has specified the need for knowledge creation. However, educational providers still struggle with what this may mean in an education context. The SECI model may assist us with interpreting the strategies in this context.

In figure 2 we see the theoretical model of knowledge creation as a continuous cycle of tacit and explicit knowledge conversions. If we look at the SECI model in an educational context (Figure 3) and bring the theory to practice, we can begin to better understand the value and recognise a familiarity of the process in action.

Figure 2. Authors visualisation of Nonaka’s SECI model of knowledge Creation
Beginning with, Socialisation tacit to tacit, we can see how informal discussions are enabled by the design studio space as opposed to traditional lecture room facilities. Externalisation, tacit to explicit, reflects how design students create sketch models, prototypes, reports from the ideation and concept generation in the studio space environment. Combination, explicit to explicit, the bringing together of other past and present findings in combination with the new one. Internalisation explicit to tacit, the practice, use and testing of findings, informs the iterative process on which design is based. Which brings us back to socialisation and the informal discussions and ideation. Overall, we can clearly see the importance of the design studio in the role of enabling knowledge, equally important however is the balance of explicit and tacit knowledge, which in turn inform each other throughout the entire design process.

To consider knowledge creation in the context of design education further, we can look at the eight steps of the design process from a standard industrial design educational process (Massachusetts, 2016). It is possible to align the design process as a series of tacit and explicit knowledge exchanges on to the SECI model and demonstrate how it, in itself is a process of knowledge creation. Again, we are bringing the theoretical SECI model to a practice level, one that is familiar to design and we recognise in action.
We can see how stages 1-3 of a traditional design process; the research, the informal discussions, the ideation, sit within the tacit to tacit phase. Stage 4 is converting the ideation to concept, taking the tacit ideation and converting it to something explicit, something tangible such as a sketch or report. Stage 5 relates to the constructing of a prototype, sitting firmly in the tacit to tacit phase as extremely tangible and communicable, relatable to other works. Stages 6-8 see the prototype in use and being tested, creating a feedback experience, moving it from explicit back to the less tangible tacit responses.

Overall, it is clear that tacit knowledge has value. Tacit knowledge is central to design process knowledge creation. The difficulty is tacit knowledge is subjective and difficult to assess. The result is that tacit knowledge is less valued in knowledge creation by the traditional university model.
3. Assessment of tacit knowledge

The World Economic Forum report ‘Future of Jobs’ released January 2016, states that

“with regard to the overall scale of demand for various skills in 2020, more than one third (36%) of all jobs across all industries are expected by our respondents to require complex problem-solving as one of their core skills” (World Economic Forum, 2016)

This emphasises the economic shift is broader than Ireland’s national strategy and reflects a global demand for tacit knowledge skills. The assessment of tacit knowledge is also a problem shared by many disciplines apart from design, such as nursing, engineering and the military.

“assessing student learning in the practice setting is one of the most sophisticated and complex forms of evaluation undertaken by registered nurses” (Price, 2012)

The person responsible for assessment may recognise and appreciate the nuances of learning taking place but may feel unsure about exactly what or how to assess the knowledge demonstrated. It would appear to be subjective and difficult to validate.

“It is understandable that mentors may express doubts about their ability to assess student learning rigorously and fairly. It is particularly challenging for mentors to state confidently what represents a demonstration of learning and competence when asked to decide whether a student is fit to practice” (Price, 2012)

A parallel study conducted on a Bachelors of Engineering course in 1996 in Central Queensland University, also revealed difficulty with areas of tacit learning and assessment. Issues identified were similar to those addressed by Irish National strategy today in education. This included concerns by employers that graduates were unprepared for the workforce, specifically in the area of problem solving, creativity, communication and teamwork; skills we can identify as tacit. The outcome of the Queensland University review was to introduce a project based learning (PBL) co-op programme based on a nominal 50% PBL. The first year of the programme was deemed successful in developing active and independent learning and a thirst for knowledge. However, the major problem area identified was the inappropriateness of the assessment. The learning outcomes may have been effective but ultimately the assessment did not reflect the learning that had taken place.

“while the facilitation of learning had been transformed from a traditional style, the assessment items had remained traditional, in that they consisted of technical reports and oral presentation.” (Jorgenson, 2005)

This type of traditional assessment also notably impinged on the full potential of the learning “students took the safe and conservative approach...rather than taking risks and developing innovative and creative solutions” (Jorgenson, 2005). Assessing knowledge that is verbal and written, works well with reports and presentation but they do not capture interpersonal communication, team building or leadership skills. “The real problem was that collaborative or cooperative learning ....is a means of learning not a method of assessment” (Jorgenson, 2005). The new method chosen by the Bachelor of engineering faculty following a survey of methods (Lejk, 1996) was portfolio assessment. Interestingly Jorgenson highlights an important difference in our understanding of portfolio. Portfolio is more generally associated with a collection of the best of previous works in a commercial or job searching experience, in an educational context it is far more dynamic.
“portfolios are a vehicle to promote reflection and student centeredness and responsibility, and their demonstration, for action learning and development” (Paulson F.L., 1994).

The grading criteria focussed on learning objectives related to attitudes and behaviours as opposed to technical outputs only. The emphasis was on reflection, evaluation and improvement. This would appear to be the correct response and fit the similar needs of practice-oriented learning in a multitude of disciplines, however in practice there were still issues, which arose. There was a lack of standardisation in a portfolio approach, also it was difficult to assess the level of assistance a student may have received and there was a tendency for students to revert to ‘best pieces’ display. These issues were tackled in practice through iterative responses and introduction of reflective journals amongst other measures.

The overall result saw Central Queensland University develop an innovative Bachelor of Engineering program focused on practice-oriented learning. Interesting from a design education perspective is the identification of assessment techniques as the key component in leading the shift in dynamics of student learning. Assessment drives learning. This highlights the need for a specific approach to assessment that captures the broader learning outcomes related to attitudes and behaviours as opposed to the technical outcomes. In order to develop methodologies which may be used to assess tacit knowledge, it would appear to be necessary to first identify the particular tacit skills that are sought after within a context. In other words identifying ‘what’ tacit knowledge is desired and relevant for assessment before considering the best methods of ‘how’ to assess it.

In 2003 Jennifer Hedlund et al conducted a study to identify and assess tacit knowledge in military leaders. The military value many tacit skills, which may not necessarily be part of formal training and assessment. An example of these skills within the military include leadership, or the ability to think on your feet, or the ability to deliver appropriate responses to a variety of situations. The study highlighted the importance of being able to recognise and identify these types of tacit skills. It also identified how different rankings within the military may require different skills, in other words, rank context was important. Subsequently the ‘Tacit Knowledge for Military Leaders inventory’ (Hedlund, 2003) was developed to assess the amount and type of knowledge leaders require for specific rankings. The interesting result was the correlations on tacit knowledge testing and pre-defined leadership effectiveness. This method was demonstrating the value of tacit knowledge but more importantly, it was establishing the tacit skills in inventory format that were specific to a rank and role.

“we developed three inventories representing the unique content of the tacit knowledge items that emerged at leadership level ” (Hedlund, 2003)

By identifying the skills sought after within each rank, it was possible to begin seeking methods of testing these particular skills in order to predict leadership effectiveness.

This approach is of particular interest to the research. Design education is embedded in subjectivity and an interplay of tacit and explicit skills. To devise a method of identifying context specific tacit skills in inventory format would provide a rigorous framework from which assessment methods may be developed.
4.0 Conclusion

Global economic strategies signify the shift from production based economy to knowledge-based economy. This is recognised in Ireland’s national strategy for higher education and has been further developed into a skills specific report. This report, ‘Ireland’s National Skills Strategy 2025’ (Department of Education & Skills, 2016) is about prioritising specific skills that are relevant to the needs of learners, society and the economy.

“We need to create an environment where ideas flourish, not to produce drones with skills, our graduates must have a strong emphasis on creativity and flexibility and think outside of the box” (Department of Education & Skills, 2016)

The report indicates specific skills of importance in the future development of graduate attributes; skills we recognise as tacit.

“skills as identified by enterprise include creativity, innovation and entrepreneurship, critical thinking & analytical thinking, team work, communication and business acumen” (Department of Education & Skills, 2016)

In Irish Higher Education, the Institutes of Technology seek to transition in response to national strategies. Some are transitioning to Technological Universities. This brings the opportunity to create appropriate frameworks for design education, which reflect the merit of design in achieving creative and critical thinkers. The challenge is in providing the rigour and transparency of an appropriate framework for assessment to communicate and transfer these skills.

It is clear, that tacit knowledge has significant value. In a design educational context, it is an intrinsic component in the creative process. The biggest obstacle that inhibits tacit knowledge is the difficulty in communicating it, assessing it and transferring it. Assessment techniques are identified as the key component in leading the shift in dynamics of student learning. This highlights the need for a specific approach to assessment that captures the broader learning outcomes related to attitudes and behaviours as opposed to the technical outcomes.

This research project aims to further explore the merits of creating a form of tacit knowledge inventory, relevant to desired graduate attributes. We can hypothesis that if it is possible to define, what is being assessed, in an inventory format, it will be easier to apply best practice methods of how to assess. If sought after tacit knowledge is captured in this way, it may then be possible as a next phase, to consider methods of facilitating the development and promotion of these skills in some way. Overall, the research and development of tacit knowledge inventories, for the purpose of assessment would support the ability to identify the type of skills that are relevant. This in turn, may provide the necessary rigour for a university model and restore the value of tacit knowledge, to assist national strategic aims.
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