Design and Technology Education and the Concept of Property

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Abstract

Knobler (1971) notes that within society at least three communities are affected by intellectual property rights and these include; the stakeholders who produce and distribute the new knowledge such as Microsoft or Disney, individual generators of new knowledge such as designers and inventors, and the public that seeks access to the created knowledge. This paper considers the inter-relationships between design knowledge and the concept of property. It also addresses the challenges and the implications of this inter-relationships. The paper is divided into six parts.

1. The Introduction
2. Defining the Concept of Property
3. Design and Technology Education in Botswana
4. The Inter-relation between Design Knowledge and The Concept of Property
5. Challenges and Implications for Design and Technology Education
6. Conclusion

The paper is informed by documentary findings and case study to illustrate the debate.

Key words

design and technology, design knowledge, property, rights

Introduction

The 1983 White Paper on Intellectual Property Rights and Innovation in the United Kingdom, asserts that: new products, new services and new manufacturing processes, no less than artistic works or scientific advances, have an idea as their origin. If the idea can be recorded and defined in some way it becomes property – intellectual property which can be bought or sold. Tacit knowledge represents the imagination, intelligence, ideas or talents that reside within an individual, and is much more difficult to codify and transfer. Ideas or tacit knowledge constitute personal and abstract entities which limits its diffusion to others. The concept of property is based on the idea that property must be capable of distinct and separate possession, because people cannot have rights in intangible things (Munzer 1990). In order for ideas or tacit knowledge to be owned they must be made explicit. The advantage of the explicit knowledge in the allocation of rights is that it represents the tangible product that results from an idea.

Kimbell and Perry (2001) suggest that design and technology is about creating change in the made world; about understanding the processes of change and becoming capable in the exercise of change making. In their view, when Honda produces a new car, Westwood a new outfit; Boeing a new airliner, Saloman a new ski, Bovis a new house, or Ericsson a new mobile phone, they exemplify not only the diversity of our material culture but also the creativity underpinning the change making process. Designers are trained to have the ability to look, learn and reproduce what is seen through drawings and models; design is primarily about making ideas explicit in order to communicate information to others (Dormer 1993).

In the production of new products the main advantage of making tacit knowledge explicit is that it facilitates the communication or transfer of information between individuals and different departments and decision making process. The purpose of this paper is to argue that because of the existence of the concept of property the learning and teaching approaches used in design and technology have a dual function. First, they enable students to generate creative and innovative knowledge. Second, they enable students to generate intellectual property.

Defining the Concept of Property

In pre-industrial societies the idea of property was first recognised in the tools which early man made, the animals he subdued and the soil he cultivated (Matthews 2002). The concept of property was applied only to material things or actual possession of material things. Macpherson (1978) however asserts that as soon as any society makes a distinction between property and mere possession either by customs, conventions or laws it defines property as a right. In his view, to have property is to have a right in the sense of an enforceable claim to have some use or benefit of something.

Salmond (1962) claims that a right is any advantage or benefit conferred upon a person by a rule of law, because in his view the interests of men conflict with each other and the rule of justice therefore selects some for protection and rejects others. Demstez (1967) suggests that capitalism depends heavily on markets and private property rights, and new property rights are created to resolve conflict over the allocation of scarce resources.

The economic function of property rights has its roots in Roman law, which made the distinction between the *'law of things'* and the *'law of persons'*. According to Nicholas (1962) the law of things included all those rights which were capable of being evaluated in monetary terms such as land, inheritance, slaves or cattle. The law of persons regarded the rights of a father over his children or the right of freedom itself, as these were usually incapable of monetary evaluation. Property rights are, therefore seen as both an incentive and a method for the efficient use of scarce resources, and allow the owner to internalise both the cost and benefit of the property (Munzer 1990). Macpherson (1978) asserts that, property must be grounded in a public belief that it is morally right; if it is not so justified it does not remain an enforceable claim. If it is not justified, it does not remain property.
There are two main reasons why property rules affect designers. The first reason is because of the nature of explicit knowledge. The second reason is that property rights allocated to explicit knowledge are based on the idea that they are the protection of labour or work, which in turn is a protection of individual rights.

The Private and Public Domain of Explicit Knowledge

Bengohzi and Santagata (2000), suggest that explicit knowledge unless it is hidden or kept as a trade secret is what economists refer to as a public or non-excludable good. Unlike cars or houses that can be locked or land that can be enclosed by use of walls or fences. Once it enters the public domain explicit knowledge is therefore like art in a museum or radio waves the consumption of which you cannot control.

The public or non-excludable nature of explicit knowledge means that the higher its intellectual content and symbolic value, the more likely that it will be illegally copied or re-produced. Innovation through imitation, leads to what economists refer to as free-renters. People who make use of innovative knowledge without incurring the cost of the work that went into both the product development and manufacture of the original product. In order, to control the problem of free renters knowledge, that is considered to have commercial value is attributed private property rights, as a means of protecting its application within the public domain. Drahos (1996) asserts that if knowledge is not capable of being owned the incentive to create it will lack. In his view, intellectual property rights, are social innovations designed to create artificial scarcities where none exist. These scarcities in turn were intended to create the needed incentives for acquiring new knowledge. There is much to this argument. Protected knowledge plays an important role within the public domain, because it is viewed as a reward for making public, vital sources of new knowledge that would otherwise remain a trade secret or hidden if it could not be exchanged for a value.

The Labour Theory of Rights

John Locke (1632-1704) observed that in the process of tilling unoccupied land, man 'mixes his labour' with the land and acquires a natural right in that property. By equating the right to property to the right to life and liberty, John Locke created the moral justification for the individual's rights to private property. In addition, his labour theory of rights encouraged people to distinguish between communal and individual property, in other words the relationship between what can be considered public property and what can be treated as private property. Furthermore, the labour theory of rights became the foundation for the moral justification that the ownership of property (both physical and intellectual) was the protection of work or the labour, time and investment put into creating new things. Laddie (1996) contends that the production of mental labour is property in a fuller sense than that of manual labour, because the worker exclusively created what can be viewed as its value.

Design and Technology Education in Botswana

The concept and model of design and technology in Botswana school curriculum was initially adopted from the United-Kingdom for senior secondary school level and subsequently rolled out to junior secondary school. The subject at the junior secondary level, offered as one of the core subjects, is intended to provide a vocational orientation of academic subjects related to the world of work and forms part of general education. At senior secondary level it is grouped under creative technical and vocational subjects and is offered as an optional subject.

As one of the goals of the junior secondary school programme, design and technology is intended to stimulate creativity and imagination in students as they solve real life problems in their communities. The subject in addition enables students to apply scientific and technological knowledge and principles, knowledge from other subjects and other relevant sources, in problem solving activities related to their communities. The senior secondary design and technology programme building on the junior secondary level therefore, attempts to equip students with a variety of knowledge, skills and attitudes that not only prepare them for further training and employment but for life in general. The programme seeks to instill a sense of appreciation of technology to make sure that students can adapt and cope with changing situations. It provides students with broader design and technology concepts and principles that will allow them to expand their thinking capacity to tackle practical real life

problems in their community. The design and technology further exposes students to a range of manufacturing knowledge, skills and processes. Thereby creating an opportunity for students to develop manipulative skills through the making of their designed products.

The coursework carried out by students during the year embraces both the formative and summative processes. For the aspect of formative learning processes students work under the teacher facilitation as part of the formative learning processes to interact with a range of media and materials while modeling a variety of ideas. The design and technology in this case becomes a process learning experience for students, where they gain feedback to improve on their design and making skills. The coursework is also conducted as part of the summative assessment for certification, the marks awarded contribute towards the students' overall terminal grade in the subject. The assessment of the coursework also influences the inclination of the nature of design tasks. The classroom-based coursework could be assessed separately as part of formative assessment – supporting learning. It could also be assessed for outward looking summative assessment – for passing judgements for external purposes.

The body of design knowledge in the design and technology subject enable students to widen their learning and understanding scope of the domain, that enhances design and making skills in constructing practical outcomes from theoretical knowledge. An example, is whereby students are able to translate and interpret drawings and sketches in 2D or 3D forms and creat 3D design projects. While students are engaged in the design and technology activities, they follow a design process, the product of which is a portfolio and a tangible end product or artifact. The design processes outline series of stages and phases students should undertake in order to accomplish the desired solution to an identified need. The designing phase of the design and technology domain involves students composing a design context: theme or situation and/or design briefs through to modeling solutions and them evaluating these. Through this process the students generate concepts or ideas, conceive, visualise and image these concepts internally in the mind and ultimately translate these into sketches on paper or model them using a range of materials such as cards, paper, found materials and some resistant materials. The latter requires good co-ordination between the mind and the hand. This activity or process exemplifies a creation of a body of knowledge.

As a thought process, design and technology involves students capturing their thinking evidence onto paper. The sketched concepts – recorded on paper and prototyped or modelled project enables students to easily share the knowledge and information generated with their colleagues, teachers and other people. This interaction involved in the learning process as students are articulating their design knowledge, could in some cases involve input from other stakeholders. Subsequently, the information and knowledge generated could be easily copied intentionally by other people who aspire to improve on the generated knowledge and make money out of it without the knowledge of the originator – the design and technology student. All this could happen while students are compiling their portfolio work and during discussions.

Students are taught and nurtured on how to make decisions and choices of materials or processes appropriate for their products. They are also taught how to discriminate between solutions to a need based on a number of design factors: design constraints, costs and other design requirement. The other types of knowledge inherent in this learning experience and activity are: aesthetics (form and shape of the product), technical knowledge (function and materials and processes content) as well as communication capability. The whole process of designing at the portfolio stage, and making of the design product emanating from the design tasks (students producing artefacts without making any reference to hard-copies of records – direct from the head and interacting with the materials) provides tacit knowledge. Tacit design knowledge in this case entails evidence of design knowledge that is known only to the individual students or designer (impression of the design being in the mind).

To demonstrate understanding of concepts and practical design processes and relevance of the conceived solutions to a need, students produce a 3D design product, be it electronic projects or predominantly resistant materials oriented. This making process enables students to interact with different types of materials and processes and interrogate a range of materials in creating the product. Both the design portfolio (an end product of externalised tacit knowledge) and the end design products are good examples of explicit design knowledge inherent in design and technology programmes offered in the Botswana school curriculum. These outcomes are exemplars of students demonstrating their understanding of design and technology design processes and pedagogy as well as their dexterity and articulation of manipulative making skills. The design knowledge in these cases is recorded as portfolio work and created in 3D. The focus of the design and technology programmes in Botswana therefore,

provides students with both tacit and explicit design knowledge. Students are taught how to become explicit in their design activities, for example, designing and making processes involved are classic examples of explicit design knowledge. Such information and knowledge is usually displayed in exhibitions, and/or teachers usually exchange their best students' portfolios to enhance their own student performance in their various schools.

The Inter-relation between Design Knowledge and The Concept of Property

In the process of creating something new, designers make their tacit knowledge or ideas explicit in order to share, verify and critique the viability of their ideas. The advantage of the learning and teaching approaches in design and technology education is that they allow students to not only generate new ideas, but also record aesthetic knowledge (form and shape of the product), technical knowledge (function and materials and processes content) as well as artistic work.

Tacit design knowledge is difficult to transfer because it is personal and usually gained through experience, while explicit design knowledge because of its 2D or 3D nature facilitates the communication or transfer of information between individuals. Kimbell and Perry (2001) claim that because of the openness of the visual, concrete language of design, students work is public and viewable to others as it progresses. The project-based model of learning in design and technology, means that designers are continuously having to make their ideas or tacit knowledge explicit, in order to have others critique or review the progress of their work. The ability to transform tacit information into explicit knowledge during the design process, however makes it a perfect vehicle for the generation of new property. As a result, when explicit design knowledge is transferred or sold, two bundles of property are exchanged the explicit design knowledge, and the rights of use. Aichian and Demsetz (1967) point out that the value of the rights often determines the value of the explicit design knowledge that is exchanged or sold.

Currently in Botswana there is both a formal and informal method by which organisations or individuals are allocated rights to their knowledge. The formal method requires that, comprehensive drawings or images of the finished product are registered to protect their aesthetic or innovative content. In the informal method, artistic explicit knowledge that is recorded during the product development, is automatically awarded copyright. Due to the automatic nature of copyright, designers must be able to prove that he or she was the originator of the original work. While the aesthetic or innovative content is an important component in the formal method, in the informal method original skill and labour are essential; the important point is that there is original expression not simply original thought. For example, Fellner (1985) claims that the majority of copyright in artistic works by designers are based on copyright in sketches, or drawings and the word 'artistic' is used as reference to the manner in which lines and shapes are expressed in drawings.

Implications for Design and Technology Education

Kimbell and Perry (2001) suggest that the deliberate and actively inter-disciplinary nature of design and technology places it at the vanguard of those preparing for employment in the knowledge economy. Though currently limited in its geographical extent, there is an emerging consensus that the knowledge economy is widening the use and value of knowledge or information while dependence on material resources is becoming less important. In the context of a knowledge economy, Kay (1999) argues that the raw material content of a product and its physical characteristics have become less significant in terms of their contribution to overall value. In his view, the competitive advantage in a knowledge economy is derived from the management of knowledge, and the addition of this knowledge to what companies produce.

The advent of the knowledge economy has led to the growth of industries whose major product is knowledge (designers, engineers, scientists and programmers) and those that manage or convey information (lawyers, bankers, managers, accountants, teachers etc) (Reich 1991). The main producers and distributors of knowledge are any companies that depend on knowledge as their main raw material such as software, pharmaceutical, banking, engineering, media, entertainment, publishing, audio-visual, print and graphic communication, photo imaging, and designers. Bertola and Teixeira (2003) contend that one of the main strengths of global corporations is the capacity to train highly specialized professionals, develop knowledge of new technologies and make risky investments in research. These challenges are a problem for most small companies, but for global corporations they are major competitive advantages. For many innovative companies knowledge workers represent not only an important source of new knowledge but also property.

Drahos (1996) contends that intellectual property laws represent an individualistic notion of creativity. The central role of knowledge within the knowledge economy in which we live seems set to increase, rather than reduce the relationship between the knowledge economy and

intellectual property laws. For example, the introduction of the Trade Related Aspects of Intellectual Property (TRIP) agreement of 1994 and the recent Registered Community Design Right (RCDR) of 2001 created to harmonise legislation on design rights in European Union member countries all indicate the increasing use of intellectual property rights in the regulation of knowledge within the public domain.

As Curry (1997) contends, knowledge or information within a capitalist society can only have a value if it is consummated through the act of exchange. For intellectual property rights to create an efficient use of resources, they must be: either owned or capable of being owned; others can be excluded from the enjoyment of the property right and can be exchanged or transferred for a value.

The increasing attempt to privatise explicit knowledge within the public domain raises a number of moral and ethical issues. First, the privatisation of knowledge will restrict access to knowledge within the public domain. Second, the design process is a collaborative process and designers continuously borrow from the ideas of others in order to create something new. Design and technology education needs to begin to debate the inter-relationship between explicit design knowledge and the concept of property, because in the knowledge economy the exchange and transfer of commercially viable explicit design knowledge will increasingly be regulated by intellectual property rights.

Conclusion

Design and Technology education is a multi-disciplinary subject integrating a wide range of knowledge. This knowledge created through the designing process can either be tacit or explicit. The explicit knowledge, therefore suggests that property is generated through production and creation of new products. However, in the teaching and learning of design and technology more emphasis is placed on the creative and innovative aspects of design and technology to the detriment of the property function of design knowledge. There is a need therefore, to raise awareness about the concept of property and its impact on the design process. Because as students are recording their ideas they are also creating property, and any subsequent transfer or exchange of that knowledge has property implications attached to it.

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