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RESEARCH REPORT

FINGERS IN THE OUTLET: A SELF-REFLEXIVE INVESTIGATION OF 'BRICOLAGE' AS A METHOD OF ENGAGEMENT IN NEW MEDIA ARTS, THROUGH DOMESTIC HACKING PRACTICES

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ABSTRACT

This research report consists of two components: a written report and a practical body of work. The written component is a theoretical examination of the concept of bricolage as put forward by Claude Lévi-Strauss in the text "The Science of The concrete", as an alternate process of knowledge production in its potential as a methodology for digital arts specifically relating to hardware hacking practices. This first chapter consists of a close reading of this text in which I explore the underlying concepts that bricolage hinges upon to better understand it as a methodology and process of engagement. The second chapter concerns the relationship between digital arts and science in terms of their individual use of 'method' and how it affects their conceptualization of 'knowledge'. This is carried out by examining the philosophical underpinnings of the scientific method, in association with a 'hacking' case study looking at art practice as research. In the third chapter I briefly isolate three key characteristics of bricolage as methodology, as a starting point in understanding the movement of bricolage as a process of inquiry.

The second component of this report consists of a practical inquiry into the viability of bricolage as method of production within a hardware hacking practice. It is incorporated into my written research in the fourth chapter where I discuss the resulting body of work in relation to bricolage as a model for research based practice, and as a mode of inquiry.

DECLARATION

I declare that this is my own unaided work. It is submitted towards the degree of Master of Arts (MADA) by Coursework at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree of examination in any other university.

_____

Nathan Gates

March 2013

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We were great builders, but one day we decided to play a game.

-Phillip K. Dick

CONTENTS

INTRODUCTION **1**

CHAPTER ONE **2**

1.1 The Bricolage *2*

1.2 Structure and Event *5*

1.3 The Science of The Concrete *9*

1.3.1 The Concrete 10

CHAPTER TWO **15**

2.1 Science = method + object *16*

2.2 Art and Science Disjunction: Contextualizing Hacking Practice *22*

2.2.1 Case Study: Various Self Playing Bowling Games (aka Beat the Champ) 26

2.2.1a Continue a modernist practice of art with adjustments for the contemporary era 27

2.2.1b Develop a unique postmodernist art built around deconstruction at its core 28

2.2.1c Develop a practice focused on elaborating the possibilities of new 31

technology 31

CHAPTER THREE **35**

3.1 A Set of Interrelated Characteristics *35*

3.1.1 The Heterogeneous Repertoire 35

3.1.2 The Potential Difference 38

3.1.3 Images, Signs and Concepts 40

CHAPTER FOUR **44**

4.1 Learning to make, making to learn *44*

4.2 Description of The Work *45*

4.2.1 Individual Description of Works *46*

4.2.1a A Very Complicated Wrong Answer 46

4.2.1b Drop and Throw: A Presentation of My Findings 47

4.2.1c Auto Logic 48

4.2.1d Set In Motion 50

4.3 Realization of The Work *50*

4.4 Anatomy of the process *53*

CONCLUSION **59**

WORKS CITED **62**

VISUAL SOURCES **67**

INTRODUCTION

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CHAPTER ONE

1.1 The Bricolage

Locating a clear definition of the term *bricolage* is not a simply matter as for the most part the concept is treated superficially as a description of form. For instance The New Oxford American Dictionary defines *bricolage* as a noun and refers to it as a "(in art or literature) construction or creation from a diverse range of available things". In this instance the term is used to refer to a class of thing that exists as a result of a process of creation. In The New Media Dictionary the focus of the term is shifted slightly towards its description of a process but it is subsumed within the broader definition of "Collage", reflecting it common usage in art discourses:

> COLLAGE-1. An artistic process that consists of pasting various elements (paper, small objects) onto a paper or canvas surface. Collage implies two operations: extracting elements and then integrating them into a new whole. Through borrowing, the artist creates new meaning...When large objects are integrated into an installation, the process is called bricolage, a concept defined by Claude Lévi-Strauss in 1958…(Poissant 233).

Although indirectly acknowledged as a process of meaning making by organization, in this definition *bricolage* covers an aspect of collage dealing with large objects in an installation, rendering the term an indicator of size. The Oxford Dictionary of Critical Theory provides the most informative definition of the term regarding its origins and processual character:

> The French word for 'tinkering', 'making do', or even 'DIY'. Someone who engages

> in *bricolage* is known as a *bricoleur*, which is the equivalent of a 'handyman' or 'jack of all trades'. It has passed into critical theory lexicon because of French anthropologist Claude Lévi-Strauss's comparison of western science and 'primitive' mythic thought in *La Penseé Sauvage* (1962), translated as *The Savage Mind* (1966), arguing that the latter is a kind of *bricolage* because it is constrained to work with existing material and is therefore only ever the contingent result of the combination of things that were ready to hand. In contrast to an engineer, the profession that personifies western science for Lévi-Strauss, the *bricoleur* cannot plan or make projects since to do so implies both that the necessary tools and material can be obtained as required and do not have to be ready to hand. (Buchanan 72).

Proceeding from the above, *bricolage* can be understood as a mode of practice described by Lévi-Strauss in its comparison to western science. This practice is characterized by a recombination of existent materials whose use is predicated on their immediate availability and access. In addition, the term itself offers an apt example of this process, for as an existing term *bricolage* has been re-appropriated by Lévi-Strauss in his description of mythical thought. Although taken out of context *bricolage* retains some of its previous meaning and exerts them in its new application. Put simply, *bricolage* is the construction of meaning through the (re)arrangement of existing elements.

In *The Science of The Concrete* Lévi-Strauss draws the distinction between two types of thought and argues for the conception of both as equally valid and independent strategies for understanding experience. *Bricolage* is presented by Lévi-Strauss as a process of instilling order or structure into the unstructured, which is alternate to the methods utilized in western sciences:

> …there are two distinct modes of scientific thought. These are certainly not a function of different stages of development of the human mind, but rather two strategic levels at which nature is accessible to scientific enquiry: one roughly adapted to perception and imagination: the other at a remove from it. It is as if the necessary connections which are the object of all science…could be arrived at by two different routes: one very close to, and the other more remote from, sensible intuition. (*The Savage Mind* 15).

In his comparison of western science and 'mythical thought' –the latter being the route 'close to sensible intuition' - he makes use of *the bricoleur* as a metaphor to describe the mythical thinker which he compares with the engineer, whom he felt most exemplified modern science. For Lévi-Strauss the act of *bricolage* on the technical plane corresponded with mythical thought on the theoretical as both mythical thought and *bricolage* expressed themselves by means of a limited, although extensive heterogeneous repertoire. "It [mythical thought] has to use this repertoire, however, whatever the task in hand because nothing else is at its disposal." (Lévi-Strauss, *The Savage Mind* 17). This mode of thought referred to as primitive or mythical, shares operational tendencies with bricolage as, "it deals with intellectual problems by manipulating a series of pre-existing concepts." (Pace 141). Accomplishing its goals with the same limited set of tools, "When faced with a novel problem, it goes back through its collective experience and rearranges existing concrete elements to produce a pattern which expresses the new situation."(Pace 141).

In lieu of the above I want to put forward a working definition of bricolage as it relates to a process: *bricolage is a process of organization in the broadest sense as it is concerned with collection, organization and manipulation of already existing objects, or*

object fragments in service of making meaning. Mythical thought on the theoretical plane and *bricolage* on the practical, resemble each other structurally by holding a set of operational characteristics in common. The following sections aims to explore these characteristics and what the process of bricolage entails by examining the manner in which it conceptualizes the relationship between *structure* and *event.*

1.2 Structure and Event

> Science as a whole is based on the distinction between the contingent and the necessary, this being also what distinguishes event and structure
> (Lévi-Strauss, *The Savage Mind* 21).

The fundamental deviation between modern science and the practice of the bricoleur is in their respective orientation towards structure and event, as they each assign them inverse functions as means and ends in the classifying their experience of the world. Whereas bricolage builds up structures by fitting together the remains of events, science creates it means and results in the form of events which is due to its constant elaboration of the structures which are it hypotheses and theories (Lévi-Strauss, *The Savage Mind 14*). Science undertakes the task of uncovering the underlying structure of a real world event or occurrence by means of theories and hypothesis that attempt to explain the events existence, thereby structuring the event's expression as sensuous phenomena and equipping the scientist with predictive power. As such, what constitutes scientific knowledge is the quantification of events and subsequent systemization of the empirical data collected from them in order to explain these events from a perspective of causality. Lévi-Strauss notes in this regard that the qualities that

science claimed at its outset as peculiarly scientific were precisely those that formed no part of living experience and remained outside and unrelated to events (*The Savage Mind* 14). If the most basic postulate of science is that nature is inherently orderly (Simpson qtd. in Lévi-Strauss, *The Savage Mind* 10), then the object of science is to uncover the necessary connections or arrangements that produces events as an expression of science, resulting from its encapsulation within the scientific structure.

According to Lévi-Strauss, bricolage operates in an inverse manner by building structured sets with events themselves, and not directly with other structures. Its structures are produced through the ordering of events, or parts of events, in relation to other events. Put into other terms by Pace, the "logical constructions" of bricolage "are created from chains of concrete elements juxtaposed within a story or ritual". This enables complex mental operations by means of the arrangement of "concrete elements to create quite complicated conceptual grids…" through which it is possible to "…express sophisticated notions"(140). One notable consequence of this arrangement, where the debris of events are assembled as means in the fabrication of a structured set, is the reversal of the relationship between the diachronic and the synchronic (Lévi-Strauss, *The Savage Mind* 22). When experience is conceptualized and arranged chronologically, or linearly, the current states of a system or structure occur sequentially as ever 'higher' or more developed states than the last, and this system is measured in terms of progress. This shapes the methods of inquiry within this framework and affects the manner in which knowledge is conceptualized; the scientific method is an example of 'proceduralization' in an effort to yield a maximum gains in terms of progress. However, when a structure is formed through the relationships created between events, or snapshots of a system, the organization of experience

becomes a spatial affair. The spatialization of experience is central within the methodology of the bricolage and fundamental to the way the in which the bricoleur approaches the world. Lévi-Strauss describes this relationship with an example drawn from Information Theory:

> Both the scientist and bricoleur can be said to be on the look out for 'messages'. Those which the bricoleur collects are, however, ones which have to some extent been transmitted in advance – like commercial codes which are summaries of the past experience of the trade and so allow any new situation to be met economically, provided that it belongs to the same class as some earlier one… (*The Savage Mind* 20)

The bricoleur is then constantly trying to accommodate new information in the form of messages fragments by 'making-space' through the reorganization of her current structure for understanding experience. Deleuze and Guattari describe this process of spatial organization as "the ability to rearrange fragments continually in new and different patterns or configurations…" this systems manifests "… as a consequence, an indifference toward the act of producing and toward the product, toward the set of instruments to be used and toward the over-all result to be achieved." (7). This is in opposition to the engineer/scientist whose actions are facilitated through the ability to carefully and clearly measure their progress as it plays a particular role in the confirmation or falsification of an hypothesis, and the production of new knowledge. Lévi-Strauss's continued comparison:

> The scientist, on the other hand, whether he is an engineer or a physicist, is always on the look out for *that other message* which might be wrested from an

> interlocutor in spite of his reticence in pronouncing on questions whose answers have not been rehearsed. [original emphasis] (*The Savage Mind* 20)

The scientist/engineer is always looking beyond his current situation and searching for that 'message' which would in effect change his structure so radically that it could no longer be utilized, making new knowledge the function of measurable difference. Whereas the bricoleur continually attempts to assimilate new information with past forms of understanding, the modern scientist searches for solutions to predesigned problems. He is especially looking for those 'other messages' that transcend existing intellectual tools and require a complete reconceptualization of old problems (Pace 142). By breaking down this process into a series of analyzable vectors the scientist begins with a hypothesis and moves to the next step in a linear sequence only insofar as it validates his proposed explanation, i.e. method of organization, as knowledge. The bricoleur by contrast remains embedded within the process of producing, in the form of continuous organization and inquiry by incorporating the recording and consumption within production itself, it makes *inquiry* and *knowledge* productions of one and the same process (Deleuze and Guattari 4).

The bricoleur's creation of structures from the remnants of others is achieved by placing these various pieces into spatial relationships with one another, thereby doing away with the causal linear sequence associated with the idea of cumulative progress. The result of this is the actualization of a process of co-construction where the relationships between elements of a structure simultaneously affect the character of the elements, as well as the structure itself and vice versa. In this way bricolage encompasses both theoretical and practical dimensions into a the same process, where "…there is no such thing as relatively independent spheres or circuits: production is

immediately consumption and a recording process…without any sort of mediation, and the recording process and consumption directly determine production, though they do so within the production process itself."(Deleuze and Guattari 4). The coupling of production and consumption results in the collapse of these distinctions into one another, making them the same process of continuous organization.

1.3 The Science of The Concrete

> The elements of mythical thought similarly lie halfway between percepts and concepts. It would be impossible to separate percepts from the concrete situations in which they appeared…(Lévi-Strauss, *The Savage Mind* 18).

Whereas scientific thought operates in terms of abstract entities in its effort to categorize the experiential world, bricolage constructs understanding with elements accessible to the senses, 'the concrete'. Lévi-Strauss's characterization of bricolage as 'The Science of The Concrete' refers to the concrete elements it employs in its organization of the world, but it is also indicative of the manner it which it uses these elements to implement order. If the modern scientist moves abstractly from axiom to theorem to corollary, the analytical methodology of western science differs from that of 'The Science of The Concrete' in that the bricoleur constructs her theories by arranging and rearranging, negotiating and renegotiating with a set of well-known, concrete materials (Papert and Turkle 169). This approach more closely resembles a web than the hierarchy of knowledge common to modern science, for the bricoleur time and time again collates these fragments together to form "…a logical system built out of pure experience, a grammar of sound, odour and texture, a formal

structure made up of perceptions…"(Wilcken 254). The following section examines Lévi-Strauss's notion of 'The Science of The Concrete' as it relates to bricolage.

1.3.1 The Concrete

> The secret of what anything means to us depends on how we've connected it all to the other things we know. That's why it's almost always wrong to seek the "real meaning" of anything. A thing with just one meaning has scarcely any meaning at all (Minsky 64).

The Science of The Concrete is in effect Lévi-Strauss's attempt to demonstrate that the thought processes involved in 'primitive' thought are as valid as what we understand as modern science today, for science is only one modality of thought. The " "science of the concrete" – [although] not always accurate by the standards of modern classification…[have] in the primitive intellectual world just the function that science, in its nonutilitarian [sic] aspect, has in ours, namely that of organizing the totality of experience into a coherent whole." (Caws 202). Lévi-Strauss expresses this difference between the two as one of degree as although both are concerned with instilling structure, they do so with alternate intentions:

> The difference is therefore less absolute than it might appear. It remains a real one, however, in that the engineer is always trying to make his way out of and go beyond the constraints imposed by a particular state of civilization while the 'bricoleur' by inclination or necessity always remains within them. This is another way of saying that the engineer works by means of concepts and the 'bricoleur' by means of signs. (*The Savage Mind* 19).

Whereas the engineers works by means of abstract concepts to develop explanations of events in the world that extend beyond the technical, epistemic and/or other limitations of there context. The bricoleur operates in terms of the 'concrete' as the materials she uses in structuring experience are signs, and these signs are entangled with the concrete situations in which she first encountered them. When re-appropriated by the bricoleur these signs are shaped by their original contexts and use. In this regard bricolage operates in terms of the concrete and local context. However, this process does not exclude the possibility of abstract thought as it is exercised in the sciences, it instead highlights the misunderstanding of the 'concrete' that arises when it is defined in opposition to 'abstract'. Wilensky defines this as the *standard view* for determining a concept's or description's concreteness: "determine how many objects in the world could fit in this description; the lower the number the more concrete." (195). He adds, "Our language uses height as metaphoric scale to measure concreteness. Thus, the very concrete is down and the abstract up (where its is presumably hard to reach and to "grasp" and to "hold on to")." (195n). This view is prevalent within the sciences in its quest to construct enduring knowledge, as the underlying assumption is that 'concrete' refers to particularity. Beginning with the concrete world the methodology and inductive reasoning of science progresses away from the particular towards the general, with the abstract holding the most privileged position as it approaches immutable knowledge. Wilensky refutes this standard view on a series of fronts but most importantly on the grounds that there is not a finite amount of objects in the world and as a result there is no objective reference on which to exercise the standard view. So dependent on how you divide your world into parts, or on what basis you do so, " your ontology can be entirely different" (196). Ironically, although this formulation of 'concrete' privileges abstract

thought it simultaneously undermines the objectivity and immutability of the abstract, affecting sciences 'objects' of knowledge. "The proliferation of concepts, as in the case of technical languages, goes with more constant attention to properties of the world, with an interest that is more alert to possible distinctions which can be introduced between them." (Lévi-Strauss, *The Savage Mind* 2), the objectivity of these quantitative distinctions loses any significance as they collapses under the weight of their own proliferation.

Wilensky shifts away from isolated objects to focus on the relationship between them when he offers his alternate formulation of 'the concrete':

> The pivotal point on which the determination of concreteness turns is not on some intensive examination of the object, but rather an examination of the modes of interaction and the models which the person uses to understand the object. This view will lead us to allow objects not mediated by the senses, object which are usually considered abstract – such as mathematical objects- to be concrete; provided that we have multiple modes of engagement with them and sufficiently rich collection of models to represent them (199).

'Concrete' then is not an intrinsic property of certain objects and not of others; 'Concreteness' is rather a measure of the degree of relatedness between objects and a property of these relationships. The more concrete an object is then the more connected it is to its surroundings and the more avenues of engagement or points of access we have with it. This enables it to be operated in a variety of subjective modalities that in turn produces a better overall understanding of it. Wilensky describes this process of understanding as *concretion*: "Concretion is the process of

new knowledge coming into relation relationship with itself and with prior knowledge, and thus becoming concrete." (Wilensky 20).

The 'concrete' in "The Science of The Concrete" refers to the operations performed on objects by means of manipulating and reconfiguring their relationships to one another. This manipulation of relationships affects the objects as far as our understanding of them goes and as a result, affects our perception of these objects which influences the set of relationship that is possible to make with them. The science of this 'concrete' is then concerned with the quality of the outcomes of this process. In this regard, Wilensky draws a distinction between understanding and explanation, and poses this question: "what does it mean to divide two fractions?" (200n). Although the majority of people could invoke the operation of 'flipping and multiplying' by referring to a conceptual explanation of solving equations, the understanding of what a fraction expresses – a relationship between a part and whole- is analogous to what we lack or misinterpret, as when thinking of the concrete as property of an object. This insight can be extended to bricolage and science insofar as they produce qualitatively different results. Bricolage organizes experience in terms of concrete images that it collects from a variety of situations, which function as signs outside of their original context. Through a process of concretion these signs are organized to "…serve as intellectual tools to express abstract notions and relationships" (Sarup qtd. in Hatton 339). Although bricolage operates in the realms of the concrete this does not exclude a capacity for abstract thought, 'the concrete' is a characteristic of bricolage that aids in understanding its integration of thought and action.

The difference in the operation of bricolage and modern science is not in the validity of their respective thought processes but is located in their approaches to the world, which is expressed in there orientation to *event* and *structure,* and the comprehension of the concrete. Both are logical, but they employ their logic on different levels of experience as they are engaged with the process of ordering and systematizing experience into comprehendible structures (Pace 139). Where one makes use of events as the proof of its discovery of necessary connection, the other utilizes them as the means and parts to build it. The placement of experience along a linear axis of time as exhibited by modern science, results in an assumption that later states are more developed then its predecessors. The spatial conception of experience as well as *event* and *structure* exhibited by bricolage permits a variety of permutations within the same closed space, where there are as many states as there are relationships between elements contained within it. As neither permutation reaches a higher state then the previous this conceptualization of event and structure creates order through the concretion of new objects and situations. This process couples production and consumption, thought and action, and the collapses these distinctions into one another as the same meaning-making process, of continuous organization. As Lévi-Strauss writes:

> Mythical thought for its part is imprisoned in the events which it never tires of ordering and re-ordering in its search to find them a meaning. But it also acts as a liberator by its protest against the idea that anything can be meaningless with which science first resigned itself to a compromise. (*The Savage Mind* 22).

CHAPTER TWO

> A complex medium containing surprising and unforeseen developments demands complex procedures and defies analysis on the basis of rules which have been set up in advance and without regard to the ever-changing conditions of history. (Feyerabend 18)

As a dominant method of knowledge production, or rather validation stemming from the enlightenment era, the scientific paradigm is derived from the rationality of logical positivism. The basic tenet of logical positivism "...can be summarized as a quest for absolute truth, trans-historical, universal foundations for knowledge, and as making a clear distinction between true scientific knowledge and subjective interpretation." (Van Robbroeck, 35-6). These underlying philosophical ideas and assumptions informing the scientific paradigm "assumed that outcomes of inquiry were mostly seen within the limits of what was already known. Knowledge in this sense was expressed as a difference in the degree or quantity and was compared to other things we knew." (Sullivan 31). This was entrenched within the scientific method as the positivist research maxim reflected: "if you don't know where you're going, how do you know when you get there," (Sullivan 31).

The scientific method perpetuates two things, amongst others, that are relevant to the discussion surrounding artistic processes of inquiry: the separation of subject and knowledge within the process of research. Van Robbroeck's extension of Reiss's metaphor of 'the telescope' is particularly insightful in clarifying this relationship: "Reiss uses the telescope as a metaphor of the instrumentalist nature of analytico-

referential discourse: the telescope distances the viewer from the world, thus creating a duality between the 'knower' as subject, and the world as object. The world is represented as a passive, inert object of knowledge, and science as the only 'true' instrument of knowing" (Van Robbroeck 34). As a result the scientific method becomes a procedure applied to an object in service of sequestering knowledge that can then be divorced from this context, to stand independently of its conditions of 'discovery'. Viewing the world as an object on knowledge assumes that it is possible to access this external reality via the senses and accurately represent it. This reflects positivisms [1] deterministic philosophy "…in which causes probably determine effects or outcomes. Thus, the problems studied by post positivists reflect a need to examine causes that influence outcomes, such as issues examined in experiments" (Creswell 7). This leads to the second point of discussion: the actual progression of research resulting from the scientific method. The scientific method follows a linear sequence of investigation that at the end of this causal chain concludes in the codification of knowledge.

2.1 Science = method + object

> …in the scientific method – the accepted approach to research by post positivists- an individual begins with a theory, collects data that either supports or refutes the theory, and then makes necessary revisions before additional tests are conducted…(Creswell 7).

[1] Post positivist revisions and critiques of positivism notwithstanding, the basic tenets of positivism and post positivism that are of interest to this discussion are still influential in how conceptions of research are framed. The rationality of logical positivism is still the long-term trustee overseeing the scientific method. (Sullivan 33).

As I discussed in the previous chapter concerning bricolage's orientation towards 'event and structure', the scientific method assigns 'event' a function inversely to that assigned by bricolage. Whereas bricolage begins with structures in the form of fragments of existing structures that it then arranges into a structure to accommodate a novel event, the scientific method starts by isolating an event and moving towards the formulation of structure. So beginning with a hypothesis data is collected through empirical testing to either confirm or refute it, the outcome of which affects the systemization of the data to become knowledge. Science and scientific inquiry is focused on method to validate its hypotheses and govern this process of systemization, with the method functioning as the scripted route of inquiry traversed within the act of research. It is commonly the case that the search for meaning becomes a tangible goal once the procedures used to determine truth are accepted and codified (Sullivan 33).

Feyerabend critiques this idea of method as the passage to 'truth' within the positivist legacy claiming that although it is "…*possible* to create a tradition that is held together by strict rules, and that is also successful to some extent…is it *desirable* to support such a tradition to the exclusion of everything else? Should we transfer to it the sole rights for dealing in knowledge, so that any result that has been obtained by other methods is at once ruled out of court?" [Original emphasis] (20). He is critical of this method as a *process of enclosing* that proceeds according to set rules that have been defined prior the act of research. This mode of inquiry is less concerned with process as it is with a pre-packaged solution aimed at the wresting of knowledge from the world, and its codification into an objective form.

The principles, against which the scientific method codifies its knowledge, stem from the Enlightenment world-view as mentioned above. Sullivan isolates four such principles:

i. The importance of rationality
ii. The authority of empiricism
iii. The polarization of the relationship between the objective and the subjective
iv. The prevalence of an essentialist conception of things in the world (33-43).

His arguments regarding these principles is directed towards the fact that, most, if not all methodologies need to address these areas as they are concerned with the production of knowledge, and to "distinguish differences between [themselves and other] research methodologies as systems of beliefs about reality, knowledge and relationships"(34). Even prior to the act of inquiry and exposure to the conditions or contexts in which it is to take place, research methodologies are constrained by having to answer to these principles. This is a result of the impact of the scientific method on the entrenchment of these principles as the sole tenets of knowledge production. Furthermore, these principles play an important role in putting forward a confirmatory research agenda that is enforced through demands of control and reductionism leaving the research process being less of an exploration and more of a search for answers. More than anything what the scientific method puts forward is a very particular conception of knowledge: "When confirmatory research goes smoothly, everything comes out precisely as expected. Received theory is supported by one more example of its usefulness, and requires no change. As in everyday social life, confirmation is exactly the absence of insight" (Kirk and Miller 15).

Although Sullivan feels it is necessary for all methodologies to address these issues, the form in which they are presented by the scientific method are not only illusory but constantly subject to critique and in-fact adaptation and change when applied in practice. Instead, what Sullivan proposes is shifting the conception of knowledge away from one solely concerned with explanation towards a knowledge that sees its "criteria for assessing the trustworthiness of findings…[as] not so much a matter of whether an outcome is statistically significant but whether it is meaningful." (44). In other words, seeing knowledge as the process of producing meaning or understanding. A process that would still involve systematic analysis and logical reasoning but also the added dimension of subjecting emergent findings to continual critique as "new observations are framed by interpretations drawn from the situation." (44). This is something that would be impossible to define from the outset and instead would require a process of inquiry that can change and adapt to these situations as they arise during the research procedure. This perception of *understanding* and it's *process,* or better yet *knowledge as the process*, in contrast to *science* and *knowledge* is lucidly expressed by Bruner: "Understanding is the outcome of organizing and contextualizing essentially contestable, incompletely verifiable propositions in a disciplined way…The requirement, rather, is verisimilitude or "truth likeness" and that is a compound of coherence and pragmatic utility, neither of which can be rigidly specific." (90).

Tied into the codification of knowledge as the product of applying the scientific method to an object of inquiry, is the separation of *theory* and *practice* or *idea* and *action.* The scientific method's emphasis on theory over practice in visible in its instrumental structuring of the research process as one that uses experimentation (empirical testing and intervention) in order to supplement a theoretical stance. What

the linear causality of this inquiry takes for granted is that a "clear and distinct understanding of new ideas precedes…their formulation and their institutional expression" (Feyerabend 25). In response to the notion of a research enterprise always starting with a problem[2], Feyerabend responds with this example of knowledge as a process of meaning making, as it is found in the development of children:

> Yet this is certainly not the way in which small children develop. They use words, they combine them, they play with them, until they grasp a meaning that has so far been beyond their reach. And the initial playful activity is an essential prerequisite of the final act of understanding.(26)

Feyerabend advocates a form of inquiry that sees thought and actions as two parts of the same indivisible process and it is only by bringing this process to a stand still, can one begin to pry apart these two forces. Put another way, emphasis should be placed on the process of inquiry instead of the points of departure and 'arrival', or, the problem and the object of knowledge. For Feyerabend these points are really just constructs whose fabrication happens after the fact, as these predefined points cannot be objectively 'discovered'. He is critical of the methods of science and any other confining strictures of a predefined method in research, as this effectively shifts the *process* of research to the periphery when it should be the defining feature of any inquiry concerned with the generation of new knowledge. This is because a process of this kind *is not*, and *cannot* be guided by any sort of well-defined programme, "for it contains the conditions for the realization of all possible programmes [sic]" (26). Feyerabend argues

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[2] (Radnitzky 1). Karl Popper was a philosopher of science who put forward the idea of *falsification* in response the concerns regarding inductive logic. Instead of looking to confirm hypothesis, which in turn only increases its truth probability scientist should seek to refute them. The purpose of this Methodological Falsification is to conjecture and refute hypothesis in order to implement an evolutionary process where theories become less inferior. This method however presented still retains a confirmatory research agenda that presents knowledge as an object to be to be taken from the world with the use of the right tools, namely science.

this process is not defined but instead guided by what he calls a "vague urge" and it is this vague urge that give rise to the specific behaviours "which in turn creates the circumstances and the ideas necessary for analyzing and explaining the process, for making it 'rational' "(26). In effect, the 'rational' proponent is one of rationalizing as it is an action taking place after the fact and with this "vague urge" he speaks of resembling curiosity, driving the process forward and responding to circumstances as the develop. By being driven by curiosity, this need to make sense or meaning out of something affects 'understanding' by shifting it away from attaining demarcated points to be 'discovered' as knowledge (the paradox of progress), and towards a situation where no big picture needs to be defined or explained. The conception of knowledge put forward here is a process of understanding that only ever 'reaches' starting points of further exploration, making it a process of continual patter*ning.* "Creation of a *thing*, and creation plus full understanding of the *correct idea* of the thing, *are very often parts of one and the same indivisible process* and cannot be separated without bringing the process to a stop." [Original emphasis] (Feyerabend 26). This conception of knowledge is only possible when the perception and very real division of *idea* and *action* are demolished, and where an idea could be made clear only by the very same actions that were supposed to create that idea.

The scientific method is a confirmatory approach to the production to knowledge, which although is useful is not the sole route to knowledge but rather a particular approach to a limited conception of it. The linear causality of the scientific method places emphasis on vectors by beginning with an idea - problem to solve- and using practice only insofar as it supplements the creation of body of evidence to explain and confirm this problem. This perpetuates a very narrow perspective on the

conception of what 'knowledge' *is* and leads to issues regarding what are viable problems to investigate and what are not. By doing what is in-effect 'looking for answers', this method of enclosure fails to take notice of emergent phenomenon by ruling them out of the research process from the outset. Opening up this conception of knowledge not only moves away from the methods that enforce it but more importantly also opens up areas and processes of inquiry that were excluded by design. "Due to the limitations of science, phenomena are systematically ignored or misconstrued as attention is focused on those that are amenable to the methods scientists have developed in order to make sense of empirical data." (Shanken 28)

2.2 Art and Science Disjunction: Contextualizing Hacking Practice

In addressing the role of artists making use of emergent technologies in their practice, Wilson indentifies a gap in theoretical discourses surrounding these practitioners. Cultural theories such as cultural studies and critical theory offer frameworks for theory based investigation for practicing artists. However artists using emergent technologies in their practice fall under their radar in terms of theoretical support. A similar encounter occurs on the scientific and technological side of this equation where scientific and technical discourses are not willing to engage with the arts on any meaningful level. In response to this Wilson offers three models which artistic practice involving technology and scientific concepts could take, in light of their existence within this interstice.

> "Critical theory and cultural studies attempt to link the arts, literature, media studies, politics, sociology, anthropology, philosophy, and technology in an

> interdisciplinary search for relevant concepts and frameworks with which to understand the current world. While art practice and theory are being radically reshaped by this activity, the techno-scientific world in general has not deeply engaged the concepts from cultural studies."(Wilson, *Information Arts* 20).

Cultural theory has played an important role in the analyses and production of art and is being increasingly called upon to understand the function of art within a broader socio-cultural context, as well as in a technologically bountiful post-industrial setting. However, these theories have not been widely used to understand the work of artists who make use of emergent technologies within their artistic practices, a site of interaction that Wilson regards as "situated in a junction of culture and technology potentially rich for insights." as many of the technologies being engaged with by these artists are key to structuring the postmodern, post-industrial world ("Light and Dark Visions" 14). Part of cultural study's disinterest comes down to digital arts location within the fissure between traditional arts/culture discourses and techno-scientific discourses. The fact that techno-scientific discourses have not engaged with theories of cultural studies, seeing no place for artists within their arena of 'proper research', is coupled with the conception of technology put forward by critical theory:

> The role of computers and information technologies is one area in which the views of cultural critics and scientists diverge. Many critical theorists emphasize the insidious nature of pervasive, smoothly functioning information technologies that control and promote superficial thought and life. (Wilson, *Information Arts* 21)

Wilson polarizes this disjunction between techno-scientific discourse and art theory/criticism into two camps, or 'visions' as he calls them, as they relate to the attitudes held within in each vision towards science and technology. These 'light' and

'dark' visions also correspond to the outlook on artists using emergent technology in their practices. Whilst Scientists and technologists still maintain faith in the objectivity and progress of their work with the belief that their discoveries could yield benefits that transcend cultural and contextual borders; The deconstructive attitude of critical theory seeks to expose the meta-narratives and assumption that shapes research to render concepts such as 'objectivity' and 'progress' as illusory and the scientific mission as deluded.

Artists utilizing techno-scientific artifacts and concepts face the dilemma of locating themselves within the interstice between the two worldviews, which constitute their very practice, but with neither side of the divide willing to fully engage with them. "On one side they are invited to help create the new technologies and elaborate new cultural possibilities; on the other, they are asked to stand back and use their knowledge of the technology to critically comment on its underrepresented implications."(Wilson, *Information Arts* 23). Lacking theoretical support in terms of framework or methodology from either side of the equation these artist are faced with the challenge of locating a rationale for their practice within what Wilson describes as 'the deconstructed milieu', the continually shifting nature of postmodern culture. Wilson offers three models of practice that these artists could possibly adopt:

a. Continue a modernist practice of art with adjustments for the contemporary era.

b. Develop a unique postmodernist art built around deconstruction at its core.

c. Develop a practice focused on elaborating the possibilities of new

technology.

("Information Arts" 26)

These models will be discussed in relation to a case study of one of Cory Arcangel's works. The work has been selected for its incorporation of both technological and cultural formal elements as well as the artist's use of technical and artistic strategies in the production of the work. Archangel's work spans a wide range of media from video to sculpture and installation, through which he explores the relationship between the professional and amateur as they are produced in internet culture, the fine arts and through digital technologies. A common strategy in is his work is the manipulation of ready-made objects and platforms that stress and blur the boundaries between expert intervention and DIY tinkering. An example of this is his video game modifications; in these pieces Arcangel would physically remove from the game cartridge the integrated circuit where the Read-Only Memory was stored. Altering the information/software stored on these devices, through processes specific to these technologies, and replacing these IC's in the game cartridges enables him to alter the very nature of the original games. One of the most well known of these was *Super Mario Clouds*, where Arcangel removed all the elements from the well known Super Mario game leaving behind only the iconic clouds, which would continuously scroll across the screen. Using fairly complicated technical operations in this process he creates a tension between the product as a simple technical outcome, and a complex and interesting cultural product. The work I have chosen to examine is another one of his video game modifications but it differs from *Super Mario Clouds* insofar as that it utilizes a physical form of hacking and hardware manipulation.

2.2.1 Case Study: Various Self Playing Bowling Games (aka Beat the Champ)

Various Self Playing Bowling Games (aka Beat the Champ) is an installation work by artist Cory Arcangel consisting of fourteen of his various 'hacked[3]' games consoles busy playing their appropriate bowling video games that have been sourced from the 1970's to 2000. Unlike previous video game 'hacks' he has produced where the code making up the actual game has been manipulated to alter the original game play, *Various Self Playing Bowling Games (aka Beat the Champ)* (from here on out *Beat The Champ*) is made by coupling the game consoles remote controller with an auxiliary system that takes over the traditional user input (figs 1-3). This auxiliary system consisting of a microcontroller attached to the remote control input is parasitic on the original structure of the remote in that it electronically inputs a series of commands, which are in effect button presses, that continually causes the 'player' in the game to throw a succession of gutter balls. In this 2011 instantiation of this installation these consoles have been arranged on a table next to one another (fig 4), with the actual game play from each console being projected in chronological order to produce a virtual bowling alley that stretches from the earliest pixilated game play all the way to the 3D realism of contemporary games (fig 5-6).

[3] De Batty et al. characterize hackers as having "a strong interest in the way things work; they like to tinker, customize, modify, and repurpose existing and obsolete technologies, and as a group they tend to embody the altruistic principles of collaboration and information sharing. That is not to say that hacker activities are free from pranks, political motivations, and anarchistic impulses. But in general these sorts of activities are directed less toward doing harm and more toward freedom in the broadest sense—freedom from limitations imposed on speech, the use of manufactured goods, access to information, and personal expression." (29)

2.2.1a Continue a modernist practice of art with adjustments for the contemporary era

Within this model artists would maintain faith in the role of the avant-garde along with the underlying cluster of beliefs associated with modernism, and modern art. According to Wilson, artists working with technology within this paradigm see their work as no different from that of artists using traditional media: "They see themselves engaged in a specialized aesthetic discourse and nurture their personal sensitivity, creativity, and vision… They work on concerns and in modes developed for art in the last decades, such as realism, expressionism, abstraction, surrealism, and conceptual work." (Wilson, *Information Arts* 26). Thus the primary figure of the individual 'genius' is retained along with his vision and its potency to transcend local contexts.

Arcangel's works can be placed within this model insofar as it allows him to destabilize many of its structuring principles from the inside. In fact many of these principles are performed 'badly' in the *Beat The Champ*, by hacking[4] these the game consoles Arcangel demonstrates an impressive technical prowess that he places in service of problematizing the promises of modernism that enabled the production of these technological objects, as Christine Paul notes in the exhibition brochure: "Various Self Playing Bowling Games thus has an element of a futuristic nightmare, a failure of gloriously seductive simulation in which the viewer has no influence on the system and is exposed to the endless repetition of unsuccessful actions. The technological progress symbolized by the increasingly sophisticated graphics is undermined by the lack of

[4] It is interesting to consider the art historical lineage of 'hacking' and according to De Batty et al.: "Many of the operating procedures of contemporary hacker artists are descended from the acts of appropriation in twentieth-century art. The story of modern art could be told as the conceptual shift from perceptual goals (creating representative and "realistic" images) to self-reflective and experimental models." (30).

progress on the level of game play— no matter how the bowling alley looks, every ball will inevitably land in the gutter." (5).

What this model seeks to achieve is the acceptance of technology as a medium within the 'High Art' canon, similar to that of photography and cinema. Wilson raises some issues concerning this desire relating to the entanglement of technology and popular culture, a situation needing to be addressed if these artists are to maintain modern arts distinctions between high and low culture. This is however only a minor detail when considering the revisions that need to take place regarding the cultural hegemony, marginalization of divergent voices and the delusion of artists in that they can "manipulate and manage their participation and independence in this world," as "…history suggests it is not easy" (Wilson, "Light and Dark Visions" 27).

2.2.1b Develop a unique postmodernist art built around deconstruction at its core

In terms of Wilson's proposed models, *Beat The Champ* fits best within the second model of which Wilson states:

> This kind of practice is challenging. It requires that artists become as knowledgeable as possible about the technologies in which they are interested. It requires that they acquire expertise in theory and cultural analysis, and asks that they become conversant with intellectual work in many disciplines. It asks that they perfect skills of research and analysis in addition to expression and communication ("Light and Dark Visions" 31).

And this is what Arcangel has done with *Beat The Champ*, by critically analyzing the cultural role of these game consoles he has managed to subtly subvert their function not

only on a physical level, but also in relation to their socio-cultural expectations. He has achieved this by avoiding simple hierarchical inversions as his means of critique. "There's something inherently absurd about people sitting in front of their TVs and controlling a virtual 3-D representation of themselves bowling a ball down a lane," Arcangel claims, by physically removing and automating the user input in the scenario Arcangel begins to unpack the notion of control and "…all you're left with is a repeated, infinite letdown." and at the hands of the very technological you willingly embraced (Arcangel qtd. Spears 21).

For Wilson this model relies on critical theory and cultural studies as the source of the "concepts, themes, and methodologies for creating artworks that examine and expose the texts, narratives, and representations that underlie contemporary life. Even more, the work can reflexively examine the processes of representation itself within art." (*Information Arts* 27). The technique with which Arcangel executes this work is of relevance not just to the physical working of the piece but the method of 'hacking' speaks directly to the deconstructive sensibilities of critical theory, both literally and figuratively. De batty et al. describes this process: "Rather than rule-breaking, contemporary hackers pursue rule-*bending*. What hacker work is *about*—the structures and limitations under which it operates—is primarily a concern with things like cultural norms, commercial products, consumer technology, legal standards, and geopolitical conditions…In brief, the "rules" *are* the medium within which hacker artists swim." (30).

What Arcangel has carried out through hacking these objects is in effect, turning the logic of these technologies against themselves and creating a direct relationship between form, content and productive process of the work. By becoming proficient in

the 'language' of technology he has enabled himself to exploit the existent structure of these game consoles in service of understanding their role as cultural and technological objects. Through this Arcangel begins probing what Crary characterizes as the "…the fundamental incapacity of capitalism ever to rationalize the circuit between body and computer keyboard…" and harnessing this circuit as the site of a potential productive fissure; "The disciplinary apparatus of digital culture poses as a self-sufficient, self-enclosed structure without avenues of escape, with no outside. Its myths of necessity, ubiquity, efficiency, of instantaneity require dismantling: in part by disrupting the separation of cellularity, by refusing productivist injunctions, by introducing slow speeds and inhabiting silences." (Crary 294).

In this model artists become technically capable of producing "works that look legitimately part of the output of the technological world while introducing discordant elements that reflect upon that technology."(Wilson, "Light and Dark Visions" 29). They develop strategies around the theory-based analyses of cultural studies that provide methods and frameworks for creating work. However the dark side of this model is the limitations placed on technology that dismiss any potential positive outcomes they may have, although benefiting from the theoretical support of such theories. Adopting their methods of investigation also means inheriting their prejudice "Many critical theorists emphasize the insidious nature of pervasive, smoothly functioning information technologies that control and promote superficial thought and life." (Wilson, *Information Arts* 17). This brings me to Wilsons third model.

2.2.1c Develop a practice focused on elaborating the possibilities of new technology

> Art and science are both manifestations of the human drive for knowledge; they provide their practitioners with a feeling of resonant connection to the complex processes that underlie our environment. And though they ultimately express a different view of the universe, they aren't mutually exclusive (De Batty et al. 9)

Whilst the first model concerns the continuation of an art historical practice that struggles to get technology accepted into the canon of 'High Art', and the second model fuelled by the skepticism of critical theory looks to deconstruct technology as wholly problematic entity. The final model Wilson proposes is by and large concerned with the artist as researcher. As Wilson's preferred stance, judged by his level of engagement, this model is essentially a hybrid of the first and second models built around the fringe positioning of art/science practice. The most important aspect of this model for Wilson is the power of the artist as researcher, operating free from market demands and the socialization of particular disciplines enables artists to explore ideas and technologies that may be deemed unprofitable and so relegated by the sciences; Artists could also pursue lines of inquiry and processes of research that are not sanctioned by particular disciplines (Wilson, *Information Arts* 28).

Within this model artists would need to be knowledgeable within their particular area of interest to meaningfully contribute to the conversation, thereby allowing them to situate themselves within the fissure between techno-scientific research and art discourse, as mediators between these two 'worlds'. They would harbour an interest in

both the technical and cultural aspects of technology and scientific developments as Wilson elaborates:

> "It asks artists to entertain the possibility of science-based progress, even though they may share an interest in deconstructing the texts and narratives of the technical world, be skeptical about its self representations, be involved in elaborating the unappreciated cultural implications of the technology, and be wary of the ways that research and technologies get co-opted. It does not automatically reject the idea that some research, invention, and development may transcend the cultural contexts in which it arises, generating new knowledge, cultural meanings, and possibilities rather than just circulating old signs." (*Information Arts* 29).

Examining *Beat The Champ* in the light of this model one finds a latent process of investigation that does in fact yields knowledge, as evident in Arcangel's modification of the game consoles and its relationship to the deliberate effect it has on the games. What was required of Arcangel to develop the auxiliary controls system was the implementation of some form of inquiry, one that can only be speculated upon here presented with its artifact but one that is nonetheless present in the work. It is this aspect of knowledge production that the third model of Wilson's is concerned with, even though their was not a conscious attempt to produce 'research' in the work it does leverage the relationship between the artists and the technology in pursuit of an understanding alternate to what is available. Within this leveraging Arcangel needed to understand the consoles sufficiently to map the manner in which they functioned in order to divert this feature towards a different end. In this process he has not only

begun to explore new possibilities where "the work itself functions as research into the new capabilities opened up by a line of inquiry." but also mobilized these new unique capabilities to explore themes not to directly related to the technology; Both of these are approaches Wilson considers vital in the role that research can have within art. (*Information Arts* 8-9).

Engaging with the technical and scientific knowledge resources and tools, artist "…can participate in the cycle of research, invention, and development in many ways. They can learn enough to become researchers and inventors themselves." (Wilson, *Information Arts* 28). This means that artists no longer need to simply accept technological developments but could instead play an active part in producing research, something which Wilson feels contributes to the overly negative stance or "dark vision" many cultural theorist have towards technology, as a result of always being subjected to it ("Light and Dark Visions" 21). However for this to happen certain ideological re-evaluations need to take place regarding cultural studies cynicism towards progress and scientific research, whilst on the other hand techno-scientific discourses need to be scrutinized and continually kept in check and examined as another aspect of culture. This mediation is the task the artist/researcher is faced with and needs to constantly grapple with as borders keep shifting and conceptions change as ever-new research redefines the rules of the game.

Although Wilson champions the idea of artist as researcher, he only goes so far as to offer models or stances of what a fringe art practice, utilizing technology, would entail in the face of predominant and more established paradigms. In these instances artists pursuing this endeavour would still be required to adopt or fabricate methodologies to

support their inquiries, as well as methods to utilize in the research process even though Wilson does offers some possible variations in response. However, regarding the conception of art practice as research and its potency as a fringe activity, what the lack of clear theoretical foundations and precise formulation indicates is the need for a methodology that neither restricts the process of inquiry and has the capacity to adapt and respond to emergent phenomena and situational understanding acquired in the process of research. Uncertain to the possibility of a clearly defined method capable of changing to unforeseen circumstances, it seems what is required is rather a shift in the conception of knowledge from explanation to an understanding. This conception would present knowledge as a continual process of patterning where the initial act of inquiry is an essential prerequisite for the final act of understanding. Only once this shift is in motion it is possible to begin to examine appropriate methodologies[5] capable of answering to the demands of such a formulation of knowledge, and coming to terms with what they would entail.

[5] "The term *methods* refer more specifically to the individual techniques (e.g., surveys, participant observation), whereas *methodology* can be construed broadly to suggest both the presuppositions of methods, as well as their link to theory and implications or society. Methodology, in short, more clearly implies a concern, an overall *strategy* of constructing specific types of knowledge and is justified by a variety of metatheoretical assumptions. [Original emphasis] (Raymond Harrow cited in Sullivan 35)

CHAPTER THREE

This chapter is an interpretation of bricolage through what I consider its most prominent characteristics. In examining Claude Lévi-Strauss's text "The Science of The Concrete", I have isolated a set of interrelated traits, or zones of activity that I argue would characterize Bricolage as a methodology and model of practice.

3.1 A Set of Interrelated Characteristics

3.1.1 The Heterogeneous Repertoire

> The characteristic feature of mythical thought is that it expresses itself by means of a heterogeneous repertoire which, even if extensive, is nevertheless limited. It has to use this repertoire, however, whatever the task in hand because it has nothing else at its disposal. (Lévi-Strauss, *The Savage Mind* 17).

In order to complete a task or address a situation, the bricoleur must do so in terms of what is directly available to her, and what is available are the event-fragments she used to build her structured sets. As bricolage deals with the concrete elements of daily experience, it develops a repertoire of heterogeneous elements that it arranges into patterns in order to meet and comprehend new experiences. Hatton discusses this characteristic of bricolage in terms of what she calls "repertoire enlargement", and "Ad-hoc*ism".* These are two aspects of this "repertoire" of the bricoleur that she develops, when she views the pedagogic practice of teachers through the lens of bricolage, and/or their practice as bricolage:

> "The repertoires of means on which teachers draw is typically enlarged in a non-principled way; fortuitously, by luck, through the example of others and the like… Practices are collected in a way that is typically unmediated by pedagogic theory. Theory is not deployed to generate the practices in question, to suggest how they might be developed, to predict how successful they might be, to suggest modifications which might improve them, etc. Practices are directly collected as they are encountered or invented and the initial criterion for selection is the teacher's subjective judgment that they will suit his or her purposes." (340-341).

For both Hatton and Lévi-Strauss this repertoire is limited in that the bricoleur is always aware of its entirety, like a catalogue of objects resulting from her process of ordering. Capable of enlarging this repertoire through 'non-principled' ways, the bricoleur is able to incorporate and re-appropriate practices based on situational pragmatics. As practices are collected in a way that is "unmediated by pedagogic theory" the bricoleur is unhindered in her organizational process by methodological strictures that attempt to define and fix this procedure from the outset, or as Lévi-Strauss puts it: "…elements are collected or retained on the principle that 'they may always come in handy' "(Lévi-Strauss, *The Savage Mind* 18). The capacity to engage with events as they emerge means the bricoleur can contextually transform and/or collect practices in her attempt to make sense of them. This 'transformative practice' is what Hatton refers to as "Ad-hoc*ism"*, which she describes as an attempt to get results by developing new structures in a non-principled way, or as an ad hoc response to the environment (342).

Starting with an outlying event or new project the bricoleur attempts to comprehend it by bringing to it what she already knows and then actualizing and operationalizing this knowledge by situating it in terms of the environment. In which

case the bricoleur's first practical step is always retrospective, by turning back to an already existent set –the repertoire - made up of tools and material, she must consider what it contains before deciding how to index and configure the set according to the possible answers which the entire repertoire can offer a particular problem (Lévi-Strauss, *The Savage Mind* 18). As a collection of oddments bearing no direct relation to the current project or situation, the relationships between fragments within the repertoire are always retroactively altered to order the new experience in relation to the changing contexts of this process. Through this dynamism, the process of ordering develops "…an intrinsic stability gained through their capacity to handle variety and perturbation." for within these dynamic situations "Feedback modulates the behaviour of the source in ways that are permitted by its construction." (Jones 88)

As her "…universe of instruments is closed and the rules of his game are always to make do with 'whatever is at hand'…(Lévi-Strauss, *The Savage mind* 17.), the bricoleur relies on her heterogeneous repertoire to meet any project or event that may arise. The heterogeneous repertoire enables the bricoleur to approach a new situation from multiple points by constructing contextual relationships to it that are not coerced by external and rigid methods. Instead the repertoire remains 'liquid' by stabilizing itself in terms of its environment, it is this propensity that Lévi-Strauss calls on when claiming that "The 'bricoleur' is adept at performing a large number of diverse tasks; but unlike the engineer, he does not subordinate each of them to the availability of raw materials and tools conceived and procured for the purpose of the project."(*The Savage mind* 17). Instead the bricoleur proceeds by entering into collaboration with herself, her repertoire and her environment; this reflexive process is facilitated by a characteristic I refer to as *The Potential Difference.*

3.1.2 The Potential Difference

> They each [the elements of the repertoire] represent a set of actual and possible relations; they are 'operators' but they can be used for operations of the same type. (Lévi-Strauss, *The Savage Mind* 18).

The bricoleur's repertoire is only ever defined in relation to its potential use in a project, as it is made up of discordant elements that derive value from its internal structure, which is organized in relation to its prospects in a given situation. Although elements exists independently from each other, each element has the potential to function differentially as an operator of this organization by representing 'a set of actual and possible relations'. The potential difference within this disjunction between 'the actual and the possible' permits the existence of a multiplicity of models that the repertoire could manifest at any one time. For each substitution of an element as operator would require a rearrangement of the entire repertoire even if the operation remained the same, as no two elements are identical.

The potential difference is the internal force holding the repertoire together in a way that can be likened to covalent forces in chemistry where chemical bonds are formed through the sharing of electrons by two elements. As a weak bond formed between two elements, it is relatively easy to disengage and form new compounds with alternate elements. As chains made up of these weak forces constitute the repertoire it is able to rapidly change states, and like a liquid conform to any situation. Despite how extensive the repertoire may be it is nonetheless limited and the only means that the bricoleur has at her disposal (Lévi-Strauss, *The Savage Mind* 17), and so it is this fluidity of the repertoire that enables the bricoleur to function across a broad spectrum of tasks and

knowledge. What the repertoire contains are elements individualized to a point to enable the bricoleur "not to need the equipment and knowledge of all trades and professions, but enough for each of them to have only one definite and determinate use" (Lévi-Strauss, *The Savage Mind* 18). And by leveraging the outcomes of their potential difference, the bricoleur produces a product whose value is derived from its underlying variable asset – the repertoire. Denzin and Lincoln describe this technique in the contexts of qualitative research where "The interpretive *bricoleur* produces a bricolage-that is, a pieced-together set of representations that are fitted to the specifics of a complex situation...that changes and takes new forms as the bricoleur adds different tools, methods and techniques of representation and interpretation to the puzzle" (4). This bricolage "…which is the result of the *bricoleur's* methods is an [emergent] construction" [original emphasis] (Weinstein and Weinstein, 161).

The tension between constraints and possibilities is a defining feature of bricolage. It is the potential use value of the set (the repertoire) as a collection of possible relation that the bricoleur imposes on projects or events to structure them, this in turn affects her understanding of it as the set mediates her experience. An event is then not just engaged with within the parameters of the possible uses of the tools at hand but its conceptualization as a problem is done through the fragments constituting the repertoire and the principle structuring their organization. The set is maintained through its internal relations of potential differential value, where "…the decision as to what to put in each place also depends on the possibility of putting a different element there instead, so that each choice which is made will involve a complete reorganization of the structure…" (Lévi-Strauss, *The Savage Mind* 19). Understanding arises in this process from a series of small steps or mid-course corrections as each object of the

repertoire is interrogated to discover what it could potentially 'signify' and so contribute to a new arrangement of the repertoire. This new arrangement that is still to materialize differs from the original set only in the internal disposition of its parts (Lévi-Strauss, *The Savage Mind* 18).

3.1.3 Images, Signs and Concepts

> …he speaks not only with things…but also through the medium of things.
>
> (Lévi-Strauss, *The Savage Mind* 21).

The elements of the bricoleur's repertoire occupy a space between percept (image) and concept, for Lévi-Strauss this liminal space joining images and concepts is filled by the function of the 'sign'. He illustrates this with an example: "A particular cube of oak could be a wedge to make up for the inadequate length of a plank of pine or it could be a pedestal - which would allow the grain and polish of the old wood to shine… "(Lévi-Strauss, *The Savage Mind* 18). As a method of imposing structure, bricolage operates through the qualities of objects that are based in sense perception and by using them as signs the bricoleur expresses herself physically with these sign fragments but also through them in a metaphorical or analogical manner. In the former instance the bricoleur uses the element as a material (an oak wedge) and in the latter as extension[6] by exploiting the objects referential qualities as pedestal. The image of the wooden block, its perception, can be leveraged by the bricoleur into performing the role of a stool through its ability to signify a chair.

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[6] "Extension: (sense6) *Logic* the range of a term or concept as measured by the objects that it denotes or contains, as opposed to its internal content."
(*The New Oxford American Dictionary*. 3rd ed. 2010. Print.)

This particular use of signification will always be confined to the characteristics of the object as defined by its history and subsequent modifications, this is because the bricoleur exploits signifying qualities of found objects and doesn't create concepts. Consequently, these "…possibilities always remain limited by the particular history of each piece and by those of its features which are already determined by the use for which it was originally intended or the modifications it has undergone for other purposes. The elements which the 'bricoleur' collects and uses are 'pre-constrained'…" (Lévi-Strauss, *The Savage Mind* 19). The bricoleur's re-contextualization of these signs allows for a degree of play in the space between the restrictions of the sign but also the limits of their new context. Signs unlike concepts, whose relation to the world is predicated on transparency and the ability to signify beyond itself to the point of complete substitution, a sign always points to itself while it is pointing to something else – looked at while looked through. Although images (perceptions) cannot be ideas they can co-exist with ideas in signs and if ideas are not yet present, they can keep their future place open for them and making its contours apparent negatively (Lévi-Strauss, *The Savage Mind* 20).

Papert and Turkle refer to two modes of inquiry, the 'Hard' and 'Soft' approaches to knowledge (169). Hard mastery maps to the traditional construction of scientific methods in that it is resonates with its logically abstract and hierarchical elements, and its naturally distanced stance towards its object of inquiry. Whereas the soft approach is caught up in ways in which "the mind can use objects rather than rules of logic to think with." and prefers a "…negotiational [sic] approach and concrete forms of reasoning."(167). This *negotiational* character of 'bricolage' is present in the history of the word itself:

> In its old sense the verb 'bricoler'… [was] always used with reference to some extraneous movement: a ball rebounding, a dog straying or a horse swerving from its direct course to avoid an obstacle. (Lévi-Strauss, *The Savage Mind* 16).

The extraneous movement exercised in the bricoleur's use of images, signs and concepts is predicated on their permutability when they are formed into a system in which "…an alteration which affects one element automatically affects all the others" (Lévi-Strauss, *The Savage Mind* 20). Jones describes this kind of system as a "collaborative infrastructure" where the *actors* "...may be represented as nodes in a network of *relationships* that show bi-directional *inter*-activity." and "Individuals influence each other or produce *things* that influence others…"(88). Using images, signs and concepts as nodes in a web like structure, the bricoleur is able to move laterally among these points to weave together multiple models of understanding as functions of this system, producing new objects to think with.

Denzin and Lincoln compare this process of understanding produced by bricolage to montage. Whereas the permutations of montage would constitute a series of shots or sequences of images, within bricolage they are the micro-processes that take place in the repertoire that are each made up of various actors and elements (4). These individual processes are not to be understood or interpreted, "sequentially, or one at a time, but rather simultaneously." (Cook qtd. in Denzin and Lincoln 5).

Bricolage is not a stage in the progression to a superior form of knowledge; when images, signs and concepts become permeable under the conditions of the heterogeneous repertoire, bricolage becomes a way to produce work through potential differences. It is the internal coherency of this cluster of attributes that come to characterize the process of bricolage, not their robustness as individual methods. For

taken collectively, it is the interaction that occurs between these three traits that begins to put forward a conception of bricolage as a methodology for organizing experience, and producing understanding.

CHAPTER FOUR

4.1 Learning to make, making to learn

From the outset of this investigation, my intention of examining bricolage as a methodology within new media arts has been framed by the desire to explore the act of producing digital art as a process of learning and by extension, learning as a process of production within my own practice. When considering the hybrid character of digital arts it became clear that the lack of theoretical support for digital arts practitioners from either techno-scientific or art discourses, posed a problem in this regard as artworks and practices were left wanting a lens through which they could be engaged with. Practices would either fall prey to the criticisms of techno-scientific discourse relating to methods of inquiry used and how this related to the outcomes produced in this process, or critical theory positions cast predominantly negative perspectives on such practices due in part to its particular relationship to technology and the knowledge of techno-scientific worldviews. The potency of digital arts to function within this fissure as a learning/research activity is neutralized by want, and need of a theoretical basis or model of practice that is achieved by conforming to either of these clearly defined categories. It is these issues I sought to address by examining bricolage as a alternate process of knowledge production in its potential as a methodology for digital arts, specifically relating hardware hacking practices.

As a body of work, *Fingers In The Outlet,* functions within the larger context of this research report as an experiment in seeing how learning can define a process of making as it unfolds. It is an exploration of learning as making, and making as learning,

and the development of a practice committed "…to the process instead of the product" (Barateriо et al. 15).

4.2 Description of The Work

Fingers In the Outlet is made up of four individual artworks; each work consists of an assemblage of sculptural elements but with a particular focus on consumer electronics. All of the material used in the production of the work have either been found or discovered in hardware and second hand stores, with the exception of the electronic components that have not been scavenged from the found consumer electronics and repurposed. These electronic components are from hobbyist's shops, the knowledge required to use them has been accrued and developed throughout this process. Each work started as a single found object that was then manipulated in an attempt to understand how it worked, both technically and culturally, so anchoring and framing the process of inquiry that ensued. The works are intended to form a heterogeneous repertoire of experiments, reflections or musings that have been physically carried out through the materials. The title of the show alludes to the type of curiosity that was the impetus behind the production of this work. Referring to the activity of intervention, interruption, addition and redirection as the very product of this exploration; a strategy that was fundamental to this entire process both literally and metaphorically. The works were installed and exhibited at ROOM Gallery located in Braamfontein and it ran from the 29 January – 9 February 2013.

In addition to the cited images, a CD has been provided that contains supplementary images of the work, digital versions of the cited images, as well a short video clip of each work.

4.2.1 Individual Description of Works

4.2.1a A Very Complicated Wrong Answer

(See Fig. 7)

This work is the result of my interest in the technical workings of video and is my attempt to replicate this process with a slide projector. Live video feed is taken from a webcam mounted on top of the slide projector, broken down into single frames and processed into very low-resolution (4032 pixels) black and white images. These images are then displayed on a LCD screen taken from a Nokia 3310 that has been placed in the projectors slide cradle, allowing light to shine through it and display the images. The images are updated at a rate of about 2 frames per second, which is as fast as the slide projector can rotate its carousel. This slow refresh rate results in a sequence of staccato images that with the help of the delayed feedback from the slide projector, the viewer is able to construct into a crude video stream.

A new tension that emerges out of this alteration is the relationship between what has been captured and displayed, and what has not. With the refresh rate of the device being in the realm of 2-3 frames per second there is a large margin for 'missing' events that fall outside of this window. When viewing this stream of staccato images you are forced to recreate the sequence of events in your mind, adding in the missing

frames to form a cohesive flow of images such as you would find in a video camera, which captures 'reality' at around 24 fps. This act of fabrication is no different from when one views single images on a slide projector where you are implicated to create the context from which these images have been removed, regardless of the images veracity. However, in the case of *A Very Complex Wrong Answer,* ones awareness of this process is amplified and this is due in part to the quality of the images. In a way the works low-fidelity reproduction of space parallels its inability to stay faithful to the progression of time, as we perceive it. Both time and space are degraded, placing the viewer in the position of reconstructing the sequence of events they are viewing even though it is happening in arguably real time.

4.2.1b Drop and Throw: A Presentation of My Findings

(See Fig. 8,9)

This piece is based around a broken Sony Video Camera I had which after discovering the CRT viewfinder was still operational, was able to convert it into a very crude oscilloscope (a tool for visualizing waveforms) with some minor rewiring (fig. 8). The input of the 'oscilloscope' was connected to a simple pressure sensor made from a toy buzzer and the amplifier of a pair of computer speakers, turning it into a tool or instrument of measurement. Setting this rig up in a sound proof room, I gathered a selection of objects I had broken in the making of this exhibition to test their various responses to either being dropped or thrown with this new device. This process was recorded (fig. 8 is a video still from this video clip) and the outcomes have been displayed next to the 'testing rig', which I have re-installed in the space in complete working order (fig. 9).

Being ‘dropped’ or ‘thrown’ are the two ways domestic technologies generally break aside from wear and tear, it is seldom the case that consumers use them creatively for things other those that they weren’t designed for. Possibly asserting some sense of agency in relation to the objects in the process. Instead they are broken by being dropped or thrown, *Drop and Throw: A Presentation of My Findings* is an investigation into how these two common categories can be productive by creating some scale of measurement for these actions and exploring them. The work constructs a platform where the underlying interrelationship between destruction and construction can be perceptually experienced. The destruction of an object creates something new by leveraging the translation that occurs between the force of the object hitting the floor, the sound its produces and the way in which that sound is represented visually. Using the hacked CRT viewfinder as the focal point of this interaction allows participants to simultaneously look at the objects, whilst ‘looking through’ them in their moment of failure (when the break).

4.2.1c Auto Logic

(See Fig. 10)

Auto-Logic consists of a combination of a cell phone and answering machine that have been coupled via wireless radio transmitters. Taping on the lid of the answering machine allows you to communicate with the cell phone that receives and echo’s this transmission by vibrating. In this work the conventional direction of communication, cell phone to answering machine, has been reversed as well reduced to the most minimal form possible between the two devices.

Playing off the idea of like makes like, *Auto Logic* allows a user to replicate a series of taps on an answering machine with a cell phone. Framed within the context of

communication the ability to contact a cell phone without a user makes the gesture meaningless in terms of exchanging information. Offering nothing more than a technological translation of a series of inputs from a user, the works becomes an absurdist Morse code: An utterance incapable of being communication but attempted when given the opportunity to leave a message and exercise magical omnipotence.

4.2.1d Set In Motion

(See Fig. 11)

After finding a penguin McDonalds Happy Meal Toy in a second hand store, I was delighted to discover the toy had simple motion detector hidden inside. After some tinkering the device has been repurposed into a trigger, activating this trigger by walking past sets in motion a sequence of events that build up to a crescendo and then returns to it's original state in a reversed order. This procedure is a consistent and set motion that is repeated whenever the work is triggered.

As objects become more and more advanced technically their capacity to reduce play and entertainment to a single functional form becomes greater. The process of engagement in the production of this form also declines proportionally to the ease with which it is made technologically available us. This is facilitated by turning the process of play into a means-end function consisting of an easy to complete sequence of steps, removed from any contact with the actual production of it; Turn on television, browse channels, *find* something to enjoy. By coupling the functional exterior of these objects to one another, *Set In Motion*, turns the instrumental logic of 'availability' against itself. No matter how many times the work is 'played' with the results remain the same, never going beyond functional 'interaction'. Instead the viewer is constantly confronted with an unchanging sequence of events that only ever leads into itself.

4.3 Realization of The Work

Already knowing that I wanted to produce work interrogating the relationship between learning and making, the fundamental concern for me was how to incorporate the work into this relationship in a meaningful way. I was weary of simply manifesting these concerns into physical images and so instead sought a way to translate this interest into a performative process of inquiry that 'produced' the work. As I very crudely derived and associated my conceptions of *learning* with the sciences and *making* with the arts, it was imperative to find a way of oscillating between either in a way that allowed me to draw on their strategies and methods, without be hindered by their political dimensions. Drawing sporadically on a range of often-incoherent strategies is one thing but making it meaningful is another. This is where I appealed to bricolage as the model of my practice to frame my investigation as 'learning through making, and making through learning', and facilitate my straddling of the methodological divide present in digital arts between the techno-scientific and artistic modes of inquiry.

Building around bricolage's conceptualization of *event and structure* I chose to align it with hardware hacking strategies through my choice and use of materials, notwithstanding its functional similarities to the act of hacking. I grounded my investigation in domestic technological objects such as consumer electronics and electronic hardware, as these were items I came across on a daily basis through my domestic setting, second hand shops and my own collecting practices. Making use of what was available to me allowed the objects to function as the parameters framing the inquiry process of learning and making. The choice of these types of objects was significant in that they are positioned as technological objects that function predominantly in the realm of cultural understanding, as they are linked to cultural

media and mediation. Many of these items facilitate the consumption of a limited form of culture that is tied into their technical workings that consumers have no conception of. This situation far from democratizing culture and technology, restricts local agency of consumers by perpetuating a situation described best by Heidegger's notion of *standing-reserve,* Lovitt explains:

> "In our time, things are not even regarded as objects, because their only important quality has become their readiness for use. Today all things are being swept together into a vast network in which their only meaning lies in their being available to serve some end that will itself also be directed towards getting everything under control." (The *Question Concerning Technology* xxix).

This 'readiness for use' is indicative of these objects instrumental reason aimed at homogenizing cultural forms for convenience of users. This structure of control removes the capacity to engage with these objects on any level other receiving them on their own terms, adjusting ones own dispositions to accommodate these objects and the 'ends' they make so convenient. Ubiquitous Consumer electronics such as televisions, video camera's and even toys require no understanding of how their underlying systems operate in order to make use of them, and as a result practices are built around what they have to offer. By engaging with these items as raw materials my intention was to subvert this by opening up their potential as 'means' in artistic practice and production, not restraints.

Making these objects the focus of my practice placed the emphasis of production on understanding how an object worked as a system both technically and culturally. Borgmann draws a "means-end" distinction between a device's machinery and its

function where "…the machinery or the means is subservient to and validated by the function or the end" (43). Applying this distinction to consumer electronics, it becomes evident our familiarity with these objects is on the cultural level of surface and function for we recognize them insofar as they make some goods or service technologically available to us. This is done without imposing the burden of means previously required to achieve the same end, as Borgmann describes it, something is technologically available when it has been rendered instantaneous, ubiquitous, safe and easy (41). As the machinery takes over this burden whilst subservient to the devices function, it was pivotal to probe the technical workings of these devices in conjunction with the cultural networks the objects were part of in order to understand them. In this way my practice became a process of learning in order to make use of these objects but simultaneously a case of learning by making as I used these objects in the process of production, where understanding and production became the same thing.

4.4 Anatomy of the process

> "Empirical understanding gleaned from observations and sensory perception does not function without the input of what we know, feel, and believe, which means that our experiential knowledge base is continually informed by whatever preexisting conditions are in place that make up our reality." (Sullivan 37).

Confronted by a collection of consumer electronics along with my preexisting functional comprehension of the devices, I directed my first step in these investigations at their technical workings or machinery. Developing an understanding of the technical systems of an object would give me an alternate understanding of its functional

operations through the way in which these systems came together. Predominantly this consisted of a physical deconstruction aimed at exploiting the modularity of many of these devices, an effect present from their techniques of construction. In these inquiries I made use of hardware hacking strategies such as circuit bending amongst other more analytical and technically driven methods. Circuit bending is the act of manipulating existing circuitry to produce alternate outcomes, at its simplest the method is carried out by grounding various electronic pathways in the circuitry and monitoring the device for any unusual feedback. Using this method it is often possible to the decipher simple circuitry of object to the point of gaining a vague understanding of how it functions, by mapping the object in relation to how it responds to certain stimulus. One such place where I utilized this method was in the CRT viewfinder of a VHS camera used in *Drop and Throw: A Presentation of My Findings,* by tracing grounds line and carefully shorting sections of its circuitry I was able to deduce where it was powered and where the video signal was input was located. Another instance of this was in the McDonald's Penguin toy in *Set In Motion,* finding this toy worse for ware in a second hand store I subjected it to the physical deconstruction to discover that it had a crude motion sensor inside (Fig 12). The motion sensor (located within the golden circle to the upper right of the black dot) was powered by an integrated circuit I could not access, using the above mentioned method I was able to find an junction that responded to the motion sensor when it was triggered. Attaching some breakout wires to this junction (see the right portion of Fig. 12) I could interface this response with a microcontroller enabling the toy to act as an input to trigger an event.

However, as large quantities of consumer electronics are composed of minute, solid-state, or surface mount components, they resist such direct empirical

manipulation without the aid of advanced equipment to mediate the investigation. In these situation I drew upon what Feyerabend referred to as a 'vague urge' to guide my process of inquiry. By coupling this 'urge', or curiosity with my functional comprehension of the objects I entered into a dialogue with their machinery and function that is best described as a process of tinkering. Allowing my cultural understanding to shape the technical inquiry in these situations, I concentrated on 'system' peripheral components that where primary mediators of human-system interaction. When opening up a Nokia 3310 cellular telephone I was unable to physical penetrate the complexities of its micro circuitry and 'map it' by eye or by implementing controlled perturbations into the flow of electricity, without advanced equipment. Lacking specialized equipment and expert knowledge, I shifted my attention to the cultural logic of the device which also shifted my technical inquiry to the LCD screen as the visual interface of the device as well as the vibrating motor as a tactile form of communication in an audio based communications objects (voice calls and ringtones). From this point I then could return to more technically conventional modes of inquiry that I had a grasp of, as well as embark on acquiring additional means in this respect, to maintain the process as it continued. The vibrating motor was easily repurposed within the shell of the phone, which was also used in a parasitic manner where the physical architecture was exploited to encapsulate circuitry. This enabled me to piggyback on technically spawned cultural conventions such as the cell phone charger to power the device (Fig.13) and for its ability to signify a cell phone in the work *Auto Logic*.

In contrast, for me to productively make use of the LCD I needed to acquire new knowledge on how it operated, a task I approached by attempting to make the screen display an image. After lengthy period of stasis and failures in trying to correctly figure

out and ‘drive’ the LCD from a microcontroller I finally managed to achieve this by displaying a single still image of myself (Fig. 14). The intensity required for the newfound ability to display images informed my perception of the screen in relation to its origins, and the excess of images produced by modern camera enabled mobile devices. Tinkering concurrently on an old slide projector for which I couldn’t source slides, I began to perceive the LCD as a digital slide in this respect. With more experimentation into the technical workings of the projector it became apparent that the LCD could fulfill this very function by fitting perfectly into the slide cradle and allowing light to pass through it to project its image. It then became a matter of being able to display multiple images on the LCD to take over the slide carousels function, which led to more technical investigation. Once I achieved this I became interested in the speed at which images where displayed which led me to the possibility of displaying video, a succession of images, on the device from a live source thereby turning the slide projector into a crude video camera. Again this led to more technical procedures, It was this macroscopic process of shifting between techniques, methods and outlooks that came to define the final artwork by shaping the very way in which it was produced, as it was produced (See *A Very Complex Wrong Answer* Fig 7*)*.

This ability to make use of heterogeneous methods and techniques was made meaningful and possible by bricolage insofar as each ‘jump’ between methodologies affected the system of practice as a whole. Adapting monolithic methodologies to make use of specific methods as they were required would not be possible in this situation, for this would demand the dissection of an entire process into smaller parts that could then be correlated to specific methods. This would not only require a stopping of the process to in effect separate theory and practice, but would be predicated on the ability to clearly delineate the process and its events before it occurred. Bricolage bypasses the

analytic violence imposed on a process without sacrificing its methods, by emphasizing the interaction between various methods and techniques employed.

Through this procession, or movement of bricolage, it eventually began generating work. As each decision is informed by its context but at the same actively affects its environment, the route of inquiry and methods of production were influenced by what questions could be asked, which were at the same time informed by what answer could be provided for them. Although eventually succeeding in displaying live video on the LCD screen in real time, this feature had to be limited to 3 frames per second as the slide projector was not physically capable of 'changing slides' so quickly, a feature which came to radically define the work. In a similar process, I came to discover the CRT viewfinder I mentioned earlier could display video from a composite video signal such as that produced by a DVD player. However, I found this particular viewfinder was faulty and as a result the images displayed would range from average, to undecipherable. Rather than continuing trying to approach this from a technical perspective to fix it and return it to its previous state, I began to push the concept of representation found in video cameras and the viewfinders dual nature of being able to be looked at as well as looked through. In conjunction with the technical shortcoming of the viewfinder, I began on a path of inquiry that saw me turning the display into an oscilloscope with the help of some technical manipulations of the device, a step that began putting the pieces in place so to speak to produce *Drop and Throw: A Presentation of my findings.*

Even though I was applying the same strategy throughout the project, it began to differentiate itself by taking alternate routes to my inquiry into learning as making and making as learning. This differentiation was informed by the various emergent

phenomena it needed to address in situ, stemming from the initial parameters of each process instilled by the particular objects they were carried out on. This potential difference expressed itself through the production of what came to be four individual works linked by their position within the same networks of meaning.

CONCLUSION

> The novelist drifts at random among these floating fragments that the warmth of history has, as it were, melted off from the ice-pack. He collects these scattered elements and re-uses them as they come along, being at the same time dimly aware that they originate from some other structure, and that they will become increasingly rare as he is carried along by a current different from the one which was holding them together. (Lévi-Strauss, *The Origin of Table Manners* 131)

The methodology of Bricolage is not identified by its consistent behaviour in various contexts, but rather by its capacity to keep a particular mode of inquiry active in the face of differing contexts and external events by incorporating and organizing these emergent occurrences into the research process, and not excluding them by design. The use of bricolage as the model for my practice in this project facilitated the procedure of methodological diversification required in navigating a research inquiry in the digital arts, by conceptualizing this practice as an open system where any such decisions influenced its very formulation. As a structuring principle bricolage allowed me to engage with the various unknowns arising in the development of this project, and more importantly address the impasses they introduced in a productive manner by incorporating them into my practice and the very production of the work; Through this, learning and making became one and the same process. As Baldacchino notes "…art *practice* is, in and of itself, a specific form of *research.* In the arts the very idea of a qualitative-quantitative divide becomes irrelevant because by its distinct nature arts research calls for a different set of categories where the arts do not *search* for stuff or facts, but they *generate* it." [original emphasis] (qtd. in Sullivan 57).

The viability of bricolage as a methodology and means of engagement within new media and digital arts is measured by its ability to facilitate the shift in comprehension of knowledge, from explanation towards a *process* of understanding. For what it suggests is that meaning is not necessarily contained within a form but exists within a network of constantly changing relationships. Whereas scientific inquiry can be reduced to a procedure of enclosure arising from its conception of knowledge, and shaping its production thereof; the practice of bricolage is always in a relationship with the *remainder* in terms of a series of fractured and temporal wholes, to which it acts as a surrogate. The emphasis on manipulating and arranging these remainders focuses the production of knowledge *across,* as opposed to within, a single discipline and method by drawing on a logic of additive synthesis. In which case, the very process of undertaking the project - the experimentation, play, and the testing of ideas right through to the finished artwork – *is* the research itself (Duxbury et al. 10)

Bricolage is a viable model of engagement for digital art in that it attempts to bring together its two formative domains of practice by means of a transformative methodology, capable of accommodating a delocalized construction of meaning. Incorporating a collection of tools, methods and materials, and accepting no single element as totalizing, bricolage moves away from practices that strive to present utopias and instead its seeks contextual understanding by playing different elements and levels of comprehension off each other, through a process of organization and patterning. Combining the inherent performativity and layered temporalities of bricolage that hold the key to its complex operations (Sullivan 37), with its ambiguous position between production and consumption, bricolage preserves the potency of

digital arts as a *fringe* research activity; By freeing digital arts practice from the theoretical dependency on a single monolithic strategy/methodology for identification and production. Substituting grand strategies for a series of small steps, hacks and mid-course adjustments, bricolage catalyzes the relationship between method and object *as its product*, thereby formulating the process of knowledge production as its impetus. 'Knowledgeability' then as an artistic form within the methodology of bricolage, becomes the expression of a site of 'making' that is continually producing new meanings, and facilitating the process of learning.

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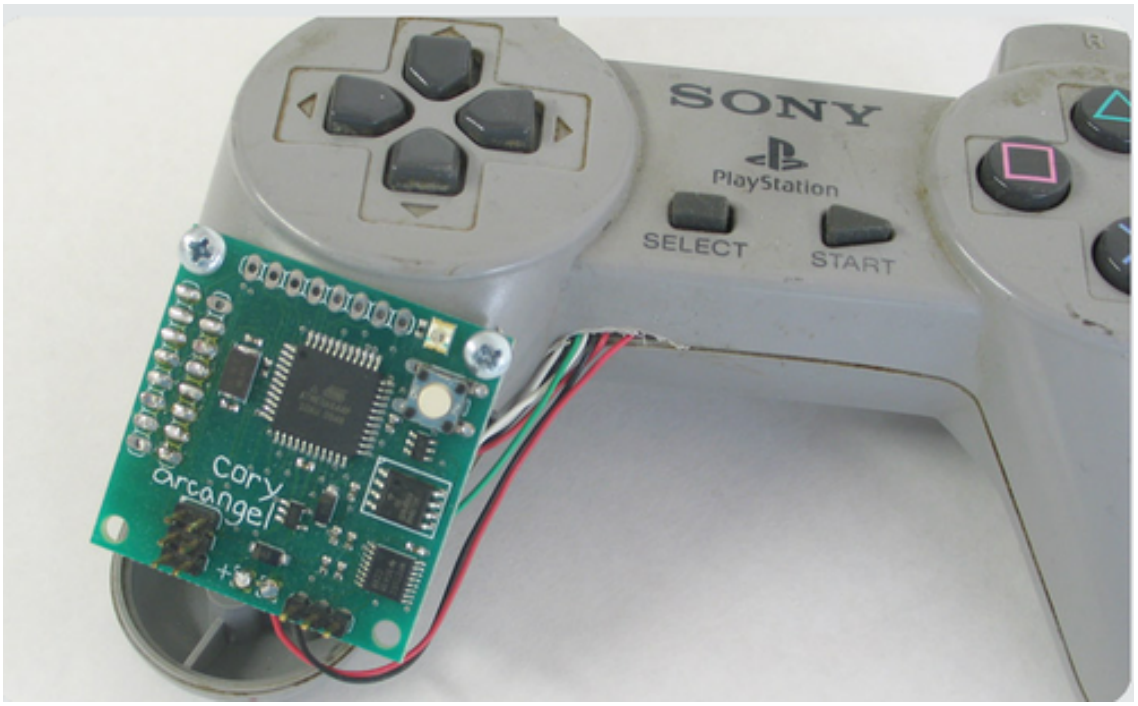

Fig. 1 Archangel, Cory. *Various Self Playing Video Games (AKA Beat The Champ)*[Detail]. Fourteen video game consoles, fourteen modified game console controllers, fourteen bowling games and fourteen video projections, dimensions variable. 2011. Web. 25 January 2013. < http://www.artslant.com/ew/works/show/402234>.



Fig. 2 Archangel, Cory. *Various Self Playing Video Games (AKA Beat The Champ)*[Detail]. Fourteen video game consoles, fourteen modified game console controllers, fourteen bowling games and fourteen video projections, dimensions variable. 2011. Web. 25 January 2013. <http://www.coryarcangel.com/things-i-made/2011-009-various-self-playing-bowling-games/0/>.

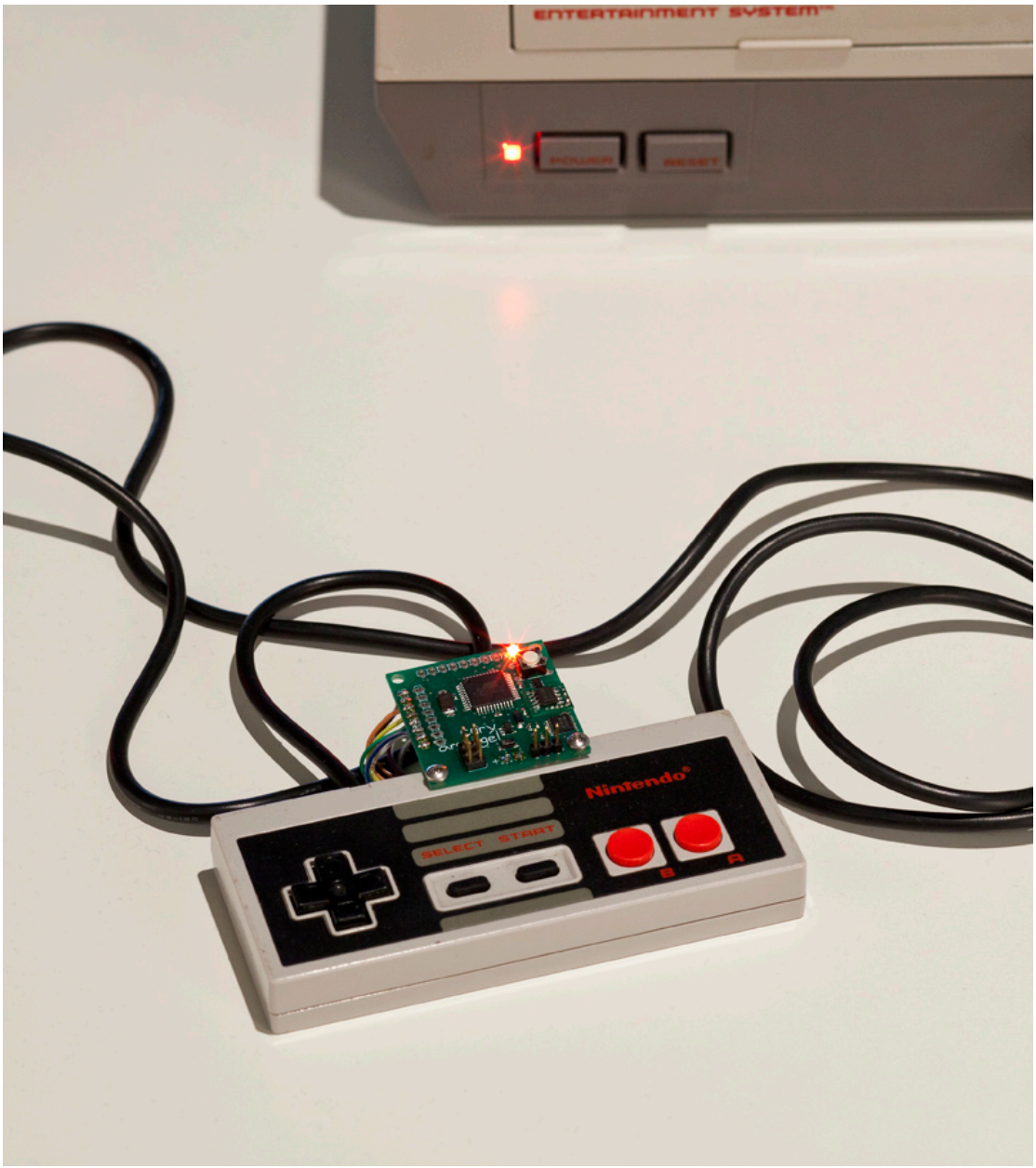

Fig. 3 Archangel, Cory. *Various Self Playing Video Games (AKA Beat The Champ)*[Detail]. Fourteen video game consoles, fourteen modified game console controllers, fourteen bowling games and fourteen video projections, dimensions variable. 2011. Web. 25 January 2013. <http://www.coryarcangel.com/things-i-made/2011-009-various-self-playing-bowling-games/1/>.



Fig. 4 Archangel, Cory. *Various Self Playing Video Games (AKA Beat The Champ)*[Installation View]. Fourteen video game consoles, fourteen modified game console controllers, fourteen bowling games and fourteen video projections, dimensions variable. 2011. Web. 25 January 2013. <http://www.coryarcangel.com/things-i-made/2011-009-various-self-playing-bowling-games/6/>.



Fig. 5 Archangel, Cory. *Various Self Playing Video Games (AKA Beat The Champ)*[Installation View]. Fourteen video game consoles, fourteen modified game console controllers, fourteen

bowling games and fourteen video projections, dimensions variable. 2011. Web. 25 January 2013. <http://www.coryarcangel.com/things-i-made/2011-009-various-self-playing-bowling-games/4/>.



Fig. 6 Archangel, Cory. *Various Self Playing Video Games (AKA Beat The Champ)*[Installation View]. Fourteen video game consoles, fourteen modified game console controllers, fourteen bowling games and fourteen video projections, dimensions variable. 2011. Web. 25 January 2013. <http://www.coryarcangel.com/things-i-made/2011-009-various-self-playing-bowling-games/5/>.



Fig. 7. Nathan Gates. *A Very Complex Wrong Answer.* 2013. Photo courtesy Christo Doherty 2013

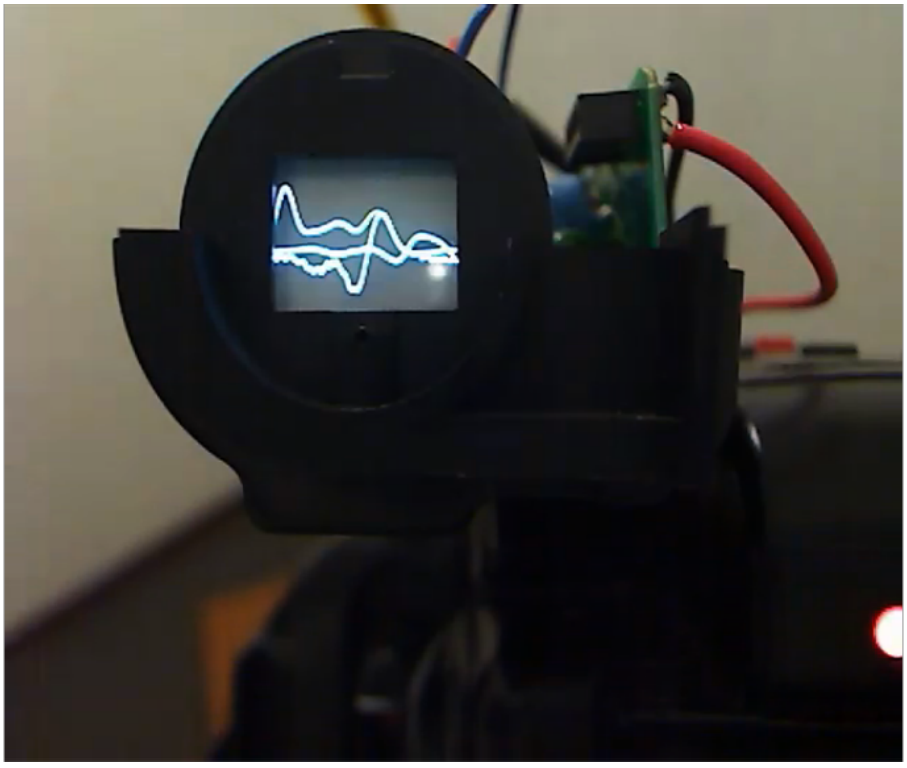

Fig. 8. Nathan Gates. *Drop and Throw: A Presentation of My Findings [Video Still].* 2013. Personal Image



Fig. 9. Nathan Gates. *Drop and Throw: A Presentation of My Findings [Installation View].* 2013. Photo courtesy Christo Doherty 2013



Fig. 10. Nathan Gates. *Auto Logic.* 2013. Photo courtesy Christo Doherty 2013



Fig. 11. Nathan Gates. *Set In Motion.* 2013. Personal Photo



Fig. 12. Nathan Gates. *Set In Motion (Process Image).* 2013. Personal Photo

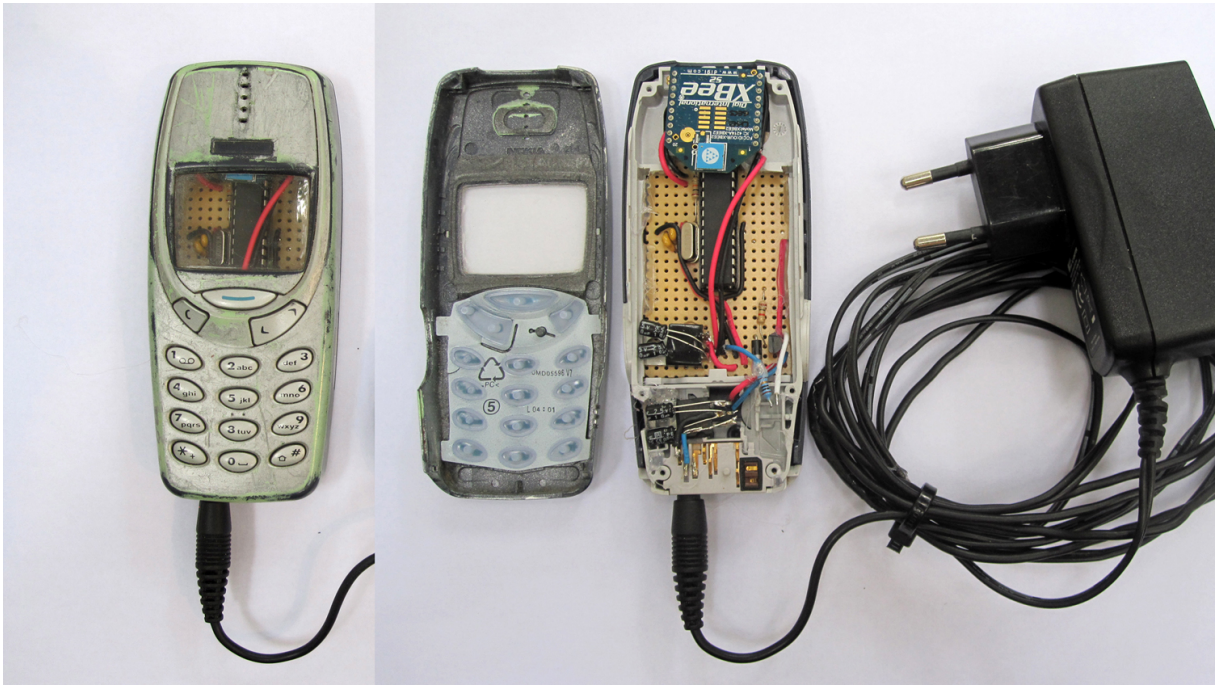

Fig. 13. Nathan Gates. *Auto Logic (Process Image).* 2013. Personal Photo



Fig. 14. Nathan Gates. *A Very Complex Wrong Answer (Process Image).* 2013. Personal Photo