Upcycling: Where function follows form

Anthony CRABBE
Nottingham Trent University

Abstract
Up-cycling is a “responsible” design approach in which designers seek to put discarded consumer products, such as bottles, to new and valuable uses, such as making lampshades. Since that approach involves finding new functions for extant manufactured forms, up-cycled products appear to be typical of other products created as a result of both designers and users adapting extant forms to serve entirely different functions. This form-adaptive approach appears to reverse the causal direction implied by Louis Sullivan’s famous dictum “form ever follows function”. This paper then reviews antecedents of the up-cycling approach historically, in order to critically examine the form-function relationship in selected examples of engineering, weapon and consumer product design.

The example of the Venturi tube shows that it can form a component of products with functions as different as wind instruments, carburettors and jet pumps. Although the Venturi effect can only be created by a tube of very specific form, the functions it performs can be very different. Furthermore it is shown that the Venturi effect can be created without use of a Venturi tube, by means of adapting the extant parts of a gas turbine to create a novel secondary compressor.

The same form-adaptive approach can be found in primitive tools which evolved into weapons such as the mace and the billhook. Ceremonial versions of the mace show that the communication of ideas is a crucial function of many designs. Since beliefs and values change over time, communicative functions are not temporally fixed. It is argued that the primary function of many up-cycled products is to comment positively on sustainability issues by demonstrating how consumer waste can be transformed into something far more valuable by creative virtuosity. Consequently, up-cycled designs appear to function less successfully in helping to physically manage post-consumer wastes.

Keywords: design and society, representation, sustainable design, product planning & development
Introduction

Designers frequently innovate artefacts and systems by adapting some pre-existent form to a new function. This is seen in the late 19th Century development of the high rise architecture made possible by W. Baron Le Jenney’s adaptation of a pre-existent system of building steel bridges on American railroads to meet the demands of constructing multi-storey buildings in cities booming within geographically constrained footprints. It then appears ironic that it was one of Le Jenney’s apprentices, Louis Sullivan, who coined the modernist design mantra: “It is the pervading law of all things organic and inorganic… That form ever follows function.” Sullivan’s use of the word ‘follows’ suggests a causal direction in the design process: choose a function → find the form to perform it, as opposed to: choose a form → find a function it can perform.

Yet the historical evidence does not seem to support the primacy of either direction over the other; designers appear to work in both directions. For example, the design approach that adapts pre-existent product forms to different functions is still evident today in the work of those seeking to address the issues of sustainable consumption by means of “up-cycling”, which involves redesigning discarded manufactured goods such as packaging and tyres into new products, such as lampshades and furniture. Hence, up-cycling is an interesting design approach to examine because it invites designers to think more carefully about the form-function relationship identified by Sullivan’s “law”, and in particular, to think about how the functions of artificial objects might be characterised. Seen in historical context, up-cycling is itself one manifestation of a pervasive form-adaptive approach to making objects, in which designers or users adapt an object with one common use into an another, and this multi-functional use of a common physical form may improve understanding of how artefacts, as distinct from organisms, originate and develop into the forms observed. The method of this paper then involves historical review and analysis of a handful of artefacts both past and present, chosen to illustrate features of designed objects that can easily be misinterpreted by those choosing to accept Sullivan’s dictum uncritically.

1. Unprecedented forms

Engineering design provides many examples that appear to best illustrate the notion of form following function. A case in point is the carburettor used in the earliest commercial automobile engines and still employed in small two-stroke engines. The inventive step claimed by Lazar et al’s 1894 patent, illustrated in Figure 1, involved using a converging-diverging tube to entrain and mix volatile spirits with the flow of air drawn through the tube by the intake stroke of the engine. Although the carburettor was undoubtedly a novel artefact, the form of its mixing tube was not unprecedented, since it is a feature of wind instruments such as trumpets, that were being made and used in Egypt in the second millennium B.C. The unprecedented, or “inventive” step, then involved finding a new function for such a tube to perform inside a fuel dispensing apparatus, which was to mix fuel and air in the proportions suitable for a continuous process of combustion in a relatively light-weight four-stroke engine. What made the Lazar invention possible was a scientific understanding of how air flows inside such a pipe, first developed in the late 18th Century A.D. by the Italian physicist Giovanni Battista Venturi, after whom such tubes are now named. Furthermore, the entrainment and mixing effect noted by Venturi is not just used in carburettors, it has been subsequently employed to build wind tunnels and “jet pumps” free of moving internal parts, that are capable of transporting solid particles as well as fluids.
Thus, a physical effect created by a specific physical form permits it to be incorporated in a diverse range of artefacts with functions ranging from the production of musical sounds to the pumping of solid particles. Sullivan’s view of the relationship between form and function then appears correct in terms of the need to design a converging/diverging tube with very specific length to width ratios in order to create the Venturi effect. Yet since the effect can be put to many uses, the Venturi tube is a common component of a diverse range of artefacts, each having a different function to the other. Therefore, designers do not utilise the Venturi effect in the same way in each artefact, and a trumpet will no more perform as a useful jet pump, than a jet pump will perform as a useful wind tunnel. It then appears to be knowledge about the Venturi effect which “leads” to the design of diverse artefacts that serve different functions, and incorporate a common converging-diverging tube component into a plurality of differing product forms.

Moreover, new products also arise as a consequence of designers imagining a new application of the Venturi effect, as in the aerothermopressor, an experimental compressor developed by the US military in the 1940s and 50s, which actually injected water droplets against the flow of hot exhaust gasses from the combustion chamber of a jet engine, in order to raise their pressure before they entered the turbine stage of the engine. In other words, the design strategy adapted the expanding nozzle of a combustion chamber into a secondary compression stage by means of slowing the exhaust gases with a secondary flow of fluids injected through a secondary converging nozzle, thereby creating a Venturi effect without using the physical form of a Venturi tube to do so.

These engineering designs further reveal that artefacts are seldom “pure” forms; they are more typically compound ones, which may happen to incorporate a number of common pure forms such as tubes, wheels, cogs and so forth. The greater the number of such components found in any one product, the greater are the number of possible permutations of net form and function – and to pick up on Sullivan’s biological analogy, the greater are the possibilities for the product to evolve into a different “species”. Consider for example, the way the first mobile telephones such as the Motorola GSM have evolved from radio-signalling devices controlled by basic computer components into mobile computers such as I-Phones and Androids that incorporate radio-signalling components. Furthermore, mobile phones cannot be considered merely as engineering designs, because their design appears driven far more by human than by engineering

Figure 1, Carburettor patent drawing, Lazar et al 1894, (Espacenet)
factors, among which personal status appears especially important, judging by many consumers’ willingness to volunteer themselves into Mac and Android factions. My next examples then involve consideration of the intangible functions performed by the form of an artefact, which include the communication of values and beliefs.

2. Physical and intangible functions

It is hard to imagine a more primitive artefact than a club, the favourite attribute of a caveman in any cartoon. By the middle ages, warriors were better protected from the injuries inflicted by such weapons by skilfully designed and made plate armour. In response, armourers developed far more effective clubs known as “maces” which carried armour-piercing flanges and/or spikes, as illustrated in Figure 2. The cost of making these better designed steel edged clubs restricted their use to the elite class of mounted knights, who in a feudal society held their land and superior social status in return for military service to their lord. The Angevin kings of England were among the most militarily active feudal monarchs of their day, engaged in fighting on frontiers stretching from Ireland to Spain. This meant that much of their governance of these territories had to be performed by proxy, using lesser members of the royal entourage, in particular, highly trusted members of a 20 strong royal bodyguard instituted by Edward 1 in 1278, known as the Sergeants-at-Arms, who were armed with maces for close quarter defence of the king.7

Figure 2, Mace, 14th Century (Wiki Commons)

Since the king also used these formidable sergeants to collect loans and levy taxes from what were often likely to be reluctant donors, it became customary for the sergeants to signify to various regional assemblies and parliaments that they had the king’s authority to start the proceedings by entering an assembly carrying items that made their identity and purpose clear (bearing in mind that many of those present were illiterate and had probably never seen either the proxy or the king before, either personally, or in image). Given the expense and professional obligations of being a royal bodyguard, an armoured man carrying the latest design of mace would be well on the way to convincing the assembly of his position. If he were also preceded by an attendant parading the kind of richly decorated long-sword with which a monarch would “dub” suitably qualified retainers as one of his chosen “knights”, then he would have substantial evidence of his authority to legitimize the proceedings on the monarch’s behalf, as well as an effective close quarter weapon with which to maintain order (a continuing responsibility of British parliamentary sergeants-at-arms).

In former British dependencies across the world, including those which have successfully rebelled against the British crown, governmental assemblies continue to be opened and closed by such a parade of sword and mace, with the latter having evolved from a vicious
looking steel weapon into a decorative confection of silver, as illustrated in Figure 3. Every element of the mace from its finial to its pommel then provides opportunity for the silversmith to incorporate signs of governmental authority, including crowns surmounted by church crosses, coats of arms and other emblems of donors and sponsors. Beyond these signifiers, the ornamental mace also symbolises the wealth, prestige and aspirations of the assembly it legitimates, such that even a modern and egalitarian university like the U.K.’s Open University has a mace formed from a single piece of titanium, a costly high-performance material associated with aerospace industries.

![Figure 3, Ceremonial sword and mace of Drogheda, Ireland (www.heritagecouncil.ie)](image)

It is also interesting to note that the descendants of Anglo-Norman kings continued to favour the mace and long-sword as symbols of their military and civic authority rather than the weapons of the rank and file Englishmen they drew into their continental armies. The longbow and billhook (or English bill) were universally recognised as being the national weapons of English armies. In the 100 Years War, their combination was devastating to the elite knightly cavalry essential to the battle tactics of medieval Western European armies. The bill-hook, illustrated in Figure 4 provides another example of an artefact adapted to serve a different function, since in peace-time it was a pruning tool for peasants who maintained the hedgerows and orchards of their Norman conquerors. For those who saw an opportunity to escape agricultural serfdom by volunteering to fight for French-speaking masters waging war in distant lands, mounting their pruning tool on a longer handle gave them at least the credibility of owning a weapon with which to fight. In battle, the curved “bill” proved particularly useful for hooking and dragging opponents to the ground,8 where an unhorsed knight could be supressed by anyone possessing simply a knife, since that could be inserted into gaps in a suit of armour that existed in the groin or helmet. Alternatively, a swinging bill could be highly effective in piercing armour (although that diminished the opportunity for ransoming a vanquished knight). Moreover, George Silver’s 1599 manual shows that the pole-mounted billhook was used differently in agriculture and battle, since in combat, the pole was essential for parrying thrusts and tripping rushing opponents. In other words, the physical function of the pole appears defined by its different uses in different contexts, and not by any original design intention, such as reaching higher branches when pruning trees. Having proved its worth, the billhook was soon modified by rudimentary blacksmithing into a more specialised weapon, by cutting into the basic form and pulling away strips to form spear like points, or improved hooks, which created the kind of weapon illustrated in Figure 5. This design provided most of the functions of the later halberd used by Swiss and German pike militia who finally made knightly cavalry a redundant military force.9
The ground, where an unhorsed knight could be suppressed by anyone possessing simply battle, the curved "bill" proved particularly useful for hooking and dragging opponents to French-speaking masters waging war in distant lands, mounting their pruning tool on a peasants who maintained the hedgerows and orchards of their Norman conquerors. For artefact adapted to serve a different function, since in peace-time it was a pruning tool for European armies. The bill-hook, illustrated in Figure 4 provides another example of an devastating to the elite knightly cavalry essential to the battle tactics of medieval Western national weapons of English armies. In the 100 Years War, their combination was than the weapons of the rank and file Englishmen they drew into their continental armies. It is also interesting to note that the descendants of Anglo-Norman kings continued to favour the mace and long-sword as symbols of their military and civic authority rather than the weapons of the rank and file Englishmen they drew into their continental armies.

It is fair to assume that for military men of the day, the very form of the bill-hook, manufactured by much cruder processes than the knight’s mace, would have communicated its origins as a modified peasant’s tool, which would hardly be suitable for communicating the authority of a feudal monarchy, even though the billhook was probably responsible for overcoming many more of the king’s knightly opponents than the mace. To the modern historian, the simple modifications of a pruning tool into a weapon that made a band of peasants the military equals of a squadron of mounted aristocrats communicates other ideas, not only about social evolution, but about the way we might choose to view the vestigial traces of medieval society as embodied in picturesque rituals involving ceremonial swords and maces. This may demonstrate that since intangible functions concern communication, they are not fixed, but change over time, according to changes in social attitude and the benefit of hindsight. In defence of Sullivan’s law, it may then be thought that its causal direction becomes more defensible if the notion of function is restricted to that of physical utility. However, the consideration of up-cycled products shows even more clearly how difficult it is to dissociate the physical and the communicative functions of artefacts.

**Up-cycled goods**

Our own age focusses attention more upon the problems of surviving our own means of production than of war. Up-cycling is a design strategy which both professionals and amateurs have adopted in order to address the problems of sustainable production and consumption. Whereas design strategies termed “responsible” or “sustainable” look prospectively at using more sustainable technologies and materials in order to make products and systems, up-cycling involves a retrospective process of finding new functions for extant products no longer suitable for performing their original ones. Characteristically, these expired products accumulate as problem wastes, such as packaging and automobile parts, which if not buried in landfills, are recycled into raw materials that can either be reformed into new products of the same type in a “closed loop” manner (e.g. glass back into bottles) or in a secondary use manner (e.g. timber waste into animal bedding or fuel briquettes). Since designers are seldom directly engaged in the industrial recycling of bulk materials like cellulose, plastics and rubber, their contribution then tends to be limited to either a) prospective consideration of the lifecycle of the products they are now designing, or b) retrospectively finding new uses for products that have already reached the end of their lives. Up-cycling is then a label describing the kind of strategy described in b). Given that the profit motive is simultaneously a cause and a possible palliative to the problem of sustainable production, anyone involved in a b) type strategy is obliged to consider how far they can find solutions for expired products which valorise its residual worth to the greatest extent.
Parallel with these design strategies is what may be termed a “craft” strategy that involves the consumer, rather than the designer following some received DIY formula for re-using common household products. This thrifty maintenance and reuse of domestic items is evident in the colourful slashed and puffed costumes of the Swiss and German militias mentioned above, since they were initially made by repairing the few clothes a peasant soldier possessed with serviceable pieces of clothing stripped from the fallen. In more recent times of need, governments have acted as the providers of the DIY formulae, as seen in the U.K. Board of Trade’s “Make Do and Mend” campaign of the Second World War. With the coming of the worldwide web there are now a host of sources, such as “www.instructables.com” giving useful advice (mostly free) about how householders can either give a new lease of life to expired products, or turn them into other useful items through application of a little craft skill. However, since the object of this craft approach is to reduce personal domestic consumption rather than to create new marketable products, once the cost of labour is factored in, the approach seldom valorises expired products to the degree found in the commercial strategies of recycling and up-cycling.

When practised by professional designers, up-cycling can raise the value of the marketed product higher than the original donor product, as is evidenced by the price of the pleasingly designed recycled tyre furniture items made by Tread, and indeed, similar items made by artisanal enterprises in developing nations, usually following a design pattern copied from some other source, and then marketed to developed nation consumers by locally-based retail organisations. The marketing stress placed on the terms “recycled” and “eco-friendly” for these products, evidences that many developed world consumers are prepared to pay a premium on “responsibly” produced goods, as is understood by supermarkets who place a higher mark up on “organic” foodstuffs, even when there is reason to believe they cost little more than foodstuffs grown using industrialised farming methods. Thus the production and marketing of goods that can wear an “eco badge”, appears predicated upon the perceived intangible benefits of those products.

Perhaps the most valued perceived benefit is the responsible use of materials. Yet when the mass of tyres just in the U.K that are scrapped as unfit for remanufacture can be estimated from 2004 figures at 1350 tonnes annually, it is evident we would need to purchase far more recycled tyre products than we do presently, in order to keep pace. Whereas any quick financial calculation would suggest that if we did keep pace, the effect would be to raise the cost of scrap tyres to a point where it would no longer be economically worthwhile to make recycled tyre products, particularly not by the present handmade processes.

What is then striking about the more successful examples of up-cycled goods is the way they have communicated not only a worthy re-use of expired products, but also a worthy demonstration of artistic prowess. Such a demonstration of prowess is evident in the prize-winning lampshades designed and made by Sarah Turner using discarded soft drinks bottles, illustrated in Figure 6, or alternatively, the baroque wonders made from worn out chain drives and wheel rims by Carolina Fontoura Alzaga, shown in Figure 7. These examples evidence both aesthetic and design approaches familiar from the introductory courses of the Bauhaus and the constructivist sculptures produced by “artist-engineers” like Naum Gabo and Antoine Pevsner. The approach involves taking one, or a few elementary stock forms produced by industrial processes and repeatedly linking the forms together in some iterative manner in order to create a beautiful new form, which can be appreciated in its own right as may a nautilus shell, but preferably, according to modernist design teaching, by forming it into something as useful as a shell is to a mollusc.
Yet as this analogy suggests, in any hierarchy of products serving useful functions, an upcycled lampshade, however beautiful, may not rank as highly as its original donor parts, which presently provide the most cost effective means of distributing potable water and connecting final drives to motors. The much higher cost of these lampshades not only reflects the premium expected for artistically communicative products, but also the fact that their design commits them to being produced by hand, rather than by the kind of mechanised mass-production used to produce the donor parts. Other than thrift products, it is hard to find any examples of professionally designed upcycled products that are a) as cost effective as standard mass-produced designs, b) able to utilise the mountains of consumer waste as effectively as industrial re-processing. Therefore, while it may seem harsh to say so, most present upcycled designs act merely as tokens of what many consumers may believe to be the embodiment of “responsible” design, even though some shine as embodiments of the constructivist aesthetic.

Whilst in terms of physical function, the upcycling design approach clearly demonstrates a reversal of the causal direction implied by “form follows function”, it is not as clear whether this also applies to its communicative function. The lampshade examples appear to evidence the intention of making extraordinary and beautiful objects out of ordinary mass-produced utilitarian products which communicate few, if any aesthetic values to consumers, even if the design aware ones may view the donor products as embodying the kind of “machine aesthetic” celebrated by Purists in the 1920s. Therefore the endeavour to both recuperate and enhance the aesthetic appeal of these expired products through a new design and make business can be taken as evidence of a design strategy having the functional aim of using modernist art techniques to valorise waste products in any manner that develops a mutually satisfactory commercial relationship between designer and consumer.

The fact that it is possible to interpret the messages communicated by these examples of up-cycled goods in either a positive way that views them as demonstrations of how post-consumer waste can be successfully recuperated by good design, or in a sceptical way that questions how successful their design and manufacture is addressing that problem, again indicates that communicative functions cannot be defined simply by appeal to the designer’s intentions. Furthermore, the fact that users can adapt objects such as the plastic bottles used by Sarah Turner to different physical functions, such as plant pots,
Upcycling: Where function follows form.

juice squeezers, reducing the capacity of a toilet flush tank, etc. shows that the physical functions of designed objects are also mutable, according to the needs of their users. So although the designer of such an artefact might feel they have the right to define its physical function, in reality, the users of the artefact have the power to transform that function into something entirely different. Jared Diamond makes this same point about sophisticated inventions, such as Edison’s phonograph. Seeing a money-making opportunity, jukebox manufacturers soon transformed the mechanism Edison intended to be an office machine into a music playing device, which subsequently proved to be physical function most widely performed by consumer owned versions of the phonograph.

Conclusion

Interestingly, Sullivan’s own work does not itself wholly conform to common notions of the modernist aesthetic. He stood apart from his modernist contemporaries in his commitment to ornamenting his new high-rise buildings with virtuoso decorations executed in costly materials, as on the celebrated facades of Chicago’s Carson Pirie Scott department store of 1899. Ironically, this commitment to applied ornament ran counter to the thinking of most of his modernist contemporaries, who preferred to hold Sullivan to his notion that every function of a design, including its intangible ones should be intrinsic to its form, as advocated by Adolf Loos in his 1908 essay Ornament and Crime. The fact that Sullivan found a place for ornament in his own design work suggests that his notion of function was confined to physical utility, rather than any combination of utility with intangible communicative functions. Yet even if we restricted the notion of function to physical utility, the evidence of the examples discussed above does not convince us that designers work only from the choice of a desired function towards the creation of a form that performs that function. The form of a stout stick can suggest a club with which to pound grain, and the resulting effects can suggest the more aggressive functions of weapon, which as it is refined over time to favour those who benefit from the aggressive function, evolves into a symbol of their enhanced status and the kind of society they have helped create. At the dawn of an era in which there is a growing awareness of the need to institute more sustainable means of production and consumption, up-cycling might be seen as a first tentative step among professional designers to explore ways of recuperating expired products by means ingenious, if not yet wholly effective in addressing the physical problems of waste management.

References

3 Lazar, P., Banki, D. & Csonka, J. (1894) “A New or Improved Mixing Chamber for Petroleum and similar Engines”, UK Patent 11,119
5 “Giovanni Battista Venturi.” Encyclopædia Britannica Online.
sophisticated inventions, such as Edison’s phonograph. Seeing a money-making function into something entirely different. Jared Diamond makes this same point about physical function, in reality, the users of the artefact have the power to transform that although the designer of such an artefact might feel they have the right to define its functions of designed objects are also mutable, according to the needs of their users. So yet wholly effective in addressing the physical problems of waste management.

designers to explore ways of recuperating expired products by means ingenious, if not consumption, up-cycling might be seen as a first tentative step among professional growing awareness of the need to institute more sustainable means of production and the kind of society they have helped create. At the dawn of an era in which there is a benefit from the aggressive function, evolves into a symbol of their enhanced status and aggressive functions of weapon, which as it is refined over time to favour those who suggest a club with which to pound grain, and the resulting effects can suggest the more towards the creation of a form that performs that function. The form of a stout stick can does not convince us that designers work only from the choice of a desired function the notion of function to physical utility, the evidence of the examples discussed above combination of utility with intangible communicative functions. Yet even if we restricted suggests that his notion of function was confined to physical utility, rather than any

References

A Speculative Approach to Drawing as Visualizing Thinking

Michael CROFT
King Mongkut’s University

Abstract
This paper starts from the premise that drawing can be a means of visualizing thinking, with an emphasis on the process involved. A gap often seems to exist in the minds of students of visual/material creative fields in ideas-generative contexts, between thought and action. The thesis is that the gap between thinking and doing can be reduced to being near simultaneous, in this instance through drawing. The methodology is practice-based, with a range of contribution from mid-program and final year students of communication design. Drawing is both the means and the subject of the research. The paper introduces the research’s theoretical basis, considers its application and concludes with subsequent developments. Some of the students’ practical work and linguistic responses illustrate points of the text. The research suggests that at prior or early stages of the design process the relative autonomy of the medium itself can offer visual/material suggestions and objects. Due to the ongoing nature of their practice, the students themselves have moved the research on from its original premise. The paper concludes by proposing to continue the research by observing how one can think about and rationalize one’s visual perception of movement at the moment of engagement in the drawing process.

Keywords: learning, participatory approaches, experience, creativity, philosophy, design practice, teaching
A Speculative Approach to Drawing as Visualizing Thinking

Introduction

The paper concerns drawing as a means of visualizing thinking, as conducted in an ideologically broad-based Communication Design program in Bangkok, Thailand, with Thai students studying through English language. The title’s reference to visualizing rather than visual thinking gives emphasis to the process of turning thinking into visual forms. Such a process is speculative in the sense of being conjectural, experimental, and insofar as this is the nature of thinking itself. A purpose of the research has been to introduce drawing situations where this process can be both observed and experienced. The usefulness of such a process has been to suggest an alternative to students’ tendency to formalize their ideas conceptually, where visualizing is a retrospective illustration of thinking.

The content of the research is applicable either to a starting generative mode of design, to an exploratory period prior to designing, or to students of design who have a more generic approach to their practice. Students participating in the research have at the same time been using the practical benefits in their studio projects, either in response to a project brief or as their final year independent projects. These other projects have also enabled evaluation of the research.

The Theoretical Basis of the Research

Students participating in the research have worked on discovering its relevance in and through the work itself, individually and collectively. Confirmation of this is most in evidence in work that a few of the students have moved onto, as described in the Conclusion. The role of this paper’s author, as teacher and researcher, has been to track the issues of the research practically and in relation to the work on creativity and visual perception by the theoretical physicist David Bohm. Additional reference has been to psychoanalysts D. W. Winnicott and Marion Milner, French writer and theorist Hélène Cixous, and philosopher A. I. Tauber.

Insofar as speculation means as yet unproven, notional, and experimental, the kind of thinking commensurate with this is likely to be what (Bohm 2004: 70?) terms "reflective." Such thinking also characterizes the research itself, and the Conclusion introduces areas into which the research has more recently moved. Imaging, according to Bohm (ibid), is carried out in the nervous system, whether or not in relation to an
externally perceived object, and a combination of thoughts "... resolves the
difficulty, first in relation to the image (i.e. in the imagination) and later in
relation to the actual fact." In this sense, visualizing as something which is
at once affected by, and determines thinking, is likely to involve imaging
ideas in process, with their less-than-finished formulation. In a similar
collection of creatively-influenced writing, (Cixous 2005: 37/38) states that 'if
she were less uncertain she would make decisions rather than essays'.
The 20th Century French cultural premise of Cixous is appropriate on the
basis of French theory’s speculation on the relationship between language
and other forms of communication. The process of reflecting is in this
instance considered through the filter of the visual /material medium of
drawing.

Bohm (1980: 23) states that one should not think of the content of thought
and the process of thinking that produces it as separate: "...content and
process are not separately existent things, but, rather, they are two
aspects of one whole movement." This quote has bearing on the integral
relationship between thought and thinking and the medium of their
exposition, how the research has developed, and the role of movement in
the research, practically and philosophically.

A broad definition of creativity as suggested by British psychoanalyst
Winnicott (1996: 13/19) may underpin designing in terms that
acknowledge the role of human subjectivity. Winnicott (1996: 13) states:
"the strain of relating inner and outer reality" relieved by an "intermediate
level of experience" commensurate with the child who is "lost in play." A
3rd year student, B., has stated of her approach to her work:

I should draw to find my own space in those public; before I lose my
chance to get into that space this is my first time to see what I
usually ignore. I will drive into it, through my imagination....

Winnicott’s 'strain between inner and outer reality' relates to the difficulties
that students seem to have in articulating thoughts in an external visual
sense as immediately as possible after their thinking. The research has
therefore explored the medium of drawing as providing "an intermediate
level of experience" psychologically, and for where it is pitched in relation
to the process of designing on a program that is broad enough to include
questions of socio-cultural and personal reflection.

The starting hypothesis of the research, that thought and action relating to
visualizing could be simultaneous, has been challenged by the theory of
(Bohm 1980: 74), who states that thinking cannot be uninfluenced by
memory; this in a broad sense that in turn interacts with sentience and
corporeality. However, according to Bohm (1980: 65), a "flash of
understanding" can often precede thought, which he terms an "intelligent
perception,” after Piaget (Bohm 1965, 1980). Such perception, Bohm
suggestions, is the only phenomenon of the mind which is not conditioned by memory. The words of a 3rd year student, J., reflect this: “It’s kind of confusing when there’s a picture in your head of what the thing looks like that you’re trying to push away, but it’s still there but blurry.” Bohm’s theory, however, does not preclude that students’ tendency to conceptualize at the outset of presenting questions can at least be reduced by a shortening of the time-frame between thinking and acting. Equally, the facility of the flash of unique insight, an “intelligent perception,” remains in place as something which can either precede visual thinking or occur at any point in the process of visualizing.

The proposition that thought is a material process suits the possibility of thinking as transformed into a visual/material medium, and can substitute for more open and less-structured thinking. It could almost be said that the medium has itself to offer as a form of thinking, whereby students participating in the project should be sufficiently unrestricted by their assumptions to interact with what are the medium’s automatic tendencies. According to Bohm (1980: 197), “…something may behave with a relative and limited degree of autonomy, under certain conditions and in certain degrees of approximation.”

The question of human subjectivity links to the above considerations. A reason for encouraging the generative and exploratory character of visualizing thinking is to enable students’ greater self-involvement, especially insofar as the process is creative. If subjectivity is comprised of individual human sensory experience, where many kinds of feeling are common and shared, it should be possible to utilize these and allude to them by visual and material means. Equally, these might be assessable to
A Speculative Approach to Drawing as Visualizing Thinking

some extent objectively in oneself, and comparatively with the subjective experience of others. Fesser (2010: 111) cites the philosopher David Chalmers on *qualia*, or human feelings: "Here there is no gap between appearance and reality, because the appearance - the way things seem, which is constituted by qualia themselves - is the reality." If the basic mechanism of the engagement of feelings is *reflexive*, this is at work before, within, or despite the activity of conscious thought. According to Tauber (2010: 182), there is a distinction between *reflexivity* and *self-reflectivity*, the former as a "passive mode of self-consciousness" and the latter as "an active introspection". 3rd student, B., had the following to say of the approach of her colleague, P., towards his work:

> In our sharing session with my group, we talked about those conscious subject…
> I wonder as she told me that P's virtue is to work with unconscious drive.
> He's born and live his life with unconscious driving.
> But my unconscious drives quite weak so I work with conscious mostly.

Debatably, students' individual enquiry into how their subjectivity works in relation to their designing will facilitate their appreciation of the reciprocal interplay of this from the client or beholder's point of view.

Similarities with the topic of this paper are apparent in recent research by Nell Breyer, *Motion Perception: Interactive Video and Spatial Awareness*, Journal of Artistic Practice, Current Issue (2011), who uses the medium of interactive video to consider how 'human movement drives the phenomenology of space', particularly the sections *Tuesday: Volume*, concerning space, and *Wednesday: Time*, concerning movement.

**The Approach in Practice**

The research project has been explored between six classes. Four of the classes have been with 3rd year Communication Design (CMD) students and two classes, Final Project Preparation and Final Project, have been with 4th year CMD students, over two semesters. Of the four 3rd year classes, the main two have been Parallel Studio/Drawing (which is a supportive concept to the design studio) consisting of ten students. These same students have explored their studio projects mainly through drawing, with the paper's author as their main advisor. Eleven 4th year students have approached their final year through their interest in drawing and 2D image-making and several 3rd year students have started to use drawing in their more independent work.

The Parallel Studio/Drawing class has involved several exercises concerning articulating movement through drawing, and two exercises that
have been objectively structured around visualizing thinking. The following short descriptions indicate the scope of the drawing exercises across the two groups.

A three-hour drawing exercise, *Two Time-lapsed Photos*, conducted with 3rd year Parallel Studios/Drawing students, concerned linking two time-lapsed photos from a cinematic narrative through drawing to suggest continuity across the gap in time and the missing transition/s. Students were required to respond to a precise set of verbal instructions.

A three hour drawing exercise, *Drawing Verbal Prompts*, conducted with 4th year Final Project Preparation students and with participation of some 3rd year drawing students, formed the generative basis of the 4th year students' independent work. This exercise was also an experiment in formalizing a situation where students would respond with near immediacy to linguistic prompts. The exercise resulted in six A2 charcoal drawings from each student. Students were provided with several keywords, for example such terms as 'object'; 'relation'; 'contrast'; 'separate/combine', as prompts from each of Mimicry; Time; Cause and Effect, each prompt producing one drawn response at a time, resulting in each drawing having several steps.

Students were instructed to respond immediately to the prompts with the first thought that entered their heads; this translated visually and materially...
through the medium. It was stressed that whatever the students drew should as nearly as possible correspond with their first thought.

According to Bohm (2004: 62): "...we have to consider the relationship between imagination and reason if we wish to obtain an adequate account of the operation of the process of thought." An illustrated presentation to both student groups theoretically contextualized the work that they had been doing in terms that encouraged them to be more aware of the role of their personal subjectivity, hence being able to read the difference that often exists between the generating thought and its visual/material outcome. A 4th year student, G., wrote the following on the process:

While I draw these project, when listening to the keyword I try to analyze, connect, and modified the meaning of the words. So I draw it by a raw Idea which on my head first. The interest point is the Image which pop up in my head that is a kind of the main perception then from the thinking base transfer the image as fast as possible for avoid the modification thinking to decrease the gap between two senses as close as possible that is the kind of Idea about transferring information between senses.

In a presentation to both 3rd year and 4th year, participating students were introduced to Marion Milner's *The Hands of the Living God* (1969), a psychoanalytical case study by Milner of her patient, Susan, through an exploration of the latter's doodle drawings. A key point, through direct reference to Milner, was that "...a symbol is both itself and the thing it stands for, without being identical to it." (2011: 46), in other words the idea that meaning can either be suspended or felt to exist in ways that do not obviously correlate with drawings' visual and pictorial qualities. In the semiotic context, Chandler (2004: 35) states that “…communication and media theorists… stress the importance of the active process of interpretation, and thus reject the equation of ‘content’ and meaning.” It was explained to students that Milner’s project with her patient was to help her to pass through her emotional block and achieve once again, “free compliance with the outside world.”
Reference in the presentation to Cixous’s corporeal visual/psychological interpretation (1998: 38) of several major artists’ drawings: "...we want to draw the instant. The instant which strikes between two instants," contextualized the question of reflexivity in terms of professional artists’ practice. The suggestion of wanting to achieve immediacy between thought and action recalls the question of thinking in relation to the interaction of the creative agent with the autonomy of the medium, as posed by Bohm.

Thinking in may consequently define the silent immediacy of engagement with the activity, while thinking through may relate to retrospective thought-based and linguistic communication of the form, content, purposes and suggestions of the resulting drawing. It was useful too, in a cautionary sense, to convey the point that Milner makes about her patient: "...an extreme and excessive concentration on logic and outer things at the expense of both reverie and fantasy." (2011: 47)

Several exercises in stop-frame drawn animation provided the basis of focus on movement. The formality of the routine of stop-frame drawing, instead of disrupting students’ imaginative flow, seemed to allow them to explore their imagination in an almost meditative sense. The sense of the students understanding the space which they were constructing through their own corporeality is substantiated by Böhme’s phenomenological interpretation (2003): “The space of bodily presence is essential to my bodily existence, since to be bodily present means to find oneself within an environment." The research has more recently involved specific exercises in drawing movement with some students.

An approach to thinking in the activity of drawing in a free-form sense with 4th year final project students has resulted in a tendency towards self-reflective abstractions of the body.
The Research’s Conclusions

Insofar as thinking in and through the medium of drawing is now in process, a way forward with the research has been to focus more closely on the question of articulating movement. According to Arnheim (1972: 379), similar to (Bohm 2009: 245), “Stroboscopic motion... takes place between a memory trace and the percept of the present moment.” Stroboscopic may here mean the perception of an apparently automatic tendency of marks made, which appear to move in their repetition across the drawing, and the apparent movement of the object and its aspects, to which the marks refer. Self-observation in this instance may take the place of self-reflection, in an investigative context, as further example of how human consciousness interacts with what are conventionally viewed as being external phenomena.

A specific current question of the 3rd year design studio class, to which some of the 3rd year students are responding through their interest in drawing, concerns visualizing time & space as a dual phenomenon in the context of memory. According to Bohm (1980: 268), “…sequences of moments that ‘skip’ intervening spaces are just as allowable forms of time as those which seem continuous.” It is proving useful to adapt the question of articulating movement in drawing to that of the lapse of time that such a question spans in the process, and how shapes that are generated can be read both as figure/ground reversals and spaces in the Bohm sense. The 3rd year students have not yet begun to individualize this to their own needs in respect of the project brief, but the idea has been put to them that the movement drawings can be adapted to the project through this direction of their thought.
A Speculative Approach to Drawing as Visualizing Thinking

Two sets of visual studies by a male 4th year student (left), and a female 4th year student (right), who are exploring self-reflectively through the human image (2012)

The Research’s Conclusions

Insofar as thinking in and through the medium of drawing is now in process, a way forward with the research has been to focus more closely on the question of articulating movement. According to Arnheim (1972: 379), similar to (Bohm 2009: 245), “Stroboscopic motion... takes place between a memory trace and the percept of the present moment.” Stroboscopic may here mean the perception of an apparently automatic tendency of marks made, which appear to move in their repetition across the drawing, and the apparent movement of the object and its aspects, to which the marks refer. Self-observation in this instance may take the place of self-reflection, in an investigative context, as further example of how human consciousness interacts with what are conventionally viewed as being external phenomena.

A specific current question of the 3rd year design studio class, to which some of the 3rd year students are responding through their interest in drawing, concerns visualizing time & space as a dual phenomenon in the context of memory. According to Bohm (1980: 268), “…sequences of moments that ‘skip’ intervening spaces are just as allowable forms of time as those which seem continuous.” It is proving useful to adapt the question of articulating movement in drawing to that of the lapse of time that such a question spans in the process, and how shapes that are generated can be read both as figure/ground reversals and spaces in the Bohm sense. The 3rd year students have not yet begun to individualize this to their own needs in respect of the project brief, but the idea has been put to them that the movement drawings can be adapted to the project through this direction of their thought.

Michael CROFT

4th year students drawing two seated human figures, placed back-to-back, while moving slowly around them, repeatedly (2012)

In the context of interactive video, Nell Breyer (2011) has stated: “We can switch immediately from taking in one instant of time discreetly to many instants of time layered or merged together. …our understanding evolves through individual, empathic translation and physical engagement.”

There is some indication that self-reflective involvement in drawing is being more deeply appreciated, where drawing, in this instance, is a channel for the medium generally as a means of personal conversation. One 3rd year student has also been using drawing as part of an independent study of a ramshackle wooden house and its owner, where her drawing also interacts with poetic text as a means of externalizing her dialogue with herself.

3rd year student, V's use of drawing for a project outside of the curriculum (2011)

He cut himself with the wood, twice
She said
And disappear

There's more than 3 persons here
His past, this I call one
He is two
She is three and myself is four
Some 4th year students are now also using drawing independently, either as a main medium or as a key support medium. Such developments confirm that students have gained from the drawing experience, and can continue to engage in the program's familiar content through being more immersed in a medium which conveys strong implicit visual/material characteristics.

4th year student, G’s drawings in black ink that attempt to visualize internally sensed muscular tension (2011)

The main linking thread in the research between a variety of exercises and two groups of students with differing needs on the program has been the question of how one thinks in and through the medium, and by dint of thinking that results in seeable and readable material, in a semiotic sense, how one communicates thought. Insofar as the transcription of linguistically presented or formulated ideas into a visual/material medium is nevertheless problematic, increased by teaching and learning in the context of English as a second language, the immediacy and subjective relative warmth of the medium of drawing has helped to facilitate this process.

References


A Speculative Approach to Drawing as Visualizing Thinking

Some 4th year students are now also using drawing independently, either as a main medium or as a key support medium. Such developments confirm that students have gained from the drawing experience, and can continue to engage in the program's familiar content through being more immersed in a medium which conveys strong implicit visual/material characteristics.

4th year student, G's drawings in black ink that attempt to visualize internally sensed muscular tension (2011)

The main linking thread in the research between a variety of exercises and two groups of students with differing needs on the program has been the question of how one thinks in and through the medium, and by dint of thinking that results in seeable and readable material, in a semiotic sense, how one communicates thought. Insofar as the transcription of linguistically presented or formulated ideas into a visual/material medium is nevertheless problematic, increased by teaching and learning in the context of English as a second language, the immediacy and subjective warmth of the medium of drawing has helped to facilitate this process.

References


