Part III: Research about Design
5 Design Methods

Until we learn to comprehend we haven’t a chance of learning how to control it (Nelson, 1957, p. 7).

Introduction

The nature, purpose, and process of design often are represented in literature as highly contentious (see J. M. Carroll, ed., 2003; Cross, 1984; Dourish, 2001; Margolin, 1995; Rogers, 2004; Suchman, 1987). Once grappled with, the resulting body of knowledge contributes to and impacts various perspectives and practises in a range of design-related disciplines. Because of this, a variety of approaches are demanded of designers and thinkers in this field to equip them to articulate the nuances required to define, describe, and contribute to the understanding of design and its practise.

In Part II of this thesis, I established the materials of the design situation. The focus of this chapter is to examine the variety of methods employed in the planning and production of design artefacts. Gaining a clearer understanding of the circumstances surrounding the approaches and objectives of various design methods emphasises the subtle, underlying strategies employed in design practise. I begin by developing an understanding of the way in which philosophic methods can assist in the analysis of design methods. I then proceed to discuss how this knowledge can be used to shape the design process, and realise a particular outcome. I do this in order to ascertain if an operational method for the planning and production of design artefacts offers a way in which complex information can be simplified in a manner that is relevant to the diverse practices of movement composition as Labanotation scores.

I conclude the chapter by suggesting that a method for the planning and production of design artefacts alone is not enough to support a way of thinking and acting in design. I argue that the combination of useful knowledge from both the arts and sciences is necessary for a way of thinking about design, and actually working with the stakeholders and materials of a design situation. I suggest that a strategy for design gains significance in the development of this research and the design of a prototype
application that facilitates diverse practises of movement composition as Labanotation scores. I further elaborate on a strategy for design, with regard to the design and development of the prototype application LabanAssist in Chapter Six.

However, before I advance my argument regarding the methods of the design process, it is important to understand the complexity of the area of design theory and its attendant practises. In this chapter, I deal with this complexity using a series of headings in an attempt to simplify the area. If we accept that the characteristics of design, the act of designing, and the nature of design all are complex concepts; then it is possible to see the benefit in the generation of an approach or strategy that supports the designer in negotiating and managing this complexity.

**Characteristics of Design**

Definitions concerning the nature and practise of design are both widely available and numerous (Atwood, McCain, and Williams, 2002). As an example of the multiplicity of views that exist within the field of design, Jones (1992, p. 15) provides us with a definition of design that serves as a means to “initiate change in man-made things.” Alternatively, Simon (1996, p. 114) regards design as a way to manage the objectives of design by “devising courses of action aimed at changing existing situations into preferred ones.” While Ehn (in Atwood et al., 2002, p. 126) considers design “a democratic and participatory process,” this contrasts with Rasmussen’s and Vicente’s (in Atwood et al., 2002, p. 126) explanation of design as an approach to “creating complex sociotechnical systems that help workers adapt to the changing and uncertain demands of their job.” If it is accepted that this is a limited representation of the available definitions of design, the consequences of this diversity present design theorists and practitioners with an overwhelming variety of theories and methods that can be called upon for the conception, planning, and production of design artefacts.

The resulting variation in response to design problems further underpins and adds to the reality that global differentiation is evident in the values, culture, and circumstances of its peoples. The diversity in which design is considered and practised resonates throughout the record of design history as a deliberation of its subject matter (Buchanan, 1992) rather than a coherent body of knowledge that establishes a
foundation for the discipline of design. While there is a need for the articulation of
design as a discipline in its own right, this is not the specific intent of this research.
Design contributes to the rich cultural fabric of society in the service it offers to enrich
the human experience. For this reason, there is a necessity for design to draw upon a
variety of established disciplines; not only to demonstrate the academic intellect and
rigor of design practise, but also to enable the integration of knowledge from a range of
disciplines to increase the potential for successful design outcomes that have a greater
impact on society. In doing so, the interdisciplinary nature of design can be effectively
augmented without reducing design to a subset of another discipline, or elevating it to a
position of preeminence over others.

Cross (1999, p. 10) summarises the complementary range of activities designers use
from a variety of paradigms in design practise as “designerly ways of knowing.” This
extends from Archer’s (in Cross, 1984) argument that there is an effective way in which
designers think and communicate that is fundamentally different from traditional
scientific and scholarly methods of inquiry. In focusing on “designerly” ways of
knowing, thinking, and acting (Cross, 2001, 2006) in a much broader sense, it is
possible to appreciate the benefit a range of theoretical and practical knowledge can
bring to the act of designing. By extending the boundaries of design to encompass
scholarship from the arts, humanities, and engineering fields; designers may utilise the
tools necessary to shape human experiences and address the complexities of design
practise.

Rittel (1972a; Rittel and Webber, 1973) characterises design as the simultaneous
evolution and understanding of a design problem and its solution. This view emphasises
the continual challenges designers face in specifying and creating form, while Schön
(1995) takes a more practical approach to designing, and focuses on the aspect of
making design artefacts. In doing so, the act of designing becomes an interplay or
conversation with the items and subject matter of a specific situation. Similarly,
Glanville (2002) describes design as a circular and conversational method of creating
innovative concepts and artefacts, while Krippendorff (2006a, p. xv) tells us that
“Design is making sense of things.” This is not so much a literal statement as it is an
interpretative one, where the emphasis of design products focuses on the capacity of a
product to be comprehensible to its users (Krippendorff, 2006a). These descriptions
briefly characterise design in a variety of ways that supply us with an understanding of various viewpoints that inform design practise. This suggests that the perspective we bring to the act of designing influences the way we think about, approach, and practise design; which directly impacts the design outcome.

In view of the diversity in which design is considered, this research proceeds on the basis that design is an integrative or transdisciplinary (Margolin, 1996) process of bringing differences together for the embodiment of a design outcome that enriches the human experience. While this description illustrates the manner in which design can be understood, it is necessary to further identify the central elements of design practise that we need to consider in order to enhance our ability to act effectively in design. This is because the nature of design and the act of designing are intimately connected to how we think about, practise, and evaluate design.

The Act of Designing
Successful design relies upon the integration of a variety of dynamic components. Individual, institutional, stakeholder, and end-user needs and requirements that embody personal and social values are elements of design that require careful consideration. These variables demand that design responds appropriately to variety and choice. This brings limitation and constraint to the design situation that ultimately results in compromise. Petroski (2003) argues that there rarely is a design outcome that is faultless to a point where it successfully satisfies an amalgamation of competing objectives. Hence, design is not perfect (Petroski, 2003). With this in mind, the results of designed objects or products do not attempt to represent a perfect resolution of circumstances in a design situation; nor is this possible. The ability of a designer to achieve an effective combination of these elements; and to produce an outcome that is useful, usable, and desirable; depends upon the approach taken in the act of designing to address these objectives.

Literature from the modern movement of design emphasises the creation of design objects from a scientific perspective based on objectivity and rationality (Cross, 2001). Typically, design involves the creation and organisation of materials for a distinct purpose. It involves the invention and formation of novel structures, while science
generally concerns itself with the discovery of the components of existing structures (Cross, 2001, 2006). Jonas (1999) discusses the notion that design could be regarded as the interface between “what is” and “what could be.” While this concept underpins the creative and innovative nature of design, the aspect of uncertainty in “what could be” represents a central issue in the conception and planning of design. This is the difficulty associated with planning and envisioning the unknown before a final solution is conceived (Rittel and Webber, 1973). They are referred to as “wicked problems” (Rittel and Webber, 1973) because they are characterised as being ill-defined or indeterminate. For the designer, “wicked problems” are intrinsically complex due to the absence of a prescribed formula or solution to their resolution (Rittel and Webber, 1973). This is because the nature of understanding a problem is related to the approach taken to solve it, where the definition of a problem develops into a specification and resulting methodology that will impact upon the direction in which the solution is derived (see also Chapter Six, “Systematic Inquiry”).

Dorst (2006) maintains that the capacity of a problem-solver or designer to understand a problem directly influences the nature of its wickedness. This suggests that the resulting varieties in which wicked problems are interpreted and resolved render them indeterminable. With this in mind, a specific design solution cannot be said to accurately or inaccurately embody the competing objectives of a design situation when the perspective of the designer, in the act of designing, is a dominant factor in its outcome. The capacity of a designer to manage the development of a design situation; determine a useful combination of knowledge to support its resolution; and devise a suitable course of action to achieve this; will directly impact the success of the design outcome.

Buchanan (1990) tells us that there are two distinct components to the practise of design. They involve the appropriate conception and planning of a specific type of product, and the ability to elucidate the results of its outcome from reasoning or principles (Buchanan, 1990). An example of this reasoning is Kunz and Rittel’s (1970) “theory of strategic argumentation.” The theory provides an argument for how a planned or a designed resolution should function under certain conditions that are substantiated by warranted stakeholder claims (Cross, 1984). This suggests that argumentation can be employed as a method of passing judgment regarding the type of
design decisions that should be made. Fundamentally concerned with design potentialities, dialogue-based planning processes make a shared process of learning, understanding, and negotiation possible (Krippendorff, 2006a; Liedtka, 2004). This process necessitates the participation of the potential users of a proposed product or service. In support of this, Aristotle (in Z. K. McKeon and Swenson, 1998) distinguishes between a user who knows the form of a product from practical experience, and a craftsman or designer who is guided by these insights in the creation of new products or services. This becomes significant when the purpose or intended function of a product is not realised to its full potential, and the fundamental design of a product fails to perform in an anticipated or appropriate manner to meet the needs of a specific community of users.

Rittel and Webber (1973) argue that testing methods based on scientific evaluation are not equipped to deal with the uniqueness of design problems or situations affected by the dynamic variables of conflicting objectives. Particularly in situations where the consequences of global differentiation and equity issues are considered, efficiency tests as measures of successful design are deemed inadequate (Rittel and Webber, 1973). In light of this, communication or argumentation that supports design thinking and reasoning can be leveraged to facilitate critical reviews of design concepts at various intervals throughout an iterative design process by supporting the simultaneous development of the design problem and solution (see also Chapter Seven, and Chapter Eight, “Task Analysis Workshop”). Design practises that involve the elucidation of design results provide a way of thinking that facilitates the production of products or artefacts (Buchanan, 1990).

The Nature of Design

Fundamentally, design is a human activity (Glanville, 1988). It is inextricably tied to our actions and how we compose our thoughts (Glanville, 1988; Schön, 1995). Petroski (2003) argues that, because design is an implicit part of our daily lives, we are instinctively aware of what it entails. The creative exploration and discussion of concepts; and the ability to envision future states and facilitating variety and choice; all are characteristics of design thinking (Jonas, 1999). This is how designers build novel ideas. If we accept that design is a fundamental aspect of how we think and act, then we
can begin to understand how strategic design thinking can assist designers to conceptualise and account for the constant change of modern day culture to offer innovative design solutions that shape and enrich the human experience. By augmenting Jonas’s (1999) notion of design, it is possible to suggest that, in the act of designing, the designer is integral to the interaction between “what is” and “what could be.” Again, the subjectivity of the designer as a significant factor in the design process is emphasised when the perspective of the designer and his or her involvement in the act of designing contribute to the outcomes of design thinking and working.

Buchanan (1990, p. 78) tells us that there are three basic issues in the nature and practise of design: the subject matter of design; the methods of design thinking and working; and the purposes or goals sought in design. Throughout the design process, designers experiment, invent, discuss, argue, review, and agree upon a set of specific circumstances in a design situation. This involves interacting with various users in order to gain an understanding of what the design situation is, and collaboratively formulate what a desirable solution could be. In actively formulating the components of a design situation (the subject matter) and proposing an approach for its reformulation (the methods of design thinking and working), there is a danger that designers may construct arguments and explanations for design outcomes that are well suited to the needs and purposes (the goals sought) of the design situation they themselves create (Rittel and Webber, 1973). This suggests that the involvement of the designer in the act of designing, and the perspective which they bring to design, are key factors that shape the design process. However, in the act of designing, it is necessary for a designer to obtain an objective account of user needs and requirements. In order to avoid constructing a design outcome that satisfies the goals of a design situation, as perceived by its creator, a designer’s ability to consider these needs from an objective standpoint is vital to the success of the design outcome.

Returning to the second element of design practise, argument-based reasoning serves as a means to capture user-centred research though an exchange of information between the designer and various stakeholders to reach a common goal (Achmad and Haruo, 2003). In this light, design can be seen as a form of conversation in which elements of the design situation are negotiated between two parties to develop a desirable outcome. Hence the collaborative development of the design situation facilitates the collective
learning of required objectives between the designer and stakeholders through a cyclical process of negotiation and mutual understanding. This means that design becomes a shared or co-creative process which must consider the designer’s interaction with the participants in the design process, and the individual understanding they each bring to the design situation. In the same way that dialogue-based planning facilitates a shared process of learning, understanding, and negotiation; conversation theory developed by Gordon Pask (1975) serves to make new knowledge explicit through conversation, learning, and mutual agreement. With this in mind, disciplines that can be leveraged for their ability to include the designer as an observer and participant in the design process, and to provide a framework in which a designer’s subjectivity may be better understood (Glanville, 1999). I discuss this notion further in Chapter Six, “A Conceptual Framework.”

**Design Methods**

In the past, a designer was thought to have made creative leaps and value judgments based on an innate sense of intuition (Archer, 1965; J. Christopher Jones, 1992). Portrayed as an innate sense of intuition, or even a “magical” element of creativity, early design methods alluded to a variety of forms of clarification or description as a foundation for innovation (J. Christopher Jones, 1992). It may appear reasonable to associate these aspects with a designer’s ability to innovate; however, design methods that guide the practise of designing have a history that can be traced; as can their influence on contemporary design processes and strategies. This knowledge can be leveraged when points of understanding are used as a tool to help clarify the pluralism that exists in design and the confusion surrounding various methods of approach (Z. K. McKeon and Swenson, 1998). Design methodology can be broadly defined as the study of principles, practises, and procedures of design (Cross, 1984). However, the practise or act of designing requires an approach that facilitates the creation and production of artefacts, products, or services.

The examination of strategies developed by central and influential figures in design theory and practise illustrate the various methods of design thinking and working used to conceive and create design products (Alexander, 1964, 1971; Buchanan, 2001a, 2001b; Cross, 1984; Gropius, 1955; J. C. Jones, 1963; J. Christopher Jones, 1992; J. C.
An analysis of the literature provides a basis upon which the appropriateness of design methods to a variety of issues and problems in the act of designing may be carefully considered. In this way, a systematic design approach that supports the clarity and simplification of complex information may provide an insight as to how the design process for the prototype application LabanAssist can be shaped.

As Jones (1992) tells us, these methods are equally as diverse as the processes they describe. For situations where creativity, discovery, or innovation occur; there cannot be a standard method of application readily available for such circumstances (Z. K. McKeon and Swenson, 1998). Nor is the practise of design simply a matter of pronouncing a fitting set of ingredients that will do the trick. In this context, Simon (1996) describes design as an academically challenged “cook bookery” discipline. For this reason, gaining a clearer understanding of the circumstances surrounding the problems and objectives of various design methods will help to emphasise the subtle underlying strategies employed in design.

**Interpretation and Analysis**

This is by no means an exhaustive study; nor is it strictly chronological or historical in its account. Instead, I provide a general view of the design methods used during the late nineteenth to early twenty-first century to gain insight into the way in which design processes have evolved. In an attempt to identify the nature of design methods and the differences between the kinds of approaches described, McKeon et al. (1994), and Watson (1993), supply us with a schema for their interpretation and analysis. This provides a lens through which to analyse a variety of approaches utilised in design. It enables a designer’s perspective and system of approach; designed to facilitate the processes of inquiry, analysis, and synthesis; to be interpreted. The recognition of a logistic, operational, dialectic, or problematic method in the examination of existing design practises provides a foundation for this understanding (Z. K. McKeon and Swenson, 1998; Watson, 1993). As such, they are not commonly used as a basis for the analysis of design methods in that they employ philosophy as an underlying theory. They are philosophic methods.
A logistic method is one of construction. It begins the development of a design solution from its smallest element, which is utilised as a foundation to produce an outcome. The designer adopting this method is void of a perspective in the creation of a design solution. This is because the practise of a logistic method is one in which individual judgements are withheld to allow for an objective and logical account of data analysis. Its necessary objectivity thus ensures consistency and certainty as a method of reasoning and decision-making, which is not subject to personal interpretation or bias. This is where the practise of design may be understood, not as a science, but as the rational solution to practical problems similar to those known to engineers and computer scientists (Z. K. McKeon and Swenson, 1998).

In circumstances where contradictions or conflicts arise in the development of a design situation, the designer that employs a dialectic method endeavours to reconcile these differences. Through conversation and the opinions of others, mutual understandings may be established to reach a common goal. In this way, a designer may assimilate known differences to design an inclusive or comprehensive solution that extends its value to a larger context—one in which an harmonious balance between the relations of a design situation from part to part, part to whole, and whole to part exist as a result of their mutual participation and unity (Scully, 2003). Design practises are tailored to meet a particular set of circumstances surrounding a design situation.

The problematic method, as suggested by its title, turns toward the resolution of a problematic situation as it is encountered from a designer’s experience. This is where the relation of its parts, the materials, and functional elements of a design situation are significant to a whole, and are examined with regard to a whole that is significant to its parts. A designer that utilises this method creates the form of a product based on the analysis of raw materials or data, and seeks to synthesise these initially disparate or indeterminate elements into an organised and integrated whole (Watson, 1993). It is a method which is based on a particular correctness of the designer that stems from an inquiry into a felt or known difficulty in the conditions of a specific situation.

Theoretical knowledge of the subject matter of design; gained from careful analysis of the elements of the design situation; guide and inform the synthesis of a design outcome (Aristotle, 2005; Dewey, 1938). Design practises that follow this approach are based on
discovery and invention that aim to transform the conditions of a problematic situation (Z. K. McKeon and Swenson, 1998).

An operational method takes the view that a single, clear-cut belief or statement of fact does not exist as a basis for thinking and working in design. In recognition of the pluralism of ideologies and worldviews, a designer’s perspective and judgements made during the design process are central to the distinctions or arguments made in support of the actions taken to reconcile these differences. It looks for the validation of a design solution in the results of successful user testing. While it does not rely heavily on the foundation of theoretical distinctions, the operational method uses, in part, techniques from logistic, dialectical, and problematic methods (Z. K. McKeon and Swenson, 1998). In reference to the broad description of philosophical methods identified above, the analysis of the following literature regarding the practise of design cannot reveal a common or widely accepted interpretation of the methods utilised in design. Instead, it enables an understanding of the function or role various methods provide in facilitating the development of the design process.

**Design Potentialities**

The Design Methods Movements (Cross, 1984) of the mid- to late-nineteenth and twentieth centuries were largely concerned with design potentialities and the techniques associated with the economy of production (Moholy-Nagy in Zucker, 1944). The age of mass communication and industrialisation gave emphasis to the form, function, materials, and manner in which design products were produced. During this time, functionalism aligned itself with a distinct purpose for design which subscribed to Sullivan’s (1896) well-known “form follows function” principle. This approach follows the notion that the form of an object is defined or shaped by the function a product is designed to perform.

However, the growing complexity of modern day culture necessitates the reexamination of this guiding principle to appropriately accommodate the changing environments of technology, culture, production, values, and society. This is expressed by Moholy-Nagy (1947), who tells us that the direct replication of an existing product’s shape or form in a new material calls for a fresh understanding of design requirements, despite a
product’s intended use or function. With an established career as a painter, photographer, sculptor, and industrial designer, Moholy-Nagy (1947) understood design as an integrative process of complex relationships that, when combined, embody an organised and coherent whole. Moholy-Nagy (1947) suggests that, to achieve this, requires a designer to understand or think about the interrelationships between an object’s external physical manifestation, its functionality, and subjective qualities for human consumption that contribute to a complex whole. Characteristic of a problematic method, Moholy-Nagy (1947 p. 42) maintains that:

The idea of design and the profession of the designer has to be transformed from the notion of a specialist function into a generally valid attitude of resourcefulness and inventiveness which allows projects to be seen not in isolation but in relationship with the need of the individual community. One cannot simply lift out any subject matter from the complexity of life and try to handle it as an independent unit.

This offers an insight into the circumstances surrounding the development of design from the traditional arts and craft movement, which provided an opposing voice to methods of industrial production commonly associated with decorative arts and architecture (Gropius, 1965). In reference to the term “profession,” it should be stated that design as a discipline or an intellectual art has since come into its own, as a result of the evolution of traditional crafts (Buchanan, 2001a). In spite of this, a way of thinking in terms of a symbiotic relationship offers a different perspective of designing that considers human encounters and experiences (the internal aspects) in relation to the physical attributes and functionality of a designed object (the external aspects). In doing so, it provides a context or environment in which a product may be considered for its value and appropriateness in contemporary culture and society. A “design for life” (Moholy-Nagy, 1947) proposed a way of thinking about design which emphasised the physical and emotional elements of form and matter in design. Furthermore, it placed the intuition of a designer, and the ability to grasp a concept of the whole from the analysis of its parts, as central to the synthesis of a design product.
The Development of Design Methods

Design as a problem-solving activity marked a period of systematic design that was later described by Rittel (1972b, p. 321) as “first generation” design methods (Bayazit, 2004b; Cross, 1984). In particular, the methods developed by Jones (1963; 1992), an industrial designer; Alexander (1964), an architect; and Archer (1965), a mechanical engineer and industrial designer; involved the rigorous investigation and clarification of elements that posed challenges to the design of an ultimate solution. A variety of processes were created in order to systematically examine the underlying parts and hierarchical interconnections of meta-structures found in design problems that followed rational and logistic methods of investigation (Alexander, 1963; Archer, 1965; J. C. Jones, 1963). Generally, techniques of optimisation common in systems engineering, management, and operations research provided a foundation for this design approach.

The work of both Archer (1965) and Jones (1963) are indicative of an operational method in which organisation, sensibility, intuition, and experience are regarded as valuable elements in the design process. To offset the rationalist paradigm, they (Archer, 1965; J. C. Jones, 1963) suggested that such qualities enabled designers to make reasonable and creative judgements during the design process. This in turn facilitated the development of innovative design solutions. For Archer (1965), design concerns the reconciliation of conflicting factors in the design situation initiated by the discord between industrial functionality, production, and marketing requirements. In particular, he characterises four key elements of the design process. Beginning with a need, a model, the intent to embody a solution as an object, and a creative leap; a designer’s judgement and experience is again critical to the synthesis of a solution (Archer, 1965). In situations where such judgement fails to achieve this, after much comparison and contrast with other fields of knowledge, a designer employs a rational method of analysis as a last resort to find an appropriate outcome (Archer, 1965).

For Jones (1963), the act of designing involves the reconciliation of a supposed conflict between creativity and logic; where the development of imagination and reason, in isolation from one another, provides a way to focus on the analysis of design elements as distinct from their synthesis. He argues that taking a rational approach to design reduced the potential for error, and works to increase the efficiency of the designer;
while the assistance of computer technology functions as a memory aid. This provides the designer with the freedom to create more imaginative solutions by not being weighed down with numerous technicalities and details. However, the disconnection between the relationship of analysis and synthesis in this method of operation has little chance for convergence when treated so disproportionately (J. C. Jones, 1963).

In contrast to Jones, Alexander (1964) worked with the uncertainty of establishing design requirements. He (1964, p. 23) developed a practise in which the “fit” or “misfit” of conflicting relations between an object’s form, human need, and context in the design situation were evaluated for their suitability to a design outcome. Characteristic of the dialectic method discussed further in Chapter Six, “Strategic Design Thinking,” he sought to eliminate the conflicts introduced by human tendencies or needs in reference to the physical design components established by architectural design and urban planning processes. A reductive approach to the analysis of design patterns or diagrams provide a way to resolve the complexity of design problems in a precise, step-by-step process to achieve the desired form or synthesis of an object (Alexander, 1971).

While “first generation” design methods subscribed to individualistic and ideal processes to solve problems, a shift in attitude that recognised the complexity involved in structuring and formulating design problems characterised the basis for “second-generation” design methods (Rittel, 1972b, p. 320). Design as systematic planning saw the introduction of argumentation into the design process as a means to resolve conflicting interests found in the controllable and uncontrollable effects of ill-structured problems (Rittel, 1972a). Rittel (1972b) maintained that participatory methods focusing on critical argument, judgment, and reasoning between stakeholders and designers involved in the design process offered a logical way of analysing and determining the significance of problematic design issues.

Fundamentally operational in approach, Horst Rittel, a mathematician and urban planner, dealt with the complexity of uncertainty and its consequences (Krippendorff, 2006a). In doing so, he prompted designers to examine the assumptions they made in the design process, and brought the potential of empirical research to the fore (Krippendorff, 2006a). However, for Rittel (1988), there were no clearly definable moments between the definition of a design problem, its synthesis, and evaluation. A
designer’s mental ability to simultaneously understand and manage design problems through a process of reasoning, therefore, determined its resolution. It was in the imagination of the designer that alternative plans and solutions for such problems were invented and manipulated prior to its actualisation (Rittel, 1988).

The notion of simultaneously developing a design problem and its solution created greater division among second-generation design methods. For Simon (1973); with a background in political science, economics, and engineering; there was no real distinction between the structures of well- or ill-formed problems. They were unstructured. In *Sciences of the Artificial*, Simon (1996) preceded the developments of the “Design Methods Movement,” which arguably set the stage for a design science by establishing a logistic method for rational decision-making and problem-solving processes. Primarily, Simon’s interests lay in establishing a science for design in which artificial intelligence and cognitive processes provided a rational approach to the management of complex systems. “Satisficing” and “bounded rationality” are terms used to describe the motivational constraints and imposing limitations of the human capacity to process information that he (Simon, 1979, p. 3) saw as key contributors to the resolution of less than optimal design problems.

In addition to this, Simon (1996, p. 5) characterised four indicia which describe man-made products as that of “the artificial.” Termed “artefacts,” they operate as an interface between an internal and external environment. While the internal and external aspects of an artefact’s relationship to the environment in which it operates shares similarities to the distinction that was made earlier with regard to Moholy-Nagy in “Design Potentialities,” above, the two are profoundly different. For Moholy-Nagy (1947), the internal elements of a product or object refer to its subjective qualities with regard to human use; while, for Simon, it is the internal substance or matter of an artefact’s structure and organisation. This makes a clear distinction between a fundamentally human-centred design approach and a mechanistic approach. Furthermore, it illustrates the difference between a problematic and logistic method of approach, in which Simon (1996), employing the latter, extends the treatment of dynamic entities or materials to the immaterial and simulated reproduction of human thought. For Simon, the analysis of the least parts of a design situation provides a foundation for the construction or
synthesis of a solution. This is a method in which the designer’s perspective is impartial to productive processes in order to generate what is arguably a valid scientific outcome.

**Design Research and Studies**

The various approaches adopted throughout the Design Methods Movement between the 1940s and the 1990s represent distinct ways of thinking about the purpose and practise of design. The diversity of approaches stem from a sign of the times, a designer’s background, and the perspective in which they formulate a course of action to examine or resolve the elements of a design situation. The degree in which this understanding extends to encompass the broader implications of contemporary society and values dictates this approach. I argue that the approach taken to understand, conceptualise, and visualise the complexity of a design situation rests on the capacity of the designer to formulate an outcome that appropriately considers not only the parts of a design situation but their combination as an integrated, organised whole.

Design theorists of the latter period of the Design Methods Movement rejected earlier design practises that focused purely on methods as a way of designing. In an attempt to counteract the process of logical analysis and ordering principles, Jones (1997) focused on experimental art practises that dealt with chance and possibility. In doing so, he sought to open up the opportunities for design outcomes, and placed greater emphasis on originality and inventiveness in the design process. The rational analyses of design elements were, therefore, indispensable to the creative synthesis of design outcomes. For Jones (1997), the use of a notation system provides a means in which rational process can be leveraged to enhance creativity. However, for Alexander (1964), analysis and synthesis were integral to one another. He saw the creation and manipulation of abstract forms as a way of inventing a reality (Alexander, 1964)—one in which an integrated, organised whole could be created to resolve conflicting elements in a design situation (Alexander, 1964).

These abstract forms or patterns represent a way of working with the independent relationships of dynamic forces (Alexander, 1964). Rather than adhere to complex mathematical or mechanical methodological procedures for their development, the natural formation of such diagrams or patterns drawn from the experience and reflection
of a designer suggests a way of working in design comparable to that of an art. Alexander (1964) argues that it is not a particular method that leads to the creation of these patterns, but it is the patterns in and of themselves which provide powerful tools for communication. They enable a designer to shape various elements of the design situation. Guided by the insight developed from and through their creation, patterns provide a language for the designer in which the fusion of abstract relations and experimentation may be expressed in a new form (Alexander, 1971). This is where an understanding of the idea behind the creation of each pattern is key to the synthesis of form, as opposed to any prescribed formula or method considered apart from the reality for which they are designed (Alexander, 1971).

Archer (1979) also shared a similar view and claims that, while logical and mathematical procedures provided a rational solution for the structural development of design objects, such an approach followed a mode of reasoning quite foreign to the actual intentions of designing. Archer (1979) maintains that this uneasiness was due to the cause, effect, and division of analysis and synthesis during the design process. The aim of design was really a communicative activity, in which the obscurities of design elements were minimised in order to find a fit between the requirements and provision of a design outcome (Archer, 1979). However, I argue that an approach that takes into consideration the relationships between the materials, function, form, and manner of designing; as a means to create products that are valuable to a specific community of practise; should also carefully consider the subject matter of design in relation to its form, utility, and the circumstances surrounding its medium of use in a technological society. Products are designed to adapt, not to a fixed need, but provide a place for action that facilitates the needs and intentions of diverse users in dynamic situations.

After a period of disillusionment with the state of design methods and procedures, Archer (in Bayazit, 2004a, p. 16) went on to characterise design research as: “… systematic inquiry, whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things and systems.” Comparable to Archer, Downton (2003, p. 2) also gives focus to the role of inquiry and tells us that: “Design is a way of inquiring; a way of producing knowing and knowledge; this means it is a way of researching.” Roth (1999), however, presents a contentious view of the role that research plays within the design community, and
argues that difficulties arise in design research, since widely accepted standards for
design process, presentation, and evaluation have yet to be established. These debates
exist because of the fundamental differences between the notions of design studies and
design research. This division illustrates design as either a practise of making and
giving form to objects for use; or as a process of devising strategies that draw upon
interdisciplinary knowledge to resolve complex situations (Roth, 1999). In response to
the confusion surrounding the meaning of design research at the time, Buchanan (in
Roth, 1999) rhetorically questions the possibility of a new model for design based on
the relationships between theory, practise, and production. Buchanan (2001b) later
replied to this by providing a comprehensive view of the various types of design
research; the boundaries of design (discussed earlier in “Design Potentialities” above);
and the potential development of design as a field of inquiry. The significance of this
suggests that, by identifying a situation as problematic, by means of inquiry, design is a
way of finding problems as opposed to being understood a purely problem-solving
activity. Furthermore, design becomes an activity where significant problems are
addressed if understood to be problematic to a particular set of circumstances, as a
result of inquiry.

As with every field or discipline of knowledge, there is a concern for the theoretical
underpinnings in which the subject matter of its field can be appropriately dealt with
and discussed; that is to say its boundaries. This is particularly the case with a discipline
such as design, which continues to establish a rich body of knowledge through a variety
of sub-related design disciplines and methods of interdisciplinary approach. Regardless
of the terminology used to define the various applications of design to philosophy,
history, methods, research, or studies; the changing environment of modern day society
and culture adds to the pluralism of perspectives in which the purpose, practise, and
principles of design undoubtedly will continue to be points of contention. Nevertheless,
I argue that it is in the very nature of difference that a variety of perspectives may
enhance our understanding of the pluralism that exists in design. Through the careful
consideration of the variety of ways in which we think, act, and work in design; we may
recognise these differences, and find a mutual point of understanding to act as a
foundation from which to develop an appreciation and tolerance for such diversity. In
doing so, we will gain the knowledge and power to move towards developing greater
coherency in the discipline of design, and begin to seek new ways of thinking and
acting in response to the changing conditions, contexts, and perspectives in a technological age.

**Summary**

The way in which leading design theorists treat the practise of analysis and synthesis in the design process provides a common point of reference for the interpretation and analysis of design methods. This examination also illustrates the ways in which research in design can be shaped. For the purposes of this research, I adopt an operational method for the planning and production of design artefacts. An operational method enables me to make a variety of distinctions in the process of designing, which move the development of the design process forward. This adds significance to my role as a designer, the judgements I make, and the perspective in which the research is undertaken. This focus becomes central to the formation of the design process. Furthermore, I will also subject the resulting design product to an iterative process of evaluation and modification to reconcile potential issues found during the product development phase. In this way, the design process for the creation of the prototype application LabanAssist can be shaped to simplify the use of complex information and interaction.

However, in view of the dissatisfaction with the outcomes of the Design Methods Movement and the function of methods in general, I argue that there is a distinct need to employ a strategy for which an ability to manage or work with diverse perspectives and dynamic situations in design may be developed. This is in opposition to a design process that seeks to offer a solution or the resolution of a distinct problem. Instead, it is a strategy or a way of working that encompasses the processes of inquiry, analysis, and synthesis to guide the act of designing and enable a designer to manage open-ended dynamic circumstances in the ongoing development of designed outcomes. This strategy enables useful knowledge from both the arts and sciences to be utilised effectively to assist the act of creating design products that enhance communication, the human experience, and creativity. This gains significance for the design of a prototype application that facilitates the diverse composition of movement by members of the dance community. I turn my attention to the development of a strategy for the design that will be operational in structure and relevant to the methods of movement.
composition for the design of the prototype application LabanAssist in the following chapter.
6 Design Strategies

Individual researchers may set their own strategy and agenda, but a centre of design thinking reflects a commonly held strategy, explored in individual variations. The focus gives coherence to research and enhances the impact and significance of research (Buchanan, p. 5).

Introduction

This research discusses the dynamic nature of the design process. It seeks to better understand the combination of design aspects considered necessary for the ongoing process of actually designing. Subsequently, it addresses how these aspects add to the complexity of design, which impacts on our ability as designers to act effectively in the process of designing. A dialectic framework drawing on cybernetics is proposed as an approach to better understand the designer’s capacity to act as an observer and participant in the creation of a design solution that embraces the social, interactive, functional, and interdisciplinary elements of design.

In Chapter Five, I argued that the designer has a role that is integral to the design process and its ultimate solution. Because of this, multiple viewpoints and their implications may be considered via a second-order cybernetics design structure. To facilitate this, conversation theory offers a means to reveal and resolve contradictory ideas through a series of interactions. The expanded knowledge that results using this structure assists with the subjectivity of a designer’s experience, knowledge, creativity, and capacity to act in an iterative design process. Obtaining a reflexive account of user and stakeholder needs will further develop understanding derived from discussion and mutual agreement to reflect a constructivist perspective.

For the purposes of this research, I propose a poetic strategy for the creation of design products in which both scientific and common sense approaches may be equally considered and argued as necessary. This process includes the formulation and
reformulation of a design situation to achieve realisation. It takes into consideration the transformation of the subject matter for design that considers its environing conditions and circumstances as dynamic with regard to the potentialities for the creation and development of a design product. I argue that this provides a strategy for the discovery, invention, production, and formation of connections between various elements of a design situation that encompass elements of dialectic, rhetoric, and grammar. This research examines the way in which a systematic design strategy characterised as a productive science or poetics can facilitate the design of a product that embodies the necessary structure to support the interaction of complex information as an integrated and organised whole.

A Strategy for Design

Designers often refer to the practise of design as being intrinsically chaotic, unstructured, iterative, and unpredictable (Conklin, 2006; Dorst, 2006). This is understandable, bearing in mind that design typically deals with invention and the unknown. However, when the act of designing is approached with an understanding that developing a response to a design situation is intimately connected with the success of the design outcome, a strategy for its creation holds significance (Rittel, 1972a). This is because the subject matter for design, created by the designer, is embedded in what is particular. The context for design presents designers with a unique set of circumstances for which they are required to develop an appropriate course of action to gain an understanding of diverse situations of thinking, acting, and making. In light of the design methods previously discussed in Chapter Five, a systematic process or a methodical way of working can been seen to emerge throughout the variety of ways in which design is practised. Nelson (1957) claims that a similar conservatism found in the gradual development of forms in nature can also be recognised in the design process. The methods proposed by Jones (1997) are, however, an exception to this where judgment, chance, and random possibility are drawn on to enhance creativity. Regardless of whether the creation of structures, patterns, relations, or processes stem from natural or artificial sciences; Dewey (1938) tells us that ,when subject to inquiry, the logic of science and common sense share a common pattern. This suggests that design can be considered less a series of creative accidents than a strategy of approach when subject to a method of inquiry. However, due to the differences in subject matter
applicable to science and common sense, the elements that constitute their makeup will have a varied effect on their treatment if found to be problematic.

**Systematic Inquiry**

For both Mead and Dewey (in Corti, 1973), the object of inquiry is based on the settlement of propositions concerning a problematic or indeterminate situation. This has significant relevance to the problems that Rittel and Webber (1973) also characterise as indeterminate or wicked problems. Where the two conceptions of the term differ, the approach taken is to identify, distinguish, and resolve an indeterminate situation. Inquiry begins with the identification of a problematic situation that is considered indeterminate because of a sense of doubt felt in an observed, existential condition or situation. However, it is the qualities in the situation that are doubtful; not something that is perceived by the inquirer (Dewey, 1916, 1938). Should the latter be the case, such problems, by their confused and obscure nature, cannot be resolved. These types of problems are seen to be imagined in the mind of the inquirer, and are without context in existing conditions of a situation. An example of this is described by Archer (1965, p. 77) under the terms of a “transactional theory of perception.” This is where a viewer’s personal experience contributes to or diminishes a phenomenological understanding of what it is one perceives. Critical to the concept of inquiry is the objectivity in which practical judgment is exercised, so as not to be confused with the reasoning of a kind that leads to moral or value judgments (Dewey, 1916). This suggests that an uncertainty or real living doubt is the key motivator for which belief or warranted assurance is sought (Corti, 1973). This is achieved through inquiry or by means of questioning to better understand the likely conditions and elements of the situation that are uncertain; in other words, the issues that makes a situation doubtful (Dewey, 1938). A situation then is considered problematic as a result of inquiry.

When an indeterminate situation is no longer doubtful, the conditions of the situation are considered determinate and no longer necessitate further inquiry (Dewey, 1938). While determined situations are not strictly defined, they provide an indication or a starting point for which the possibilities and treatment of such elements can be considered in resolving them. For Rittel and Webber (1973), the notion of wicked problems suggests that, by their inherent wickedness or indeterminacy, such
problematic situations are never fully resolved. I argue that a method of analysis seeks to provide an in-depth understanding of the elements of a design situation and the interrelationship of its constituent parts. An indeterminate or undefined situation by method of analysis does not permit the extent of its conditions to be known. At best, this approach can only facilitate a less than ideal resolution due to the vagueness or ill-defined nature of the problem. Therefore, when faced with a problematic situation, it is necessary to remove the wickedness or impossibilities from the problem in order to provide a concrete platform with which to develop a solution. Nevertheless, while these methods of approach differ, the identification of a problematic situation alone does not present an appropriate course of action for its solution.

A Unifying Concept of Design

Because of the lack of a given process in which to plan, design, and make products for an intended use; design may serve itself better when considered as a type of attitude (Moholy-Nagy, 1947). According to Gropius (1955), the objective of the Bauhaus School of Design was to take a principled approach to humanising the practise of design. The basis of this principle saw design as a unity of all forms of creative endeavours in relation to the fundamental nature of living, and sought to bring about a new bearing on life (Gropius, 1955; Moholy-Nagy, 1947). This in turn called upon the ingenuity of a designer to find a solution based on the surrounding economic, social, and technological conditions of modern day society; rather than a ready-made formula (Gropius, 1955). While the resulting outcome of this intention was largely mistaken as an overt fixation with the form and style of designed objects, it aimed at bringing into fruition a modern “architectonic” art (Gropius, 1955). A derivative of the Greek term *architectonikê*, architectonic refers to the characteristic qualities of “the structural design that imposes order, balance, and unity upon a work or an entity.” (Gove and Merriam-Webster Inc., 1986, p. 113). An architectonic art is a principled approach that gives order to the productive elements or scientific methods of knowing, doing, and making in the design process (Buchanan, 1995; Z. K. McKeon and Swenson, 1998).

In a similar yet profoundly different way, Simon (1996) makes reference to an architectonics of music. He does this, however, to provide an organising principle for the creation of alternatives or variations of a theme, which are guided by the underlying
substructures of a larger system. This is where the invention of new structures, for example of a melody or of a rhythm, is calculated for their potential and the scope of what can be known technically. Such structures are examined for their capacity to be manipulated and controlled and, in this way, created. The term architectonic in this view is understood more as an art of scientific calculation. Then again, Schön (1995) provides us with a different view in which the underlying structures or schema of musical notes, known to musicians, provide a basis for invention in a very different sense. I argue that this is where the performance of music is a personal expression of creativity, and not something that is objectively assessed and formulated for its potential to project in a variety of forms; such as one in which a musician has a “feel” for the situation in which they perform and are actively engaged. Through a familiarity with the variety and potential for which the vocabulary of musical notes can be arranged, sound becomes an instrument for creativity and invention. Creativity enhanced by the art of improvisation enables a musician to impose an order and structure on the music and sound they produce; rather than inventing musical variations and themes based on the prediction of variability and formulaic structures. In a sense, musicians are also designers.

Just as a choreographer forms an understanding of the physical capabilities of a dancer; a designer seeks to understand a client’s needs and requirements given these possible variations. In recognition of such needs, I argue that designers create specific criteria to direct the focus of a design purpose or goal. While a choreographer may be guided by the cultural sensitivity of a work, the aesthetic quality of a dancer, or the genre of music; the way in which he or she shapes the relationships between these elements to form a unified whole characterises a particular way of working—an art. Like most arts, design takes a disciplined approach to creatively develop, make, and produce a design product. Whether it be a performance, a novel product, or information technology; management it is indeed artful in its making. A principled approach that provides order to the elements of knowing, doing, and making is architectonic in its function. An architectonic art, therefore, imposes unity and balance upon a work. It assists the process of orchestrating all of the elements of a performance to come together as a unified whole: a composition.
This marks an important distinction in which the structure given to the form and matter of a product is considered an art that relies upon a knowledge of various materials, tools, and skills for its production (Moholy-Nagy, 1947). I argue that the significance of this characterises design as a unifying art that draws upon a variety of knowledge to formulate a solution. One area of knowledge in particular is the materiality and skill required to produce physical artefacts to create anew. This is commonly referred to as design or production techniques. This also suggests that the role of a designer is one that takes into account a broad perspective of the knowledge that contributes to the realisation of a design solution. In doing so, it requires a sense of resourcefulness on behalf of the designer to draw upon specialised knowledge from other productive disciplines. An approach which involves an aspect of collaboration in the process of formulating the elements of a design situation is in stark contrast to the approach of first-generation design methods or Simon’s (1996) method of scientific calculation. Rather than begin with a close examination of the relationships between the underlying parts of the design situation, an architectonic art concerns the essential unity of all forms and creative ways of thinking, doing, and making. It provides a strategy or schema that gives coherency to a particular way of working.

A Unifying Idea for Design

For Dewey (1938), an idea gives unity to a situation and marks the possibility for its solution. In the context of design, it does so by providing a designer with an insight or the ability to see more clearly into the relationships between the elements of a complex situation. This gives weight to Kant’s (1901, p. 91) saying that “Thoughts without content are void, intuitions without conceptions, blind.” I argue that this, however, relies on a designer’s ability to grasp these associations, which augments creativity and guides the direction of the design process. This means that the experience of the designer has a significant impact upon the resulting outcome of a design product. While such experience may be claimed as a flash of pure insight at a significant moment in the design process, an expanded view understands that knowledge developed from practical experience provides a designer with an informed intuition. This, in turn, guides the design process, which then is said to be operational in its method. I argued in Chapter Five that knowledge developed as a result of this provides designers with a line of reasoning that carries the design process forward; one in which a designer distinguishes
between different user needs and requirements to develop an argument as to how design products should function. Buchanan (1995) refers to the concept of forethought as a type of universal, or architectonic, art concerned with the aspects of production and making such as discovery, innovation, argument, and planning. Highly relevant to design and possibly how design is understood today, the term first characterised by Aristotle in the *Poetics* (2005) distinguishes forethought as an element separate from its application to a specific subject matter or way of making (Buchanan, 1995). The concept of forethought is also in contrast to the belief that an innate sense of intuition offers an adequate explanation for the mysterious creation of highly successful design products. In support of this, Watson (1993, p. 95) tells us:

> Not only is knowledge organised by ideas to form sciences, but knowledge itself is already a unity of concepts as form with intuitions as matter, and intuitions are a unity of the forms of intuition with the matter of sensation. There is thus a three-layered structure of form and matter: the matter of sensation united by the forms of intuition gives empirical intuitions, intuitions united by the concepts of the understanding give knowledge, and knowledge united by the ideas of reason gives the systematic unity of a science.

This suggests that an informed sense of intuition is guided by a unifying idea or the thought behind the planning and making of design products as recognised in the notion of forethought. Nelson (1957), however, argues that successful design achieves a sense of wholeness or unity in connection with its surrounding environment, which is less of a physical relationship than it is social. The nature of design previously discussed in Chapter Five, “The Act of Designing” and above in “Systematic Inquiry” refers to the wickedness or uncertainty of design problems. Cross (1984) tells us that Archer (Archer, 1979) also recognised that the types of problems arising out of everyday social situations were of a similar nature to those defined by Rittel and Webber (1973) as wicked and tame problems. In devising a designerly way of thinking and doing, Archer (1979) came to understand the nature of these of problems as being innately human. Because of the growing awareness surrounding the methods of design practise, research and education took a fundamentally human-centred design approach towards addressing these problems (Cross, 1984). Returning to the notions put forward by Moholy-Nagy
and Gropius as early as 1947, it is possible to appreciate the aim of the Bauhaus School in creating a vision of design that was fundamentally concerned with humanising the design process. Rittel’s (1972b) methods of argumentation and participation also introduced a what-ought-to-be approach to design. This not only illustrated an awareness surrounding an accountability for conflict resolution and the implications of design outcomes, but led to the development of a theory of technology concerning instrumental knowledge (Dubberly and Rith, 2007).

Although as early as 1916, Dewey (1916) characterised the art of experimental thinking as way in which different modes of practise can be controlled and developed. This characterization underpins the way in which an idea can give shape to the practise of designing. In this process, the incremental acquisition of meaning or knowledge over time is instrumental in informing and regulating human action or practise (Dewey, 1916). Operational knowledge is acquired as a result of inquiry into a problematic situation, to which the physical making and experimentation of a proposed resolution is not only vital to its success but also controls and informs its practise (Dewey, 1916). This is achieved through the progressive development of iterative prototypes during the design process, which involves their evaluation by potential users of the proposed object or artefact. In the course of resolving a problematic situation, the object of knowledge is not the intent in which thinking sets out to achieve, but is the result of what is made in the process of experimental thinking (Dewey, 1916). Under the terms of instrumentalism, referred to as “the logical version of pragmatism,” knowing is derived from the physical experience of doing, making, and thinking (Dewey, 1916, p. 170). Furthermore, the re-contextualisation of objects or things as products of design is intimately affected by knowing and thinking in a practical sense of the term, and is necessarily grounded in experience. This means that practical judgments made on behalf of the designer play a critical role in the design process in situations where inquiry is used a method to further explore a problematic situation.

**Theory and Practise**

Judgments concerning the kinds of practical and theoretical knowledge that can be utilised in the move towards finding a solution for a problematic situation are critical to their treatment and resolution. Dewey (1938) characterises these modes of working and
thinking as nonscientific and scientific approaches. Nonscientific or common-sense approaches can be broadly described as the qualities of doing, sensing, and feeling. In relation to the practicalities of working and making, these qualities function to shape practical judgments. In doing so, judgments or beliefs facilitate the physical actions taken to create products concerned primarily with use and enjoyment (Dewey, 1916). An example of this can be found in the visual and performing arts such as literature, sculpture, singing, and dancing. The subject matter with which such judgments interact, between knowing and doing, are used to shape and transform physical objects or things (Dewey, 1916). They do so on the basis of what is known to be appropriate to a particular situation from prior experience. It is important to distinguish that this type of activity is not one that derives from an intellectual understanding. Rather, that it is practical and operational in its utility (Dewey, 1916). This is where a sense of purpose is felt or known through the experience of doing. In contrast to this, the nature of scientific methods of working and thinking involve the abstract examination of entities far removed from concrete experience (Buchanan, 2006). This disconnection or objectivity regulates interaction to prescribed transactions or conventions of working; derived from a body of knowledge to which they subscribe. Thus, the activity is intellectual and seeks to establish the working relations between entities in order to rationalise their behavior and effect. The products of scientific inquiry are of a conceptual and intellectual nature, which contribute to theory and knowledge.

While fundamentally opposed to each other in practise and procedure, a combination of theoretical knowledge and practical experience can facilitate the controlled progression of inquiry to meet a distinct purpose (Dewey, 1916). This, in turn, presents a paradox between the modes of practise to which scientific and common sense approaches suggest (Dewey, 1916). This is one in which the scientific abstraction of things, removed from the restrictions of existential conditions, works to simplify complex situations. It follows that the greater the abstraction of problematic elements are from the restrictions of environing social and cultural conditions, the greater the possibility and freedom there is to examine the potentialities and alternatives for their solution. Through the process of ideation that involves the abstraction and representation of everyday objects in a symbolic form, scientific practises can assist the development of the unknown, rather than establish what is already known (see Figure 10. Design Thinking). This is achieved through diagramming and drawing or other forms of
symbolic representation such as the practise of Labanotation and modelling that facilitate the objective evaluation of things or objects. Through the symbolic representation, modification, and development of things or objects removed from their environment; and therefore detached from their conventional meaning; scientific methods of abstraction and modelling can work to facilitate the generation of design concepts through the processes of brainstorming and ideation.

The contradiction in terms comes in to play when the objects or subject matter of design are developed by nonscientific practises alone. Just as scientific practises subscribe to the conventions of their own making, when things or objects are left untouched to develop in a natural environment, they too succumb to a process of gradual and habitual adaptation on the basis of self-interest. With this in mind, scientific methods of abstraction present a practicality uncommonly associated with its procedures that assists in the reformulation of everyday objects and things to more appropriate modes of practise (Dewey, 1916). Such an approach necessitates the successful integration of both scientific and nonscientific practises. This is dependent on the ability to work with contingency and possibility in the design situation, and to devise an appropriate course

of action that leads to the development of a potentially, useful, usable, and desirable outcome.

**Strategic Design Thinking**

At its core, design thinking seeks to address contemporary design problems by combining useful knowledge from the arts and sciences (Buchanan, 1992) to assist in the development of appropriate design outcomes. There exist four areas of design thinking that encompass the design of: (1) “symbolic and visual communications”; (2) “material objects”; (3) “activities and organised services”; and, (4) “complex systems or environments for living, working, playing, and learning” (Buchanan, 1992, pp. 9–10). While these areas are represented as distinct from one another, knowledge used to support design thinking is not mutually exclusive to these domains of design inquiry (Buchanan, 1992). Instead, each area draws on a variety of different disciplines to assist in its development, which reflects the transdisciplinary nature of design (Margolin, 1996). Because of this diversity, Buchanan (1992) tells us that the greatest challenge of design thinking lies in our ability as designers to gain insight from the application of design thinking to a variety of problems and situations that benefit the intellectual development of design practise.

To illustrate the application of strategic thinking to design, I argue that Pask (1969) provides us with an early example of this by which the introduction of a systems-oriented approach to architectural design prompted the development of a cybernetic theory of architecture, and impacted existing design practises. In *The Architectural Relevance of Cybernetics*, Pask (1969) describes a shift in thinking during the Victorian era that changed the conceptual design of architectural structures by considering their development within a part of the larger ecosystem of a human society. This was done to overcome the limitations of existing architectural rules and a lack of a prescribed formula to adequately address the problems of the time (Pask, 1969). By conceptualising a design situation in the context of a dynamic human environment, or a whole, a new way of thinking facilitated innovative design techniques and enabled evolutionary practises and novelty to enter the design process (Pask, 1969). Furthermore, Pask (1969) proposed the development of five specific areas as a result of this approach, which included the advancement of computer-assisted design procedures.
and a variety of disciplines that deal with a broad understanding of “civilisation,” city, or “educational systems.” In establishing The Architectural Relevance of Cybernetics, I argue that Pask (1969) provides a way to contextualise design in an intellectual and technological culture which can be drawn upon to enhance design thinking and the strategic development of effective design practises and outcomes (N. Ebenreuter, 2007). Moreover, this approach takes a holistic approach to designing; as opposed to examining the constituent parts of a situation outside the context of a large whole.

A further application of strategic thinking to architectural design can be seen in the work of Alexander (1966), who understood cities as dynamic living environments. In dealing with the changing and conflicting conditions of the built and natural environment, he was largely concerned with the sustainability of meeting human needs. He sought to eliminate the conflicts introduced by human tendencies or needs in relationship to the physical components established by architectural design and urban planning processes (1966). To achieve this, he developed numerous design patterns and diagrams, known as “patterned languages,” that offer a way to resolve the ongoing and evolving complexities introduced by the developing needs of a technological society (Alexander, 1971; Alexander, Ishikawa, and Silverstein, 1977). This method of approach provides a holistic framework in which independently functioning parts or subsystems of a larger system, environmental or otherwise, can be developed. The significance of this is the organisation of individual functioning components, relevant to the design situation, to be integrated into a larger complex system over an extended period of time. As a result, the cumulative development of an evolving system provides a way to accommodate the continual shifts in human needs.

In parallel to Pask’s (1969) work, this method of approach has also had a significant impact on engineering and computer programming disciplines known as object-oriented programming. While taking a fundamentally materialistic approach to design, the approaches to strategic thinking illustrated by Pask (1969) and Alexander (1966) contrast significantly to Simon’s (1996), where he extends the treatment of dynamic entities or materials to the immaterial and simulated reproduction of human thought. Instead, Pask (1969) and Alexander (1966) offer an holistic framework for the development of dynamic human interactions with regard to the changing conditions of
the built and physical environments that extend to a digital environment. With the ever-increasing complexity surrounding the management of dynamic social systems, technological development, and the sustainability of the environment in concert with the changes in contemporary culture; strategic thinking may not offer immediate solutions to complex situations. It does, however, offer an alternative way of working that contributes to an ongoing collaborative effort toward alleviating the contradictions that arise in the nature of designing of new ways of living, working, and playing.

**A Conceptual Framework**

As in design, cybernetics can be thought of in a variety of ways. Cybernetic concepts are utilised in a variety of disciplines, which suggests the nature of its adaptability as a conceptual framework. Mead (in Glanville, 2004) regards cybernetics as a common language that communicates among many disciplines; while Von Forster (in Glanville, 2002) maintains that the influence of cybernetics and its successful integration into a variety fields therefore renders its utility unnoticeable. Cybernetic reasoning in the form of second-order cybernetics can be applied to an almost infinite range of situations because of its concern with human qualities of communication, collaboration, and knowledge creation. In comparison, design thinking can also be applied to any area involving human experiences. The range for its application is vast. However, a specific subject matter for design neither exists nor is possible. Design is fundamentally concerned with the unknown. As a result, designers are required to create the subject matter of design from their understanding of a specific set of circumstances. If we accept that, in the act of designing, a designer creates the subject matter for design, then the development of design products or services becomes embedded in what is particular. Typically, the application of design is subject to a specific field of knowledge and a community of practise that a designer wishes to propose new ways of thinking, working, and acting to enrich the human experience. As an approach to developing a subject matter for design, second-order cybernetics and conversation theory offer designers a conceptual framework to support and enhance design thinking through interaction, conversation, learning, and understanding.

Second-order cybernetics is essentially concerned with the extent of our knowledge and the manner in which it is acquired (Pangaro, 2006a). Derived from a constructivist
epistemology where the world is invented, objectivity and understanding are a result of interaction, mutual agreement, and self-reflexivity. Cybernetics offers a theoretical framework in which human-centred design practises that involve collaboration and participation can be effectively managed. This is achieved by considering the process of design as conversation (Glanville, 1999; Schön, 1995).

Pask’s (1975) Conversation Theory is a dialectic framework that offers a mode for inquiry and the exchange of information through a looped series of interactions (conversation) to reveal and resolve contradictory ideas. Fundamental to second-order cybernetics is the function of an observer. It concerns the manner in which an observer becomes an accepted participant in the act of observing, and allows for the subsequent understanding derived from such actions (Glanville, 2002). Therefore, during the development of a design situation or its subject matter, a designer is acknowledged and accepted as a mutual participant in the act of knowledge creation. In doing so, the designer becomes a necessary element in the development of the design process, and enables designers to act subjectively. By interacting with various stakeholders involved in the design process, understanding is created through conversation and mutual agreement. This involvement is interactive and productive so designers affect and are affected by the interactions in which they participate. However, it is without control or direction. The interaction is circular, and represents the culmination of the participant’s interpretations (Glanville, 2001). In support of this, Jones (1992, p. 73) argues that:

Methodology should not be a fixed track to a fixed destination, but a conversation about everything that could be made to happen. The language of the conversation must bridge the logical gap between past and future, but in doing so it should not limit the variety of possible futures that are discussed nor should it force the choice of a future that is unfree.

Through conversation, multiple viewpoints are expressed and internalised by those engaging in the discussion; the result of which is a shared understanding of what is known from that which was previously unknown. Central to this interaction is that participants enter into the conversation with different perspectives and individual understandings that are distinct from any others (Glanville, 2001). Glanville (2001) tells
us that the basic epistemological position of conversation theory requires this form of diversity in order to facilitate interaction since, without difference, there is no basis for discussion among participants or the possibility for the reciprocal understanding of something new (Glanville, 2001). This view is also shared by, Barnlund (1979) who tells us that communication ceases to be productive without a context of difference or conflict to initiate change.

For Pask, it is important that, in the course of interaction, understandings are not communicated (Glanville, 2004). They are, however, built collaboratively through conversation in which participants derive meaning from their interpretation of the discussion. This new-formed understanding is then offered to participants for further interpretation and comparison to the original, which eventuates in mutual understanding and agreement. With this in mind, it can be said that knowledge is constructed from the interactions we create; in which the product of mutual agreement from conversation provides a foundation for what is known (Pangaro, 2006b). When taken as an approach to thinking and working with the subject matter of a design, a designer’s ability to act subjectively, as understood in a second-order cybernetic framework, is integral to knowledge creation. However, when establishing the purpose or goals sought in design, there remains a matter of responsibility which the designer must consider. To avoid satisfying their own sense of purpose, it is necessary for designers to appropriately consider the implications of their interpretation of the design situation, and the intent behind the actions they propose in developing a suitable outcome. In light of this, I argue that it is necessary to draw on Von Foerster’s (in Krippendorff, 1996) seminal contribution to cybernetics, who saw it as an ethical imperative to “act always so as to increase the number of choices.” More recently, Krippendorff (1996, p. 141) argues that the words “for others” be included in the description as a way for design to extend this approach to accommodate user needs.

Second-order cybernetics is the cybernetics of observing systems, as opposed to systems that are observed passively from an objective point of view. In the course of conversation in which differences are identified and considered, an awareness of self and identity emerge (Pangaro, 2006b). When a distinction is made between self and other in observation, observers become aware of their own identity, which enables them to act autonomously and observe oneself (Glanville, 2002). Drawing on this idea, it is
possible to act in a subjective manner that includes the observation and interpretation of not only others, but also ourselves during conversation. This suggests that it is also possible to reflect upon and consider the observations and actions we propose from our understanding of a specific situation. As a result, observers become personally responsible for the observations they make, their interpretation of these observations, and the resulting actions derived from this understanding (Glanville, 2002). In addition to this, Glanville (2001) makes explicit the qualities necessary for a conversation, as he suggests Pask intended it to occur, in a set of operational and inspirational requirements. These requirements describe elements of the procedure and the necessary attitudes of those participating in conversation as prerequisites for a conversation to be considered successful.

It is important to note that Krippendorff (1996) has also compared the notion of otherness within a second-order cybernetic framework. However, in The Semantic Turn, Krippendorff (2006a) describes a second-order understanding as a necessary component of a human-centred design approach. This understanding recognises the need to develop a greater awareness of the multiple perspectives of diverse individuals. While this approach shares distinct similarities to this research, the distinguishing element between the two lies at their foundation.

**A Poetic Strategy for Making**

Establishing the elements of a design situation and creating structures to manage dynamic use situations requires the integration of theoretical, practical, and substantial components in design, often represented as contradictory in philosophic and design literature. I proffer the notion that a strategy; which unifies elements of form and matter, theory and practise, and methods of analysis and synthesis; is essential to the formulation of a design situation. This is not in a purely static sense, but one that is dynamic and provides a fundamental basis for invention and the execution of new ways of thinking and acting, previously discussed from a user’s perspective in Chapter One, “Design Purpose,” and Chapter Two, “Symbolic Communication.” I argue that such an approach necessitates the use of productive practises that incorporate these elements.
Aristotle (2005) provides us with one such strategy to assist this development, which includes elements of dialectic, rhetoric, and grammar for creative productive purposes. Within the *Poetics* (Aristotle, 2005), the form, function, manner, and materials of design products are considered. Aristotle (2005) characterises these in terms of the liberal arts in which: (1) the art of dialectic highlights the contradictory elements of design situations; (2) rhetoric, the counterpart of dialectic, is an art of discovering effective means of communication; and (3) grammar as an art of composition is based on structures of syntax and speech or language. In the *Poetics*, language is treated as it is in the creation of poetry; where the “poet” or “author” of metre, verse, discourse, thesis, or an idea can be equally substituted for the terms “maker” or “creator.” In support of the use of the liberal arts, Watson (1993, p. 10) characterises the notion of “reciprocal priority,” in which commonalities among the differences and treatments of subject matters concerning words, things, action, and thought can be inclusive of one another. This suggests that the *Poetics* represents a totality of arts or doctrines that in turn translate from one primary focus for the consideration of others, in order to determine and establish an organised, integrated whole (Watson, 1993).

This research has undertaken to deliver the transposition from symbol to action that is grammatically correct. It finds a basis upon what is made or created is a result of individual thought and ideation. To achieve this, a comprehensive understanding of the elements that constitute the creation of a unified concept of design is required in order to treat particular subject matter and the circumstances of the design situation appropriately. McKeon (1987, p. 107) argues that: “The arts of communication and construction are arts of conjoining form and matter in the concreteness of experience and the individuality of existence.” Kouwenhoven (in Rand, 2001, p. xiii) adds to this when he tells us that the basis for the term “art” is “to join, to fit together.” The liberal arts, therefore, can be leveraged to provide a strategic framework for the discovery, invention, production, and formation of connections between various elements of a design situation to create a unified whole; where problems associated with the differences in knowing, doing, making, and saying can be treated by a particular art and method of approach, relevant to the situation at hand (R. P. McKeon, 1987).

However, a poetic strategy is one that guides the development of a design solution as opposed to imposing a distinct set of rules on a particular way of working, thinking, or
making. It is architectonic in structure, but not in a fixed sense of the term; where its function is not taken to represent a predetermined model, plan, or frame of reference. Rather, it is an art or a way of working that provides a means to guide and inform the design process. Skepticism surrounding such strategies are expressed by Alexander (1963) when he tells us that a designer’s mind can be trapped by a mindset and persistence to follow well-known and accepted elements already established in design practises. In this way, design becomes a way of reproducing variations of existing or known elements and structures rather than a way of producing innovative solutions (Alexander, 1963). He (Alexander, 1963) argues that the design components created by the designer shape the design process, and cannot be structured into a systematic process which impacts on a designer’s ability to change his or her way of thinking. Jones (1997) also highlights similar concerns surrounding the circumstances that destroy a designer’s ability to innovate. I argue that this happens if creative processes and ways of thinking are cemented by rigid habits and frames of reference. For this reason, a strategy for design offers a point of departure in which a design process can be shaped. This is based on relations developed in the act of designing; determined by a designer’s sensibility and knowledge developed in the act of doing. It incorporates the capacity for design components to be shaped by the designer, which forms a basis for the strategic direction in which the design process can then be developed. The methods utilised in this type of design process are operational in function.

For the purpose of this research, and having an understanding of the philosophies espoused in the Poetics, a poetic strategy is adopted to assist the creation of a unified concept of design. This is demonstrated through a process of inquiry, analysis, synthesis, and evaluation discussed throughout the remaining chapters of this thesis. This process is illustrated in Figure 11. Design Process Model, which includes a set of design techniques in Figure 12. Design Techniques that support each method in practise to reach a design outcome.

**A Place for Creativity**

Through this research, I describe the designer’s relationship in the act of designing as an integral element of the ultimate design solution. A second-order cybernetic framework is offered as a means to facilitate a designer’s capacity to act effectively as an observer
Figure 11. Design Process Model
**01 | Envision**

**Product Concept**
- **Definition Document**
  - Create high concept product statement
  - Identify product objectives
  - Identify usability goals
  - Identify high-level constraints
  - Identify high-level functionality
- **Market Research**
  - Identify product environment
  - Identify user population
- **Production Schedule**
  - Create production timeline
- **Preliminary Interface Designs**
  - Design initial screen concepts
- **Knowledge Representation**
  - Create argumentation schematic
  - Movement Family Tree

**02 | Understand**

**Frame**
- **User Profiles/Modeling**
  - Create student personas
  - Create lecturer personas
- **User Prerequisites**
  - Define prerequisites
- **Hierarchical Task Analysis**
  - Perform expert interviews
  - Develop hierarchical user task structure
- **User Requirements**
  - Persona needs
  - Shared persona needs
  - Persona needs vs functions
- **Develop Use Case Scenarios**
  - Descriptions/Charts
- **Functionality & Task Analysis**
  - Task Analysis
  - Hardware specifications
  - Interaction design
- **Design Rationale**
  - Model movement structures

**03 | Transform**

**Design**
- **Interface Design Concepts**
  - Map interface objects & actions
  - Create design screens
- **Low-fidelity Prototype Design**
  - Create storyboard prototypes
  - Create questionnaire
  - Heuristic evaluation
- **Enhance Interface Designs**
  - Develop mid-fidelity designs
- **Mid-fidelity Prototype Design**
  - Design usability tasks
  - Create usability test
  - Create questionnaire
  - Create interface walkthrough
  - Think aloud usability test
- **Enhance Prototype Functionality**
  - Develop high-fidelity designs
- **Enhance Interface Designs**
  - Design usability tasks
  - Create usability test
  - Create questionnaire
  - Create interface walkthrough
  - Think aloud usability test
- **High-fidelity Prototype Design**
  - Usability tasks
  - Usability tests
  - Usability questionnaires
  - Usability interface overview
  - Final usability test
- **Review**
  - Definition Document
  - Product Concept
  - Requirements Analysis

**04 | Re-form**

**Test & Evaluate**
- **Expert Heuristic Evaluations**
  - Effect
  - Severity
  - Extent
- **Expert Heuristic Workshop**
  - Define problems
  - Complexity rating
  - Brainstorm solutions
- **Preliminary Usability Tests**
  - Think Aloud: test 1
  - Usability questions: test 1
- **Analyse Results**
  - Review
  - Enhance
- **Final Usability Test**
  - Usability questions
  - Review Evaluation
  - Enhance design solution
  - Complete specification

**05 | Realization**

**Design Outcome**
- **Prototype Application**
  - LabanAssist

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**Figure 12. Design Techniques**
and participant in the co-creation of a design solution. This is achieved by characterising the design process as a conversation in which the role of the designer becomes an observer-participant in the conceptual development of a design situation. I argue that a second-order cybernetic framework provides an explanation for a designer’s actions by acknowledging his or her presence in the design process. In light of this, designers may better understand the complexities of interaction, the actions derived from interaction, and the outcome these actions have in the act of designing. As an approach to understanding and mutually agreeing upon users’ needs and requirements, conversation theory can be effectively utilised to enhance a designer’s capacity to conceptually develop novel design solutions in participative situations.

Furthermore, it provides a method to enhance interaction in circumstances where information garnered from a reciprocal interpretation of shared understandings can provide a foundation for developing the constraints of a design situation. Participants involved in the co-creation of a design solution are understood to act as intelligent or knowledgeable beings that are responsible for their actions (Krippendorff, 2006a). In this way, an understanding is developed between participants in the design situation that enables communication and understanding to interconnect. Knowledge gained from this can be leveraged to establish an appropriate purpose or set of goals for the design situation (see Chapter Eight, “Task Analysis Workshop” and “Design Rationale”).

I argue that, through conversation or the act of designing, we as observer-participants create our own meaning from any given situation. When fully understood, we formulate a suitable response to this situation based on the information available to us. As a result, the outcomes we propose cannot bear a particular correctness or incorrectness either in relation to the understandings we derive from conversation, or to the combination of elements we seek to address and challenge. Therefore, it is reasonable to suggest that the process of conversation and design share the common elements of interaction, negotiation, agreement, and knowledge creation. This involves a discussion or conversation between the designer and: (1) various users and stakeholders in the design process; (2) the construction of new knowledge that participants mutually create and agree upon; and, (3) the elements of design and materials in a circular process of design iteration (N. Ebenreuter, 2007).
However, developing our own meaning during conversation or the act of designing offers little guidance as to the appropriateness of this understanding or the resulting course of actions taken to develop a design outcome. To enhance this process, I argue that design thinking provides a means to facilitate and inform the meanings we construct. This is achieved by integrating useful knowledge from various fields of inquiry to support the development of new productive practises. When employed effectively, design thinking enables designers to introduce evolutionary and innovative ideas into the design process for the advancement of theory and design practise, as exemplified earlier in reference to the development of Pask’s (1969) cybernetic theory of architecture (see Chapter Six, “Strategic Design Thinking”). Without a means to connect useful knowledge to the context of modern day society, the potential for design to effectively enhance the human experience is reduced. As a means to facilitate communication and understanding, I argue that a second-order cybernetic framework that utilises methods of conversation theory has the potential to provide designers with a greater understanding of a design problem and its reformulation. To support this, design thinking offers a way to expand the intellectual capacity of design and the development of design outcomes. Designers are then able to draw on interdisciplinary knowledge from the arts and sciences to develop plans with actionable outcomes. Once developed, these plans will provide better solutions for addressing and managing design problems and their reformulation.

The reformulation of a design outcome is, however, distinctly different from its solution or resolution. The reformulation of a design problem is one in which an endless variety of potential circumstances, unknown to the design situation, can be managed. One such example is the vast potential and scope for which movement can be described. This is different from the design of a product that offers a determinate solution to a particular need or desire. Instead, the unfixed nature of design potentialities that can take shape is therefore unknown. This is because of the creation of a dynamic or evolving set of circumstances in which diverse interactions can take place. However, the nature of this indeterminacy by way of description or name is in no way indeterminate or wicked as Rittel and Webber (1973) suggest. It is an extension of the potentialities offered by a generative system, where the variables for their reformulation differ significantly from facilitating rich user interactions that meet a distinct end. While it may appear useful to compare and contrast the benefits of a second-order cybernetic framework and
conversation theory against other theoretical approaches and methods, Rogers (2004, pp. 131–132) argues that to do so is not only untenable but also impossible. De Zeeuw (2001) tells us that conversation theory is not considered a theory in and of itself, but rather as the study of interactions to enhance values. Given this assertion, should conversation theory find greater application in the field of design, the potential and understanding of its application as a model for generating novel design solutions through conversation could be further explored for its principled approach. The development of task structures that facilitate the description of movement in Chapter Eight, “Task Analysis Workshop” and “Design Rationale” provide examples of the application of conversation theory to the generation of novel solutions that enhance the design of communication.

Summary

For the purposes of this research, I adopt a second-order cybernetic framework that is dialectical and sits within a poetic strategy as a way to facilitate designerly ways of knowing, thinking, and acting to inform making. In doing so, it enables a design situation to be developed that considers the diversity of its users through interaction, reflection, mutual understanding, creativity, and innovation as essential elements of a human-centred design process. The following research through design approach in Part IV of this thesis proceeds on the basis that a systematic design strategy characterised as a productive science or poetics can facilitate the design of a product that embodies the necessary structure to support the interaction of complex information as an integrated and organised whole. In Chapter Seven, I begin with the examination of interactive functions within existing dance notation applications and similar applications designed to capture movement. I do this in order to better understand the functional elements of existing notation applications, and to support the reformulation of a design outcome that enhances the composition and interpretation of movement for a variety of user interactions. In particular, the poetic strategy I propose takes into careful consideration the treatment of matter and form in a dynamic set of circumstances.