

# Storied Objects

## DESIGN THINKING WITH TIME

by

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at the

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### **Abstract**

The traditional approach to the design of everyday objects is articulated by form and function. This thesis aims to model an approach to design thinking that extends the praxis of form and function to include the expression of time. Designing objects to explicitly express the passage of time extends their useful-useable-desirable quality to include a storied expression of their everyday existence. We introduce a design synthesis framework with a set of principles for object-story-construction. These are used to refigure a recorded history to project an object-centric perspective. Our principles and method suggest a new class of objects that could be present in future spaces.

Situating point of view, experiential compression of time, and the privileging of extraordinary over ordinary events within a collection of records are critical to the art of history-making. In our approach, the object is instrumented with sensors to continuously capture the passage of time in an audio stream. This stream is parsed in order to highlight extraordinary events from the perspective of the object. These events are then arranged such that the object can express its everyday history to humans and/or other objects in a timely and aesthetically engaging way; we call this “audio time-lapse”. The audio time-lapse provides a temporal compression of the historical stream. This thesis considers how the capability for recording and expressing history can add aesthetic and cultural value – a “storiedness” – to the object.

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*And for my sisters,  
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## CHAPTER ONE

### Introduction

---



Imagine when everyday objects can tell us stories of their life. Imagine the armchair you sit on at home, imagine the dining chair at a restaurant, imagine the seats at a movie theatre, and imagine the park bench. What would they tell and in turn how would their stories attribute to the way we make sense of our everyday, our life, and the world we live in?

This thesis concerns how objects that surround us and part of our everyday experiences can be designed with a *storied voice* – their re-telling of past time based on records captured in situ of their physical experiences in the designed environment. The design of *storied objects* is bounded by the object’s point-of-view; objects have capabilities to record their experience, look back upon the captured records and reconfigure the recordings in order to re-play what actually happened.

For designers, this thesis introduces means to extend traditional design thinking to include time and story in object design. The intent of object design is no longer limited to how objects can mediate (as tools) to support our goals and expressions; rather they can be a source for reflection and appreciation (for engagement and pleasure). Storied objects express time passing, while their implicit points-of-view reveal to situate them in the environment; subtlety, secrets, actions and interactions allow humans to take away and reflect upon what was seen, heard, and felt from the re-telling of the object’s experience.

This thesis provides a method for the re-telling expression of an object’s history: a *storied expression*. For instance, the re-telling of a year in the life of an umbrella can show a perspective of family camping trips, time spent between two lovers, and Mother Nature’s unexpected violent storms. Storied objects are not of a particular type or a class of objects (such as a doorknob or a vehicle or a collectible Barbie doll), it is a foundational idea that conveys time progression; objects can be designed to have capabilities to capture and re-tell a string of notable events from the past, with the goal of shedding perspective on time passing. Imagine a pair of scissors recounting all the canvases it has cut; the audible sound of the seeping wound of thread and canvas, and the vibrations of a coarse and smooth landscape it has cut through. The expression of

such history gives us a glimpse into the past allowing human and non-human encounters to experience and come to an understanding of what the life of a scissor was like.

The design-thinking-framework that is put forth in this thesis (see Chapter 3) looks at how storiedness implicates the design of objects. The framework shifts the boxed relations and procedural interactions between artifact and author-teller-audience towards – designing an integrative approach to time-based experiences between human and artifact. For example, a storied desk chair is no longer an artifact that is to be sat on; a storied desk chair is also a thing that can hold and recount memories of how people spent time sitting on it. Imagine what your desk chair will tell you after it witnesses you sitting on it for ten years. Would it tell you the same story from ten years back or would it recount details of newly encountered experiences that reveal a passage of time? Imagine listening to glimpses of you talking about ideas, fidgeting while scribbling through the night, your grandfather snoring, your one year old child trying to keep balance on the chair, and your child sitting and drawing through the years.

By incorporating time in the object, the object becomes a story machine that works to interdependently relate its system's processes of recording transactions, interpreting and creating a narrative, and having a teller system (with a feedback loop) that takes in old and new experiences. As a result the storied expression can reveal the object's existence in relation to humans (and other sources of involvement), and affords a basis for reflection on what it means (to humans and in the future, to other entities that seek understanding) for an everyday object to hold its history. The temporal continuance of the storied object can allow for a deeper understanding of its significance in the human environment; consider issues such as how storied thinking can impact the object's sustenance in the built environment, and the societal impact on how we may live.

A storied object is designed to witness time and have testimony of its experiences. Consider the doorknob that you use to open the door to your office building. On a normal day, people enter and exit the building frequently. Tracking allows us to measure the functional aspects about the doorknob and human activity such as, how many people have passed through the building, what times are busiest in the course of a day, for instance. On the other hand, designing an object with a storied voice – an object with memory and an ability to re-tell past events framed by design constraints and intention – can reveal implicit points-of-view of the object. This can be moments that are usually unaccounted for in the functionality of an object as new (unexpected) experiences

are formed, while the object lives in its environment: imagine when a person is banging on the door and pulling on the doorknob having been locked out of the building; imagine the mailman trying to squeeze your mail under the door; imagine the silent evenings after everyone has left the building; imagine the sunlight and the passing shadows through the day.

Such experiences arise as a byproduct of what the design of an object was originally intended for. A sequence of a day's history will no longer stay the same as time progresses and as new things are sure to happen. The progression of events captured and re-told allows us to imagine, and provides us with a historical trace which can lead to emotional attachment, disclosure, transparency, and pleasure. Every object will have a unique story to tell, and each story that we experience will attribute towards a deeper appreciation of it.

For designers it is critical to make appropriate design choices: designers need to consider how the object will exist over time; consider how objects can reveal implicit points-of-view of their experiences; consider how events can be distinguished between the extraordinary within the ordinary, and the eventful within the ambience. These aspects can aid in constructing a storied expression where the object can capture, re-configure, and re-tell its historicity.

The challenge for this thesis is a three-fold step: to convince the reader that storied objects are desirable and perhaps inevitable; to provide designers with a framework that will allow them to design storied objects; to raise more general issues concerning how such objects and the design choices that are made may impact society.

## **Story**

Before launching into the how, we need to explore the general idea of what we mean by story. Most everyone is familiar with the mainstays of fiction: plot, structure, and character. Fiction makers invent their stories from a set of libraries of human action and reaction that have been observed and codified over the years such that they are recognized and may generate an expectation and reaction by the audience.

While fictional stories engage, they do not generally conform to a set of events that has actually taken place in the world. Stories that are true to the lived environment are often referred to as

histories or documentaries. These are stories in which the passage of time has been captured in some way, configured and possibly reconfigured. The most basic instantiation of this type of story is an episodic progression in which a character progresses through a series of events as if on a journey. The action and the events are conveyed in a way that makes the journey events memorable/insightful/extraordinary even as context, the everyday world in which the action takes place is conveyed as ordinary.

While narrative theory provides a broad swath of potential experts, our approach focuses on the idea of historicity from the perspective of the individual object. To that end, we can ground our argument for narrative by connecting it with the argument made by the renowned French theorist, Paul Ricoeur, in his third-volume discourse on “Time and Narrative”. In this work Ricoeur points out that we correlate historical narrative with “actual history.” He shows that the evolution of certain instruments such as the calendar afforded us the ability to remember and re-configure time based on our identification of exceptional or momentous events that serve as markers in the historical flow indicating that things that follow will be different.

He distinguishes the local from the universal historical narrative making use of Reinhart Koselleck’s articulation of the two axes of narrative: “the space of experience” and the “horizon of expectation”. He argues that historical temporality is articulated through narrative; it is a discourse and mediation of how we understand the complexity of actions, events, and human context. Actions (motion, arrangements, and sequences) that take place are at the junction of these two axes while actions cannot be determined by them.

The space of experience makes traces (of the past) possible, where this argues for new actions (that take place in the present) to be experienced; history would be meaningless without its past. Ricoeur argues that the horizon of expectation presents pathways that can be taken; the way that the future is then brought into the present. The expectation for the future is interdependent on looking back on the tradition of the past and what is happening in the present. In other words we are affected by history and we are affected by the history we make. The space of experience that constitutes the past and the present determines the horizon of expectation for the future.

How can designers use these ideas about story to frame the storied object of the future? As we journey through space of experience, memory becomes the carrier of history. The selection of exceptional events and the recombination of elements of the telling maps to the horizon of

expectation. In our work, we use digital memory to continuously record the historical stream of events; we then process this stream in order to express the recorded history in such a way that the person experiencing a foreshortened version of the recording can perceive a horizon of expectation, a sense of what the future life of the object may be like.

A storied object is instrumented with input and output technology to capture and re-make the expression of its history that is authentic and integrated within the physical form. It requires that the object have the ability to: record experience (convert analog signals from the physical world to digital bits), re-configure the recording (sequence notable events from memory), and re-play a storied expression (a foreshortened account of what actually happened). To re-configure time it requires that the object distinguish what was extraordinary from what was ordinary in its everyday experience.

In our case study, audio is used to capture and re-tell the experience from an object's point-of-view. Audio time-lapse – a foreshortening of the audio stream based on event detection, segmentation, and organization – is used to convey a sense of history (“what took place” from the object's point-of-view). The method for foreshortening the audio stream requires that the system distinguishes and samples “extraordinary” and “ordinary” events within the captured stream. Segmented historical events – that are tagged as ordinary and extraordinary – originate from the recorded stream of an object's experience.

### **Provenance**

In order to argue for audio time-lapse, we can examine the notion of provenance and its opportunities in how it relates to history and objects. Provenance is a record of ownership that implies social significance of an object; in turn it may change the economic value of an object. This record attributes to the history of an object, yet we realize that the actual history is separated and remain external to the object (Figure 1.1). For example, the owner can tell you all the long hours and years she spent sitting on the particular chair working on a project. The accounts of events are stories that are remembered by and told by the owner and not the chair. We can see wear-and-tear on the chair but the telling of history remains separate from it.

We are interested whether we can expand provenance to include the everyday experience from the object's point-of-view. This would entail that the recordings are not only representative of ownership transactions but also include factual accounts of everyday experiences of the object. We are interested in whether the storied expression can be integrated in the design of the object, where the granularity of recordings can vary to support story-sequence-constructs that are representative of the everyday.

Storied objects are designed to re-tell their experiences; the living history is expressed in a telling manner that is characteristically episodic. We are interested in how to construct such histories and whether these histories can play a significant role in story construction for objects. History begins with a continuous recording; we define history recordings as a continuous accumulation of data that is processed so as to be storied. In other words can the selection and the sequencing of events suggest the everyday-ness and perspective of "what really happened" as it relates to the life course of the object? We argue that the history of an object can be recorded in audio, parsed for event structure, and aesthetically shaped to convey such a historical view: we are articulating an approach for audio time-lapse that is a history-based-audio-expression in using story construction methods.

A traditional time-lapse sequence, which is generally associated with a photographic technique, is a sequence of frames that is recorded at a set interval over time. The time-lapse sequence taken at various intervals can be combined individually, which acts as the source for story. Generally the playback of a photo time-lapse sequence shows the unfolding of events in a linear form of time. When we consider how to apply this idea of interval recording to audio we are challenged; audio time-lapse poses a different technique to a photo time-lapse.

In audio, points in time are identified as *bits* per second rather than frames per second. Bits cannot be recorded at a set interval as in the technique of a photo time-lapse. Each bit does not capture the entirety of the context as a single frame in a photograph. Rather audio bits need to be captured, parsed into variable length segments, and sequenced in an aggregated time-based form for the construction of an audio time-lapse. Bits need to move forward in time and are dependent on adjacent bits to holistically make-up a perceptual sense of patterns, context and meaning to humans.

For humans everyday listening is experienced through events rather than sounds [Gaver 1993]. An F-16 fighter jet randomly passing through the sky just above us would probably make us duck down to the floor. We would probably notice the sound as a powerful flying vehicle (i.e. event) rather than noticing it for its changing intensity as it approached, passed over, and disappeared. The loudness would have caused us to react. Understanding the changing intensity in volume (i.e. pattern change) is an example of musical listening [Gaver 1993, Epstein 1995]. Parsing audio events and associating meaning to events (i.e. characteristics and identity) is an open problem [Jehan 2005, Whitman 2005].

In this thesis we work to resolve structural matters in “how we might organize events” that support and manage to make an expression of historical time of objects. Our approach attempts to reveal ways for events to be prefigured, configured, and refigured in a sequence to express the narrative history of an object. Three time periods are needed in story: the state of prefiguration, configuration, and refiguration [Ricoeur 1983]. These are necessary in order to foresee an outcome, understand events as they unfold, and look back to understand unanticipated events. These three perspectives in time, which we call “re-configuration”, allow a narrative to convey significance and retrospection of how life became to be what it was from their point of view [Martin 1986].

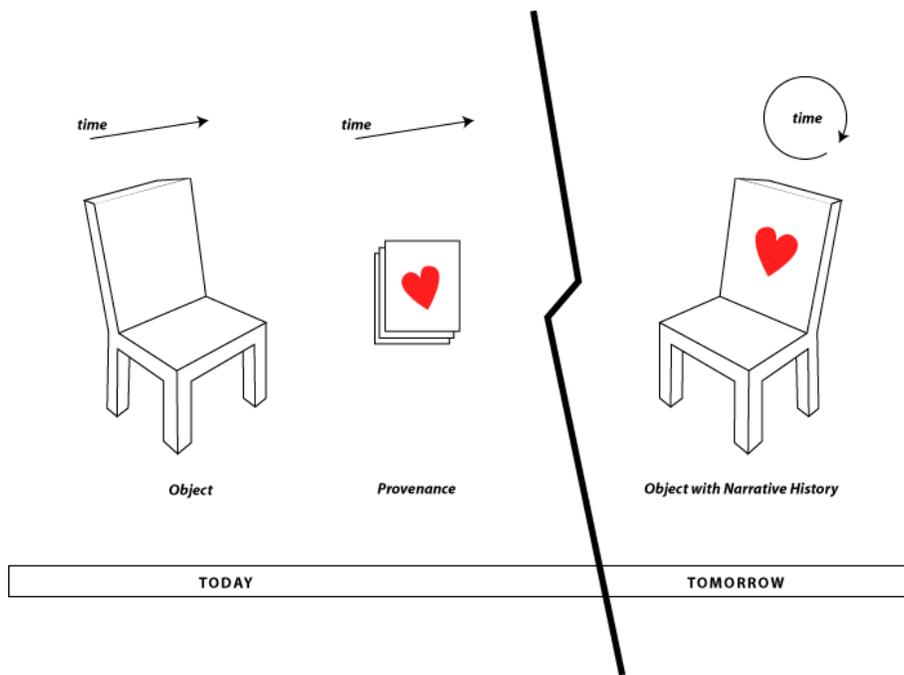


Figure 1.1 Today historical records are external and separate from the object. Tomorrow we can incorporate historical records within the design of objects for a storied expression.

Objects have history just like people – however, how we see their history is limited. Today objects often have a recorded provenance. The provenance of an object is a set of records that shows factual information such as ownership and date stamp of the object’s transfer of ownership. It is recorded on a medium that is external and separate to the object and is a way to access recordings that are points in time of the object’s past. A land deed for example, is a transaction of records indicating ownership transference (i.e. the land deed shows that the land has been in the family for generations, acquired and transferred between specific siblings and cousins). The provenance of a library book is accessible in a card located in the book pocket; the card shows the transactions of the book checked out from the library shown through a list of names and signatures with due dates. Tomorrow when objects are augmented with a larger extent of sensing technology their history maybe more varied and aesthetically more engaging. The question we ask in this thesis is can we expand provenance to be the recording of everyday events and can that recording be re-configured so as to become storied? What value might that bring? Can the foreshortening of history describe what happened and imply what is likely to happen?

The historical trace of an object can affect its economical and cultural value: for example the rocking chair used by President Kennedy (Figure 1.2) and subsequently owned by Jacqueline Onassis was an item to be watched at Sotheby’s auction house in February 2005; it was auctioned off to an anonymous bidder over the telephone for \$96,000. These records are a static source of information associated within the growing history of the object.

This collection of history transactions detail “what really happened” as it relates to the life course of the object as witnessed by human beings. In the example of the rocking chair, the records show that the chair was bought from a Pennsylvania family woodworking company; used at the White House by Kennedy; owned by Onassis; and recently acquired by an anonymous bidder in London. These events do not depict to tell the story of how and why the object was passed through people and places; these events are merely absolute markings without regard to the nature of everyday life.

As for Kennedy’s chair, the records that come with the chair do not tell us a story (structure with a sequence of events, actors, actions, etc.) of how he came to own the chair. He was first introduced to this particular chair at his doctor’s office. He later acquired not one but many for each room in the White House because he liked the way it supported his bad back. In short the records today are a flattened chronology indicating only ownership transference.



Figure 1.2 President Kennedy sitting on the Rocker.

Source: <http://www.jfklibrary.org/>

According to the object’s records, we can further reason that the rocking chair which was once bought for \$18 in the 1960’s, was auctioned off in 2005 at a higher price for the fact that it was owned by President Kennedy. The depreciation of the artifact for its wear-and-tear and the story of the chair that remain external to the object (and are now perhaps lost) did not have sufficient visibility to impact the final auction value. The authentic stories have now been physically separated and are even further away from the object as it has been passed onto a new ownership. Imagine if the rocking chair had capabilities of a storied expression in an audio time-lapse form; imagine today that you are sitting on this chair and you hear Kennedy’s rhythm of how he rocked the chair, his heel tapping the floor as he rocked back and forth, page turning, sighing, laughter, his voice of calmness, and his children running around him. Imagine fifty years

into the future where you sit on this chair again – you hear traces of Kennedy and something more. You hear a rhythm of the rocking chair that is in sync with a female voice humming lullabies to a child, you hear leaves falling from a tree – the telling reveals that the rocking chair continues on with its life witnessing new experiences and new encounters.

The figurative-telling (i.e. prefiguration, configuration, and refiguration) of an object tries to resolve the tension between history as lived time (what it was about) and history as world time (what really happened). In other words, the narrative is a re-configuration of sequences of events that deals with the paradox that story is both fact and fiction. When there is a form of continuity such that events are interconnected to show reference and express a possibility of meaning, events “seem” to be credible and we “experience” a sense of truth to them. This action results from our perspective-taking of what we learn and experience from the telling of an object’s history.

When we look at any photograph taken a while back, we remember the particular point in time, “dad and I fishing at the lake in summer 2000”. We use the photograph as a catalyst for storytelling, “dad and I weren’t too thrilled about only catching one catfish that hot summer”. The

photograph itself is not a story nor does it tell a story, rather the photograph triggers a recollection of the past for the viewer to tell a story [Frohlich 2004]. Current objects do not provide us stories that allow us to make sense of events (interpretive ordering of events); current everyday objects show moment-capture, physical markings of wear-and-tear, and that we rely on people to recall the stories.

When we are able to incorporate a technological system for recording within an object that also combine new electronic forms of memory, it begs us to ask about how we might design the whole cycle of collecting, re-configuring, and displaying events: (1) What should the object capture? How should it capture events? (2) What will it remember? How will it convey salient events and their context? (3) What would it tell of the sequence chains of events? By engineering an object to capture a detailed history of events, we ask how we should create a system to transform the recording into a storied expression: a shaped object-centric articulation of the past that can be recognized and appreciated by humans and potentially by other objects.

We are interested in the design space that allows us to explore how man-made objects can craft and relay a temporal sequence (an expression of time) from real-time capture of its experience of the world. In an effort to “image the object’s history with motion” – that is to acquire provenance and to express provenance – the problem can be seen as a three-fold implication: (a) the stance that an object takes upon the world; (b) the transactions of historical records and how it is able to abstract an experience from the transactions of records, and (c) the teller system (with a feedback loop) that provides for temporal continuity.

The thesis addresses the design value of the re-play context of an object. We can expand the notion of provenance to be the record of everyday events that can be re-configured so as to become storied. We reveal how the storied expression can show implicit points-of-view of an object’s experience; the history is no longer external to the object and the object is understood in a temporal context. The physical object constrains what is recorded and the foreshortening of the recorded stream leverages extraordinary events from ordinary events. The story construction method for audio time-lapse allows us to work within an organization scheme and construct that is an approach to express time passing as it relates to the object’s experience.

The following section outlines the thesis statement and two central claims that are generated from the hypothesis.

## Thesis Statement

When everyday objects are designed in consideration of form, function, and time, digital augmentation can be used to give voice to a narrative discourse which serves as an expression of their living history. These utterances can be supported by and embody story construction methods.

## Central Claims:

1. By extending traditional design thinking (form and function) to include time, the idea of the provenance of an object can be expanded to include everyday experience.
  - a. Designing with time, the expression of the object's history can become integral to the physical object.
  - b. For time to become visible in real-time, it requires that the object be endowed with the ability to record experience, to reconfigure and foreshorten this recording, and to re-play the storied expression.
  - c. The ability to reconfigure time requires that the object distinguish what was extraordinary within the ordinary of its everyday.
  
2. Methods for audio time-lapse can be used by the object system to construct a storied expression.
  - a. Audio can be used to capture and tell the experience of an object from the object's point-of-view.
  - b. Audio time-lapse (a compression of the audio stream based on event detection, segmentation, and organization) can be used to convey a sense of history ("what took place") from the object's point-of-view.
  - c. The method distinguishes and samples "extraordinary" and "ordinary" events within the captured audio stream.

## **Roadmap**

Chapter 2 introduces the background and motivation on design thinking, transactions and time, and story construction. The chapter concludes by surveying relevant work produced by other practitioners.

Chapter 3 guides designers in how to approach designing storied objects. The design thinking framework provides a foundation for object design to incorporate time – a storied expression.

Chapter 4 surveys design explorations and workshops prior to the final thesis case study. Various research projects provide facets of design thinking and help shape the framework for designing storied objects.

Chapter 5 describes the technical implementation of the final case study, the Audio Time-Lapse Bench. It details how the physical bench was constructed and how the software algorithm generates an audio time-lapse.

Chapter 6 is an evaluation of the final case study, the Audio Time-Lapse Bench. The study reveals before-and-after feedback and results from 12 study subjects. The goal of the study was to show how communicable the audio time-lapse is to human listeners.

Chapter 7 concludes the thesis with contributions, and discusses limitations and opportunities for designing storied objects.

## CHAPTER TWO

### Foundations

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“We generally assume our objects belong to us, and generally we are right. But there are times in life when we belong to our objects.”

– Busch (2004, p.27)

I focus on the design thinking for how everyday objects can be designed to have means for a narrative-based expression of their living history. The chapter presents three distinctive areas in regards to *time*; they provide an interdisciplinary basis for the thesis: *design*, an object’s stance in a post-industrial contemporary society; *provenance*, the history records of objects; and *story construction*, shaping anticipation and expectation through narrative form. These themes are well established in both research and practice, and continue to evolve. Their potential for interdisciplinary scholarship provides a theoretical basis for novel rationales, insight, and articulations for the thesis.

### 2.1 Design

The idea of Design can mean different things to different fields of thought, as our socio-economy continues to evolve. Much of this variance in what Design is originates from the Industrial Revolution; perhaps some argue that the specialty of Design was conceived during this period [Giedion 1948]. The role of the craftsman dissolved; craftsmen were once responsible for creating whole objects and systems. Technological advancement brought about a full mechanization of mass production and mass distribution, bringing about a cultural shift in mass consumption. This approach brought about new attitudes of labor; experts emerged specializing on one aspect of the product conception. For example, engineers were expected to resolve the functional details and artists were responsible for creating products that were formally attractive.

This wave brought about new attitudes of consumption as well; perceptions and rituals of life activities were redefined through the availability of mass produced goods that were once available for the privileged. Today, in a post-industrial/modern and contemporary society, the culture has once again reached a remarkable stage: a design initiative towards engaging and

empowering individuals through personalization and expression is available in products and services. This initiative has evolved the specialist to become a renaissance craftsman (as producer and consumer); they are no longer expected to solve specific details but expected to also have a broader outlook on influencing human values and the socio-ecological system. This entails them to become a multidisciplinary and interdisciplinary specialist, in which the Design profession is defined as in the 21<sup>st</sup> century.

The advent of technological advancement in the 21<sup>st</sup> century has aided in forming a working consensus in the meaning of Design across disciplines. At the core, Design is about making sense of things. A meaningful order is achieved through intuitive reasoning and a process of conscious planning and patterning [Papanek 1984]. We address two perspectives that articulate the impact of Design of everyday objects: the *point-of-view* in the creation and consumption process, and the *intention* that is associated with the point-of-view. It aims to reveal the current state of “today” that everyday objects are considered to be static in the person-object relationship. We show an opportunity for objects to contribute to the everyday environment (which we take for granted); objects can incorporate capabilities to recite a “lived-time” expression that reflect on the nature of their situated stance.

### 2.1.1 Designing Stance



Figure 2.1.1.1 Servant carrying umbrella; 1903; Yogyakarta - Jawa (Indonesia); Photo: Gertrude Bell.

Objects are designed to have intent and persuasion to help resolve the dialectics of how we may live; this calls for a balance between the interrelationships of three classical themes in design theory: ethos, logos, and pathos [Buchanan 2001]. Buchanan provides an explanation for the

three themes: ethos is the voice of the object that reaches out to the human, so that s/he can identify with the object and that the object is desirable; logos calls upon the technological formulation and system validity that makes the object useful; pathos is the fit of the object – the object is useable for the intended human participant.



Figure 2.1.1.2 Clockwise: Jonas Hanway, the first Englishman who ever carried an umbrella; 1712-1786; Portrait of Marchesa Elena Grimaldi, Wife of Marchese Nicola Cattaneo; 1623; A rainy and windy day captured by the

The rhetorical balance between the useful, the useable, and the desirable aspects of an object is expressive of the object’s stance of what it is and how it is (i.e. function and form). For example, a chair is structurally built to last while communicating safety and providing support to comfort the human back. However, the triadic axes lack the means to articulate the relations of *why it is* (i.e. truthfulness) between human and object.

Since the mechanization during the Industrial Revolution, our society has progressed towards a transient manner in practicing and positing cultural heritage and values [Benjamin 1937]. This period changed the way people lived, including how they understood objects in their homes. Furthermore, the availability of mass-produced goods has much promoted ownership and implicated generational

societal-scaled rituals to become personal-scaled rituals done emphatically.

Goods became widely available through mass production; its economically priced scheme allowed consumers to own the same products that were innovative and previously desired and only available to the privileged. For example, an umbrella was no longer an item of luxury signifying class and leisure, but it was an item to own for its utilitarian role [Sangster 2003]. In the past servants in South East Asian countries carried them to mark the presence of a king passing through the village (Figure 2.1.1.1) and in England it was part of the gentleman’s attire (Figure 2.1.1.2). Today umbrellas are less of a social-class signifier and are used for practical functional purposes so that humans don’t get rained on [Lee 2005].

In the 1920’s, Earnest Elmo Calkins promoted a business strategy that was adapted into the societal consuming behavior – the idea of obsolescence of products – whereby consumers’ attention was brought to desiring revamped products [Ewen 1988]. Consumers owned perfectly functioning objects, but the old were discarded for the new based on the stylistic changes made.

With the availability and increase ownership of goods, consumers eventually started to invent their own ways of how objects fitted in their homes. In a culture where it was visible that everyone owned the same thing, it brought about a cultural shift where individuals created a new sense of ritual in the home. Individuals invented their own sense of culture and their own sense of understanding objects [Benjamin 1937].

Change and individuality is a rhythm and quality that is evident in our society today. When we observe people in general, it becomes evident that there are no two individuals alike in how they carry themselves. Individuals present themselves in a unique manner both in public and in their private homes; individuals surround themselves with objects they find interesting and to which they can relate [Miller 2001]. Our interests and attention in how we surround ourselves with objects may be intentional, contingent and in a sense fanciful.

The presence of objects also shows how they are well integrated into the social and living history of our environment. For example, the partially broken bricks of the Berlin Wall not only signified a new era, but show a passage of history to the reunification of the East and West. The role in which objects witness and embody living history, allows them to act as a mediator in the social environment [Riggins 1994, Miller 2001]. Meaning is derived from their existence, whether it is inherited within or imposed upon the object. When objects are socialized, the embodiment of history may allow objects to take on their own attitude (i.e. mythos) extending beyond their formal and functional qualities. For example, “dialogic objects” are objects such as trophies that act as a surrogate to success, achievement, and desire when presenting the self to others [Riggins 1994].

### **2.1.2 Meaning of Objects**

Objects in our environment partake in our daily lives. Objects have come to exist in our environment to contribute to how we may live. We wake up while sleeping on the bed; we brush our teeth with the toothbrush; we wear clothes to keep us warm in the winter. We also eat breakfast off a plate using utensils such as a spoon, a fork, and a knife. In the morning, we sit on a chair at the breakfast table where we talk about the news at daybreak, while the news feed comes through the radio; we talk to our loved ones through the telephone, and so on.

Graumann (a psychologist who studied the complexity between people and their possessions) describes the person-object reality in the “Psychology and the World of Things” [Graumann 1974]:

... try to think of any ten everyday human activities, which we prefer to call behaviors; then we soon find out that most of them are intimately related with everyday things: getting up in the morning is getting up from a bed, being alarmed by a clock,...going through today's mail, reading, dictating letters...

Objects are very much situated in our daily lives while it also bears witness to the ongoing life narratives that form in time and space. Objects are an extension to our activities and take part in how our experiences are formed; they take on a secondary, passive role in support of the human environment – humans are able to mediate their goals and expression through objects. Imagine after a long day, a person sits on a bench to relax, and after a long jog, a person drinks a glass of water.

*NYTIMES.com*

*The Meaning of Objects*  
*Published: August 16, 1990*

To The Home Section:

Over the decades I've been amused to see my clothes, then my food and now my decor, or lack thereof, come into fashion ["It's Not Chic. It's Not Plain. It's Homey," July 26]. But Dr. Grant McCracken, while he makes some interesting points, seems to have things turned around.

For example, he says we shop to complete the self. My own decor is achieved not through buying things. A pig trophy won in a pie-eating contest, grandmother's plates, rocks from a beach in Maine, furniture cast off by former relatives, the French candlesticks from before the war: it's the things we could never find in a shop that have meaning for us.

But even though objects do carry meaning, it is not the case, as Dr. McCracken says, that we depend on objects for their meanings.

Just look at the way objects' meanings change after a death, or even when you move. I think as far as objects are concerned, they need us more than we need them, meaning-wise.

*PATRICIA S. CAPLAN*  
*Cambridge, Mass.*

The design of objects has progressed over the years to focus on user-centric issues such as: how objects may be experienced in context of where they may be used, how they may be used, and how they may continue to be useful. The experiences of objects are designed to articulate and make connections with the psychological, physiological, and sociological factors that humans intrinsically perceive and desire in the interactions with objects. Objects have been designed to strictly exist in the human point-of-view and their needs (i.e. supporting physical tasks to satisfying what we see, hear, touch, and taste). Despite their particular form and function, they help reflect the socio-cultural stance of how we see ourselves and how we imagine ourselves in how we may live.

Figure 2.1.2.1 A letter to the editor on the meaning of objects. Source: nytimes.com.

In the 1990 New York Times editorial section, a commentary was published about the relations of objects and meaning in response to an article a woman read (Figure 2.1.2.1). The letter sheds light on two implications regarding the human point-of-view of objects: (1) person-object transactions create a relationship; (2) meaning arises from the person-object relationship and is perceived with different degrees of permanence. Much of how we associate meaning to objects is related to an object's presence, and the types and frequency of interactions (what happens) between humans and objects. Human psychology also contributes to how we perceive meaning from objects.

In “The Meaning of Things”, Csikszentmihalyi and Rochberg-Halton show that our experiences and perspectives on life are closely “linked” with objects [Csikszentmihalyi et al. 1981]:

... the transactions between people and the things they create constitute a central aspect of the human condition. Past memories, present experiences, and future dreams of each person are inextricably linked to the objects that comprise his or her environment.

In their study they investigated how Americans (young and old) related to things in their living space – they discovered that the *aesthetic quality* determined the primal facet in the person-object transaction [Csikszentmihalyi, Rochberg-Halton 1981]. In defining the “aesthetic experience”, they made a distinction between the *act of recognition* and *the act of perception* based on Dewey’s work [Dewey 1934]. The fundamental difference being that recognition is an acknowledgment of an object or experience, and that such static conditions cause no further change in the acknowledgement response. On the other hand, perception is an experience that is a continuous change of conditions resulting in a deeper appreciation and understanding, as a result from “undergoing an experience” [Dewey 1934]:

An aesthetic experience involves something more than the projection of meaning from the person to the environment or vice versa. It involves a realization of meaning through interaction with the inherent qualities of the object [Csikszentmihalyi, Rochberg-Halton 1981, p.179].

In Figure 2.1.2.2 we charted their classification-study results; the tree structure shows a breakdown of subjects’ descriptions of what made an object significant. The classification articulates how their value of an object is *related to time and space* (past and present/future) and

what they appreciated of it. From one perspective, value is attributed to objects that reflect permanence (a quality that shows continued existence) in their relationship with an object. For example, objects today linger past relations of memories and recollections. Consider the following scenario: a dining table was given to you as a family heirloom. You did not fancy the table at first as it added more clutter to your dining room, but every time you sat on it you were reminded of particular childhood memories.

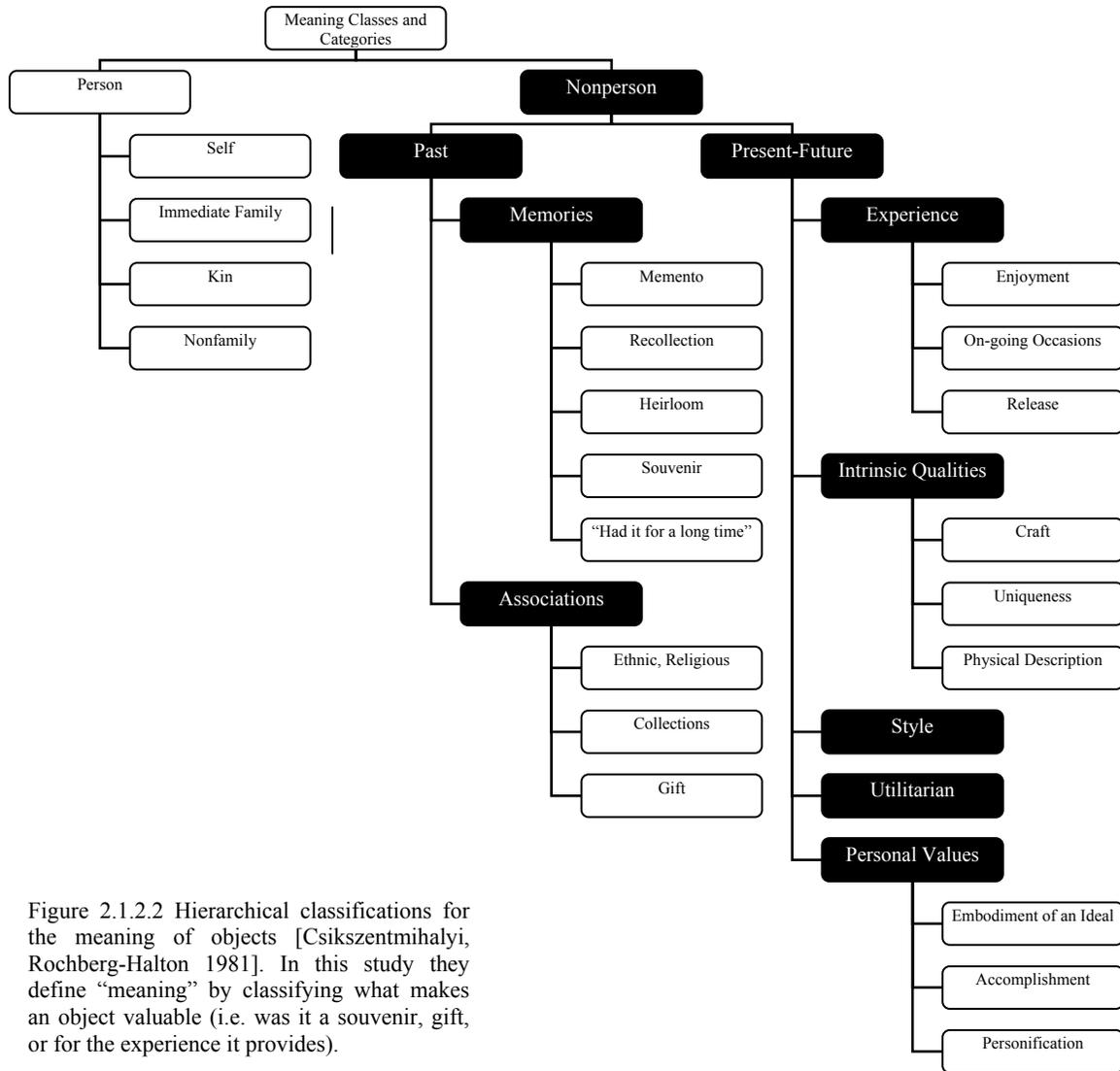


Figure 2.1.2.2 Hierarchical classifications for the meaning of objects [Csikszentmihalyi, Rochberg-Halton 1981]. In this study they define “meaning” by classifying what makes an object valuable (i.e. was it a souvenir, gift, or for the experience it provides).

Humans are fundamentally temporal [Heidegger 1962] and the aforementioned study suggests that relations between people and objects are not passive but active because of time. In a different investigation that is complementary to their study, the meaning of objects was articulated by how objects *mediated time and space* [Bih 1992]. Students from China studying in the US were asked

about their relationships with objects they brought from home. The study showed that objects helped them to achieve certain goals and expressions while appreciating the process (Figure 2.1.2.3). For example, a transcript reminded them of their scholarly achievement back home and encouraged their study in the US; a family photograph reminded them of social affection and compassion and helped them to involve in community affairs with interest and care.

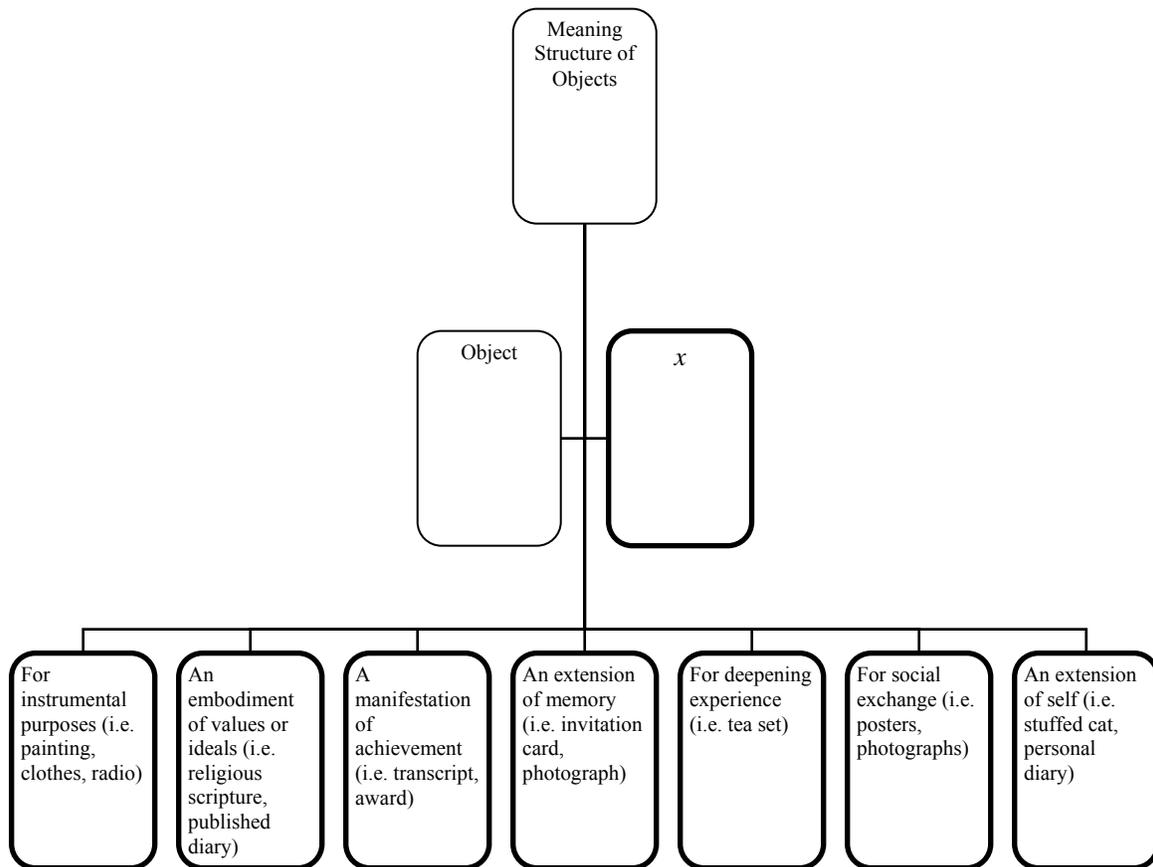


Figure 2.1.2.3 A meaning structure of objects; ‘an object is a means to x’ [Bih 1992].

The object’s role in the mediation process is to support *change* in conditions for human expression. We use a pencil to illustrate what we imagine; we use microphones to transmit and amplify our voices; we look at a photograph to remind us of happy times; we wear certain types of clothes to project identity; for the Chinese student, the photograph helped him to adapt to the social environment.

Through objects we arrive at new goals for expression, and subsequently require new meaning of objects; during this stage objects come to have *transitory states of meaning* for humans. Imagine

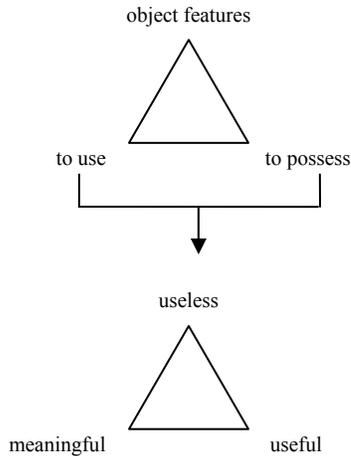


Figure 2.1.2.4 How people experience objects [Lee 2005].

that you are at a store looking for a comfortable chair to buy. You find one that supports your back, is the right height, and has a nice hard cushion you can sit on. You realize that the chair is desirable until you discover a different one that has the same comfort but with an aesthetic appeal that reminded you of the chair your father used to sit on.

Our view of the object changes as motivations and intentions shift. Everyday objects can be thought in terms of how it is used and possessed (Figure 2.1.2.4). Recall your first car that you bought as a teenager and how you can remember vividly the day it broke down. Perhaps it

was a vehicle that expressed your youth and energy; perhaps it was used to pick up your younger sister from school. Depending on whether it was perceived as a symbolic thing or a practical thing, the useless, useful, and meaningful relations you had with the car changed the way you felt about it. When the car broke down, you disliked it because it was useless and left you stranded – in contrast, you can recall how meaningful and useful the car was when you had a sense of independence and adolescent freedom, or a sense of family satisfaction for picking up your sister from school.

In a person-object transaction, objects help humans *relate* to time and space, and act as tools to *mediate* time and space. Meaning of objects is acquired through time, and the way we interpret and perceive meaning from them can *change* over time. Objects support changes in the human condition; once we achieve our goals for expression and subsequently appropriate new ones, it requires us to find new meaning in objects.

The following section discusses how person-object transactions contribute to the object’s history.

## 2.2 Provenance: An Object’s Record of Ownership

The principal approach to the history of an object is through the patina and the provenance. Patina refers to the apparent wear-and-tear of an object – they are visible markings of time; we often see



Figure 2.2.1 Water Lilies by Claude Monet. French, 1840–1926. Former Title: Water Lilies (I). 89.5 x 100.3 cm (35 1/4 x 39 1/2 in.). Oil on canvas. Photo: mfa.org

the wear-and-tear that shows oldness and perhaps in a negative light of it showing deterioration. Provenance is a record of ownership that historically authenticates the object. It can add value with particular types of transactions – that imply social significance – the record of transaction is not in a form that expands our sensual experience of an object; for the most part, the provenance of an object is not even incorporated into the object.

Transactions of ownership are generally privatized. In museums, the canvas of a painting and its identification label do not include the trail of ownership transactions. Documentation remains separate from the object; factual information such as the owner’s name, date stamp, and geographical location of the object’s transfer of ownership are documented (i.e. on paper and in a database). The Water Lilies by Claude Monet (Figure 2.2.1) is one of forty-eight canvases he painted that represent the Giverny water garden. The painting was originally sold by Monet to Durand-Ruel and through the next forty years it was sold to one other collector. Later it was inherited by a family member (Table 2.2.1) who donated the painting to the Museum of Fine Arts in Boston, Massachusetts in 1939 where it currently resides.

Ownership Date	Ownership	Place
1905 - 1909	Monet, Claude	Giverny, France (the artist; d.1926) New York, NY, USA;
1909 - 1911	Durand-Ruel	Paris, France (from Monet)
1911 - 1931(?)	Fitz, Walter Scott, Mrs. (Henrietta Goddard Wigglesworth).	Boston, MA, USA (d.1927)
1931(?) - 1939	Holmes, Edward Jackson	Boston, MA, USA (by inheritance?; d.1950)
1939 - Current	Museum of Fine Arts (gift of Holmes; Accession number: 39.804)	Boston, MA, USA (Gift of J.E. Holmes)
Getty Provenance Index Databases: Monet, Claude; Water Lilies (I); Boston, MA, Museum of Fine Arts; 39.804; canvas		

Table 2.2.1 Provenance of Water Lilies. Source: Getty Provenance Index Databases.

The course of events – the trail of records – details possession but does not tell us about the intermediary stages of transactions. For example, the record does not show how Monet felt about this particular painting when there were a series of them; why Monet sold it to a particular person; or how Monet convinced the collector to buy it from him. The set of records do not show how it was cherished by each owner and viewer, or where it was displayed. These transactions in general do not reveal the appreciative process of the object’s journey across different people and places (how the object was socialized); it does not show how the painting took part in changing people’s lives and their surroundings.

Other objects such as a library book, a furniture heirloom, and a land deed also hold a set of records that indicate who took possession of it for a period of time. These transactions show ownership and reflect a span of time. However, the records do not show how an object changed over time (aging, new types of uses, how they took care of it, and etc). With time we seek to create a more positive spin on the history representation by: incorporating it as an aesthetic component of the design of objects and acquiring finer grains of time and experience. This requires that objects capture records in smaller intervals of time; the transactions are no longer limited to ownership and can include other types of object-centric transactions such as utility, partnership, memory, and emotion [Lee 2005]:

Transactions of Utility: *How am I being used?*

This transaction occurs when an object is used. Events are captured based on the object’s utilitarian role (functional aspect) and how objects are used. This history transaction is a recorded depiction of an object’s functional quality intersecting with human action. Transactions of utility include a trail of events that capture: the function/use of an object (i.e. the chair affords a person to sit), and human interaction with an object (i.e. a person sits on the chair). It generally shows a record of who used the object and how the object was used based on the affordances of the object.

Transactions of Equal Standing: *How are we doing today?*

This transaction occurs when an object is used as well as when it is possessed. This is a temporal record that shows partnership, co-existence, and participation between objects and its human encounters. It is different from the transactions of ownership because it describes partaking-interactions; for example, observe the difference between: all the people who have interacted with an object as opposed to all the people who have owned the object. The latter example is claiming temporal rightfulness of the estate of an object rather than the idea of progressive relations for

existence. It also shows that humans can better function with objects; we have seen evidence of tools used to hunt and cut meat from the Stone Ages. On the other hand, humans are essential to objects having storiedness: an object's psychology can find a reason to exist and share its story.

Transactions of Memory: *How is my life changing?*

This transaction occurs when an object is used as well as when it is possessed. This shows how causal relations show linking and progression in event sequences; energy is transferred from one event to another. For example, the asymmetric form of a crushed soda-can can be traced to its past symmetric form, and the asymmetric quality would not have happened if there weren't any energy transference between points in time and space [Leyton 1992]. Furthermore, it may be argued that an asymmetric form essentially is holding memory, a trace of history [Leyton 1992]. We can also imagine the wear-and-tear of an object to be true to this type of transaction. Transactions of memory show the temporal trails of deviations from a canonical form.

Transactions of Emotion: *How do we feel about each other?*

This transaction occurs when an object is used as well as when it is possessed. Here we assume that there are means to capture emotion as an externalized labeled-form in the future (i.e. sad, happy, and angry). This type of transaction requires that captured events are labeled so that an object may tell a story intuitively; the types of stories and how they are told are particular to its human encounters. Furthermore, a history of exchanged emotions may inform how a storied object and its human encounters feel about each other, which is a mutual gain for both entities since they co-exist in the environment.

Transactions of Time: *Do you believe in me?*

This transaction occurs in a twofold: an object re-figures time internally while an object is used and when it is possessed, and with this re-figuration of time, a story is told with respect to "cosmic time". The re-figuration of time is a negotiation and appropriation of its own reality to cosmic time and its "lived time": a historization of its history and a fictionalization of its history. A story is told in cosmic time while internal mechanisms require a continuous re-figuration of lived time. This category qualifies and is an exception to how we describe history transactions; the relations between objects and its human encounters are not an externalized form but present the continuous and strength of relationship between objects and its encounters.

The current notion of provenance is limited to records of ownership that remain separate from the object and its context. These records do not help depict the socialized life of an object across time and space. With time there is an opportunity to expand the object’s provenance to include a richer history (a set of records) that details and reflects what role it had and what it witnessed; with time, objects can reveal implicit points-of-view on experiencing different types of person-object transactions. It requires the designer to consider: how the object will record, re-configure, and re-tell its history; and how these capabilities will be integrated into the design of the object.

The following section is informed by story theory and discusses how designers can frame a collection of historical records to make an abstraction of experience.

### 2.3 Story Construction: Anticipation and Expectation Shaped by Narrative Form

Narrative is an external form of communication that allows people to connect emotionally, associate beliefs and values through the telling of events and circumstances. “Narrativity is what marks, organizes, and clarifies temporal experience” [Kohler 1938]. Narrativity reflects time and it negotiates social reality (culture). It is something that we experience in time, is particular, generally it is told by someone and to someone, and sets the extraordinary in the ordinary.

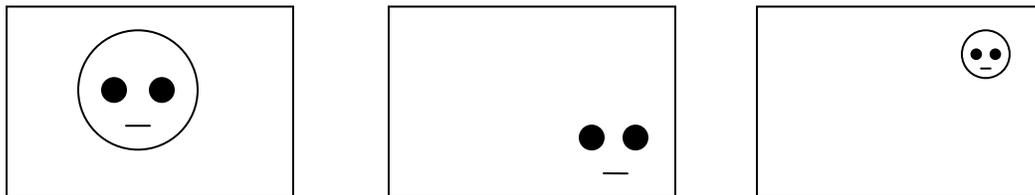


Figure 2.3.1 A designer can shape the narrative form by framing (in any media) what an object captures and re-tells. *Left to right examples show how the same information can be framed differently for different purposes: front full capture; details only; from a distance.*

For objects to make sense of a set of records and re-figure them to reveal implicit points-of-view, the designer needs to consider how *narrative attributes* can shape the story form. The designer needs to consider how s/he can *position* the object as a teller and a listener; and subsequently how s/he can *frame* {what is captured, how events are re-configured, and what is re-told of its history} (Figure 2.3.1). The use of time, point-of-view, intention, and temporal continuity are few examples that attribute to how information is used in constructing a story:

### Narrated Time

When events reference other events it defines the axis of time [Ricoeur 1988]. Events can traverse back and forth within intervals of time that show the preceding and subsequent relations between events [Ricoeur 1988]. The naming of recurring intervals subjects to cosmic time such as minutes, hours, days, months, etc [Ricoeur 1988].

Events can be thought of, and captured and organized in four ways of time [Ricoeur 1988]:

1. “Chronometry” is recurring cycles of time (i.e. a day, a week, and a month).
2. “Chronology” is a linear time of long periods marked by founding events (i.e. WWII).
3. “Chronography” are temporal systems defined by their relations to other episodes (i.e. good or bad, unique or succession).
4. “Chronosophy” is characterized by opposing stationary and reversible time, and that has no temporal direction or signification defined, and that of an order of thought that ignores the sense of limits (i.e. Christianity, Islam).

An object’s internal time include both lived time and world time. Not only can an object reveal what happened, different appropriations of linking and associating events with time may allow for fresh interpretations and new perspectives. For example, a photo album can chronologically show how the human skipped through certain pages, but in a different instance the album may show the obsessive human character by revealing recurring traces of accessing certain pages. Imagine a scenario where an album was filled with photographs over the course of World War II and the album was designed to show traces of remembering a loved one at war.

### Syuzhet, Point of View and Figurative-telling

Russian formalists made a distinction between what is happening in a story (fabula – raw materials of the story [Martin 1986]) and what it is about (syuzhet – procedures used to convey story [Martin 1986]). This approach makes a clear distinction between story and discourse but assumes that the audience will temporally reconstruct the narrative in chronological order.

Syuzhet allows an object to hold ranges of expressive techniques for presentation diversity of the same narrative gist. In other words syuzhet allows for events to be represented differently while it expresses the same gist of the story. Imagine that the album got bored at the way you kept looking at the same pages over and over again. The album then decides to share its favorite

stories about the photographs in five different ways so that you may have a new perspective of the photographs.

Generally speaking there is a narrator's relation to the story and the audience: techniques of distance, perspective, and voice allow the narrator to be flexible in the telling. These techniques may be used to orient how an audience interprets the story. A storied object has a point of view, which influences the mannerism of figurative-telling (non-literal; particular selections, sequencing, emplotment, and perspective) of the story. The point of view allows for the historization of facts and the fictionalization of history, which is expressing a way of "seeing" the past. To the human, the figurative-telling of an object's story questions the truthfulness (see verisimilitude versus verification [Bruner 1991]) and not the accurateness of it. Imagine the album's figurative-telling of events; stories were told over and over again, and made it more believable.

#### Context Sensitivity

Narrative negotiates social reality [Bruner 1991]. When an audience hears a story, they take into account the teller's intentions as well as the audience's own knowledge and experience. Hence the story construction goes through a negotiation between what is heard and what is intrinsically known or believed to be true. When an object expresses narrative history (both capturing and expressing events), context sensitivity reflects how it should consider its circumstances at all times. There is an interdependency and co-existence between an object and a human encounter. For example in music, an A-minor melody cannot be analyzed in independent parts or else the character of the minor would be lost [Kullberg 1995]. In our context, the human may be generating the event flow and dynamics. From this feed the object can accumulate stories based on human action and situation; this is what makes stories culturally exchangeable between an object and a human encounter.

When an object expresses a story, it is directed to an audience and requires an awareness of what stories may be relevant. We can take a step further and claim that emplotment is based on affordances of objects; it offers, it provides, it invites, and it furnishes [Kearney 2002] what the human is to do with the object. Hence these affordances are cues to what stories and situations may be relevant to the human encounter and situation (and how it reveals implicit points-of-view). For example, the passing of the Pope John Paul II inspired me to look for the photograph that I took of him several years ago. The album may tell me a story about the day I received the

photograph and how I put it in the album, based on recognizing the situation of current events and that I were specifically looking for the photograph.

### Causal Deviations

“Generally” events are linked by causal relationships (events can be linked in parallel without any causal relations as well [Bordwell 2001]). The idea of cause and effect, and change is significant because it gives a basis for narrative interpretation and expectation (both cause and reason give a basis for interpretation [Bruner 1992]):

1. Event accrual [Bruner 1992]: An accumulation of sequences builds history and tradition. Cumulative events provide collective representation which gives the past a continuity into the present. For example, the idea that the photo album has been passed through generations, the album stands as visible evidence to generations of the past, present, and future.
  
2. Horizon of Expectations [see Koselleck in Ricoeur 2004]: We are affected by history and we are affected by the history we make. In other words, the space of experience that constitutes the past and the present, determines the horizon of expectations of the future. For example, the photo album is constantly being shared with other people. The history of frequency and duration of the object being socialized determines an expectation model of it constantly being socialized.
  
3. Breaches in Canonicity [Bruner 1991, Martin 1986]: The recurring and continuous story construction and reconstruction of the past provides canonical forms. This sets the space for the object to realize when a breach is made. Determining whether or not an event is legitimate is important because every object has different thresholds of what is an extraordinary event within the ordinary. For example, the photo album that has been socialized, will tell you a story of its vivid social days when it becomes apparent (to the album) that it was inaccessible by people, as it was put away in the attic.

### Traces (Gesture)

We may think of traces as synthetic activities that are conceptual marks left behind [Ricoeur 2004]. It is an expression of the present that stands for stories while it gestures the past. The imaginary mediation is a re-inscription of lived time within cosmic time [Ricoeur 2004]. A trace re-figures the past as if it were truthful. It is important that these traces are not an imitation of the past but rather resonate a historical imagination.

These gestures are a preservation of sequence of event actions, and preservation between the teller and the audience. Visible traces of story and historical facts may be expressed with consideration of formal factors and situation of an object. For example, the photo album may show a story expressed through traces that show how the album became socialized. It may be a life story of how the photographs were organized and put into the album, or it may show traces of genealogy to signify as if the album was a treasured heirloom.

Traces are a physical externalization of past points of time and space. It is a physical reminiscence of time. The crossing of time, space, and expression makes it a form of gesture. A gesture is different from body language. Both forms may have intentions in communicating the same message (i.e. the photo album is lonely). The difference between the two lies on time. A gesture is a signaling expression over temporal states. It presents a narrative space; it is a thought in action; it is a part of discourse in which the teller is participating [McNeil 1992]. Body language is also a signaling expression, but its message is captured and expressed as a single point in time and space. Thus, it lacks a narrative structure of time and space, action, perspective, and the relations between the teller and the audience.

## **2.4 Related Work on Designing Electronic Objects**

In this section we review related work (Table 2.4.1) that implicates history into designing electronic objects and systems. For most works digital technology is incorporated into the design and attributes objects with capabilities for time-based interactivity and expression; other examples research what we can do with an infinite body of digitized data. Examples are diverse and each project shows facets that are significant to the thesis. Some are designed to sense the environment and interface with the world. Others are designed to communicate with other objects or show traces of the past to evoke memory.

Title	Description	Why it is interesting to this thesis?
Where's George?	Online system tracking bill circulation.	Everyday transactions are records of time and space.
StoryCorps	Sharing humanity and identity through recording audio stories in a mobile van.	Sharing stories; archiving stories for future access.
Audiophotography	Role of sound in photographs as a new media form.	A thing that marks a point-in-time and mediates interaction and sharing stories.
Trace	Evokes memory through sound in public maze installation	History continues to accumulate and reflects people participation.
Bins and Benches	Robotic objects with a life of its own.	Point-of-view continues to evolve from what it was originally designed for.
Life is Suite	Stories are embroidered onto the sofa for exploration and reading.	Memories can shape the appearance and persona of the object.
Terra Grass Arm Chair	Object is intentionally incorporated in the environment.	Object is integrated into the environment and this is achieved through continuous participation of the owner.
Nipple Chair (part of the Placebo Project)	Making what is invisible visible in the environment	Users perceive their surroundings differently by realizing aspects that were not apparent to our everyday senses.
Personal Audio Analysis	Analyzing and visualizing audio-based personal archives.	Audio segmentation and classification methods to automatically index audio data.
MyLifeBits	"Lifetime information store" and information retrieval methods.	The way information can be captured; accessibility and usability of information from an increasing body of data.
iSensed	Wearable sensor stream reveals life patterns through capturing continuously for 24 hours.	Events can be marked and sequenced to further mine data; past redundant behavior can help predict future behavior.
SpeechSkimmer	A system for skimming recorded speech.	Structuring, filtering, and presenting recorded speech to interactively browse information.

Table 2.4.1 Examples of related work and how it relates to the thesis.

“Where’s George” (Hank Eskin) is an online tracking system that monitors traces of where the US bill has been. The work reveals a geographical trail of normal everyday use; the project’s goal is to show that it is a medium of exchange between people, and not about how far or different places the bill has traveled to – their policy prohibits when bills are sent over mail or passed onto people (family and friends) excluding everyday use.

A US bill is stamped with an online address so that the person in possession of the bill can log an entry of it into the system (using the unique identification number on the bill); here they can log its latest date, time, location, and comments on how it was acquired. The work exemplifies how objects are very much related to people while having the potential to have a life of its own. It also emphasizes that everyday transactions are records of time and space. The historical trail is linear and long but reveals everydayness and chance; the mobile nature allows it to travel through time and space. Refer to Figure 2.4.1 and 2.4.2 to view a geographic circulation mapping of a bill and refer to Table 2.4.2 and 2.4.3 to see the itinerary of that bill.



Figure 2.4.1  
The map shows where this particular dollar bill has been.  
\* Miles calculated as the Great Circle distance based on Latitude/Longitude.  
Photo: wheresgeorge.com

One Dollar Bill, Serial# <b>A3271---8B</b> Series: <b>2001</b>					
This bill has traveled 18,565 Miles in 3 Yrs, 167 Days, 2 Hrs, 52 Mins at an average of 15 Miles per day.					
Entry Time (Local Time of Zip)	Location, State/Province	Travel Time from Previous Entry	Distance *	Average Speed (Miles per Day)	Comments provided by user
12-29-2002 09:43 am	Tamworth, NH	Initial Entry	n/a	n/a	
12-29-2002 01:11 pm	Brunswick, ME	3 hrs 27 mins	65	453	
01-24-2003 06:38 pm	Milton, FL	26 days, 6 hrs 27 mins	1307	50	Looks great!
02-14-2003 01:27 am	Sasebo, Japan	20 days, 5 hrs 48 mins	7413	366	
06-05-2003 11:24pm	Yokosuka, Japan	111 days, 20 hrs 57 mins	586	5.2	Navy Exchange
04-19-2005 07:31 pm	Brunswick, ME	1 yr, 318 days, 20 hrs 6 mins	6652	9.7	This bill has been hidden in my pocket for a long time.
05-12-2005 09:26 am	Danville, IA	22 days, 14 hrs 55 mins	1105	49	Great condition with 3 folds.
02-25-2006 09:28 pm	Maumee, OH	289 days, 12 hrs 2 mins	400	1.4	Staying at the Hampton Inn in

					Toledo OH
03-19-2006 09:04 am	Goose Creek, SC	21 days, 12 hrs 2 mins	626	29	Got this bill while traveling the east coast
05-30-2006 10:02 pm	Fredericksburg, VA	72 days, 11 hrs 57 mins	388	5.4	
06-13-06 01:36 pm	Quantico, VA	13 days, 15 hrs 33 mins	23	1.7	Now making rounds around Quantico VA

Table 2.4.2 A list showing time, location, and date of appearance of the dollar bill in figure 2.4.1.

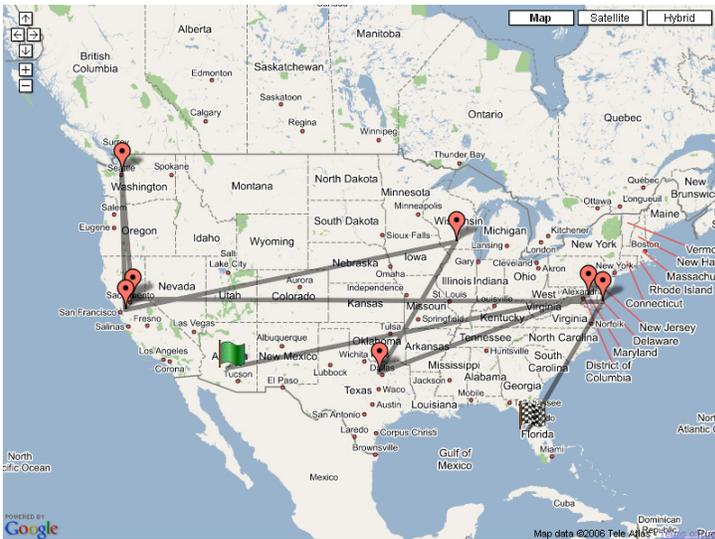


Figure 2.4.2  
The map shows where this particular hundred dollar bill has been.  
\* Miles calculated as the Great Circle distance based on Latitude/Longitude.  
Photo: wheresgeorge.com

Hundred (old style) Dollar Bill, Serial# <b>B3260--9D</b> Series: <b>1988</b>					
This bill has traveled 10,354 Miles in 4 Yrs, 83 Days, 6 Hrs, 39 Mins at an average of 6.7 Miles per day.					
Entry Time (Local Time of Zip)	Location, State/Province	Travel Time from Previous Entry	Distance*	Average Speed (Miles per Day)	Comments provided by user
04-17-2002	Chandler, AZ	Initial Entry	n/a	n/a	
04-25-2005	Severna Park, MD	3 yrs, 8 days, 15 hrs 52 mins	1997	1.8	
10-25-2005	Grapevine, TX	182 days, 23 hrs 50 mins	1219	6.7	
10-31-2005	Madison, WI	6 days 7 mins	810	135	
11-25-2005	Concord, CA	24 days, 12 hrs 24 mins	1729	71	Supermarket
01-13-2006	Lynnwood, WA	49 days, 13 hrs 59 mins	680	14	

03-08-2006	Rocklin, CA	54 days, 2 hrs 1min	625	12	
04-03-2006	Millsboro, DE	26 days, 3 hrs 32 mins	2454	94	Found it under a deck at the beach
07-09-2006	Tampa, FL	96 days, 6 hrs 50 mins	840	8.7	The bill was used to make fake money for party city! HAhaaaaa

Table 2.4.3 A list showing time, location, and date of appearance of the hundred dollar bill in figure 2.4.2.

“StoryCorps” (Dave Isay et al.; Sound Portrait Productions) is a soundproof recording studio available as a mobile unit (Figure 2.4.3) or as an installation piece (in a park or building) where people go to record audio stories. The project aims to facilitate dialogue and expression between people; each audio story is not self-initiated – people are asked to interview others to learn something about them while also taking the role of instructing the interview process. The studio travels around the country looking to collect stories; audio recordings are archived for others to listen to.



Figure 2.4.3 A StoryCorps Van that travels through different cities.  
Photo: storycorps.net

The recording symbolizes the “sharing of humanity and collective identity”; this work-in-progress was inspired by the oral history interviews recorded throughout the country in the 1930s by the Works Progress Administration. This work shows that dialogue is a two-way process where one can learn about the interviewee and learn about the self as interviewer. Interviews are not formal but comfortable, and new relationships are built beyond the recording session. The van itself symbolizes meaning as it travels through places; we can always discover new stories and we can always contribute stories. It is a place where we can appreciate and understand our self through other people’s experiences.

“Audiophotography” (David M. Frohlich) studies how sound relate to a photograph(s); a photograph is both an image of time and an artifact that stands witness to time (Figure 2.4.4). The



Figure 2.4.4 Audiophotography; the role of sound in photographs.  
 Photo: [www.dwrc.surrey.ac.uk/People/DavidFrohlich/tabid/74/Default.aspx](http://www.dwrc.surrey.ac.uk/People/DavidFrohlich/tabid/74/Default.aspx)

investigation revealed that the photograph creates two types of spaces when presented to people: a personal and a social circumstance. Different people had different purposes for them; for example, when people gathered around a photograph, it created a space for them to exchange private memories rather than find shared memories. A photograph also triggered complex memory associations such as the original emotion of why it was taken. In

cases of showing many photographs to an individual it caused nostalgia and a sense of what it was like. When asked to describe the photograph, individuals related the subject in the image to them.

Photographs also provided means to tailor a story to different audiences. Different types of sound (ambient, music, talking – one person voiceover, conversational) also enhanced relationships between “image-subject-audience-photographer”: a voiceover was least flexible; conversations helped interpret the photograph; ambience gave a sense of “retro-presence to the past”. Both music and ambience helped extend conversations around photographs and changed the dynamics of photo sharing. It was evident that photographs and sound needed to closely relate to each other when there were many of them lying around.

A photograph is an interesting thing because it is a representation and a marking of time that can be associated with sound. It mediates interaction and sharing stories around it; we can re-visit the moment the image was captured. The photograph is a powerful interface: it can shape human spaces in how they react and interact with people and objects. It is organic, familiar, and unique; it is a record that shows history; the study showed that presenting multiple images at once can trigger complex emotions of how it was like when the shot was taken.

“Trace” (London Greyworld) is a sound-based interactive installation in a historic maze (Figure 2.4.5). Visitors walk through and trigger sounds that reveal past whispers of its history and culture. People are led through the maze by following a faint laughter in the near distance.



Figure 2.4.5 Trace is a sound-based installation in evoking memories. Photo: greyworld.org

Once visitors reach the place where they thought the laughter came from, they hear it in another nearby corner. Through this walk they discover different sounds that are woven in the visitors' mind; the intention is to disorient visitors from determining which sounds are factual or fictional while projecting a historical tone.

Visitors are led towards the center of the maze where two benches and a compass await them.

The bench is for them to rest on after navigating through the maze. The compass spins and stops in a particular direction where visitors can then hear a historical sound from the part it is pointing to in the maze. The compass and the bench play a part in evolving the history of the maze. People's reaction to the compass and conversations that happen while sitting on the bench are captured. These sound events are then fed back into the maze-installation and combined with past sounds. The installation exemplifies how it continues to live and that it is not static. History accumulation is reflective of time passing and that each experience represents new participation and interactions.

“Bins and Benches” (London Greyworld) have mechanical capabilities to move around a plaza (Figure 2.4.6). Their movements are determined by their persona and spontaneity: they can sing together (if they wished to); bins line up on a specific day so that their garbage is collected. Benches can find shelter under a tree on a rainy day. This work shows potential for everyday objects to be



Figure 2.4.6 Bins and Benches; mechanical objects that have their own persona and intent. Photo: greyworld.org



Figure 2.4.7 Life is Suite; a sofa with memory that one can read and re-discover. Photo:lifeissuite.co.uk/

imbued with life. They are designed to be ego-centric that take advantage of their form and function. We can imagine future objects to roam around the environment with their own activities; their views of the world are continuously evolving from what it was originally purposed for.

“Life is Suite” (Rebecca Molina and Phoebe Jenkins) is a sofa that is embroidered with imagined stories of its experiences (Figure 2.4.7).

Stories are permanently woven

into the sofa and people interact with it to discover what it witnessed. The stories are imagined and representative of conversations it heard, lost objects it has seen over the years. Searching around the sofa such as looking between cushions allows the person to engage and discover new elements. Stories are represented in the form of photographs, text, and abstract imagery.

The sofa engages a person to interact at a personal level and take part in the memories it presents. This project allows us to imagine objects that reveal secrets of their past encounters. These memories shape the appearance and persona of the object; the presentation makes it less anthropomorphic and more informational. The surface of the sofa shows the importance in communicating a narrative from an object point-of-view.

“Terra: The Grass Arm-Chair” (Nucleo) is an armchair for outside use (Figure 2.4.8). The chair itself is not a finished piece of work and comes as a building kit; the design of the product requires participation from the owner; s/he needs to construct it and integrate it into the environment for it to be useable. The owner grows the chair as part of the outdoor landscape with soil and grass seeds.

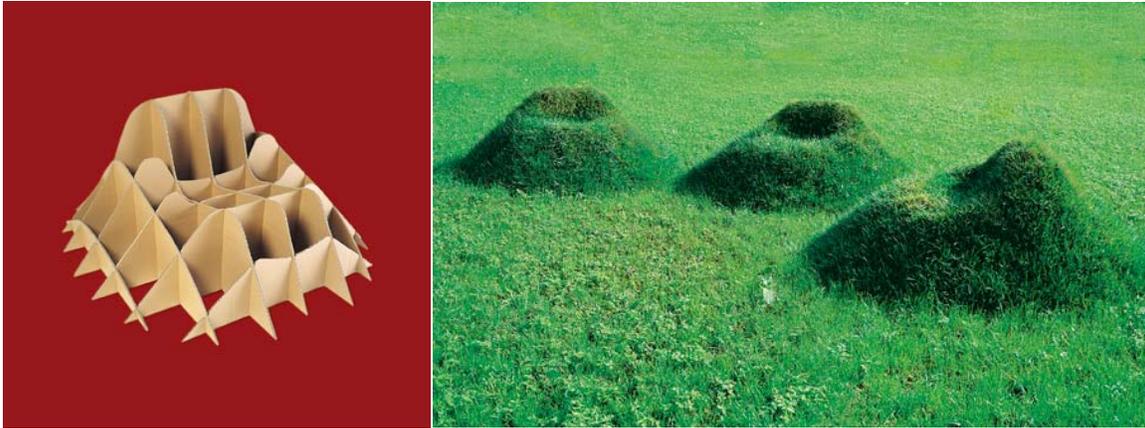


Figure 2.4.8 Terra Grass Arm Chair;  
Photo: nucleo.to

The process of undergoing the experience of constructing and seeing the chair shape up allows the participant to build an appreciation for it. It requires continuous involvement since s/he needs to water the grass chair and if necessary trim the grass. The material is environmentally friendly and it is organic in form. Sitting on this chair allows the user to experience it as part of the landscape. This work exemplifies seamless design in how the chair is made, where it is used, and that requires continuous participation of the owner with the object.

“Nipple Chair” (Anthony Dunne and Fiona Raby; Placebo Project) is an investigation of people’s relationship to electromagnetic fields that is emitted from consumer products (Figure 2.4.9). It is part of the Placebo Project where physical objects, in this case, a chair is designed to intentionally vibrate (via nipples on the back of the chair) whenever it is near electronic products (i.e. television).



Figure 2.4.9 Nipple Chair part of the Placebo Project.  
Photo: dunneandraby.co.uk

The chair’s function (to support humans to sit) is closely knitted with bringing awareness to the chair’s environment; it attempts to make the invisible visible. Sitting on the Nipple Chair changes how a chair is experienced and how humans perceive their relations with objects and their surroundings.

“Personal Audio Analysis” (Dan Ellis) investigates how a body of data, specifically an audio-based life log can be exploited. Consumers can continuously record digital audio, and it is technologically easier and cheaper to upload and store it in personal archives; the work explores to build tools that can automatically analyze and index audio data to create an “automatic diary of daily activities”. Subsequently they look at how this data can be visualized and used in other contexts as well (i.e. calendars and photo collections).



Figure 2.4.10 Gordon Bell, Microsoft Research. Photo: [iee.org](http://iee.org); photo-illustration: Mike Vella.

“MyLifeBits” (Gordon Bell, Jim Gemmell, and Roger Lueder) is researching into how everything can be captured and stored, and retrieved to assist human memory (Figure 2.4.10). There are two parts to this project: the first part experiments in how life events can be captured digitally, which includes everything from phone calls, email, to cards and books. The second part of the project investigates how information can be searched and retrieved using various methods such as an annotation and a rating system. The research is a fulfillment of the Memex vision by Vannevar Bush in 1945 – cataloguing, hyperlinking information so that it can be retrieved with speed and flexibility. The work exposes the hard problem of: how information should be captured, and in what form should it

be captured, and how accessible and useable the information is from a growing body of data.

“iSensed” (Brian Clarkson) reveals life patterns from a continuous capture of life events; these events originate from a wearable sensor stream where the recording device is in a form of a backpack. From the captured data, the daily human experience is computationally modeled; clustering, classification, and prediction determine how recorded memories from different points in time are associated to other similar life moments in the same individual. The system can also

predict future actions based on redundancies from past behavior. The findings of this research show how certain events can be marked to frame an activity and that events can be combined as sequences (and sequences of sequences) at multiple time-scales to further mine the data.

“SpeechSkimmer” (Barry Arons) is a system for browsing recorded speech and reduces the need for linear, continuous playback. The nature of audio is time-based and the work presents techniques on how speech can be automatically processed and presented for skimming and quick listening. These techniques are based on speech processing where time compression, pause shortening, emphasis detection, and feedback are used. The research shows opportunities in analyzing and processing audio for efficiently consuming compressed forms of speech.

## CHAPTER THREE

### Designing Storied Objects

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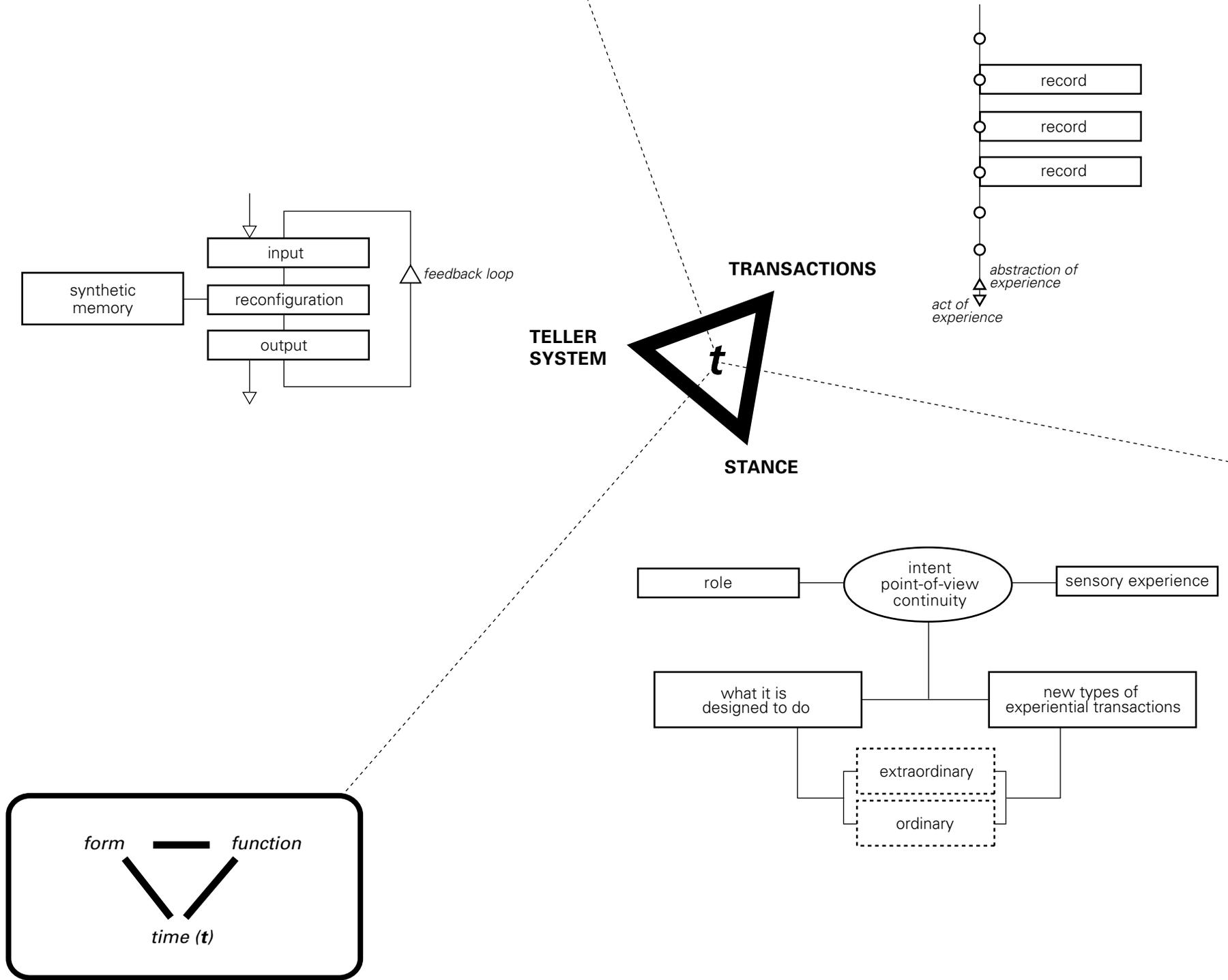
This thesis introduces a generalized framework (Figure 3.1) which designers can use to design objects that have the ability to capture and express their history. The framework elevates “time” to be a co-equal principle to form and function. The framework calls for integrating sensors, temporal memory, and a narrative-centric approach to foreshortening time into the object. Thus, by combining a structural means and a computational processing component, the framework enables everyday objects to express and communicate an impression of “what took place” over the course of some time interval. Using this framework, designers can make appropriate decisions about the medium of expression, the interval of time reflected in the expression and the quality of the expression with a clear understanding of the cultural and contextual goals of the expression.

This approach draws on ideas of episodic narrative. The object is considered as an inanimate object that never the less experiences time in context. The designer can consider the value of this expression to the consumer: should it add pleasure based on the aesthetics of the expression? Or should the expression highlight critical information about the passage of events? Should it foreshorten the whole memory of the object or only the last few hours? How and in what detail should the object know the people who interact with it?

Let’s think of a doorknob scenario, how might it be designed to re-tell its past experiences? Designers should consider two aspects of how, what, and why in making design choices: (1) the implications of what we understand by an everyday object when (computational processing) technology is *integrated* as part of the form and function, and (2) the implications of the computational object being *integral* to its environment.

Doorknobs can be designed with sensing capabilities for various human-interaction scales: for example, it can detect whether someone is touching or turning the doorknob, how many instances it has afforded to opening the door (in contrast to a door that is locked and cannot be opened), and to identify when it was least busiest in people traffic. Doorknobs can also be designed to detect how tight a person might grab the doorknob or to detect whether the same person (based on gathering identification) has opened the door more than once (assuming the activity of a person entering and leaving a room).

Figure 3.1 Design Framework for Time (Stored Expression)



What if the same person opened the door more than twice? We can imagine that s/he had a frequent day that required her/him to enter and leave the room many times. Of those captured records, how might the system be designed to make sense of and express irregular incidents from the perspective of a doorknob? What of the activity records are considered ordinary and extraordinary? How might the doorknob reveal one year of instances that were not explicitly intended for in the functional purposes of the object? In these scenarios the doorknob would need a feedback loop in the system to observe event state changes over a period of time. We can also imagine that the episodic nature of events captured by the doorknob can be expressed through vibration, transformation of the material, or a change in shape, color and temperature.

In a different scenario, perhaps the story was that the man who was frequently opening the door was a doorman at a residential building who would greet and open the door. If we imagine that the doorknob was capturing and expressing its experiences in audio form, the doorknob can reveal an audio-based socialized context of its environment. Through the foreshortening of audio (we call this Audio Time-Lapse), imagine listening to the social scene – a doorman’s greeting with a wave of silence followed by human greetings, chatter, and laughter – followed by another wave of human chatter, a little girl singing and a dog sniffing. Imagine that the audio can also express the history of tactile energy – how people hold and pull on the doorknob – the energy can be translated to intensify certain sound events. Perhaps the story that one can take away is the busy life of a doorknob that expresses a lively and active community who enter and leave the building. What would it mean when suddenly the doorknob does not express stories that are full of life, but stories of desolation?

Storied objects are designed to express a perspective of how it lives as part of its environment; stories are not representative of a single point-in-time but expressive of events that happen around them over time. Designers should think about how they may approach this issue: they should consider the time scale representation in the life of an object (i.e. representing five years versus one day in the life of the object) and subsequently what an object would re-tell of those captured records in that particular time frame (i.e. what is significant in the events); and to select appropriate media and technology (both input and output) that manifest implicit point-of-views of how an object experiences time passing (such that it reveals intimate interactions and ambience which is pulled from its context). Storied objects are not artifacts for surveillance but entities that remember aspects of what they witnessed and give off a storied impression of that history. The

re-telling expression of time allows other encounters to experience and understand what took place in the life of the object.

The following sections guide designers in thinking about “storiedness” in objects.

### 3.1 Design Model: Advancing Traditional Design Thinking

**form** ————— **function**

Fig. 3.1.1 Form and Function in traditional design thinking.



Fig. 3.1.2 The Barcelona Chair by Mies Van De Rohe in 1929.

An everyday object can be articulated by design principles of *form* and *function*. The form is the visible language that communicates and conceptually images the designed intent of structure and pattern (i.e. does it communicate beauty? does it communicate safety?), and the function describes the purpose, role that supports the utilitarian aspects of an object (i.e. does it allow humans to complete their task? is it a fit product?). Form and function work hand-in-hand in design thinking and successful cases of designed objects exemplify how formal and functional qualities are interrelated.

The Barcelona Chair (Fig. 3.1.2) was designed to be light, strong, and comfortable. Mies Van De Rohe was inspired by the Egyptian folding chair and designed a chair for the Barcelona Pavilion in 1929; the chair gave a sense of noble and formal aesthetic to the modern structure of the building while it was designed for mass production (i.e. the stainless steel frame is made from a single piece of metal; the design was revised in 1950). The elegant form of the chair communicates that it should be sat on; the structural design, the material selection, and the design for manufacturability attribute to the overall sophistication and impression that it is a timeless chair to engage in.

In particular, after the Industrial Revolution in the late 18<sup>th</sup> century, objects have been designed to consider how it can be mass produced. Mass production introduced an economical and automated way for manufacturing parts to assemble volumes of products. This meant that identical mass produced goods were more likely to be found among the masses than in a single household;

goods were no longer unique but available and affordable for the general public, and consequently each household gained a sense of identity through re-discovering *ritual* within their home (see Chapter 2.1).

A dining table is a piece of everyday furniture that implicates the social circumstance. Like other objects, we can imagine that it is an inanimate entity with a secret life that already witnesses ritual in the home but has no means for testimony. The table is made-up of a flat surface area that sits on four legs. The table top and legs can be aesthetically shaped to be stylistic yet functional. The table top and legs can be shaped to be ergonomically fit and consider other human factors. The table top affords users to place their dishes and cups to eat their meal or even place a book to read. The legs balance and support the weight of the table top and things that are put on top of it.

On the other hand, each mealtime experience sitting at a dining table is ordinary yet unique – tables create a space for people to gather around and form a sense of rite such as a Saturday night family dinner, reviving the sense of kinship and family value (Fig. 3.1.3).



Fig. 3.1.3 A family dining at home. *Photo Credit: nytimes.com*

Over time the *action space* around the dining table (the space associated with activities that occur around objects - i.e. where plates of food are on the table and a family is sitting around the table) becomes a source for ritual. From a human perspective relations and memories are formed, become salient, and associated with these objects. These experiential transactions reveal ritual – a human-centric activity and a routine that is apparent across different classes of objects. For

example a boy drinking a *glass* of milk before retiring to *bed* or a *bell* that tolls every night at dinner time.

Generally the dining table plays a role when we eat (for example, it is a utility object for holding culinary dishes on one surface area) or when we need to sit around a table to talk or work on a task. It is designed for humans and each household has their own creative means for using it. Over time, the dining table can become *symbolic* to those who take part in the ritual; the table can remind you of those events. Imagine the monthly afternoon tea time you have with your friends, or the Sunday breakfast table that is waiting for you in the morning, or those times you find your brother snacking in the middle of the night.

The umbrella is also symbolic like the dining table such that it is an active yet passive entity – it generally serves to protect humans from being rained on and can create ordinary yet ritual-like situations. Imagine lovers walking under the spring showers cozied-up under an umbrella; the girl who uses an umbrella as a parasol; the grandmother who uses the umbrella as a defensive armor to avoid birds flying too close to her head or as a weapon in fending off handbag snatchers; or the spy wearing an overcoat and carrying an umbrella under his arm to meet with his contact.

The social significance of an umbrella was quite different before the Industrial Revolution; for example the umbrella was adopted as a spiritual artifact from the Church of Rome in Italy, and in England and France, it acted as a social tool to project social status (i.e. royalty, dignity, honor) [Lee 2005]. The umbrella originated from Southeast Asia and was introduced to new cultures of Western Europe and the Americas mainly through traveling tradesmen. Through its cross-cultural travels the umbrella brought along authentic stories of origin that would soon fade away. The living history that the umbrella once embodied was lost in transit to new cultures; upon arrival to a new society it was exposed to new ideals and it eventually adopted a new sense of being, a new symbolic meaning.

Today the average umbrella is very much utilitarian and dispensable. The symbolic idea and stories that are associated with the umbrella are once experienced but soon after, the stories of what happened are dependent on the human memory. In our human experience we lose (forget) stories that were once cherished and meaningful (stories that were played over and over again in our minds or told to others). One of the purposes of a photo album is to explicitly hold records (photos) that we can revisit. With a photograph we often make physical notes on the back of it to

remind us where the picture was taken or why it is significant. It becomes clear that access to past experiences - the history – the stories - *remain separate and external* to the object. A photograph is a point-in-time captured on a photographic medium; however a single photograph does not have information that connects it to the past and to the future so that we can have an understanding of the narrative behind the frame.

Traditional design thinking with form and function considers the overall experience of the object to be useful, useable, and desirable for the consumer. A doorknob with a microphone embedded inside the hollow form of the handle makes it useful because it is functional for capturing data, useable because we can search through the data for evidence, and desirable because the technology is embedded within the form of the doorknob. The two principles of form and function do not address how captured records should be considered and used to remember experiential aspects of time progression. The current model allows for capturing and accessing records as actual evidence, but does not help in making sense of the overall historicity, the “storiedness”, of what actually happened in relation to the object and its context.

The following section articulates how the thesis advances traditional design thinking by extending the model to include *time* in order for objects to have storiedness capabilities. How might designers go about designing objects with history? How can the storied expression be representative of the object’s point-of-view? We make a clear distinction between objects owning their own history and humans associating values with the object’s presentation. Remember how you used to take your younger brother for a drive in your first car you owned. Remember how your grandfather used to always take a sip of wine sitting on the armchair in the living room. Imagine if the car or the armchair could offer this memory to the next owner.

### 3.2 Extending the Design Model

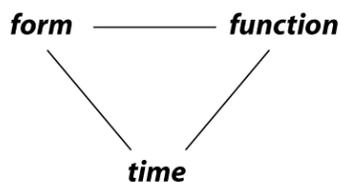


Fig. 3.2.1 Form and Function extended to include Time in design thinking.

The experiences that occur around an object provide us grounding and opportunity to implement ways for witness and testimony of its history. We extend the design model (form and function) to include *time* so that it can voice a storied expression of time passing (Figure 3.2.1).



Fig. 3.2.2 Sotheby's Auctioneer.  
Photo Credit: Michelle V. Agins/The  
New York Times.

Let's fast forward in time to about 50 years. Imagine that *you* are sitting at the Sotheby's auction house in New York City. You do not have any particular item of interest but are willing to add something to your collection at a reasonable price. A dining table (Figure 3.2.3) appears on stage and is introduced by the auctioneer. The room is silent and the act of bidding has not yet started. The auctioneer then steps off the podium and sits at the dining table (that is being auctioned off) while another colleague brings him a cup of tea. Then he takes a sip of tea and carefully places the tea cup on the table. In a short while the table starts to share its hundred year history of what it has been through; you hear distinct whispers and you see imagery. Abstract traces of cups and dishes and hand gestures

appear as part of the grain of the wood. You hear the audible sound of people drinking, talking, singing, and sound of utensils hitting the plates; you also hear four distinctive voices. You hear lapses of conversations; bits and pieces allow you to sense life and time passing – a living progression of what the table witnessed. At that moment the auctioneer gets up from the table and goes to the podium and starts the bidding process; the audible and visible story fade away.

Imagine if the voices in the story were of someone socially famous like President Kennedy, someone you personally knew like your parents and grandparents, or strangers of a different lifetime. What if the story was a collection of secrets or significant markings of time such as birthdays and anniversaries? From a human perspective, the associations that you find interesting would affect how significant the artifact is to you. Not only are you able to listen to stories of the past, but you also gain a sense of understanding what it was like – a grounding to the past.



Fig. 3.2.3 A Dining Table. Photo Credit: shimu.co.uk.

Stories that are captured through the table (and you can imagine other objects as well), are relevant to the form and function of the object. A storied object is not about recording anything and everything, and in turn playing back everything that was captured. It is designed to carefully

consider which aspects (i.e. interactions and ambience) it will capture and process – events and activities that occur in relation to the object, and play back a foreshortened version of its past. This approach can help reason for and differentiate each storiedness capability in an object from another. Perhaps the stories of the table were not re-telling all the times the family came together to eat and laugh; rather, the stories were representative of the awkward silences, the serendipitous moments, or the little boy who quietly came downstairs to eat ice cream in the middle of the night. In contrast imagine a sofa that re-tells a story of all the instances of the dog sleeping on it while his owner was away.

By extending the design-thinking-model with time, objects can reveal how significant events played out in its environment – we are adding a cultural value to how an object lives; in a sense it is a source for humans to appreciate how we make sense of our living environment. Technology has become ubiquitous and able to aid with vast computational power to monitor and provide living standards for safety, convenience, and efficiency for instance; however the presence of technology has been less aligned to the poetics of human living; it does not contribute to the mythos in how we may live – it lacks reflective experiences for how we may appreciate and understand simple but essential values of our progressive life (i.e. giving flowers as a thank you gesture or decorating an office with flowers every week).

Designers should consider how an object can construct stories in relation to what it is, what its intended context is, and how it is experienced – designers should think about how and what human encounters can take away in terms of the historical and contextual values. The communicative and history-based expression of the object – *the voice that changes over time is the storiedness quality of the object*. Perhaps the stories that are re-told by the dining table are to show consistency and continuance of family value and human nature from past generations – imagine listening to a fifteen year history in five minutes: a mother’s voice, children talking and giggling as they secretly feed the dog under the table, and the sound of children growing.

Consumer objects in particular are designed to have purpose and intent (i.e. a scissor that cuts, a chair to sit on, or a vase that is meant to be looked at for its beauty). In order for objects to have temporal means to obtain and express history in relation to its form and function, designers need to consider choosing appropriate hardware (for example, sensing technology, material and structure) and consider how it will interface with the physical world to capture and output information (Figure 3.2.4).

Storied objects are designed with three processes: input, re-configure, and output. Input is the process by which it captures data from the physical realm to the digital space; re-configuring captured data allows for an analysis, data storage, and story construction for re-telling what happened; and the output is the means to express the re-configured historicity outwards to the physical world.



Fig. 3.2.4 Capabilities needed for objects to have a storied expression: input, reconfigure, and output.

### *Input*

A chair can have contact, pressure sensors, temperature sensors, and microphones to continuously record a person sitting and talking, or even a dog or a cat sleeping on it. The types of input capabilities and the physical placement of it in the object's design will affect the quality and type of information that is gathered. In this example, pressure sensors can be placed on the cushion seat and in the back support as well. In order to obtain a richer history, we can also embed microphones in the legs of the chair to capture her/his foot movements. Placing sensing technology in a particular part of the object should consider the 'designed intent of the object's storied voice' into account (i.e. what aspects of the object's life should be re-told). For example, to recount a story of a chair that is an inanimate yet rebellious in character, one should consider how human encounters and other entities interact with the chair when it starts to shake every time someone stands on top of the cushions; such interactions can inform how events can be captured and how the input can be designed as part of the object. This is critical to how *relevant*, *authentic*, *situated*, and *experiential* stories will be when it is re-told from the object's point-of-view.

### *Re-configure*

Once activities and interactions interface with and are converted from the physical world to digital bits, captured data goes through a re-configuring process. This is a procedure that analyzes the captured data, stores it in manageable form, and as necessary puts it back together in a storied way. The purpose of this process is to obtain descriptors for each event (i.e. parameters, time

stamp, etc.) and store events and descriptors in memory so that it can be accessed methodically when constructing a story.

Since an object lives through time and space, it is exposed to and gains new experiences from its context and environment. Past memory (stored events) can be designed to be selectively forgotten (deleted) as newer memories are formed. We want the system to construct stories that are concise (foreshorten events) to give off an impression of past events rather than playback every detail and activity that has been captured; lengthy detailing can be meaningless, tedious and mundane for both teller and its audience (see Section 3.3; an elaboration on how to think about time and the reconfiguring process that is interrelated with the input and output). Imagine if your shoes told you where it has been to in the past year – rather than re-telling every footstep it has trekked through the city, events are captured, prioritized, and foreshortened to include only the places it has spent a significant amount of time in.

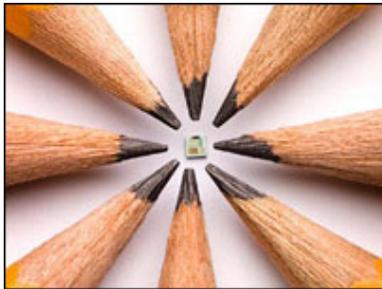


Fig. 3.2.5 Hewlett-Packard Wireless Memory Chip. Photo Credit: AP News.

As for the physical component of this process, it requires a computational processing system (either locally within the object or remotely located) to process the data. As technology advances we can expect to see small and powerful hardware (for example, see Figure 3.2.5) that can be integrated unobtrusively within the form and function of the object or the designer alternatively can choose to make the object communicate seamlessly through wireless technology to a remote location.

### *Output*

The output is the process that interfaces and externalizes the storied voice of the object; we can experience this through various modalities such as hearing, seeing, smelling, and touching. This requires the design of the object to integrate new materials and hardware (that incorporate electronics as separate components or intrinsic within the material) as part of the object. In the dining table example, sensors can be placed at the periphery of the table (i.e. this is an area where humans would generally have physical contact while sitting at a table), and we can also imagine sensing technology to be integrated/grown within the grain of the wood to hold color changing properties and to sense touch for input and output capabilities within the natural form. The output (as well as the input) is designed as a seamless interface of the object – imagine a car seat

interface: the fabric itself can sense where you are sitting, how you are feeling, and can draw traces of history (see a similar example in Chapter 4: TechStyle); imagine where you would place speakers if a park bench were to sing to you its experiences; imagine where you would place vibration capabilities in a doorknob so that the house master knew it had a lonely day.

The following section elaborates on how designers can think about *time* in designing storied objects. Time relates to how captured events are processed and woven back together in the form of digital bits. By thinking about time, the framework demonstrates the interrelationship between the input, the output, and the re-configuration of captured events in constructing a storied expression.

### 3.3 Design Framework for Time in Storied Objects



Fig. 3.3.1 Man riding a bicycle with dog in Amsterdam.  
Photo credit: ski-epic.com.

Imagine if bicycles in Amsterdam (the Netherlands) were designed with capabilities to have a storied expression. Bicycles are a way of life (common) in Amsterdam; special lanes and traffic lights are designated for bicycles and a substantial percentage of people get around the city riding them. Generally the outer appearance and the functionality of city bikes in Amsterdam are similar; you can see racks of parked bicycles throughout the city.

If bicycles were designed with capabilities for acquiring and expressing a year's length of history, how might their stories differ from one bicycle to another? What can we take away from a bicycle that tells us of its past? In this scenario imagine a male owner (Figure 3.3.1) and his unique habits; he might be someone who treats his bicycle like a prize possession, or someone who treats it poorly, or simply objectively as a vehicle to get around the city. In the life of the bicycle (that is, from the bicycle's point-of-view of the world) it encounters both old and new experiences in its passages. Here the bicycle's story is in audio – the audible sequence is an episodic journey through time and space that gives a sense of an archaeological layering of events over time: the

bell ringing in traffic, the owner talking to his bicycle, the dog treading behind the bicycle with much thirst, squeaking tires, people chatter, then you hear the distancing of city sounds fading into a slower serene tempo; birds are chirping, leaves are falling off branches, and in the background you hear the wheels of the bicycle riding the dirt road.

The episodic nature and presentation of re-configured history events are not imaged in an aggregated form, but woven sequentially (with motion) whence a perspective can be drawn from the story told - the expressive passage of one event to another provide narrative continuity. The temporal succession of one frame to the next re-tells what was captured electronically through time; it reveals ambience and an intimate sequence of events that are directly related to the particular nature of the object's affordances, and happenstance (i.e. the bicycle can reveal a relationship between the way the owner rides his bicycle and the dog that goes everywhere with him). Each event that is used in the re-telling of the past is significant as to what happened; this (computationally processed) event sequence is also reflective of the design choices made by the designer which is based on the framework (Figure.3.3.2) for designing a storied expression.

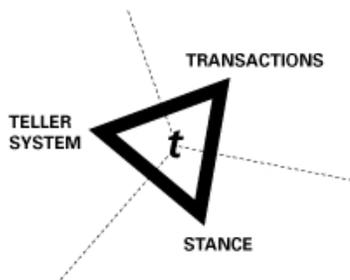


Fig. 3.3.2 Time (a storied expression) is made up of three elements: transactions, stance, and a teller

The framework concerns how everyday objects can be designed as a story machine; to have capabilities to capture a continuous stream of activity and process it to extract and store significant events that can help to re-create a narrative based on what happened. Time is the storied expression of an object and consists of three elements: *transactions*, *stance*, and *a teller system*. These elements are interrelated and interdependently work together for the object to have storiedness qualities: transactions refer to

records that are captured where the system is designed to reveal and differentiate records as in/significant (i.e. the system can pull out scenes from the audio stream where the man fell off his bicycle); stance refers to the attitude that an object takes upon the world (i.e. the bicycle is designed to only extract events that relate to the owner and the dog treading behind); a teller system is the underlying structure that make it work (i.e. the more frequent the bicycle travels in different spaces, the more it can reveal the dynamics and progression of its history).

The following sections explain each element in detail and interconnect them as a framework.

### 3.3.1 Transactions

The story machine can be designed to record an object’s experience continuously or at particular points-in-time (of a certain length). For example, the dining table can capture the entirety of a dinner evening of a family eating and conversing, or every time a dish is lifted from the table, or it can be designed to record the first ten seconds of every five minutes through the evening. The records that are captured reveal a trail – history transactions – that took place in the life of the object.

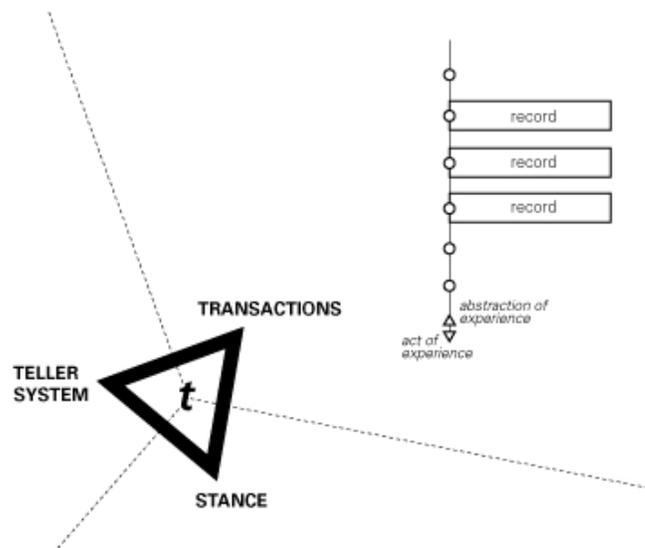


Fig. 3.3.1.1 Transactions

Transactions (Figure 3.3.1.1) is described as the element where historical records are captured over time which serve as evidence and resource for constructing a story about its past. Records originate from a continuous stream of activity in situ of the object, where techniques are used to define and segment events from the recorded stream. For example, the system can analyze the raw footage and look for changes and patterns that determine the boundaries of an event, or there can be pre-set intervals between each capture that define an event. These techniques and others allow designers to think about: (1) the type of information that is gathered (i.e. what is it about?); (2) the computational processing efficiency that identifies an event (i.e. how relevant and accessible is it?), and (3) the resolution of the information that is used for re-telling what happened (i.e. how detailed is it?).

The granularity of the recordings determines how much information is generalized and remembered of what happened, and subsequently this affects what is re-told of those past events. On the other hand, having a finer granularity (i.e. recording continuously and storing everything in memory) will not always be efficient or necessary in certain circumstances (today this requires greater processing power to manage vast amounts of data). For example, when people are gathered at the dining table and eating, it may make sense for the system to record with bigger intervals than smaller intervals as there may not be any significant changes happening.

In contrast, designers may want to record continuously or in smaller intervals to expose a detailed texture of the object's life, or that certain objects demand a continuous capture. Imagine what a camera would record of its experiences; imagine Jackson Pollack's canvas capturing paint splattered onto different spaces at various moments with different speeds; and imagine a dining table detailing an unsuccessful dinner party: the forking of food, people's movements and whispers, the tapping on the table, the silence of eating, and the night ending with the sound of people gathering dishes.

With time, the system is recording the act of experience, and with past time, the system is looking back and making an abstraction of experience. In other words moving forward in time allows for acquiring historical records, and moving backwards in time allows for a retrospection and characterization of the captured history. The abstraction process allows designers to think about the overall scale in which records are captured and segmented, and subsequently the resolution that affects the detail and authenticity in remembering what happened.

The following element elaborates on how to manage the transactional history (i.e. what to do with the records that are captured).

### **3.3.2 Stance**

Stance is the attitude and position an object takes upon the world it lives in. Should the dining table consider how it is used for breakfast, dinner parties, or work? Should it remember the moonlight and the sunlight that move across the table top through the night and day? Should it remember all the times the baby spilled milk on the table? What becomes an interesting event to re-tell what happened? What if these events occurred periodically?

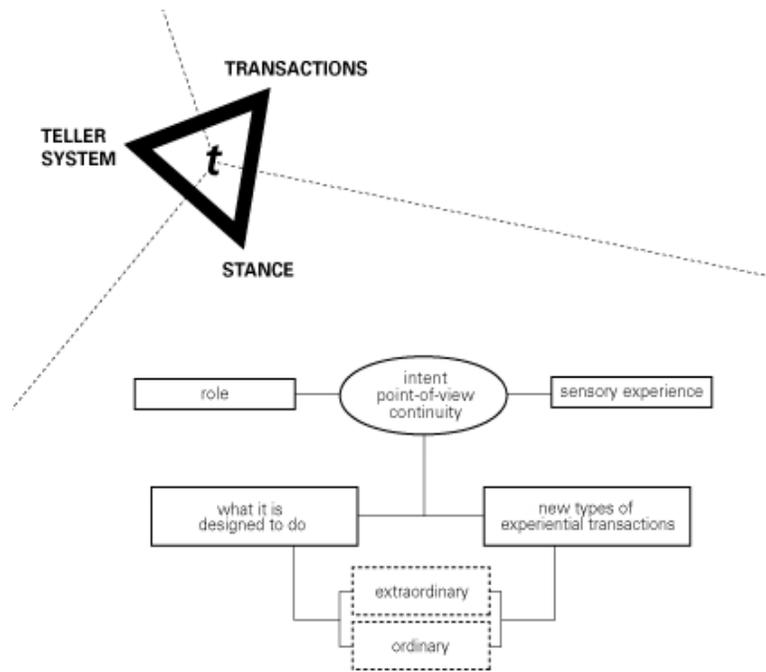


Fig. 3.3.2.1 Stance

Transactions (Section 3.3.1) introduce the idea that the object acquires records where the granularity between each capture can be circumstantial. With transactions – a set of records – the stance of an object (Figure 3.3.2.1) can help distinguish which events are extraordinary from the ordinary. The differentiation allows the system to tag events that ‘are’ important (i.e. current state) or ‘have become’ significant (i.e. change of state).

The everyday object lives continuously in the environment, therefore it is experiencing time; the state of how unique an event is ever-changing since the object is continuously undergoing something – over time new experiences become old experiences, and old experiences are revisited as new experiences. Imagine a little girl who did not want to eat her vegetables for dinner. She secretly feeds her dog by passing her carrots and broccoli under the table. From the table’s point-of-view, this would be considered as extraordinary since the table has never witnessed it before. However imagine if the little girl repeatedly fed her dog throughout the week. The table can be designed to find this frequent activity as uneventful. Now fast forward to thirty years; the little girl has grown up to be a mother with a little boy who also doesn’t like vegetables. Imagine how the same dining table, thirty years later, would re-tell a story about witnessing once again a child feed his dog under the table.

Designers should consider the circumstances from which events can be captured, as well as the frequency and duration of such events. There are two aspects to consider: what an object is primarily designed to do (i.e. role, purpose) and new types of experiences that it was not originally intended for. The table is designed for people to sit around, eat and socialize, where as secondary tasks can include reading and working on the table. On the other hand, the little girl feeding her dog under the table, a father stepping on top of the table to replace a bulb in the chandelier, or the children sitting around the table tapping on it as if it were a drumming session, are eventful examples that the table can consider as new experiences.

In order to distinguish the extraordinary events from the ordinary, the system needs to tag events with particular characteristics that define it as unique (i.e. has this ever happened before?). We borrow from narrative theory on how designers can approach this process. Narrative attributes such as point-of-view, intent, and temporal continuity give form and voice to the object's position (attitude) on past experiences. Designers can frame how objects evaluate their experience using these attributes so that the system can look back and construct a story based on what happened.

Point-of-view is how the object frames what it views and expresses from its experiences. This is not necessarily absolute cut-outs of how an object captures interactions (i.e. recording every time someone touches the table), but a holistic, contextual approach to capturing particular aspects of what happened – to reveal implicit circumstances, progression and change (i.e. instances when the angry kid starts banging on the table followed by the mother and father talking with their child, and the loud noises stop when the kid gets up from the table).

The narrative intent is the focus, purpose and direction of what the object is designed to reveal of its experiences. The dining table can be designed to reveal that Sunday family dinners have been a tradition for generations. When there is a breach to this canonical form, where the family dinners become rare or obsolete, the table can (with intent) re-tell stories that reveal changes made in the family tradition. In a different scenario, the table can be designed to witness the liveliness of family members through generations. For instance the table can recount a story of all the people that dominated the conversations through the years.

Temporal continuity refers to the order, frequency, and duration in which events mark a progression across time and space. This gives progression to story and allows the system to check

whether events have changed state between the extraordinary and the ordinary as the object experiences time. The little girl feeding her dog every evening becomes uneventful from the table’s point-of-view, but the table can also recount the times where the mother scolded the little girl for feeding the dog and the dog wagging its tail. When events are woven together with consideration to narrative attributes, the audience can gain a perspective from the story. In this scenario we can imagine a girl who learned to eat vegetables and was very close to her dog in her growing years.

The following section outlines the third element that unifies all the elements to make it work as a framework.

### 3.3.3 Teller System

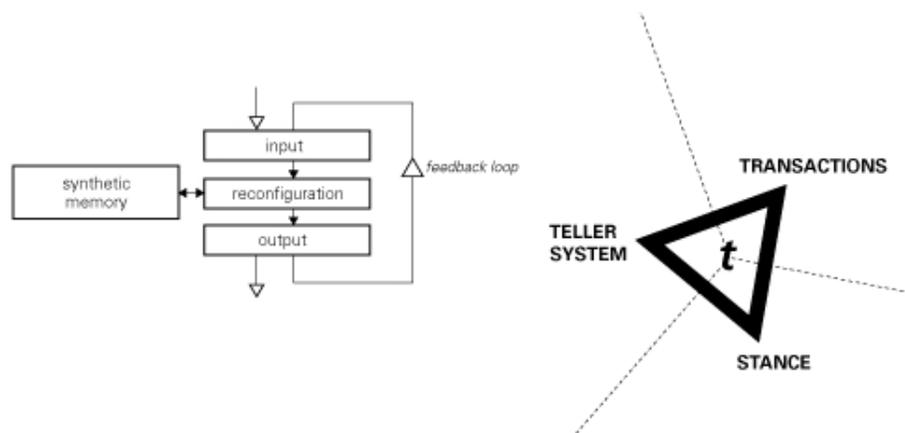


Fig. 3.3.3.1 Teller System

The teller system (Figure 3.3.3.1) interworks all the elements to generate the story machine. Transactions refer to the system acquiring a set of records of time and experience; stance positions how the object frames what it experiences and in turn affects how the history is re-told.

The teller system proceeds by channeling the flow of records in and out, so that history records can be captured, re-configured, and re-told as a sequence of events. This system requires various components to make it work: input, a reconfiguration component that interconnects with synthetic memory, and an output. Input captures records, the reconfiguration component accesses memory

and weaves events together based on the object's stance, and output expresses the story of what happened.

In a separate channel, the output is connected to the input in order to keep stories authentic and to represent time passing. This allows the object to continuously acquire and consider both old and new experiences. When a human teller shares a story with her/his audience, the storyteller takes the audience's reaction into account as the story progresses – subsequently this alters how the story is told. The story is different each time because every interaction between the teller and the audience is unique and relevant to a particular time and context (whether the audience is the same or different).

Likewise the teller system in a storied object expresses a different story each time, since time is passing and circumstances change. The system continuously acquires (input) experiences and expresses (output) what is remembered (synthetic memory) of the past, while the output is fed back into the system as part of the new experiences that are captured. This *feedback loop* allows for the system to generate authentic stories that are reflective of narrative progression and time progression.

Let's return to the auction scenario in Section 3.2; imagine the dining table and the story it told at the beginning of the auction. As the bidding war started the crowd in the room demands to hear another story! The auctioneer considers their unconventional request and once again steps down from the podium and sits at the dining table. In a moment's time, the table starts another story and it is different story. This time only one handprint image surfaces onto the table. The handprint disappears and whispers are heard. Suddenly silence falls as one distinctive voice dominates the story space. In that moment the crowd in the auction house realizes that the story was a pivoting moment in the table's history.

**CHAPTER FOUR**

Design Explorations: Persistence of Time and Narrative in Objects

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The supporting research projects (Table 4.1) investigate design issues related to how objects can be experienced in a temporal context: (1) situating input and output mechanisms; how we can position technology in relation to form and function of objects and spaces; (2) how events can be captured and expressed; (3) from which point-of-view is the story told and to whom is the story told; (4) how interactions can shape the expression of historical time that is captured through objects.

<b>Project</b>	<b>Interface</b>	<b>Time-based</b>	<b>Point-of-view</b>	<b>Causality Characters</b>	<b>Design Issues</b>
Alternative Autobiographies	physical and virtual	yes	writer	writer’s work and space, writer, and human audience	expression, real-time correspondence and accumulation of data over time, rich media composition, persona
Socio-Kinetics	virtual	yes	online community	Usenet community	motion impression, asynchronous data capture, persona
Ceiling with an Attitude	physical and virtual	yes	pod	pods and human audience	temporal and spatial interaction between object and human encounter
TechStyle	physical	yes	chair	person who sits on a chair	textile interface that shows “sense of chairness”
Building with Gesture	virtual	yes	building	Stata building and its circumstance (i.e. MIT community, weather)	time-lapse technique, ordinary and extraordinary events
Post-Card	physical and virtual	yes	card	physical greeting card receiver and Post-Card sender	transactional loop, experiential cycle, action space

Table 4.1 Summary of prior research and design issues explored

Projects are aimed to be exploratory and are generally focused on a particular design issue. Each project is unique and effective in how it mediates expression and interactivity; appropriate media (analog/digital, 2D/3D) is used accordingly to fit the experiential aspects of the designed intent. We focus on how things can be experienced in a time-based scenario and work towards blending human expectations with new, unintended experiences with artifacts and the built environment.

## 4.1 Design Portfolio



Figure 4.1.1 Alternative Autobiographies: *the writer's room*.

“Alternative Autobiographies” is an exploration and a first attempt to mediate a storied *impression* of a living character, Richard Kostelanetz (Figure 4.1.1).

Biographical, textual information is augmented onto the physical space (window, canvas, fireplace, floor) and writer-related objects (typewriter, ink bottle, desk). The representation of the physical space was designed to mimic his

writing room in Manhattan, New York to express the evolving prose of the writer. The installation was technologically instrumented for real-time display (audio and video) and correspondence between exhibit-visitors and the writer.

In this work we attempted to capture and express the life of a writer through two explorations of time-based interfaces (Figure 4.1.2). First was a visualization that represented his collective past work in a continuous prose, which was not possible through traditional media such as paper. The



Figure 4.1.2 Alternative Autobiographies: *the typewriter juxtaposed against the computer, a correspondence station with the write, the writer's daily diary.*

desk augmented his ghostly rhythms in punching typewriter keys, the typewriter expressed the non-syntactic literary autobiography, and the ink bottle expressed a threaded articulation of one word; the metaphor for the desk aimed at communicating his creative expressions as well as him stumbling over a writer’s block.

In the second interface, the digital writing machine (i.e. the computer) was juxtaposed against the traditional typewriter and desk where visitors corresponded asynchronously with the writer. The visible information space evolved through the course of the exhibition to show an *accumulation of history* – this included the correspondence and the daily diary of the writer. The data visualization explored kinetic composition techniques to express the constraints of both objects – the traditional typewriter and the computer – in creating information form and expression. The typewriter constrained words in a linear way, moving from top to bottom on a two dimensional page; the computer interface constrained words within the screen but utilized depth and superimposition, and attributed motion to individual letters and words. The installation aimed at expressing the persona of the writer by overlaying his virtual participation with the autobiographical prose that is projected in space.



Figure 4.1.3 Socio-Kinetics: *visualizing ambience of Usenet communities.*

“Socio-Kinetics” is an investigation to visualize online public discussion spaces (Figure 4.1.3). The social dynamics within the community are not obvious by looking at the strings of text-based content.

A careful reading of the threads allows the viewer to discern complexities and nuances of social interactions. Expressive social visualization, however, is

an alternative medium for effectively conveying such information. In order to animate the dynamic social qualities found within the static data of a Usenet interface; *motion* is used as the communicative agent for this visual translation.

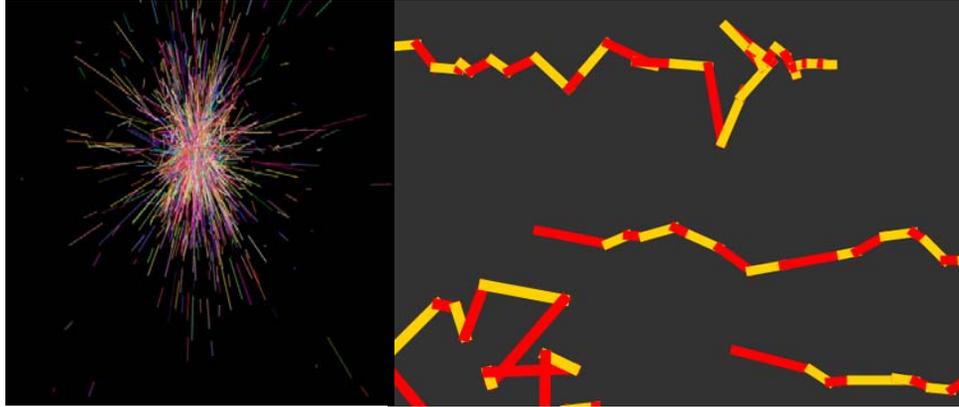


Figure 4.1.4 Socio-Kinetics: *visualizing motion and meaning; Lining: 9/11 community activity represented in spaghetti motion.*

A series of studies exploring this problem are carried out using a theoretical framework inspired by cognitive and artistic precedents (Figure 4.1.4). Color, size, position, direction, speed, a play between background and foreground are examples of design attributes that we can use to graphically manipulate and represent social information. We learned that it was critical to expose an anchor system to highlight change when representing past and present information states.



Figure 4.1.5 Ceiling with an Attitude

“Ceiling with an Attitude” (Figure 4.1.5 & 4.1.6) is the first of a series of projects that try to articulate how objects may have *gesture* (a means to utter based on experience). The installation is made-up of organically-shaped pods hanging from the ceiling that embed technological narratives to provoke a re-thinking of our relationship to objects and spaces.

Passersby or visitors engage in a gaze encounter with the pod-like entity that hangs above their head; this encounter triggers a response from the living character found within the pod. This entity imparts a day-to-day dependent narrative that is expressive and reactive to an accumulation of past interactions.

This project explores the dichotomy of tension and engagement. By using a blue-eye camera, we can establish eye contact and track pupils; we can use this technology to record experiences and interactions between the real-world visitor and the encountered imaginative character. We provoke actions and meaning of a wink, a blink, staring, and looking away. We can imagine that each pod and character has its own kind of attitude towards the world it interacts with.

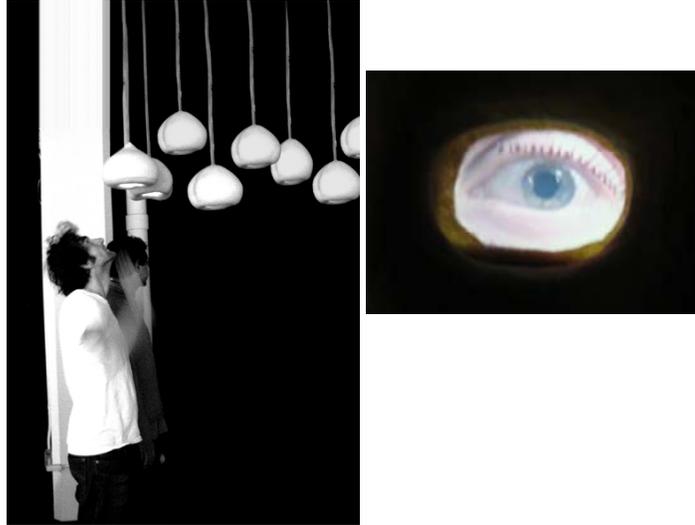


Figure 4.1.6 Ceiling with an Attitude.  
*The pods hang from the ceiling and the imaginative character peeks into our human world through the pods.*

The imaginative-computational-actor is designed to remember and mimic past interactions with humans. It is designed to also have capabilities to show sadness and happiness, depending on its past experiences with passersby. If a person walks away in the midst of their interactions, it would most likely affect the character and trigger the actor to cry and avoid welcoming any interactions for that day. Experiences accumulate and the history becomes a source for how the character gestures through the pod and looks upon future interactions with human encounters.



Figure 4.1.7 TechStyle: an I/O e-Fabric.  
*The car seat reveals traces of the boy and the affective state of the mother driving the car.*

“TechStyle” is a next-generation electronic textile that incorporates *input and output capabilities* in the woven structure (Figure 4.1.8).



Figure 4.1.8 TechStyle: an I/O e-Fabric  
*From left to right: floating conductive fibers successfully signal coordinate points for output mode; input and output mode is incorporated in the structure of a woven fabric piece.*

Imagine a little boy who goes on a drive with his mom (Figure 4.1.7). He is quite excited at first, jumping about in the backseat of the car. The mother then starts to get a little tense with her son. The boy realizes that his mom might be getting angry; he notices that her seat has turned red! The boy gets a little scared that he might be in trouble for being hyperactive. From a car seat’s point-of-view, it reveals traces of the boy’s excitement; his traces of hands and feet are exposed everywhere on the seat. Perhaps we can imagine that the seat is camouflaging him from his mom!

The e-fabric takes on a skin metaphor that can register the history of spatial displacement; the fabric expresses by means of color and pattern. It is designed with the idea of objects that might be touched or sat on. It is designed to change color pixels and sense pressure coordinates throughout the surface; this technology allows the system to remember interactions and draw traces of history. The fabric interfaces to help communicate a “sense of chairness” beyond the seat’s formal and functional quality.

This research explores how we might enable a car seat – or any object – with an input and output that provides technological means to reflect, share, and reveal its stories of experience. The system accumulates a multifaceted log of occurrences and encounters with humans and their contexts, and formulates unique expressions that reflect "attitude" back to the human.

“Building with Gesture” is a series of event sequences that is in a *time-lapse* form (Figure 4.1.9). This exploration shows us the opportunity to use the time-lapse technique to capture and show temporal facets of an object’s life. Captured as 2-dimensional images over time, they reveal views of how man-made artifacts, such as buildings, stand with and against natural wonders. We



Figure 4.1.9 Building with Gesture.  
*A photo time-lapse of what the building witnesses over the course of a day. Time-lapse shot at the MIT Gehry Stata Center Bldg 32.*

photographically captured Frank O. Gehry's Stata Center on the MIT campus where the time-lapse was framed differently for each particular location and weather condition. The time-lapse reveals the interaction of the building with light and with human encounters; it characterizes the rhythm and flow of spaces through time that may resist a human story.

Imagine if cameras were permanently situated around the building. How would the history of images be layered over many years? How would a designer consider the camera placement in relation to the design of the architectural layout? If the captured records were re-processed and foreshortened to reveal particular aspects of history, how does this change the idea of a time-lapse? In this time-lapse story, we can imagine that it reveals more than a place for people traffic. Imagine a surprise birthday chorus; imagine the tinkering of a robot and how it navigates through hallways; imagine the smell of pastry at the cafe; imagine human chatter and their excitement; imagine if students use the building pathway to get across campus faster; imagine how light passing through the building signifies time passing.

Time-lapse is a technique that can reveal more than the mundane tasks of how people use the building, spaces, and artifacts. By re-processing what is captured we can reveal implicit rhythms of experiences and history; it is a way that can show “lived time” [refer to Ricoeur 1988: on “lived time”]. Social dynamics, change, and unprecedented activities are witnessed by the built environment and can engage in a discourse for time and story.

“Post-Card” is an exploration of designing a *transactional loop* for a greeting card and examines how a digital recording of this loop can change our value perception of the card (Figure 4.1.10). In this scenario, the receiver opens the physical card and the “moment” that the card is open, the



Figure 4.1.10 Post-Card  
Imagine the moment you open a card; your reaction is captured and sent back to the sender of the card.

reaction and happenings around that card are captured (i.e. laughter, reading and commentary of the card, etc.).

This temporal record is then sent back to the original sender of the physical card. The experience model held by the Post-Card extends the experience cycle (Greeting Card = Card + Post-Card) by actively creating and capturing a transactional loop between the receiver and the sender of the

greeting card (Figure 4.1.12). By realizing a critical experiential extension to the provenance of the greeting card, the Post-Card imbues the object with history. Time allows for the object to have more than a one time relationship and transaction. Each time the card is opened, a record is captured and relayed back as a piece of history; the records can be used to make an abstraction of the card's experience of time.

The Post-Card design is instrumented with electronics that does audio capture when the card is initially opened. It then transmits the audio to a nearby computer hub where an online application component allows you to edit it before sending it back to the sender of the physical card (Figure



Figure 4.1.11 Post-Card  
Left to right: a wireless transmission of audio to a hub nearby; an online audio clipping interface for the "moment" audio capture.

4.1.11). Subsequently we can imagine that the captured audio can be transmitted directly to the sender without editing it.

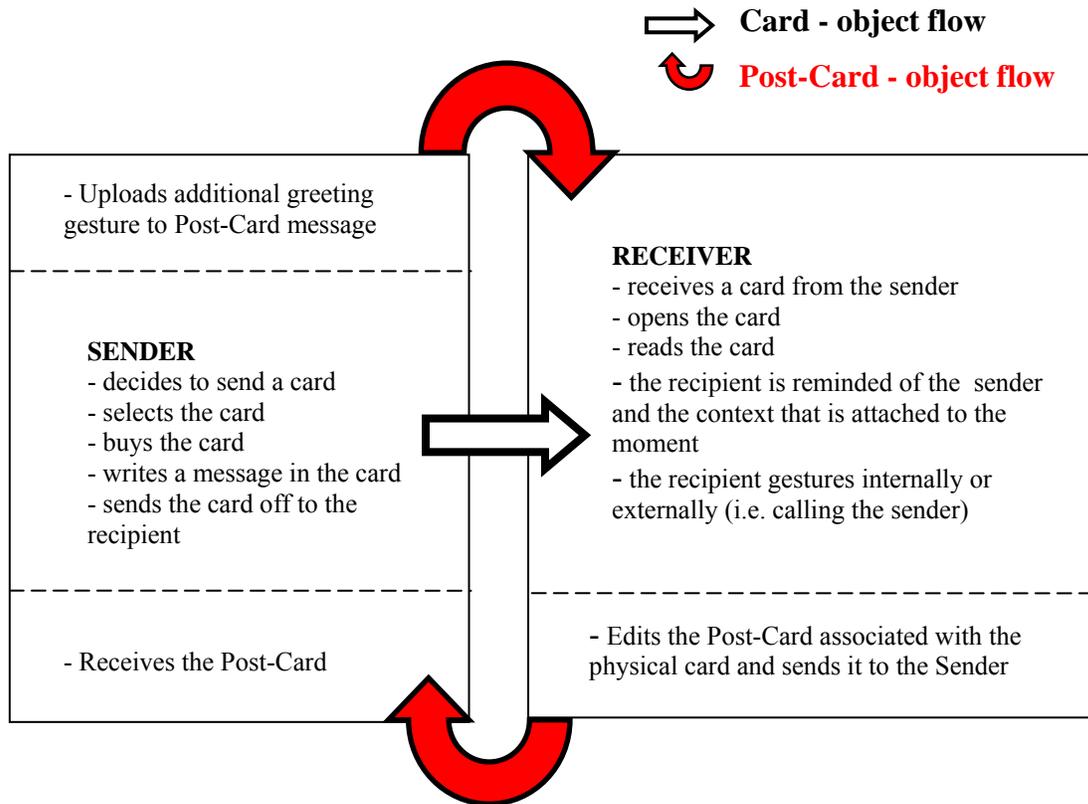


Figure 4.1.12 Experience Cycle of a Greeting Card  
*Greeting Card = Card + Post-Card*

The Post-Card addresses how objects can context-capture any intimacy relationship it creates with its audience (we bind event capturing to what the object witnesses) and fulfills the experiential expectations of both the sender and receiver. In this design, *time* allows for the recording and relaying traces of historical events between people and spaces.

## 4.2 Workshop on Design Thinking with Time

I had the opportunity to conduct 2 studies to test out the notion of *time and narrative* in design thinking. We extended traditional design thinking – of form and function – to include time. The first study was a two week workshop (4.2.1 Group A) and the second study was a three hour workshop (4.2.2 Group B). The theme was explored through theory and practice. It was evident that storiedness in design thinking expanded our concepts about the co-existence, partnership, and relationship between humans and objects across time and space.

The 3-part design workshop expanded the student’s understanding of design methodology and theory as it relates to practice. The process of idea generation, research, and creative development were discussed; the workshop allowed students to reflect on the interrelationship between humans and objects that help define contemporary behaviors past, present, and future. More particularly, the workshop developed our understanding of *time and feedback* as these apply to idea generation and object construction.

#### 4.2.1 Group A

The Design workshop (see Appendix: “*ITRI Workshop on Design Thinking with Time*”) consisted of two groups of approximately twenty people. Each group had a three hour session everyday for two weeks. The workshop was intended to be communicative and interactive as is the practice of Design. The course of the workshop included lectures, discussions, Q&A, and undergoing the doing of making-presenting-critique. The workshop participants were engaged; they were creative, interested, and self-motivated. Participants came from different job posts and backgrounds; the group consisted of a mix of journalists, engineers, scientists, designers, economists, public relations, and general managers in science and engineering.

The goal of the workshop was a two-fold: realizing the role of *communication in design* and grounding design thinking by articulating the *theoretical approach to designing with time*. Communication skills are essential in Design – I tried to help them voice their thinking from both sides, as a designer and an audience. The goal was to expose how the designer’s intent and responsibility, presentation, and the art of constructive critiques were critical for the process.

It was a challenge for participants to realize the intricacies of the temporal form as it relates to story and design. It was hard for them to imagine what an object would do or how it would relate to humans over time (Fig 4.2.1.1). Students were hung up on formal and functional aspects – the way a door handle is held to open the door more easily, the colorful aesthetic, and how it provided security. By asking the meaning and implications of each feature and interaction of an object, we were able to extend design ideas to include storiedness attributes (Fig 4.2.1.2). Ideas were thought-provoking in terms of what it meant for an object to have a life of its own. At the end of the workshop, the articulation of time as it relates to traditional design proved to be groundbreaking for Design Thinking. The workshop bridged the students’ experiences between design theory and practice.

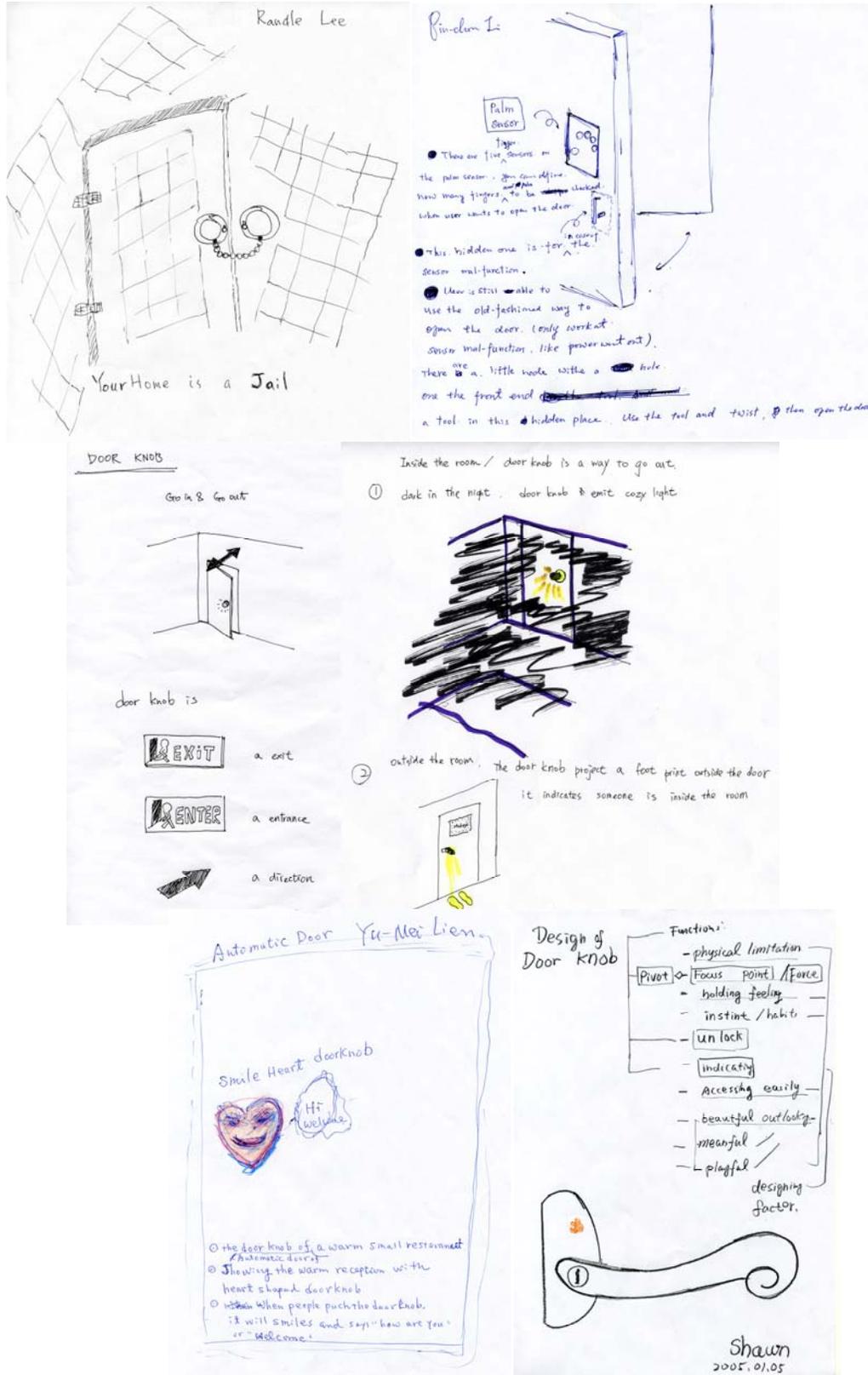


Fig 4.2.1.1 Student designs on thinking about conventional doorknobs (ITRI, Taiwan)  
 Themes include security, awareness, aesthetics, and ease-of-use.

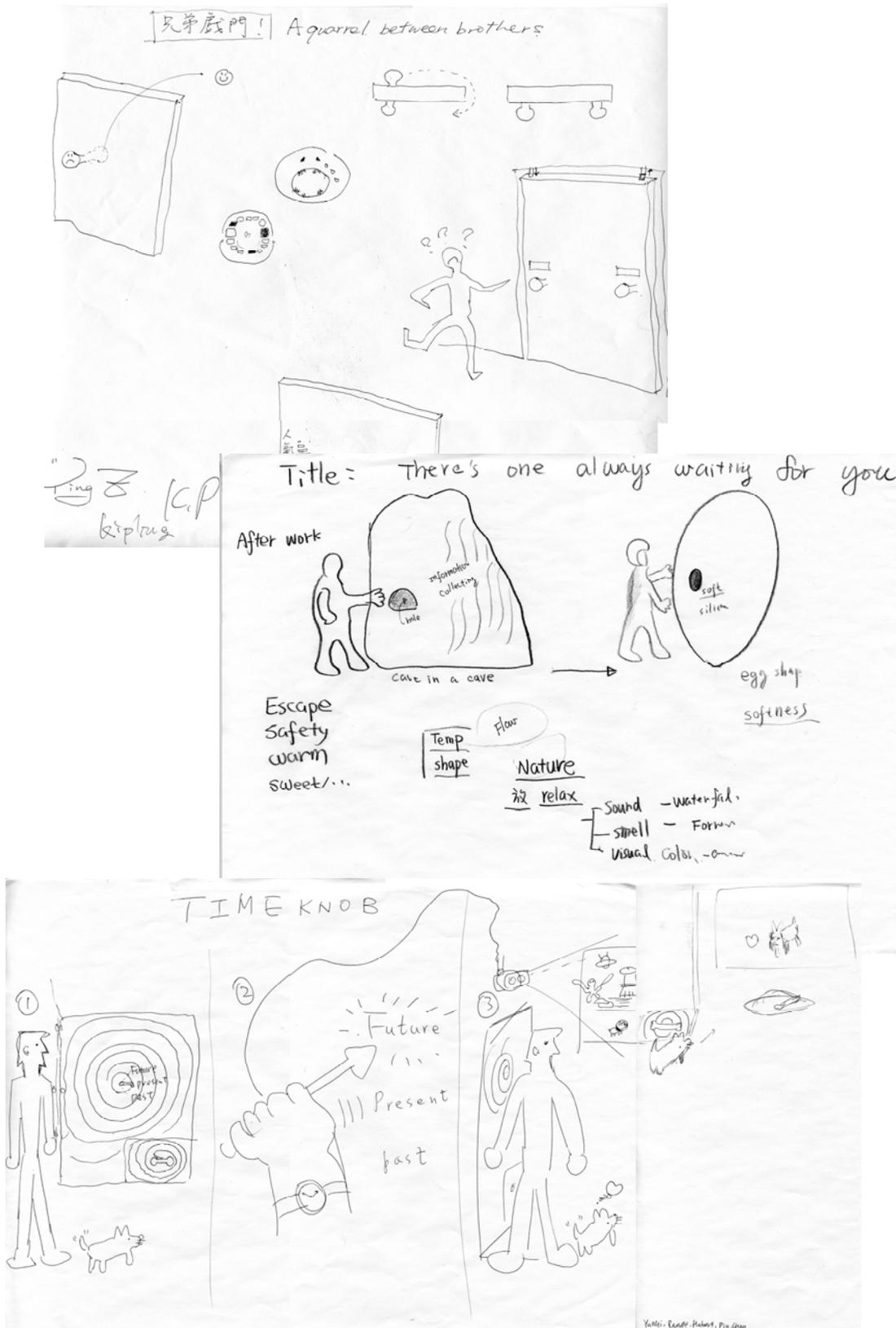


Fig 4.2.1.2 Student designs on thinking about storied doorknobs (ITRI, Taiwan)  
 Themes include the relationship between the owner and object, awareness, emotion, and meaning.

#### 4.2.2 Group B

The workshop was a three hour one-time session that focused on object design and story theory (Figure 4.2.2.1). Ten students were from programs in Comparative Media Studies and Media Arts and Sciences at MIT. They were asked to imagine what it would be like when objects had stories to tell. The first part of the workshop consisted of a two hour lecture on design theory and in the second part students were asked to rethink their doorknob designs (based on part one exercise) to have storiedness qualities for presentation and critique.

At the beginning of the workshop students were thinking about objects in the traditional design sense of form and function. Their thinking was generally consistent as we experienced in the ITRI workshop (Group A). Although students in this group were asked to think about the doorknob as it is today, they weren't given many constraints and asked to innovate and re-design a doorknob. The most popular theme was security – they felt that it was important for the door handle to do its job in keeping the door locked. This is an interesting theme since students related the importance of a product feature with the human need for security [see Maslow 1968: Hierarchy of Needs]. Other common ideas included issues relating to ergonomics and better assistive doorknobs, use of new materials, and aesthetics (for example, texture, shape and color).

In part two we discussed story theory and implications of how humans make sense of their world through narrative. Students approached the design problem with a perspective on how objects took part in their lives on a daily basis. This process was more reflective than what they proposed in part one of the workshop. Students imagined their habits and stories of life; they saw how the doorknob took part in their stories and realized the opportunity for witness and testimony from an object's point-of-view. It was not surprising that students anthropomorphized the doorknob to give meaning to each reaction and interaction over time. On the other hand, one student in particular did not believe that objects should have storied qualities to them and argued that objects served as tools for getting things done.

Through this process it became clear to students that a storied expression in objects gave more awareness to: objects in our surroundings, how objects survive through time, and helped position technology in relation to design thinking in order to create a relationship between our actions, activities, and what an object can do with that record. It was evident that storied thinking extended and shifted traditional design concepts.

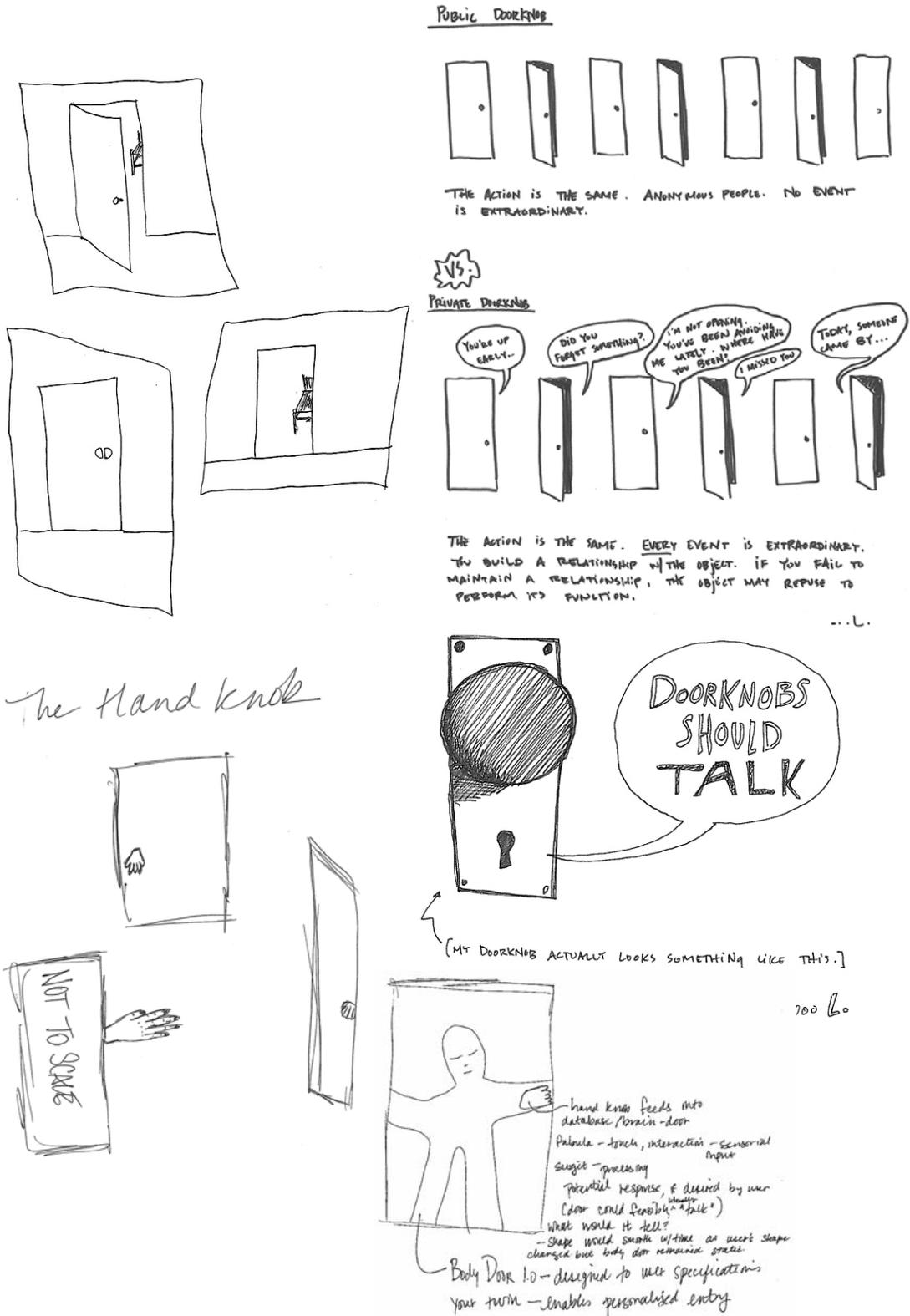


Fig 4.2.2.1 Student designs on thinking about storied doorknobs (MIT, USA)  
 Themes include attitude, relationship between owner and object, anthropomorphism, aging.

## CHAPTER FIVE

### Case Study: Designing an Audio Time-Lapse Bench

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Figure 5.1 A Storied Object: The Audio Time-Lapse Bench

A storied object has capabilities of continuously acquiring events (recording things that happen in their context) and expressing stories of their past history (recounting interesting accounts from memory). This object will never tell the same story twice; time allows for the object to continue acquiring new experiences and telling new perspectives of it.

Humans make sense of their worldly experiences (of the past, present, and future) through narrative [Bruner 1992; Ricoeur 1988]. The mechanism of a storied object is motivated by this framework and designed to consider instances of time and experience to re-tell its story. In our study, we have designed a bench to have a voice; the Audio Time-Lapse Bench is an everyday object that lives outdoors in a park with a storied expression.

We have instrumented the bench with technological form and function to witness and give testimony of events and of its own participation in the environment. The storied expression is

driven by a computational-story-construction-system that is connected with devices that mediate information input and output. We use audio as the medium for the bench because audio is continuous, evokes time, and something that can be foreshortened.

The bench is designed to record a continuous audio stream, process the audio that is captured, and play back a representation-sequence of the history. We call this story construction method an *Audio Time-Lapse*. Audio time-lapse is conceptually similar to photo time-lapse; time is compressed and we can grasp a sense of history in a short amount of time. The difference lies in the method and technique – audio is not as informative when recorded intermittently at a set interval as in a photo time-lapse. Rather the construction method for audio requires parsing the continuously recorded stream to sequence a collection of events that are distinguished and organized by their extraordinary quality within a set of ordinary events.

Imagine for a moment what you would hear at a park setting in a time-lapse form – in this thesis we take an object’s point-of-view of the world and we are less concerned with the meaning of sound. The focus of our work is an exploration of how we can organize and construct a sequence of events that re-tells a history of what actually happened. In our design, metaphorically speaking, the bench ears act as if they were eyes to observe its surrounding.

From a human point-of-view, it is difficult to know the implicit views of what the bench might hear and see. Yet much of our social environment is apparent to us, and this familiarity allows us to make sense of the collection of events presented by the object. Imagine when the bench tells you a story of what its past week was like: it witnessed cheerful conversations, birds chirping, tree branches moving, leaves falling, squirrels munching on acorns, and dogs barking endlessly. The nature of the story form is episodic, and we can gain an understanding of its historicity because the time-lapse is only available to be heard in situ of the object and the environment.

For the designer this raises a critical issue in designing storied objects. It is important to consider the *context* of where the object will live and the *time-scale* in how the object will portray stories of its on-going life in a particular context. Different spaces bring about different experiences; a bench that lives in the center of Times Square, New York City will tell different stories from a bench that lives in the middle of Yosemite National Park. This idea is consistent with time-scale as well – a bench will tell different stories for different seasons and different hours of the day.

The type of transactions that occur in the object's environment shape the storiedness quality of what is captured, remembered, and re-told of its past.

For the human encounter, we want her/him to experience pleasure and engagement with stories told by the object. The object becomes more than a recording-playback device; its form and function implicate the contextual, social experiences in time and space. Imagine listening to a dog sniffing around a sandwich left by someone, or the heartily confessions between lovers and friends on the bench. The storied expression situates the narrative (actor, space and collection of events) so that the sequence of events interrelate the object and its surrounding with what happened.

The goal of a storied expression is aimed at a deeper understanding and appreciation for what lies beyond the surface of what we see as an interactive encounter. In our approach and in the object's view – the world is not under surveillance; the recording may be continuous but the object is designed to only remember and re-play interesting accounts of the past. The state of these accounts (i.e. extraordinary-ordinary) is dependent on circumstances of what happened (in the past) and what is happening now (in the present).

Storiedness is a new aesthetic that allows us to holistically reflect and appreciate our existence in relation to the living environment. This chapter describes key design decisions in implementing the physical bench and the audio time-lapse method.

### **General Design Considerations**

The Audio Time-Lapse Bench is made to tell stories. In order to listen to a story, the bench needs to have speakers that project sound and infrared sensors to know when someone (or something) is sitting on the bench (to tell a story to that person). In order to create story, the bench requires microphones that transmit the audio so that the processing and storage unit can capture, parse, store, and sequence story events.

Infrared sensors (and other types of sensors) can also be used to determine whether an event is directly related to the object – the question to consider is: how does the system bind events to the object? For example, we would need sensors to determine whether a mother singing to her crying

child on a bench or the siren of a fire truck passing by, is in context of what the bench considers as an interesting, relevant event. In our bench, microphones are used to capture the stream of activity in audio and infrared sensors also help in determining (through distance measure) how relevant an event is in relation to the object. Did the event occur when they were sitting on the bench or when they were close by?

Once we establish design constraints (guided by the framework in Chapter 3), the next step is to realize which technological components are needed to instrument a particular type of object that will capture, re-configure, and re-tell a sequence of events. The kind of input and output device will vary depending on the designed intent, and the form and function of the object. For instance, we can design a haptics-based input and output in a clothing-fabric scenario, whereas an audio-based interface would make sense for a park bench that is designed to pick up ambient sounds in the environment.

Designers should consider the types of expression that are possible for particular technologies – consider what we can hear through our ears, what we can see through our eyes, what we can smell through our nose, and what we can feel through touch. They should also think about how these modalities relate to the object and its action space. Does it make sense to show traces of

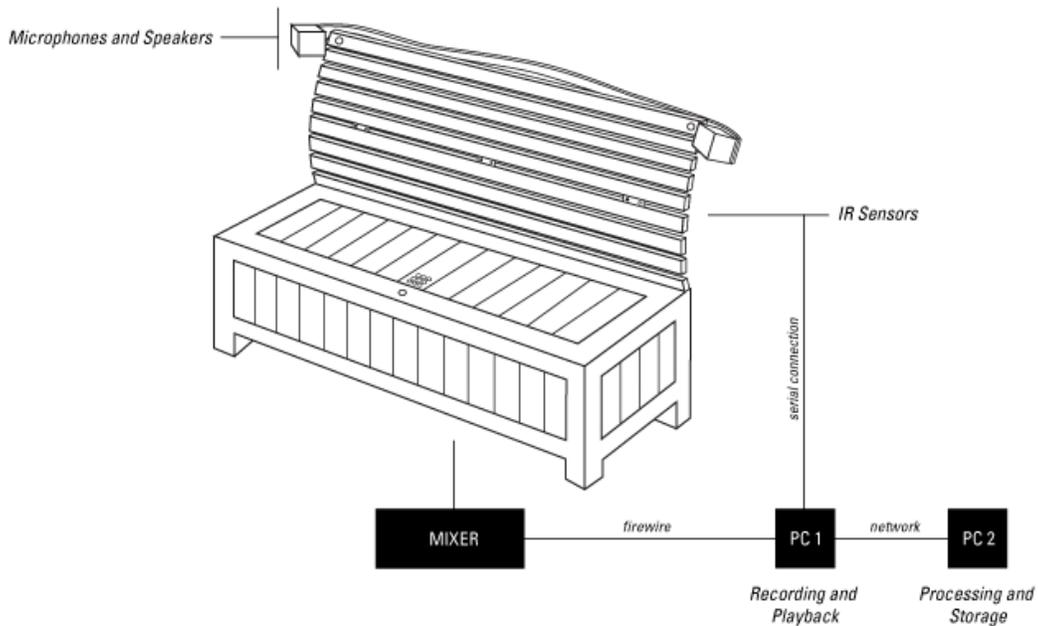


Figure 5.2 Input and Output System of a Storied Object

hands and feet on the surface of a bench? Does it make sense to visualize the pressure weight felt by the bench seat? The form and function of objects can guide these scenarios in imagining stories that an object might tell, and subsequently designers can explore in finding or creating technology that fit these needs.

The design of the Audio Time-Lapse Bench is construed as three parts:

1. Physical input and output mechanism that considers the form and function of the bench.
2. Functional modules that digitally acquires and processes events.
3. A processing approach that realizes an audio time-lapse which conveys a history.

The bench components are of two types: hardware and software. The hardware is made up of several parts. Three microphones and three speakers are incorporated into the physical design of the bench. They are connected to a digital mixer that interfaces the multiple input and output channels (MOTU 896HD – with pre-amplified microphone inputs). Three infrared sensors are also embedded in the bench to detect when an encounter (i.e. a person, an animal) is sitting on the bench. The computer processing unit is in charge of: controlling the hardware, processing audio (recording, storing, mixing, and organizing), and the time-lapse playback (Figure 5.2).

### **5.1 Physical Design and Implementation of the Audio Bench**

The Audio Bench is designed to listen to its surrounding, voice-out stories in audio form, and detect whether someone (or something) is sitting on it. With these basic constraints in terms of how it will capture, communicate, and detect – the first step was to think about different points-of-view and scenarios of a storied experience in the context of a bench. From one angle we imagined a bench-teller that creates an intimate space for the listener and for the act of telling. This way the human listener can engage and embrace the telling of story.

As for a human-listener, we imagined her/him to grow a metaphysical relationship with the bench so that s/he feels compelled to listen closely and attentively to story details. From a third person stand point (i.e. one who is not part of this experience – like a person who walks by), s/he would see that the bench and the person sitting on it were occupied in some kind of process (that both parties were in the middle of undergoing something).

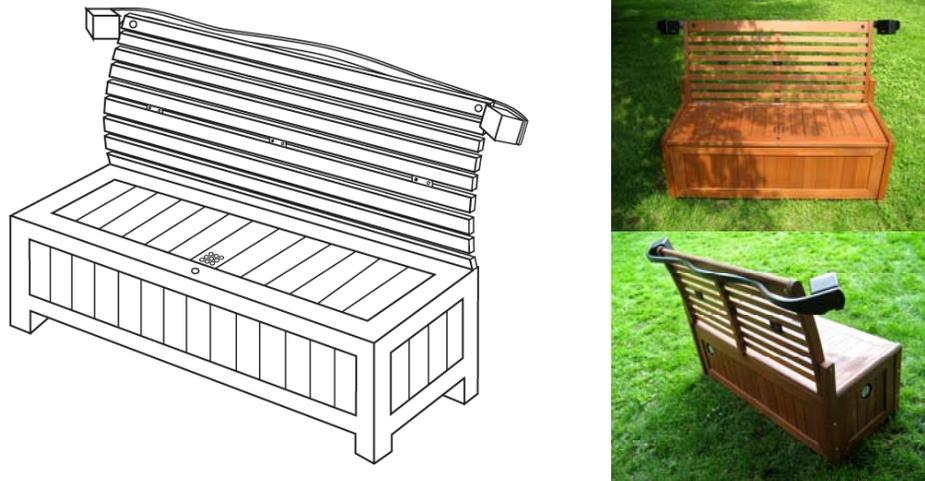


Figure 5.1.1 An illustration of the Audio Time-Lapse Bench

The design of a standard outdoor bench is mundane and straightforward; the basic form does not attempt to create a relationship with the user in the storied sense. When we sit on a bench the object is designed to physically support us and create a space for us to do our own thing. Essentially the bench takes on a secondary role in fulfilling the functional and formal aspects of what we expect from a bench as an object.

Stylistically a bench might have a contemporary look or a traditional feel to it, which is usually in tune with the aesthetics of its surrounding. It is common for an outdoor bench to be made of wood (i.e. teak) or metal (i.e. steel). A park bench can be made of many sizes and in particular some are designed to seat only two to three people. This type of seating creates a place for people to sit closely with others or to sit by themselves.

The current state of the bench lacks to create a relationship that we envision in a storied object. We wanted to visualize a bench-persona that shares and tells its own point-of-view of what it experienced, while deeply engaging the human listener. For practical reasons we decided to purchase an existing bench from retail and modify it to meet our design criteria in implementing the prototype.

We translated our storied-experience concept to what the storied bench would be like: the bench would have an arm-like structure that extends out from both sides of the back. This structure holds a speaker at each end. We reasoned the concept in two ways: the extended arm looks like ears that anthropomorphize the look of the bench, and it looks like posed arms that communicate

the idea of embracement. Functionally it acts as the teller’s mouth that projects stories within the space of the bench. The placement of the speakers strategically determined how microphones and infrared sensors were incorporated in the structure and form.

The process of designing and implementing the Audio Bench went through different stages from ideation-paper sketching, model making, to final production and implementation. In the context of designing a storied object, it is important for designers to include technology as part of the process. Technology should not be treated separately as a before-or-after-thing to put in the object; rather it should be integrative in the design process for shaping and defining the storied experience from concept to execution.

### **From Concept to Execution**

In order to choose the appropriate bench, we needed to find one that sufficed our design criteria: adequate storage space (for the mixer, speaker bass, computer, power supply, and other electrical components) that is part of the bench; a sturdy outdoor structure that can be modified; useable for two to three people (~55inches long); cost of the bench.

Once we settled on a specific bench, we started sketching out how we might transform the experience of the bench to have a storied expression. We built small-scaled models (Figure 5.1.2) to play with size, scale, and the placement of speakers, microphones, and sensors in the goals of making it storied; we were interested in determining the overall aesthetic (i.e. shape and material) and see how an arm-like extension holding speakers would contribute to the form.



Figure 5.1.2 Model sketch on how we might modify the bench for our purposes

The scaled-model of the arm-piece addressed whether it can structurally support the weight of the speakers, and how it can account for structural vibrations in case someone were to strike it (you



Figure 5.1.3 Arm-piece supporting speakers.

can never assume what a user will do) or the vibrations caused by moving the bench. We decided that the organic shape (curviness) of the arm-piece visualized and resolved our problem. This shape also helped to aesthetically incorporate the speakers to the form of the bench and provided a surround-sound effect (Figure 5.1.3). We made full-scale mock-ups to get precise curvature dimensions, angles, and position placement on the bench.

Gathering raw materials was a challenge; in order to have a structure that was strong and that can withstand vibrations, we decided to do a bent lamination. This technique allows us to create curves by bending the wood, rather than cutting a curved-shape from a piece of wood.

We could have saved time and cost by cutting a shape using the band saw, but the wood grain in this scenario could not have withstood the weight of the speakers and strong vibrations. Also, it would have been harder to replicate exact curve dimensions if we needed to make another piece.

In our bent lamination, we used scrap wood (i.e. plywood) to make a mold (a negative and a positive form) and used hard wood lumber (i.e. Ash) to make the actual arm-piece. The piece of ash had to be long enough (roughly 8ft. in length), thick enough (8/4 which is equivalent to 2”), and wide enough (6” or more). These dimensions allowed us to create thin strips of wood (each piece is cut and planed, and glued back together as one whole piece) that allowed for more flexibility in bending. It also worked to our advantage that the piece of wood was “air-dried” since 12%-14% of moisture is retained in the wood (this helps the bending process). “Kiln dried” wood retains about 7%-8% of moisture and can also be found in the New England area.

The bent lamination technique is different from steam-bending. It required us to place the strip of wood in between the negative and positive mold forms. Once we put it in place, we brought the top and bottom mold pieces together (with many clamps) and forced the piece of ash to bend to



Figure 5.1.4 Woodshop tools used to make the Audio Time-Lapse Bench  
*Tools include: band saw, jointer, planer, hand tools-saw, drill, router, sander, and the drill press.*

the shape of the mold (Figure 5.1.5a). It was always important to know what the next step was since each stage relied on the previous one to have completed successfully.

Various tools (Figure 5.1.4) in the woodshop were used to make the speaker arm-piece as well as to modify the bench. For example, the piece of ash used in the bent lamination was made from gluing together 8 pieces of thinner-planed wood (each is 1/10" thick). We passed each piece through the planer to make it as thin as possible without cracking it or making holes. It was critical that once we had all the thin sheets of ash, we glued each layer one on top of the other in the order we originally cut it from (this preserves the shape of the grain).

We left the piece of ash in the mold so that the glue dried over three days. When we took it out of the mold, the arm-piece had permanently retained the curvature. We used hand tools such as the scraper to take off excess glue, and even out the surface and layered edges. An electric hand saw was also used in this stage to further transform the bent shape, making it look like as if it was twisting into another axis (Figure 5.1.5b).

Once the shape was finalized, we hand-sanded the surface with sand paper (starting from a coarse grit to a finer grit). We aired off wood dust when we finished sanding and created an interconnection bolt structure to attach the arm-piece to the bench. We also drilled holes on the arm-piece so that each speaker was positioned correctly. We then took the arm-piece and dyed it in black and left it to dry. In the final stage, we applied two coats of protective satin varnish (Figure 5.1.5c) with in-between hand-sanding to smooth out the varnish surface.



Figure 5.1.5a Bent lamination using 8 layers of Ash.



Figure 5.1.5b Once the bent structure is separated from the mold, we use hand tools to clean and smoothen the surface. In our case, we used a handsaw to cut out another shape from the bent piece of wood.



Figure 5.1.5c Bolt structures are made to de/attach the arm structure to the bench. Afterwards, India black dye is applied followed by coats of satin varnish for a clean look before attaching it to the back of the bench



Figure 5.1.6 Physical modification to the bench.  
*Dimensions: 50"W x 23-1/2"D x 35-1/2"H*  
*Arms were cut off the bench and it was structurally reinforced with a steel pin. Arms were no longer there to give structural support to the back.*

In parallel to making the speaker arm-piece, we were also taking apart the bench to unobtrusively fit microphones, sensors, and wires. The first step required us to cut off the arms from the bench (Figure 5.1.6). This allowed for more sitting space and gave way for speakers to swing forward on each side of the bench. We added extra reinforcement in the back structure with a steel pin (connecting the back to the side); much of the structural support was relying on the arms that were cut off.



Figure 5.1.7 Detail shot of the speaker and microphone placement.

### Speaker and Microphone

Each speaker and microphone represents one channel recording. The Audio Bench is designed with three separate channels for recording and playback (left-back, right-back, and middle-seat). It was important to keep one speaker and one microphone coupled; they were placed near each other for playing back how it was originally recorded.

We drilled 3 holes to affix microphones near each speaker unit. We drilled passage holes and grooves for electrical wires from speakers, microphones and sensors to connect to the mixer and computer in the storage space under the seat. We also built one additional speaker housing that is coupled with a microphone under the cover of the seat.

In our park bench, we use boundary microphones to capture audio (Figure 5.1.8). These microphones are small, sensitive (omni-directional and is an electret condenser capsule), has a high frequency range, has good sound noise ratio and extended depth coverage, and ideal for mounting on reflective flat surfaces such as tables, walls, and ceilings. These microphones need phantom power to make it work – ours comes from the mixer. The boundary microphones are generally used for surveillance.

As for the speakers, we tried to find the smallest speakers with sound amplification that can be loud enough for outdoors (Figure 5.1.8). The ones we use are conventional black multimedia speakers; it has a 33 watt output; and each 3x3x3” cube functions as one channel (mono). They can be hung on walls; they are encased in a plastic housing, and their power source comes from the subwoofer that is stored under the seat.



Figure 5.1.8 Left to right: AKG C562 CM Boundary Microphone; Cambridge Soundworks Multimedia Speaker System.

### **Infrared Sensors**

We placed three infrared sensors on the back of the bench (Figure 5.1.9); we distributed them evenly across the back. It made sense to put them on the back because it detected change when someone was nearby and detected when there was a change of state – for example to see whether someone sat on the bench or left the bench. We use these sensors to calculate any differences in distance to signify that something happened. Subsequently we tag the event as something that happened in proximity of the bench.



Figure 5.1.9 Back view of where IR sensors and cooling fans are fitted.

We needed a custom built housing (Figure 5.1.10) for the infrared sensors since they needed protection and needed to mount below the surface of the wood (so that it is not in the way when someone leans back on the bench). We used a Bridgeport to make a negative image of the sensor so that it can snap into place. These sensors

are permanently fixed to the bench and their wires run through the grooves on the wood slack, and into the storage unit that connects them to the interface controller.

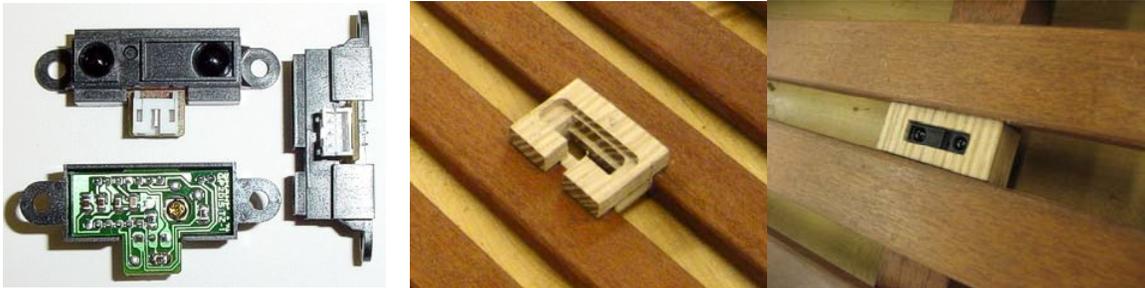


Figure 5.1.10 Sharp GP2D15 Infrared Sensor with custom housing built on the Bridgeport

### Cooling Fan

Our particular bench was made for outdoors and the design accommodates for the wood to expand during the summer. Inside the storage unit, the floor is not solid and has ample ventilation. We found it necessary to put in two cooling fans (Figure 5.1.11) because the summer heat and humidity only attributed to overheating the machines. We placed a fan on different, adjacent walls so that air can circulate from all corners. The only downfall for having cooling fans was that they made noise that cannot be heard by normal human hearing standards in an outdoor setting, but it can be picked up from the highly sensitive microphones we used. The cooling fans that we purchased were supposedly “silent” motors.



Figure 5.1.11 RadioShack 3” Cooling Fan

Much of the process that is outlined in this section “Concept to Execution” is tedious but considerate in terms of documenting how key elements were integrated in the bench. For designers it is a reminder on concept translation; every detail needs to be worked out so that the system as a whole can work successfully and sustain itself. With the implementation of the physical bench we can move on to discuss the technical implementation on constructing an audio time-lapse.

## 5.2 Audio Time-lapse



Figure 5.2.1 Julia Child holding a monk fish. Photo: wikipedia.org

Julia Child was a renowned, rather quirky cook who introduced the how-to French cuisine through media. In her career she gained her iconic status through publishing books and for having her own television cooking show. She had a laid-back attitude and in the allotted TV time she magically cooked up a recipe in a masterful way. Her melodic, friendly high-pitched voice of “ooh and aah” never failed to show her excitement and passion for how the food turned out at the end of the show.

In a TV cooking show like the one from Julia Child and Martha Stewart, we can appreciate the know-how of cooking a particular recipe through their presentation. Watching video imagery, listening to their commentary,

and cooking along with them allows us to gain an insight to the artful process. What if we did not have the time to watch the whole show? What if we preferred to intermittently come back to watch fragments of the show? Is there a way to get a sense of what happened in a short amount of time?

Imagine if we can somehow fast forward through a cooking show such that we could grasp the flavor of “what took place”. Imagine if there was a way to collectively put together imagery of Julia Child’s tinkering, movements, and laughter to help us with our process of preparing a cuisine without necessarily showing us a step by step implementation of one recipe. How might we foreshorten or compress a collection of events so that we can get a sense of what was important and interesting?

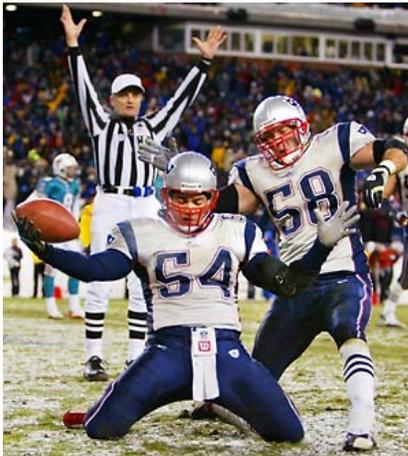


Figure 5.2.2 Tedy Bruschi touchdown.  
Photo: AP News

Sports fans of baseball, football, and golf sometimes do not have the time to watch a game that takes four hours. They end up watching highlights on the evening news – “the play of the day”; “the score that saved the game”; “the turning point for the player to lose the championship”. Watching an entire game allows us to appreciate the effort and process that results in what defines the team, the opponents, strategy, endurance, and game audience. However, these subtleties require our participation through time; it is something that cannot be seen on the evening news. These aspects are not about the final score of the game, but rather *how we can interpret or feel about* the final score.

Imagine if there was a way to put together interesting moments from the game. These would not be highlights that a sports editor finds interesting, but extraordinariness defined by the course of the game implicated by the performance of a player. What if we saw a time-lapse of Tedy Bruschi (Figure 5.2.2) smiling, staring, sweating, throwing his helmet on the ground, eating a banana, and making the only touchdown of the night? This type of story construction and foreshortening of historical time can give us means to have a deeper understanding and appreciation of what was going through the player’s mind.

Video imagery such as watching a TV show or a football game can be compressed into a time-lapse form by putting frames together based on intervals of time. Generally this method allows us to see what happened in a short period. Audio on the other hand requires a different approach than video. We cannot make sense of audio when it is segmented by time (i.e. every 5 seconds). In our approach we rely on analyzing the audio signature and scene change in order to define an event. Subsequently we can classify these audio segments and organize them in a way that foreshortens the history. Our approach presents a re-play value and opportunity that can change how we navigate through past records in audio that are not constrained by time.

### The Storied Expression of the Audio Bench

An audio time-lapse is a sound expression that represents the captured history of the bench. The recorded audio is processed and segmented into events, which are later sequenced and organized (in a non-linear fashion) to construct an audio time-lapse. The event boundaries are defined by abrupt changes in the quality of the sound, based on a simple psychoacoustic model that considers changes in the intensity of the sound as well as its frequency content.

Once a series of events has been captured, the system then labels each event as ordinary or extraordinary based on similarities between the acoustic properties of each event against all other events. An event is considered ordinary when there are many others which are very similar, and tagged as extraordinary in the opposite case.

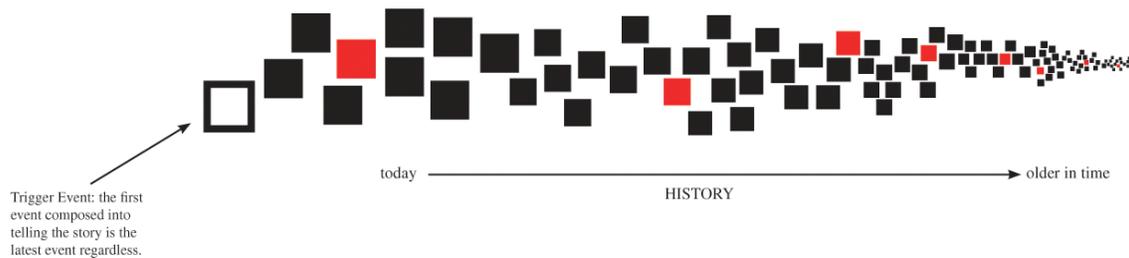


Figure 5.2.3 Audio Time-lapse: An expression of time

Once all the events have been labeled, the system can create a time-lapse by sequencing events along the axis of time. This sequence is explicitly designed and shaped to recount “mostly about today” followed by the telling of what was most salient in previous days (Figure 5.2.3). The telling of the day is composed of ordinary events mixed in with a prominent description of an

extraordinary event (In Fig 5.2.3 red events are extraordinary and black ones ordinary). In other words, we can hear common events surrounding an event that was extraordinary.

The design of an audio time-lapse requires techniques for how events can be organized. This thesis explores how we can organize events to express a story in the form of an audio time-lapse.

### System Overview

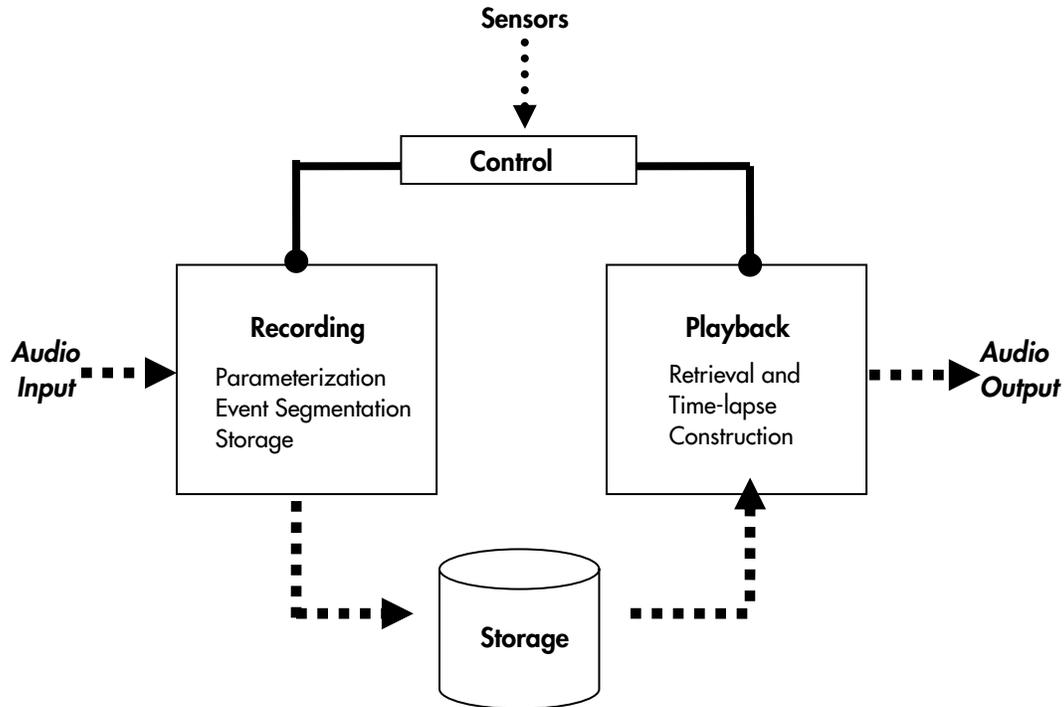


Fig.5.2.4 System Overview

When someone sits on the bench, sensors determine whether the bench system should be recording audio or playing back a time-lapse. In order for the bench to record sound, audio goes through the recording module process where events are segmented and stored to be retrieved. In order to playback a time-lapse, events are retrieved from memory and put together in a storied way.

The bench software is made out of four modules: control, recording, playback, and storage (Figure 5.2.4). The software modules were developed in the Java programming language and a number of open source libraries. The systems for recording and playing audio use the JSyn libraries [Burk 1998], which provide support interaction with the ASIO drivers of the hardware

audio mixer. The detection, parameterization, and categorization of events use the Colt [Hoschek 1999] and the Weka [Witten and Frank 2005] and libraries which have accelerated routines for linear algebra and pattern recognition respectively.

### Control Module

The control module has the function of coordinating the recording or playback modules when they are activated; it retrieves the status of the sensors every few seconds. If the sensors do not detect any activity, the recording module is activated. Likewise, when the control module continuously detects activity from the sensors over a fixed amount of time (1 minute), it stops the recording module and initializes the playback module.

### Recording Module

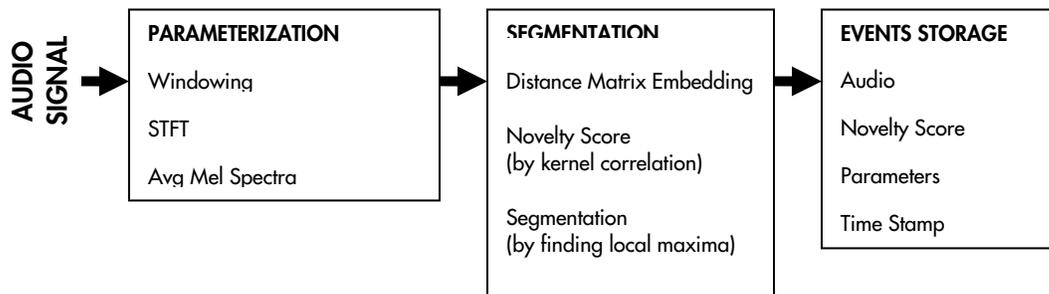


Fig.5.2.5 Overview of the recording module

The main function of this module is to record the incoming audio from the mixer. Along the way this module is also responsible for the parameterization and segmentation of audio events. At the final point, the recording module sends each event to the storage along with some extra information like a *time stamp* of when it was recorded, or how *novel* each event was when compared against its neighbors. Figure 5.2.5 shows each of these stages.

The first stage is the parameterization, which starts by dividing the audio signal into a series of overlapping windows; this is common in many audio and music analysis algorithms [Whitman 2005]. Rather than having a 10-25 ms window which is common in these approaches, the system

uses a longer temporal resolution – since the events that we are interested in identifying have a longer duration (conversations vs. musical notes). Currently the window is about 0.5 seconds, overlapped by 50%. The system then calculates the Fourier transform over each window (STFT). This frequency information is used to calculate the average Mel spectral [Grey 1977] which reduces the number of dimensions required to characterize the audio window, and provides an approximate account of how humans perceive sound.

The second stage (Figure 5.2.6) uses each parameterized window to find the points where an event occurs. This stage follows closely with the *self-similarity matrix* method [Foote 2000]. It starts by calculating the distance measurement from the parameters of a window to all other neighbor windows over a fixed duration. These distances are then used to create a distance matrix. The matrix is then correlated with a kernel that is designed to give a maximum value over regions that have larger differences in distance. Foote calls this value the *novelty score*, which reflects how different a particular audio window is from in its neighbors. The software then finds where the peaks occur in the novelty score; these peaks determine the start of an event which last until the start of the next event.

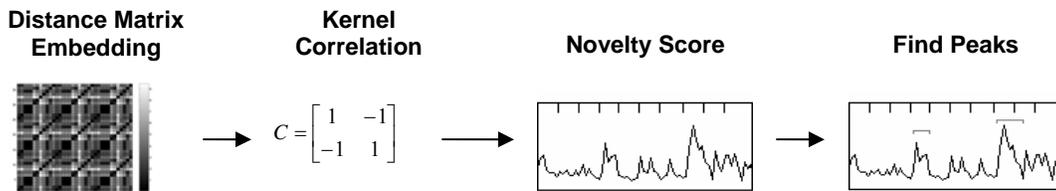


Figure 5.2.6 Flow-diagram of the *self-similarity matrix* method.

Once the event recording is finalized, the event goes into the storage stage, where it is tagged with its time stamp and duration. The system also records the state of the proximity sensors at the time the event was recorded. Finally, the system calculates the average of the Mel spectra of each window over the event duration that is used to parameterize the whole event. This parameterization is later used to calculate the similarity of the event to other events as we describe in the playback module.

The event detection procedure is performed simultaneously on all input channels. If an event fires on any channel, the information from all channels is recorded; the original channel will be the

only one that will be used to determine the event termination. This simplifies the functionality of the system while retaining the necessary functionality to construct the audio time-lapse.

### Storage Module

This module is the permanent storage space for audio events. It keeps track of all the information that describes the event, such as its duration, time, sensor activation, and event signature as described above. It also allows the retrieval of events based on the information associated with every event which allows the playback module to construct the audio time-lapse. The main parameter is the event time-stamp: this functionality is implemented using a standard SQL database (MySQL) using the proper Java drivers. The audio streams corresponding to each event are not stored directly to the database but rather to the file system of the computer hard drive. The name of each event file is created according to the date and channel of origin. These file names are stored in the database for each event.

### Playback Module

The main function of the playback module (Fig 5.2.7) is the construction of the audio time-lapse. The process is started by the Control Module that sends a query with the events' date range that should be used and target duration for the finalized time-lapse. The Playback Module uses the information to query the Storage Module for events between the particular date range and with durations less than the specified target time.

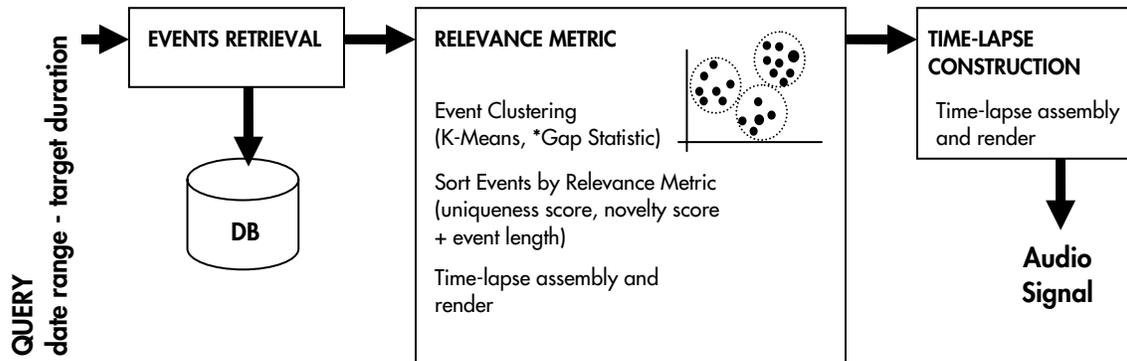


Fig 5.2.7 Playback Module

To construct the audio time-lapse, it is necessary first to find both the most common and the most extraordinary events for the specified data range. For this purpose, the events in the range are then clustered using the k-means algorithm with using the average Mel spectra parameterization as input vectors for each event [Logan and Solomon 2001]. This clustering divides the events into groups that are more or less similar to each other. The number of clusters is determined using the Bayesian Information Criteria (BIC) [Chen and Gopalakrishnan 1998]. The use of parameters such as the average Mel spectra with the k-means clustering techniques has been proved to be useful in audio similarity tasks [Berenzweig et al 2003]. The system calculates a *uniqueness score* [Cai et al 2005] in order to calculate how extraordinary an event is; this is based on the number of events in the event cluster and the event relationship to the cluster mean and variance. This score is greater for events that belong to a cluster with very few elements (hence more unique) and lower for events with many elements that are closer to the center of the cluster.

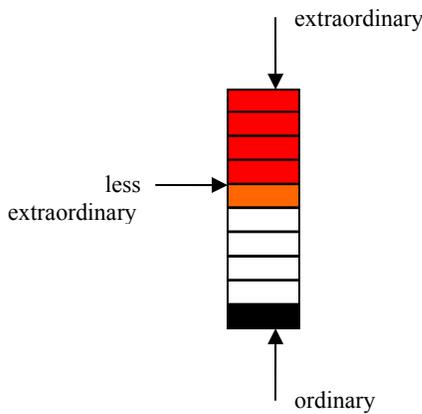


Figure 5.2.8 Sorted list of extraordinary-ordinary events

In the intermediate state the events are sorted according to their *relevance*, which is calculated by a weighted sum of the uniqueness score, the novelty score, and the inverse duration of the event. The result is a sorted list of events (Figure 5.2.8), where the more *extraordinary* and shorter in duration are on top.

To assemble the time-lapse, the system selects a number of events from the top of the list until their combined duration exceeds a percentage of the target duration of the time-lapse. In our system the value was 80% to 90% – which corresponds to the percentage of extraordinary events that will be used to compose the time-lapse.

Selected events are then organized according to the time they were recorded. New events are added from the bottom of the

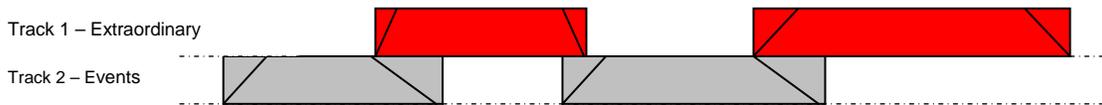


Figure 5.2.9 Example of mixing a channel for an audio time-lapse

sorted list, taking into account timestamps that correspond to gaps in between the already-selected extraordinary events. All selected events are then organized in two tracks, which ordinary and extraordinary events overlap by a small percentage (Figure 5.2.9).

Finally the events-audio is retrieved from storage and the time-lapse is rendered according to the previous event selection. The mixing is done in real-time, using 2 tracks for each output channel. Events are designed to fade in/out at their overlapping ends to avoid clicks or pops.

## CHAPTER SIX

### Case Study: Evaluating an Audio Time-Lapse Bench

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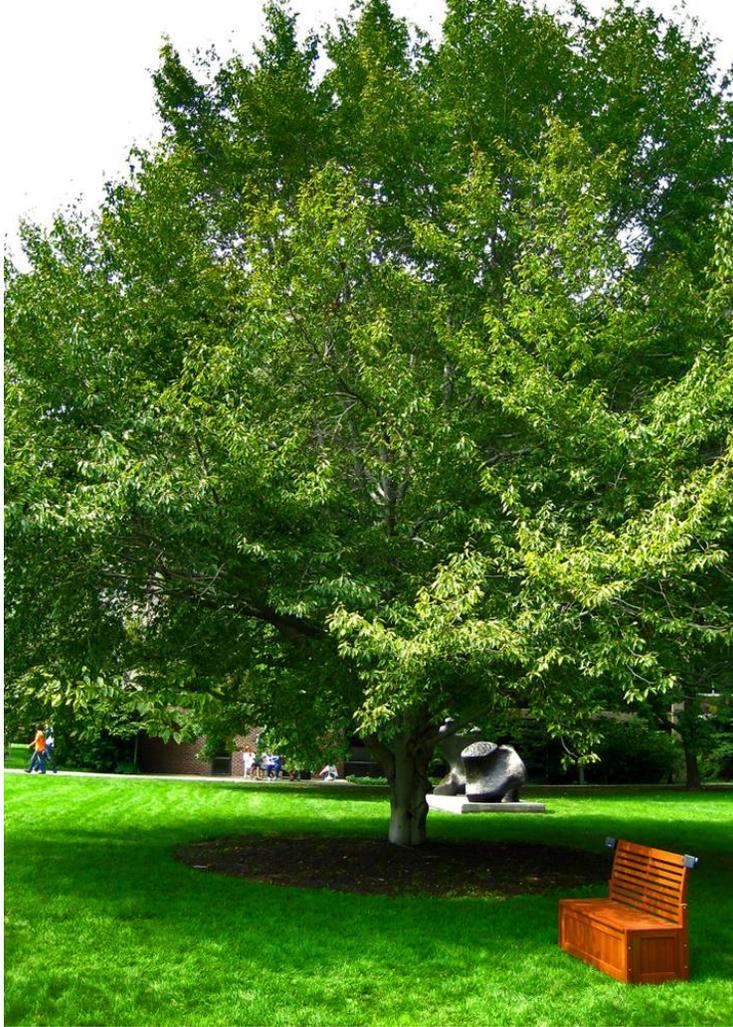


Figure 6.1 The Audio Time-lapse Bench

If you were sitting on a park bench late in the evening, would its audio time-lapse story – that re-tells a day’s passing of birds chirping, kids playing, dogs sniffing, and people talking – bring a sense of situated pleasure, intuition, and perspective of time passing? The story that is told by the object – in this case a park bench – is shaped by its transactions with its environment over time.

The goal of this evaluation study is to gain an understanding about how acceptable the time-lapse (that is made by the bench system) is in communicating to humans. The system has limited processing constructs

(Chapter 5); the system records audio, evaluates and refigures segments from the stream, and replays the foreshortened piece. The evaluation assesses an experiential quality of a time-lapse made by the bench system that would be heard by humans - by comparing it to a time-lapse made by human editors.

The evaluation consisted of a two-part process. In the first stage of part one (Section 6.1), the human editor created a free-form time-lapse story that was later used in the second part (section

6.2) of the study. Using the free-form constructed by the human editor we then probed at the limitations of the system's time-lapse form that was created using the same audio file as the human editor. The second stage allowed us to gain a better understanding of how human editors made segmentations in audio, in particular how they treated segments that they considered ordinary and extraordinary. This analysis was then compared to the bench system's method of processing and segmenting audio.

In the second part of the evaluation (Section 6.2), we compared human constructed stories to the stories constructed by the bench system by evaluating the listener's experiences and impression of the story aesthetic. In particular, we wanted to learn how the audio-based time-lapse form was apprehensible to the participants who encountered the bench.

This evaluation study allows us to comment on and possibly improve the design of the bench's story construction system.

### **6.1 Part One: Story construction by a Human Editor and the Bench System**

Part one of the study consists of 2 sub-sections that focus on the construction of an audio time-lapse story by the bench system and a human editor (who is already knowledgeable in audio editing software and has worked with sound). The Audio Bench was installed outdoors on the lawn (MIT campus) and a human editor was seated next to it facing the same direction as the bench. On separate occasions a total of two participants were blindfolded for a specific period of time on each of three days (i.e. six sessions). In every session they were instructed to listen in on the world and make mental notes of what they experienced through their ears while the bench system recorded raw audio:

*Instructions given to the human editor:*

*Consider yourself to be a living being with ears to listen, make sense of what you hear of the world and its events.*

*Consider the story that you will tell in Section 2 will be an account of events, an episodic journey of your (one hour) experience.*

After each listening session, participants took their blindfolds off and moved indoors; the participants were asked to complete two tasks using audio editing software to: (1) construct a free-form story of what s/he heard and experienced during the listening session (using the raw audio provided by the bench); (2) segment parts in each of the labeled window in the raw audio file and mark them as ordinary and extraordinary based on how important they are in their immediate context.

The first session lasted one hour, and the second and third sessions lasted forty-five minutes each. The first day was longer than the two other sessions since we needed to allow for human subjects to get used to being outside and listening in on the environment while they were blindfolded. After both tasks were completed each day, there was a follow-up conversational interview where s/he was asked questions regarding their thought process in creating a free-form story.

### 6.1.1 Human Editor One

Human Editor One is an expert in story construction and uses various media (i.e. film, video and audio) to express story. This participant is the faculty advisor to this thesis.



Figure 6.1.1.1 Human Editor One is blindfolded and listens in on the world over three different days, same time, and same place.



As we started the interview, her first comments were on how she was keenly aware of the ambient sounds in the environment while she was blindfolded. On her first day of the study

people passed by and did not initiate any verbal communication with her, which seemed odd to her based on her expectations.

On the first day she tried to build a time-lapse sequence that highlighted what she perceived as being extraordinary (i.e. about a boy and a dog, and a breezy warm day), and attempting to “stir the imagination” of the listener of what she experienced. As she situated events in a stream, she began to question: “What should the segment length be? How much quietude or chaos can a listener really engage with?”

Her story was chronologically constructed, that is segments were followed in the order that they were recorded. She attempted to convey ambience using ordinary occurrences (i.e. segments of wind and branches to depict a warm breezy day). She distinguished between ambience and events: “patterns establish ambience and events are interpretable and discernible by humans”.



Figure 6.1.1.2 Human Editor One in the process of story construction.



Figure 6.1.1.3 Audio Expert One talks about her experience and decisions made in her story construction.

Her statement reflected on how she might have been segmenting and organizing the audio. Segmentation of audio is an action that bounds and represents an event within a frame, whereby segments help construct a sequence to convey a sense of time passing, or help construct an expressive depiction of ambience in a story. If patterns create ambience, this means that the teller can repetitively use similar and if not the same sound segments to *depict* and be *expressive* of ambience to create presence in story (i.e. windy). On the other hand, the use of unique segments maintains presence and prominence in story when an event can be identified as a *foreground-happening* (i.e. a dog and his jingling collar are highlighted in specific scenes). Both ambience and events can be interchangeable in how they are used in story construction; ambience can be labeled as an

extra/ordinary event (i.e. it was a windy day), while an event can be used repetitively to create ambience (i.e. the boy and the dog were running around the lawn all day).

By day three sounds in the environment became very familiar. Her stories focused on communicating a sense of time passing. She was interested in the combination of sensibilities needed to convey this. Her stories involved switching the order of events and layering events to intensify the story since her expectation space of experience broadened and needed to be expressive of what was now very familiar. She noted that in editing audio, one needs to consider how humans listen to sound; the editor makes decisions based on what the audience looks for.

In cases where the human editor as observer entered into a dialog with a passer-by, the conversations were difficult to segment. Segments of conversations were used to express happenings (i.e. a boy entered the scene and started talking) rather than to convey the language-meaning derived from the conversation (i.e. the boy wanted to know more about the bench's life).

### 6.1.2 Human Editor Two

Human Editor Two is an expert in designing musical toys and has been exploring acoustics and electronic sound production.



Figure 6.1.2.1 Human Editor Two is blindfolded and listens in on the world over three different days, same time, and same place.

Over three sessions, we were able to observe differences in his expectations and responses in listening to the environment. He commented on how seeing gave an intuition of what was happening in the scene. He noted that some people made more sounds than others. If he had not been blindfolded, what seemed more important to him may not have had anything to do with who made more sounds (walking by), but the sum of all characteristics (i.e. visual and aural) that described as being important in that context. He concluded that isolating hearing from seeing is different in understanding the happenings in the environment. He argued that human intent would be involved when evaluating a scene purely acoustically because it would be looking at the relationship between sound and action.



Figure 6.1.2.2 Human Editor Two in the process of story construction.



Figure 6.1.2.3 Human Editor Two talks about his experience and decisions made in his story construction.

The stories he constructed were generally episodic, as he described it as, “a bonanza, one after the other”. Stories were all chronological and were summarizing (i.e. bounding story events) while condensing it down in time. He was very adamant about stories being short; stories should be three to five minutes long to hold a good attention span. He believed that the length of the actual bench history should not matter in determining the length of a time-lapse; every story representation should be of a similar length.

His story point-of-view and intentions were to highlight unusual things while trying to convey what he was experiencing. In cases where there was human interaction, it gave him a structure to work with. He made the story embedded with stories; it had real-time chunks where time was constant. He separated story events as foreground and background (i.e. a person asking him a question while in the background a soccer game was in play).

His experiences were surprising to him because he noticed changes in the environment even though it was in the same place and the same time on different days. On the first day, it was all

new and he was realizing that so much was going on. Going into the second day he realized how much things he did not grasp on the first day.

On the last day he didn't really experience extraordinary things and everything seemed ordinary. For instance random people came up and asked questions, but it was the same kinds of questions he had been asked before; therefore they were not exciting enough to be included in his story. At the end of the blindfold sessions, he was getting used to the environment and his receptive state was not all that excited anymore. The story he created on the third day attempted to express that not much had happened even though things still happened. He layered a lot of events and in retrospect he noted that layering was expressive and descriptive of an ambience rather than conveying that time had passed. He commented that he would have liked to experience all the other things from previous days.

The stories he made was distilling down his experience to the parts that he remembered with much sequential ordering. He noted that his approach in what his story tells may not be interesting to someone else. Beyond the first day of the study he pointed out that there were not much salient features within ordinary events because ordinary events in general get removed from his memory; ordinary events had no discrete parts, no big changes, and had uniformity. He concluded that making stories had a lot to do with one's approach and the type of experience one brings, where the environment is the only common factor between human editors and their stories.

### **6.1.3 Organization of Events**

The next phase of the study involved analyzing how stories were constructed by human editors (Table 6.1.3.1). The intent of this analysis was to get a hold of parameters and organization ideas that the bench system could use to put together an improved time-lapse that was aesthetically comparable with the story made by a human editor (Section 6.2).

	Day 01	Day 02	Day 03
	Outdoors: 60 minutes	Outdoors: 45 minutes	Outdoors: 45 minutes
<b>Human Editor 01</b>	Noon – 1pm 14 Segments Length: 4mins 49secs (.750) Chronology (yes)	8:45am – 9:30am 24 Segments Length: 4mins 2secs (.158) Chronology (yes; one segment out of order)	8:45am – 9:30am 39 Segments 6mins 23secs (.558) Chronology (yes)
<b>Human Editor 02</b>	Noon – 1pm Unknown (maybe 13 segments) 8mins 5secs (.622) Chronology (yes)	Noon – 12:45pm 34 Segments 6mins 34secs (.135) Chronology (yes)	Noon – 12:45pm 17 Segments 47secs (.891) Chronology (no to ordinary; yes to extraordinary)

Table 6.1.3.1 Time-lapse construction by human editors. Highlighted boxes indicate in-depth analysis.

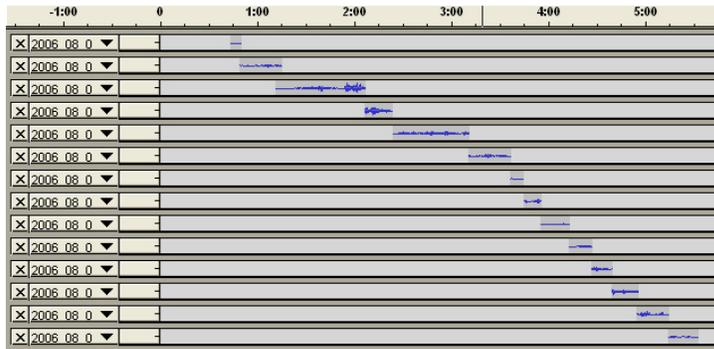


Figure 6.1.3.1 Human Editor One time-lapse story construction with 29 segments made from a one hour blindfolded session.

In analyzing the stories created by a human editor, we were not too concerned about the number of segments used or the total duration of the time-lapse. What we found to be interesting was the *pattern* in which the human editor put together the time-lapse. In Figure 6.1.3.1, the event sequence is as follows:

bird | siren + bird/wind in background | intense sirens + prominent bird chanting + wind/people talking in background | child screams + dog chain | dog chain + siren background | child/mom +wind background | people laughing in a distance + birds in background | different people laughing passing by | wind | people passing by + wind background | wind | wind + bird + wind background | wind + bird background | tree chanting insects + two people talking + wind background

The sequence can be described as episodic. The storiedness quality emerges from the change in state throughout the sequence; each segment content and length is different from one to the next. What seemed to be striking was the *balance* and *even quality* between similar events. For example in the latter part of the sequence, events were continuously alternating between people, birds, and the wind.

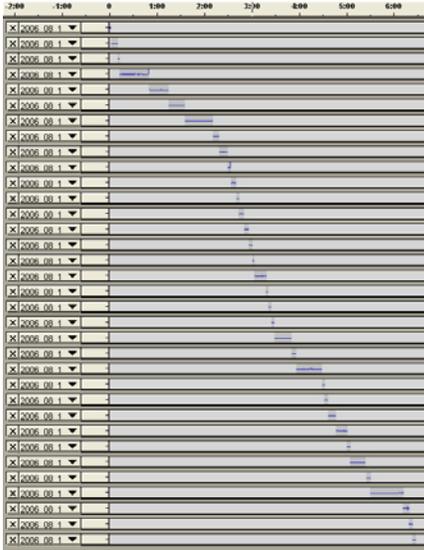


Figure 6.1.3.2 Human Editor Two time-lapse story construction with 33 segments made from a forty-five minute blindfolded session.

In another time-lapse (Figure 6.1.3.2), there was a strong concentration of similar events followed by different events:

insect noise | ball hitting + boys screaming | ball bouncing | ball bouncing | ball bouncing + man’s voice | man’s voice + ball bouncing | clapping + men’s laughter | boy screaming | ball bouncing | clapping + men’s voices + background insect noise | ball bouncing | scream | greeting of a person passing | boy screaming + people talking while passing | clapping + men’s voices | men’s voices + airplane passing + ball bouncing

In this story the concentration of similar events - i.e. a ball bouncing alternating with a boy screaming - seems

to show that the eventfulness was about some men playing with a ball. The pattern of activity and events with prominence may vary depending on the time and day, however the pattern found in all stories created by participants presented an opportunity to explore how the system may arrange events together (Figure 6.1.3.3).

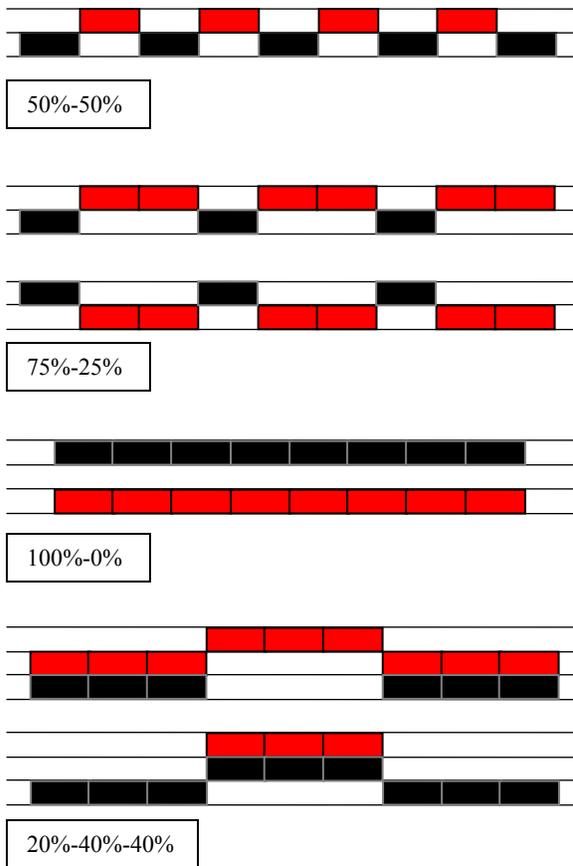


Figure 6.1.3.3 Organization of segments for time-lapse construction. Red=Extraordinary event; black=ordinary event.

We applied this form (i.e. balancing and concentration of events) to how the system constructs the time-lapse; we allocated a percentage of extraordinary and ordinary events we wanted present in the time frame of the system’s story. For example a time-lapse sequence may consist of 50% extraordinary and 50% ordinary events or in another case 75% extraordinary and 25% ordinary.

What we discovered was that the end result was populated by a lot of wind and silent moments and that the ordinary events woven between the extraordinary *sounded just as prominent* as the extraordinary. Our initial weaving mechanism followed much of story-telling techniques, where eventful happenings are fruitfully described and supported by setting a scene (i.e. descriptors, background description). Since we were aiming for a story that was episodic in audio form, every event needed to be important in the sequence. This was consistent with how the time-lapse sounded but it sounded odd and non-eventful compared to how human editors described it. We needed the system to select events that were of importance (see Section 5.2 in how the system clusters events) to express an eventful sequence.

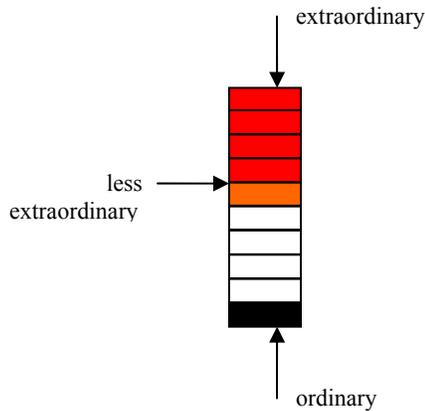


Figure 6.1.3.4 Method for selecting events for time-lapse.

Previously the sequence was using events from both extremes of the continuum of what was extraordinary and ordinary. The solution was to select events that were extraordinary and *less* extraordinary than the extraordinary (Figure 6.1.3.4). With this selection method, the system was able to produce eventful stories (Section 6.2).

The system was also improved to disregard events that were too long (Section 5.2). For example, the system may capture various wind sound

because of the thrusts caused by the speed of the wind. In order to stay true to the nature of an episodic story we needed to the system to convey time passing with changing episodes rather than indulging the listener with a lengthy description of the wind.

From this analysis the system created four time-lapses that varied in the concentration of extraordinary events:

- #1: 50% - 50%
- #2: 75% - 25%
- #3: 100% - 0%
- #4: 75% - 25%

The duration of each time-lapse was identical for both human-made and machine-made (Table 6.1.3.2). The number of segments differed between the two because the system is designed to select and lay out the percentage of extraordinary events first. Then the gaps between the extraordinary are filled with segments of the less-extraordinary. When these filler segments are not long enough in duration, another event is concatenated to it as long as it fits the gap. Consequently if there are no events that fit the gap, the smaller event remains as the sole filler (see Section 6.1.3.5 and 5.2).



Figure 6.1.3.5 Depiction of a sole filler and fillers between extraordinary events.

	Day 01	Day 02	Day 03
	Outdoors: 60 minutes	Outdoors: 45 minutes	Outdoors: 45 minutes
<b>Human Editor 01</b>	14 Segments Length: 4mins 49secs (.750) Chronology (yes)	24 Segments Length: 4mins 2secs (.158) Chronology (yes)	n/a
<b>Bench System</b>	56 Segments Length: 4mins 49secs (.750) Chronology (yes) 50% : 50%	40 Segments Length: 4mins 2secs (.158) Chronology (yes) 75% : 25%	n/a
<b>Human Editor 02</b>	n/a	34 Segments 6mins 34secs (.135) Chronology (yes)	17 Segments 47secs (.891) Chronology (no to ordinary; yes to extraordinary)
<b>Bench System</b>	n/a	58 Segments Length: 6mins 34secs (.135) Chronology (yes) 100% : 0%	12 Segments Length: 47secs (.891) Chronology (yes) 75% : 25%

Table 6.1.3.2 Comparison between human editor and bench system construction detail.

Eight time-lapse stories (4 human-made, 4 machine made) have been evaluated in Part Two of the study.

### 6.1.4 Informal Study:

#### Intersections between a Human Time-lapse and a Machine Time-lapse

An informal study was conducted to see how the machine time-lapse was comparable to the human time-lapse. The study revealed whether the events selected (distinguished) by the human editor and the machine were similar. We were specifically looking at whether the events segmented by humans overlapped with events that the machine categorized as extraordinary.

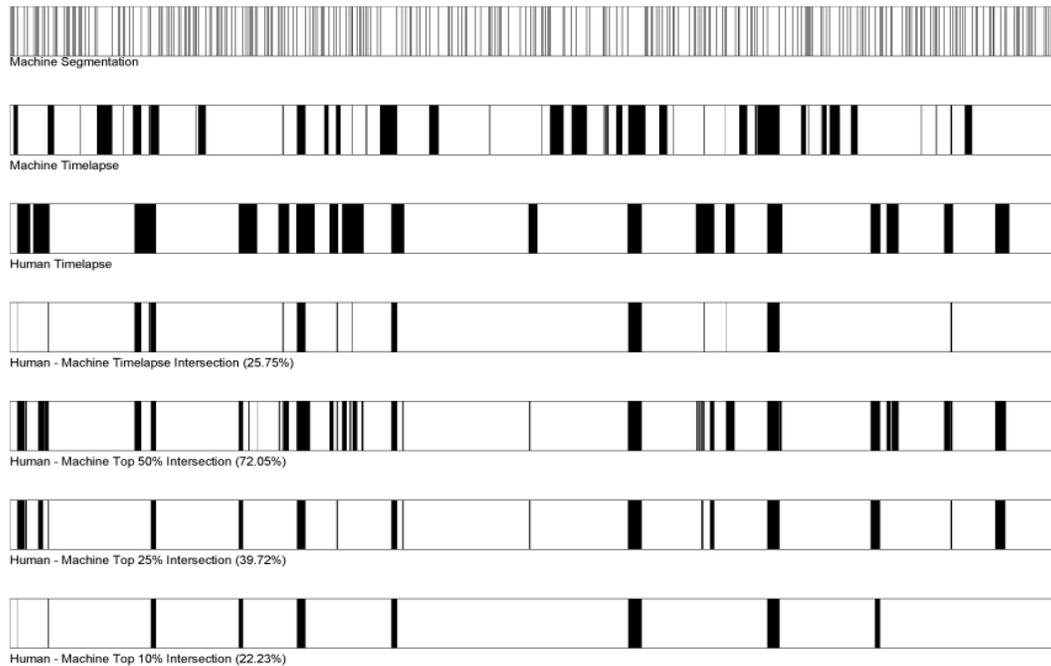


Figure 6.1.4.1 A Comparison Chart between the Human Time-lapse and the Machine Time-lapse

Two main comparisons were made (Figure 6.1.4.1): (1) a comparison in the intersections between the human time-lapse and the machine time-lapse, and (2) a comparison of the human time-lapse with the machine list of events. A match of 72.05% of events selected by the human editor were found in the top 50% of the machine list of events; a 39.72% match in the top 25% of the machine list; and a 22.23% match in the top 10% of the machine list (Figure 6.1.4.2).

The results show that the state of the system can distinguish events that are comparable to those chosen by the human editor. The goal of the informal study was: to confirm that the system algorithm was performing adequately in distinguishing events and categorizing the extraordinary from the ordinary, and to get a general sense of how comparable the events defined by the machine were with those selected by the human editor.

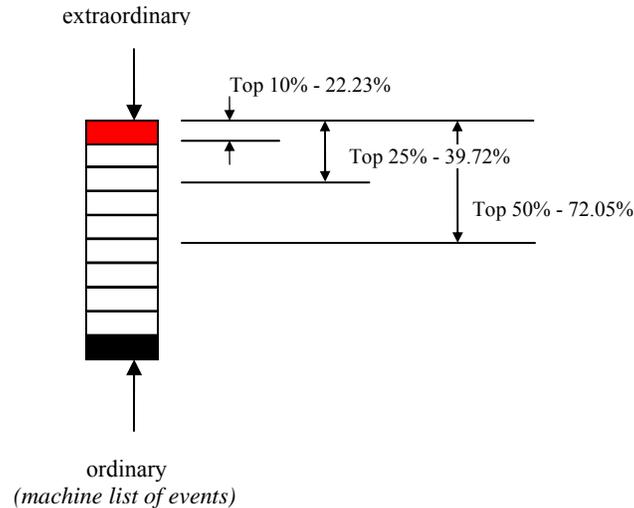


Figure 6.1.4.2 Percentage reveals the overlap of events used by the human editor and the machine.

## 6.2 Part Two: Human Interpretation of Stories



Figure 6.2.1 The interpretation study took place in the same place as where the Audio Bench was installed in the blindfold study.

In this study we take qualitative measures in the form of questionnaires and ask human subjects (a different population from part one of the study) to respond to things that were particular in the story form, how the time-lapse stories made sense, and their general impression of the aesthetics of the story they listened to in regards to time-scale. The study

was designed to have three sections focusing on immersing subjects in the context of *story* and *everyday objects* (see Appendix).

A total of twelve subjects (6 females and 6 men) participated in the study; each session lasted one full hour. In sections one and three of the study, subjects were asked questions in the form of a conversational interview. In section two subjects went through a listening experiment and answered questions in a written form. There were eight stories they listened to and subjects were encouraged to take notes during the experiment.

- Section one attempted to bring the subject into the space of time and narrative while probing their thoughts on a ‘what if’ scenario of how their everyday objects would have mechanisms to tell a story based on their past experiences.
- In section two subjects were asked to attentively listen in on eight stories and respond to questions regarding time-scale, time progression, particularities in the story, their general sense of experience and quality of the story they heard.
- Section three was a follow-up on their perspectives on objects and stories (conversed earlier in section one) - whether the ‘what if’ scenario had changed and how they felt about it, and their general impression about the aesthetics of the stories they heard.



Figure 6.2.2 Six women and six men participated in the study.

### 6.2.1 What is Story?

At the beginning of the study, subjects were asked to verbalize what they understood by *story*. It was apparent that most subjects felt uncomfortable in articulating what story was. Afterwards two

alternative perspectives on story, which were drawn from human editors earlier on in the first part of the study, were read to subjects so that they would compare it to their own understanding of story:

- a. *“Story occurs over time, and involves state change, but you only understand change by the things that don’t change and/or don’t matter.”*
- b. *“Story is an attempt to make sense of the complexities of the universe in a way that gives it handles that we can understand.”*

In defining story (see Appendix) four aspects became salient in subjects’ responses: *imagination, point-of-view, form, and motion*. Generally the responses were an attempt to talk about story in relation to how they experienced a narrative. Imagination was contrasted to extrapolation, revealing story to be both fact and fiction. Point-of-view and the particularities of a story were common aspects in their responses: “a story won’t be a story unless it is engaging to me”, “events as seen by a particular person”, and “a specific theme or an event that happened during some period of time”.

Form and motion were closely knit in their definitions. The form seemed to have an overarching construct that included: the relations between and the point-of-view of the teller and the audience; a string of events that described some past or future; and that there was time progression in the chain of events. Motion was noted as, “recounting of events” or “sequence of events” or “an event related from one another” or “a sequence of events that add up to something larger than its parts”.

There was a general consensus amongst the subjects that story was a sequence to be heard (separating the teller and the audience) and a way to better understand, negotiate, make sense of the complexities of what surrounds humans. Thereafter subjects were asked to think of story from an object’s point-of-view.



## Their Response about a Storied Object

Having experienced the Audio Bench, study subjects showed a shift in thinking regarding the potential of objects having capabilities for expressing story. Foremost subjects were able to better articulate on what and how objects would express a story form and how they (humans) would relate to the stories told.

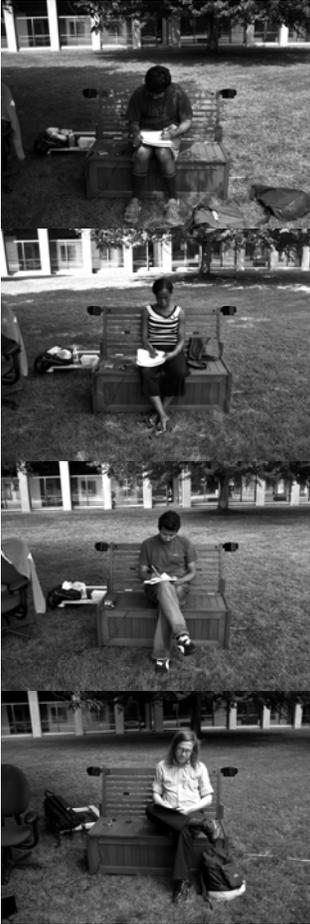
The following sections highlight the before-and-after attitudes of how they responded to the idea of a storied object.

### Before Experiencing a Storied Object

In the beginning of the study (i.e. before they experienced the Audio Bench), study subjects were asked to imagine what it would be like and how they would feel if their everyday objects told stories based on past experiences. Answers varied and were general: “too distracting”; “pretty interesting”; “my sofa gossiping with my doorknob”.



It became apparent that subjects humanized – anthropomorphized objects in order to imagine and relate to objects that tell stories (i.e. “the door knows who came in and who came out”, “the car wants to tell you that it works hard in the rain and the snow”). A common concern was that their human activities were too ordinary and repetitive for objects to tell anything interesting (“it would be boring because the chair would be the same thing over and over again, it doesn’t change much because you don’t move”). They also imagined feeling uncomfortable and noted that they would behave differently if objects were to have any surveillance characteristics. (Note: subjects were not informed of how a story is constructed in the Audio Bench or how the system was designed to process real-time events.) Most of the subjects returned to a human-centric view on what an object ‘should’ tell, and at most times subjects could not break away from imagining objects telling stories other than objects having reactive and respondent interfaces



(for example, a refrigerator telling date and time based on a human request).

### **After Experiencing a Storied Object**

Having listened to eight stories, subjects were able to better imagine what it would be like when their objects told stories; they were able to relate to the Audio Bench and its context from their point-of-view. Responses varied and four themes emerged: *different object types may have different stories, time-scale: how to be selective of what you capture, story-telling skills: how interesting can you tell a story, and an object point-of-view versus a human point-of-view: who is the audience?*

Not knowing what to expect of the stories, one subject looked forward to hearing a human narrator to tell a verbal story with a storyline representing a traditional story form of conflict and resolution [Martin 1986]. The subject soon realized that the stories were in the form of an episodic narrative sourcing on what actually happened. After the first two time-lapses all participants got the hang of listening to the aesthetic expression constructed by the bench system. One subject stated, “I didn’t realize that it could be possible to synthesize a lot of information into one minute or two minutes that gives you an overall idea of the story itself”.

On the other hand, some were able to argue that the object as we know it would change by it having capabilities to tell stories. At the beginning of the study, a participant was fancied by the idea of storytelling objects, but having gone through this experience she realized that she didn’t have a definite opinion because “it depends on the object and the time and the story”. In her scenario, she was concerned about what her bed would tell and to whom it would tell. In contrast few participants thought that they were able to reflect and take away meaning from such an experience.

One subject talked about the train set that his grandfather made for him when he was a child. He noted that different types of objects would have different stories since the “focus” was different.

In his example, the focus of the train set was his grandfather making it for his grandchild. He was able to further articulate that different point-of-views and intentions would matter because the psychological meaning he would take away from it would be different from other kinds of objects. For instance, was the object purchased or acquired directly, or could it have been a hand-me-down, borrowed or gifted? In this scenario, time became irrelevant and the intentions to acquiring a type of object became the source for story.

Another object of fascination was “her mother’s scissors”. She wasn’t allowed to play with them as a child and knew that her mother would take them everywhere since she used it as a florist and used it for sewing. She would notice the wear and tear, and that there was ‘residue’ left over from what it had gone through. Different places brought back pieces of thread or other bits of things that were stuck on the scissor. This participant was interested in knowing how the scissor would sort all the memories and show particular “sprinkles of memory”. Her scenario addressed the issue of how captured transactions would be segmented to show a passage of time. The subject was also curious about what it would record over time when there was much time lapsed between the past and the present.

When participants talked about time, they seemed to anthropomorphize the notion of time with aging and experience. One subject thought that the presentation of the stories reflected a personality of the bench – some stories were expressed by a younger inexperienced teller and other stories were told by an elder who had told more stories and had more experiences. The participant thought that the stories made the object feel like a living thing; he appreciated that it didn’t feel as if it were a “sentient human level thing”. This was a critical feedback since the design framework aims to look at how objects can express past time as it were, but in a compressed form without connoting any anthropomorphic effects on it.

Another interesting point that was drawn from this session was that sometimes a story is not engaging because of the types of events in the story. He pointed out that a story can be “fabulous and interesting” even when the actual events that occurred are mundane. On the other hand, a story can be boring despite the events being extraordinary. The manner in which events are selected and woven might affect the overall engagement of a story.

Today everyday objects are used as a means for supporting humans to achieve a goal in a utilitarian or formal way (i.e. I sit on a chair when I am tired, a couple professes their love sitting

on a bench) and it became apparent that some participants viewed the story from their point-of-view (i.e. how it is meaningful to him/her) rather than listening to the point-of view expressed by the bench system and consequently attributing and synthesizing meaning to it. Overall the Audio Bench did succeed in allowing participants to make inferences and draw meaning from the stories told (whether it involved recognizing the object’s point-of-view). Participants realized that objects with such storytelling capabilities were expressing a history described as snippets of interesting accounts rather than conveying the feeling of an object for surveillance.

**6.2.2 Interpreting the Story in the Form of an Audio Time-lapse**

In this section we were interested in learning how human subjects envision the passage of time in a storied way. This means that the listener must be able to perceive, interpret and relate what took place over how long of a time, what is the ambient environment like and what events can be recognized as extraordinary in the sense of representing moments that are particularly memorable from an objects point of view.

Eight stories were presented to all participants on separate occasions. They were not aware of the play-list order and they were not aware that tracks (i.e. stories) constructed from the same raw audio were coupled in order; one track was created by a human editor and the other track was created by the bench system. The general order between a human-editor-constructed story and the bench-system-constructed story was flipped for the latter half of the group of subjects, to balance any biases of listening to one type before the other (Figure 6.2.2.1 & 6.2.2.2).

H	M	M	H	M	H	H	M
---	---	---	---	---	---	---	---

Figure 6.2.2.1 Group One; H = Human; M = Machine

M	H	H	M	H	M	M	H
---	---	---	---	---	---	---	---

Figure 6.2.2.2 Group Two; H = Human; M = Machine

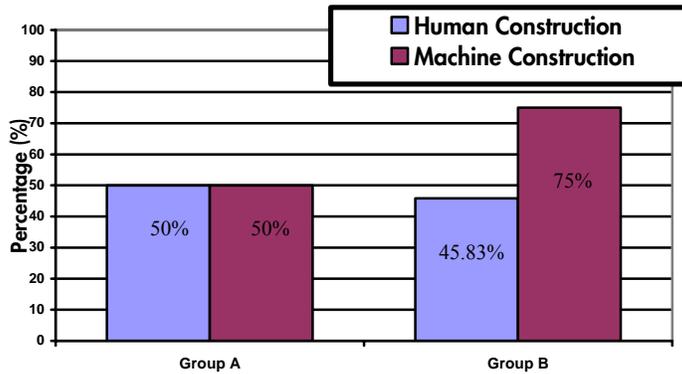


Figure 6.2.2.3  
 Subjects were divided into two groups and the play-list was reversed for one group. The chart shows how many of the stories were guessed right in determining who/what created it.

In this experiment it was critical that subjects were not blindfolded but exposed with both eyes and ears to the same location as where the stories took place. Subjects were not aware of the fact that the stories took place in the same place. They were informed that the time-lapse stories were based on the raw recordings of the bench.

Subjects were given a questionnaire and asked to answer five questions for each story (see Appendix for questionnaire):

*Written-form:*

1. Describe exactly what took place.
2. Describe the general quality of story, time, and duration.
3. What was particular about the story?

*Multiple-choice:*

4. How much time does this audio sequence represent real life?
  - a. 1 min, 5 mins, 15 mins, 30 mins, 45mins, 1 hr, 6hrs, 12hrs
5. Who might have constructed this story: human editor or bench system?

The questions were aimed to learn how they interpreted time-lapse: progression of events, time-scale representation of the story, and quality of how coherent a story sounded. The intent for each story created by a human editor is outlined in Table 6.2.2.1.

	<b>Day 01</b>	<b>Day 02</b>	<b>Day 03</b>
	Outdoors: 60 minutes	Outdoors: 45 minutes	Outdoors: 45 minutes
<b>Human Editor 01</b>	<i>Chronology (yes)</i> “to stir the imagination about what the ambience was, and then to allow a sort of falling off of almost sleeping state I was in and then to surprise people by your entry into the story recognizing that there was a character there and that the character was blindfolded”	<i>Chronology (yes)</i> “the notion of time passing, and how do you create that sense of time passing between more extraordinary events. What is the combination of sensibilities that make it really like how time passes”	n/a
<b>Bench System</b>	56 Segments Length: 4mins 49secs (.750) Chronology (yes) 50% : 50%	40 Segments Length: 4mins 2secs (.158) Chronology (yes) 75% : 25%	n/a
<b>Human Editor 02</b>	n/a	<i>Chronology (yes)</i> “having many less important events together to try to underline the idea that at least half the time was occupied by that; to distill the events”	Chronology (no to ordinary; yes to extraordinary) “to express that not much happened; the point both that nothing happened and still all these things happened and I just didn’t think anything happened”
<b>Bench System</b>	n/a	58 Segments Length: 6mins 34secs (.135) Chronology (yes) 100% : 0%	12 Segments Length: 47secs (.891) Chronology (yes) 75% : 25%

Table 6.2.2.1 Chart of what aesthetics human editors were trying to convey in their story.

The goal of the system time-lapse was *not* to mimic a human editor, but to sound coherent and express a passage of time that would be comparable to a quality of a human-constructed story. It was interesting to see that participants got used to the aesthetics and the form of an audio time-lapse during the first two stories. From the third story and onwards, subjects were more receptive and were able to provide critical feedback.

Five points became salient in all participants’ responses:

1. Subjects’ experiences were affected by real-time events because they were juxtaposed or superimposed to what they were listening to in the experiment.
2. The story situated the object (i.e. bench) and was successful in helping imagine events that occurred in the same place.
3. Stories presented distance between events. Some were posed in the background and some were posed in the foreground as a major event. At times events felt as if they were both distant and close by.

4. Participants were able to relate to sequences that included human conversation. However, conversations were like a window into someone else’s conversation and something that they were not able to control.
5. Participants realized that different types of objects would tell different kinds of stories.

There were moments when participants thought that real-events such as a plane passing by or a bird chirping were part of the story. The story aesthetic was described as urban and revealing of the life of the bench.

Event segments were cut the right amount in most sequences. Participants were able to intuitively grasp and imagine spaces presented in the story in addition to triggering memory of other familiar spaces with a similar quality. In favorable cases, sequences were thought as coherent and engaging, while others were incoherent, sporadic and perhaps choppy.

In general men had a higher percentage in identifying a sequence that was constructed by the bench system (Figure 6.2.2.4). However, statistically there were no significant associations of the male gender answering correctly when it came to machine stories (Figure 6.2.2.5 & 6.2.2.6).

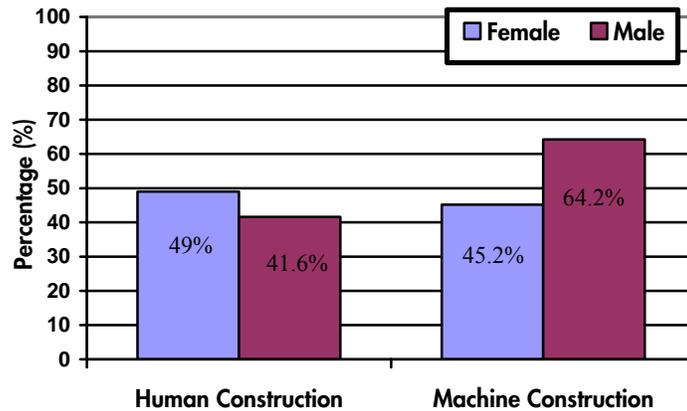


Figure 6.2.2.4 Females performed better in identifying human constructed stories as opposed to males performed better in identifying machine constructed stories.

			Story Editor		Total
			Human	Machine	
Gender	Female	Count	13	12	25
		% of Total	24.5%	22.6%	47.2%
	Male	Count	11	17	28
		% of Total	20.8%	32.1%	52.8%
Total		Count	24	29	53
		% of Total	45.3%	54.7%	100.0%

Figure 6.2.2.5  
Gender Cross  
Tabulation.

	Value	df	Asymp. Sig. (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	.862(b)	1	<b>.353</b>		
Continuity Correction(a)	.425	1	.514		
Likelihood Ratio	.863	1	.353		
Fisher's Exact Test				.415	.257
Linear-by-Linear Association	.845	1	.358		
N of Valid Cases	53				

Figure 6.2.2.6  
Chi-Square Test.

a Computed only for a 2x2 table

b 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.32.

The presence of human conversations in the time-lapse made it appealing to the human listener. For one participant, the conversation was described as, “fun, engaging, interesting, and gossipy”. On the other hand, conversations conveyed too much of what it was about rather than conveying the idea that a conversation happened around a bench. For the human listener, conversational segments did not express time but froze time to reveal what the conversation was about. Figure 6.2.2.7 shows that subjects were not as successful in identifying whether stories 4 & 6 were constructed by the bench system. It is our hypothesis that when there were human voices or conversations at the onset of a new scene, listeners were convinced that the story was created by a human editor.

We wanted to understand how good people were at discriminating between human/machine – made stories. In particular we wanted to analyze whether the presence of human voices in a time-lapse influenced how people received the story – whether it was a machine-made or a human-

made time-lapse. Based on our statistical analysis, we can conclude that humans are prone to think that a human editor made the time-lapse when story segments included human voices.

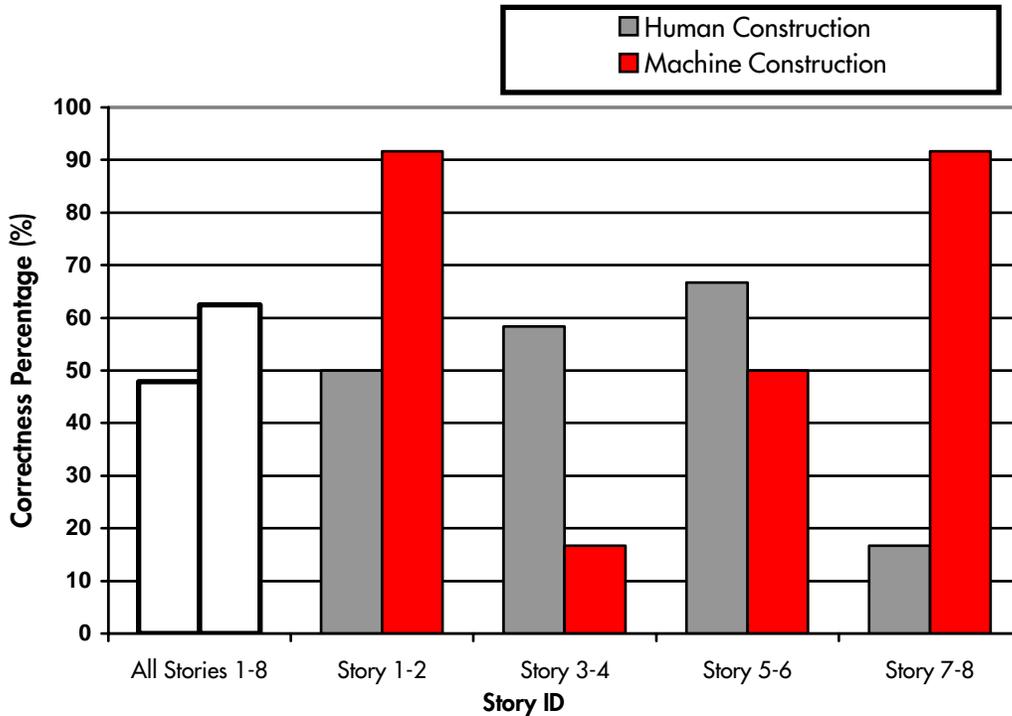


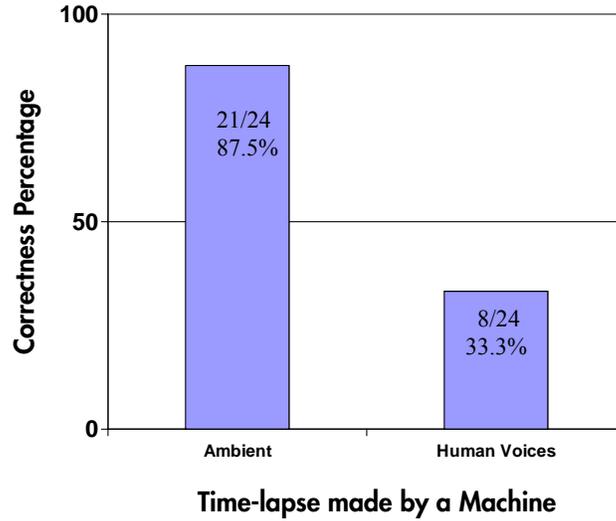
Figure 6.2.2.7 General performance of subjects selecting (story maker) source.

The statistical evaluation measured the discrimination significance between stories made either by the machine or the human editor. In Figure 6.2.2.8, the t-test indicates that all 12 subjects who rated ambient stories produced by the machine had an outcome of  $M=0.88$  and  $S=0.338$ , compared to all subjects who rated voice stories produced by the machine with an outcome of  $M=0.33$  and  $S=0.482$ . The mean differed significantly at the  $p<0.0001$  level. We can deduce from this comparison that subjects were significantly better at guessing correctly when the machine produced ambient stories. The results also show that a story with human voices can have a significant affect in determining the source of who the story-editor might be; the presence of human voices can influence in how humanly it is received by the listener.

In Figure 6.2.2.9, the t-test indicates that all 12 subjects who rated ambient stories produced by a human editor had an outcome of  $M=0.38$  and  $S=0.495$ , compared to subjects who rated human voice stories produced by a human editor with an outcome of  $M=0.67$  and  $S=0.482$ . The mean differed significantly at the  $p<0.04$  level. We can deduce that people were better at rating voice stories produced by a human editor than rating ambient stories produced by a human editor. This

outcome can support how the presence of human voices influences how it is received and experienced by the human listener.

Figure 6.2.2.8 Subjects were significantly better at guessing machine-made stories when it was populated by ambient sound.



**T-Test: For Machine Producing Stories**

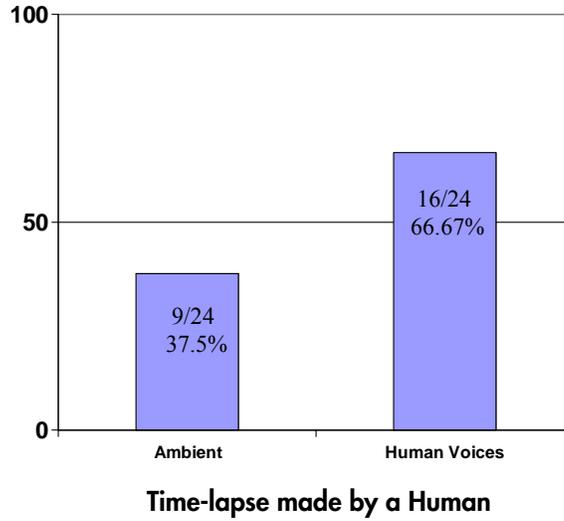
**Group Statistics**

	categories	N	Mean	Std. Deviation	Std. Error Mean
Machine producing stories	ambient	24	.88	.338	.069
	voice	24	.33	.482	.098

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Machine producing stories	Equal variances assumed	13.589	.001	4.511	46	.0001	.54	.120	.300	.783
	Equal variances not assumed			4.511	41.226	.0001	.54	.120	.299	.784

Figure 6.2.2.9 Subjects were significantly better at guessing human-editor stories when it was populated by human voices.



**T-Test: Stories Constructed by Human Editors**

**Group Statistics**

	categories	N	Mean	Std. Deviation	Std. Error Mean
Human editing stories	ambient	24	.38	.495	.101
	voice	24	.67	.482	.098

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Human editing stories	Equal variances assumed	.345	<b>.560</b>	-2.070	46	<b>.044</b>	-.29	.141	-.575	-.008
	Equal variances not assumed			-2.070	45.967	<b>.044</b>	-.29	.141	-.575	-.008

In stories 1, 2, and 8, ambient sounds dominated the storyline. In these stories it was easier for the human listener to distinguish a time-lapse that was made by a human editor from one that was created by the bench system. Here the limitation for the system is that it is not designed to segment what a human might find most “attractive” in a given scene. Rather each scene is classified by how unique it is in regards to its neighboring scenes.

Story 7 was a short sequence with many layers of events. Despite the chaotic organization and expressive sound ensemble; subjects were successful in identifying that a human editor created it. For shorter sequences, the bench system does not excel in putting together a sequence composed of many short events.

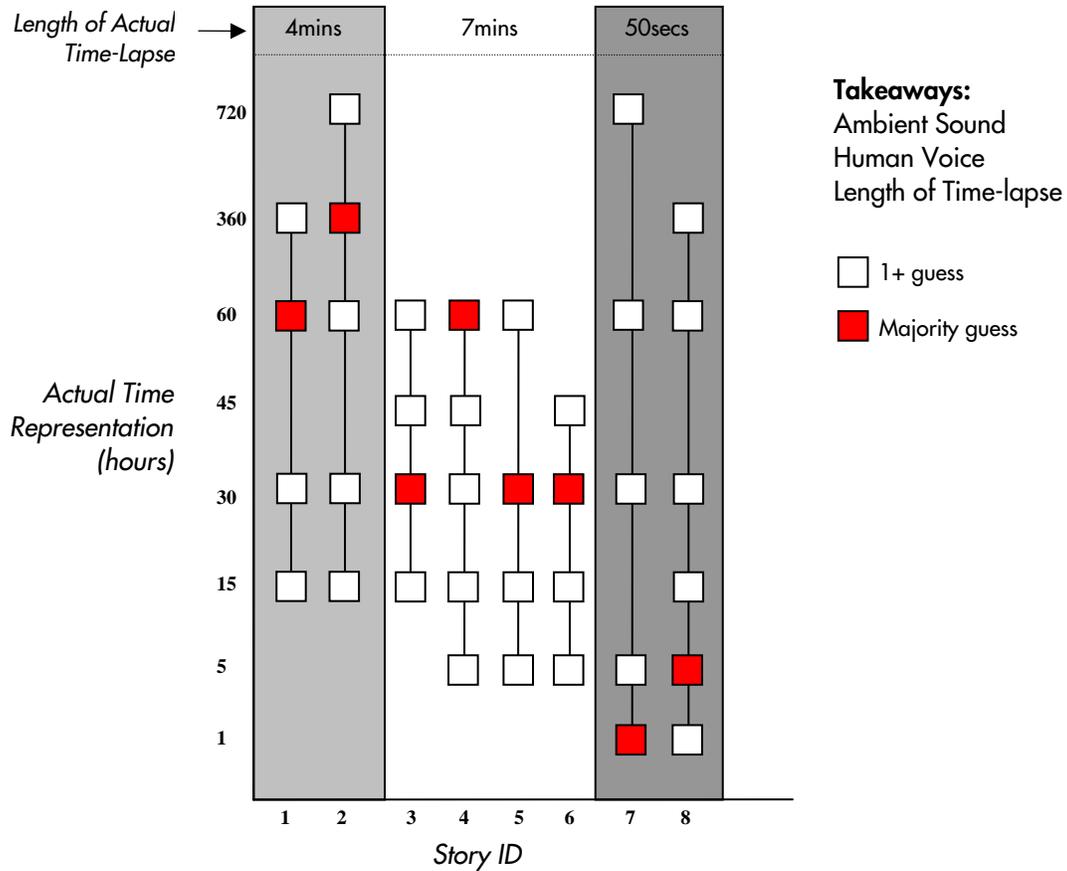


Fig. 6.2.2.10 Subjects’ perception on the actual time representation of each story.

In most cases subjects had an impression that stories represented one hour of the life of the bench (Figure 6.2.2.10). Subjects described story 2 as, “lonely, boring, calming, ambient, surreal, and repetitive”. Their impression was consistent to the time-scale representation results; most subjects

thought that story 2 represented about 6 hours of the life of the bench. Story 2 was also described as “long and boring” and the survey showed that it was representing about an hour’s amount of time.

As for shorter sequences (story 7-8), subjects thought that it represented a shorter duration of history. The actual length of the time-lapse was under one minute and subjects found it difficult to grasp a narrative from the short sequence.

In story 3 through 6, the actual lengths of the time-lapse were longer than story 1, 2, 7, and 8. Subjects were more consistent with their answers in how they thought that these stories represented a thirty minute range. Upon interviewing subjects, it became clear that these stories contained more of human conversations and human voices compared to story 1, 2, 7, and 8; additionally they could not imagine a conversation lasting longer than half an hour. They described the conversations to be detailed and involving which bounded their perception of time.

In our analysis we were able to discover that the presence of human voices and conversations in the story altered the actual time representation of a time-lapse. We also learned that a 4-6 minute time-lapse can represent a foreshortening of 30 minutes to an hour, and a shorter time-lapse under a minute can be incomprehensible as a narrative and misrepresent it as a 1 minute history. It is important that there is a rhythm when sequencing of events so that it can vividly express episodic motion and form.

### **6.3 Evaluation Summary**

The experience of a storied object changed per visit for each participant. There was a shift in attitude about how they imagined what a storied object might be like; study subjects were able to better articulate how objects can express story.

Through this evaluation we learned how the system can be designed to construct a story with a form that expresses an object’s everyday; how a sequence can be improved to tell “what really happened” (as opposed to “what it was about”) that reveals implicit views of the object beyond its form and function; and how a designer can use the system to integrate story into different types of objects:

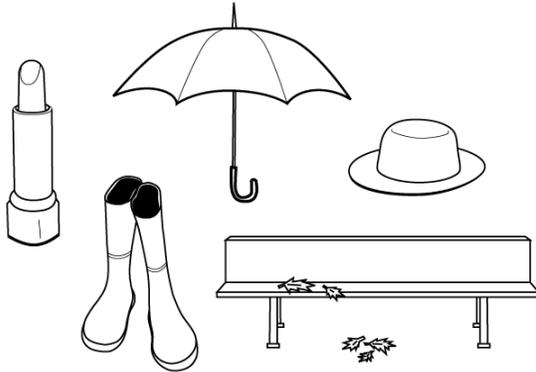
- The story form is not heroic (i.e. a sequence with resolution and conflict) rather it is episodic (i.e. segments in a sequence that depict changing scenes rather than the meaning of each scene change). The episodic nature of the story helps express what took place from an object's point-of-view.
  - The story reveals what is experienced; implicit points-of-view in how an object continues to live in its environment.
  
- The story distinguishes events by what was extraordinary and ordinary in a scene. In constructing a time-lapse story, ordinary events did not express the 'ordinariness' within the time-lapse; it competed with extraordinary events and sounded just as prominent. The design of the time-lapse construction was further improved to put together a sequence with a set of extraordinary and "less extraordinary" events; a percentage system is used for balancing two types of events in a sequence based on when it actually occurred (i.e. 75% extraordinary and 25% less extraordinary).
  - Story segments can be cut at a length where it reveals just enough information for human participants to intuitively grasp and imagine what it is.
  
- The designer has the opportunity to determine the threshold for setting the granularity of what is considered extraordinary from the object's perspective. The level of threshold sensitivity affects the abstraction expression of the episodic nature of an object's experience.
  - Human voices and conversations can engage the human encounter with the history-telling of the object.

Our findings suggest why everyday objects should have an authentic story playing each time than having one that plays over and over again. We observed with human editors and study participants (in the interpretation study) that listening to a repetition of events suggested *sameness*. In order to design an experience that is engaging and unique [Davenport & Friedlander 1995], objects need to construct stories that tell the encounter that time has passed by. The study supports to show that storied objects are experienced in a temporal context with a new form of aesthetic.

## CHAPTER SEVEN

### Conclusion: Storied Objects

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In this thesis we put forth the argument that everyday objects can be designed with a *storied voice*. Storied Objects present a discourse on a new design perspective of time-based interactivity and expression; objects no longer serve as tools that mediate our goals and expression, but can be a source for reflection and appreciation. It is inevitable that

objects will have capabilities for expressing time-and-story as we progress to find new meaning and cause for breeding human living with technology.

For designers we have demonstrated that we can shift an object's stance from being a resource for information and activity to become a source for understanding and expectation. Our approach transforms the stark, experiential attitude between person-object, teller-listener to an audience-audience partnership. This requires that objects and humans consider both roles of creator and listener in their engagement; the re-play value for each experience becomes desirable.

We introduced a theoretical framework (Chapter 3) that guides design thinking to include temporality and historicity. We first articulated that the socialized history of the object remains separate from the physical object; we hypothesized that the provenance of the object (a record of ownership) can be expanded to include different types of records, and integrated into the design of the object through digital augmentation.

For time to become visible in real-time, it required that the object be endowed with the ability to record experience, to reconfigure and foreshorten this recording, and to re-play the storied expression. In our case study – the Audio Time-Lapse Bench – we demonstrated that a park bench can have a storied voice by acquiring and expressing transactional records (Chapter 5 & 6). Technological components (sensors and a processing unit) were incorporated into the design of the physical object that enabled us to use audio as the source and expression for story; audio is a

good medium that is continuous and time evoking – we decided that it was an appropriate medium for the bench that lives out in the park.

Three elements in the framework drive the story construction: transactions, stance, and teller system. The storied expression is designed to consider the recording intervals that shape the abstraction of experience. By controlling the granularity of recorded transactions, we can in parallel consider the object’s stance to determine event saliency and event change-of-state. Narrative attributes such as point-of-view and intent help in distinguishing (real-time) which events are extraordinary within the ordinary. The third element, the teller system, is the underlying architecture that provides flow between input-memory-output. The particularity of the teller system design is the feedback loop; this allows for continuity in memory and testimony to reflect the temporal context of the object.

For designers we addressed how the framework can be appropriated to imagining their own kind of storied object (in a particular context): how are events captured and relevant to the object and time? What will it remember? What will it tell? In our investigation we have demonstrated that an object-centric articulation can reveal implicit points-of-view of what it experiences; our bench revealed a life more than how it was used for sitting – it witnessed familiar strangers and their conversations, children running about, and dogs sniffing about the bench. Its experience of time passing allowed it to reveal happenstance. Each story in each encounter is unique and shifts the re-play value for humans and objects.

The framework guided the design of the bench to have capabilities for: capturing a stream of audio, processing, and re-configuring audio events in order to re-tell (in present time) a storied sequence of what actually happened (past time). We call this *audio time-lapse* (Chapter 5.2). Audio time-lapse is a story construction method that foreshortens the audio stream based on event detection, segmentation, and organization. It is used to convey a sense of history (“what took place” from the object’s point-of-view). We demonstrated that it is a different approach to photo time-lapse – the idea of collecting events in a sequence is similar; however event detection (framing an event) is not defined by time. Event segmentation and classification is based on analyzing the scene and analyzing change in audio signature in order to put together an audible sequence.

Foreshortening the audio stream requires that the system distinguishes and samples “extraordinary” and “ordinary” events within the captured stream; segmented historical events are tagged as ordinary and extraordinary, which help resolve structural matters in how we might organize them in a sequence. This type of storied expression allows for the human audience to interpret the history of the object in a short period of time. In our case study, it was evident that the audio time-lapse expression situated the object in space and allowed for the human audience to imagine time passing in that context (Chapter 6).

### **Into the Future**

Humans live and interpret life through a temporal context; yet everyday objects do not reflect this temporality. What will it mean when different types of artifacts such as the clothes you wear, the newspaper you read, and the building you work in all have capabilities for expressing story? We envision that the design-thinking-framework introduced in this thesis will have broad implications to how we can realize the built environment.

The nature of having something “storied” shifts the activity and information flow from the isolated instance to a fruitful engagement with history. Storiedness requires our continuous, responsive participation in the formation and contextual evolution of our surrounding. We can imagine that humans and objects alike will contribute to the storied expression. Imagine how your daily interactions with the bench will change as you discover how it expresses to you. Imagine how the stories change once it starts sharing information with other benches and things. As objects and humans will both transition between creator and listener in their interactions to create storied expression, it will be crucial for Design to facilitate a time and space to reflect change, and provide means to interconnect and re-shape experience.

Storiedness abides by Koselleck’s articulation [Ricoeur 1988, 2004] in how we look into our past and present to draw perspective on our future. This thesis contributes an exploration of the importance of a record as it relates to the object, context, and the marking of time; and how we can use time-and-story to gain a perspective on a collection of records in the situ of the object. We hope that the thesis will encourage a storied approach to articulating experience as it relates to beauty, appreciation, and engagement in design thinking with time.

**APPENDIX**

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**1. Audio Expert/Human Editor Study Instructions**

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**Part 1 (Outdoors)**

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In the next hour, you will be blindfolded and asked to listen to the sound in the environment you are in. Try to make mental notes on what you hear so that you can tell a story of what you heard in the hour.

*Consider the story that you will tell in Part 2, will be an account of events, an episodic journey of your one hour experience.*

*Consider yourself to be a living being with ears to listen, make sense of what you hear of the world and its events.*

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**Part 2 (Indoors)**

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- A. **Free-form:** Create a story of what you heard-experienced in the past hour. The construction of this story is free-form.

Freeform: Create a story (through audio) of what you just heard and experienced outside. There are no rules to what you make and how you make it – keeping in mind that you are trying to convey a story of the past hour. This portion of the study is intended to look at human creativity and the expressive aesthetic of how you create the story.

At the end of the study, the interviewer will ask you a couple of questions regarding your free-form construction and the decision you made.

- B. **Rule-based:** You have one hour of raw audio of what you heard-experienced. You will see labels that are windows of two minutes each. In each window annotate segments to which you consider ordinary and extraordinary. Segment types (i.e. ordinary and extraordinary) should be determined by listening to neighboring adjacent windows (i.e. before and after).

At the end of the study, you will have most likely selected 30 ordinary and 30 extraordinary segments.

## 2. Audio Expert Interview Questionnaire

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### Interview Questions

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*Goal: Consider the story that you will tell in Part 2, will be an account of events, an episodic journey of your one hour experience.*

*Consider yourself to be a living being with ears to listen, make sense of what you hear of the world and its events.*

#### **General Questions:**

- 1) Can you tell me a story of what you experienced outside?
- 2) What was it like? Anything unusual or usual about what you heard, considering that you were blindfolded?
- 3) What is a story?

#### **Free-form Questions:**

- 1) What is the story you created? What were you trying to express in your story?
- 2) What is special about your story – what happened – anything particular?
- 3) What was hard and what was easy?
- 4) What defines your story to be an episodic journey?
- 5) How did you portray time – that there was a progression?

#### **Rule-based Questions:**

- 1) How did you determine what was ordinary and what was extraordinary in each window, given that you were listening to neighboring windows?
- 2) Navigating from window to window, did you ever look back or look forward beyond adjacent windows, to determine whether they were ordinary or extraordinary in relation to other segments?

### 3. Interview Transcript of Audio Experts

#### Audio Expert 1 -- 08/08/2006 Day 01 Interview

**Hyun (H):** This is August 8th with Glorianna Davenport. I have ten questions. The ten questions are divided into three parts: general questions, free-form, and rule-based. What is the story that you experienced outside today?

**Audio Expert 1 (G):** From the point of view of the bench?

H: From your point-of-view.

G: It was a warm breezy day, not too hot, not too cold. In the beginning there were clear bird sounds all around, then there were sirens and the sirens got louder for a while. And then all the while some people were passing by but mostly in front of me, then all of a sudden there was a kid who ran through behind of me, pretty soon he started playing with the dog, and his mother wanted him to be very careful to not trip over the root of the tree and wanted him to go inside. And then I just enjoyed this warm breeze and people going by and laughing, and I couldn't imagine anybody else except for the boy.

H: So because you were blindfolded is there anything unusual or usual that you picked up on from the experience?

G: I think you are much more aware of the different sounds from the ambient environment. It was also very surprising to me... oh I forgot to say one thing from the story: which was nobody came to ask me why I was blindfolded which really surprised me. Nobody asked me any questions or commented on what was happening that I could hear. That was pretty surprising. I sort of expected some unusual interaction to occur based on the situation I was in. I think that might happen more, if you were sitting on the bench itself and it were an unusual bench in the environment, for the environment. Because people don't usually come to you when you are eating a sandwich. People don't come and say 'hey! how come you are eating that sandwich'.

H: The third question is, what is a story, to you?

G: A story has to do with a passage of time. And being situated in the world over a passage of time, where some change occurs in that passage of time.

H: So we are going to go into the freeform questions. What was the story and what were trying to express in your story?

G: I was trying to situate the story of the boy and the dog and the ambience of the breezy warm day. So to stir the imagination about what the ambience was, and then to allow a sort of falling off of almost sleeping state I was in and then to surprise people by your entry into the story recognizing that there was a character there and that the character was blindfolded. Because that was the only time I was addressed the whole time except by the wind and the sun.

H: What was hard and what was easy about creating your freeform story?

G: It was just an arduous task. It was like all editing, you need to be a little picky, and it was hard in the software that I did not know very well even though it is very similar to other software, it wasn't hard to learn, to have the right sequence of events so that I could make sure that the piece I captured was the right piece. What is most interesting to me about the story, story changes based on the real material. Even though I had in my head this memory of the birds and the sirens, and then the kid playing and the dog, and then almost going to sleep, I almost went to sleep at the end, and having you come in say 'ok your time is up', even though I knew that going in you don't know exactly how that's going to play out, you don't know for one thing what should the segment length be? How much quietude can a listener really engage with or how much chaos can they engage with? One sound that I couldn't really do well was, it is typical of audio recording, is the sound of the wind through the branches, and the branches you can hear them sort of crackling and the leaves shifting back and forth. But the human being can't hear the wind sound, which very annoying.

H: Your events, that you put together, are they true to how it happened or did you mix it up according to the story that you made.

G: It's pretty much how it happened. Although if I had had more time and also more flexibility with the tool, I would have probably found bird sound, siren sound, I would have found certain effects, and then I would have layered them in, and it's now five minutes, and I think it probably should be like two minutes. I think it could be that but that just takes a lot more doing.

H: The last question is, how did you portray time, and its progression, because it is an episodic journey of 45 minutes?

G: In the freeform?

H: Yes.

G: In the freeform, basically events or patterns; patterns that establish ambience, events that were interpretable. So human events tend to be more interpretable than ambient events.

H: So going into the rule-based, two questions: how did you determine which was ordinary and extraordinary in each window? And in your case, you seem to not have some.

G: One thing I think that you need to establish is when you do this, you need to tell somebody whether you are supposed to relate the windows to each other. Because if you do once you have established an event as extraordinary, the next time it occurs no matter in what window it occurs, it then could be then an ordinary event. If you don't establish that first, you don't know. The second thing is, when you say event that is different to me then ambience. Event needs to be marked by a discernable, interpretable sound. And that might not be what you intend, and actually when I started, I didn't pay any attention to that. I just take some, because the way I edit is I grab some ambience and layer that with some event, but to me those things are very different. If it is not an event but it is ambience or event, and ambience is considered, see in my freeform what happened was, when

ambience was established, once I had established ambience then I could have the event occur. But I needed to establish ambience, that's almost like establishing it through the extraordinary of not having heard it first. Like not being aware of the bird singing, or not being aware of the sirens, I eventually in the freeform dropped the birds because that portion of them was not clear enough and there is a portion that is much later that is very clear, where the birds are really clear. If I had more time I would have gone back and gotten them.

H: In your rule-based, did you look back and forth?

G: I always assumed if I didn't look back and forth, but if I had already established, for instance the wind as extraordinary because it is loud and very massive, then I assumed that the next time I hear the wind, it could be recognized again. And then I got into problems, because by the end, there weren't necessarily any extraordinary events left. Particularly in the end, there was no human engagement. Your part by the way was cutoff there. So when you get to the end, it's sort of more normal. I had a hard time figuring out how long an event lasted, and whether ambience could in fact be an event. Like if I am defining my own segment, if you said segment, so extraordinary segments - ordinary segments, I would have much broader palette to deal with it. The issue of event, I couldn't quite figure it out.

H: You mean if you had a set you can compare it more.

G: If you told me don't, it's not about events, it's about segments, it's about segmenting each of these windows, and you can have larger segments or smaller segments, but want at least one ordinary and one extraordinary segment, then I would, then the question is whether in the human mind, you would ever define lets say the bird sounds as extraordinary. And they were extraordinary out there, the first time I heard them and the also at the end, when everything was very quiet and they were very loud, they became the most important thing. So it has to do maybe with importance, within the window. Maybe what you really want is a ranking of importance or something. I am trying to figure out how to match the human head with what the instructions said is, because that was confusing for me.

H: Great. That's all. Thank you.

**Audio Expert 1 -- 08/09/2006 Day 02 Interview**

**Hyun (H):** This is day two, we have five questions, similar to yesterday. So what did you experience outside this morning?

**Audio Expert 1 (G):** It was a hot languid day. First of all I was greeted by the bench person and invited to sit down. It was very much hotter than yesterday and not as much wind and some louder birds. I don't know whether they were magpies or what, and then sort of after a while somebody walked over. Let me just start again, can I start again?

H: Of course.

G: The bench person greeted me and I sat down and it felt really good to sit down. But it was very hot. The breeze wasn't as loud. There were some very loud birds with a particular kind of call. It seemed like people passed by in sort of waves coming from the direction of the subway, I suppose. Then after awhile, somebody came up to me and asked me what I was doing. And I said I was bench tending, and he wished me a good day, which was really fun. Then I thought I should have a conversation, I should do something practical, and I should have a conversation so I called for the bench person, but she didn't come. So I started to describe this book that I am reading right now, to the bench. Sort of not really sure if the bench would get all of that and then a little bit later the bench person came over and we had a conversation, that was pretty interesting.

H: So from that experience, what is your story today?

G: So my story is the relation of the bench and the attention it gets.

H: Anything particular you want to point out?

G: I think interesting thing about the ordinary and extraordinary and how you play that in a story is the notion of time passing, and how do you create that sense of time passing between more extraordinary events. What is the combination of sensibilities that make that, it really like time passes so that was a fun piece but it took a little time to do that.

H: So I asked this yesterday, regarding time progression and story, the narrative, were you true to chronology?

G: No. Because there were things that made, there were elements that you could put in that made it more, the story a little bit more intense, if you switched the order a little bit.

H: As for the rule-based, today we changed the rules a bit, so that you were comparing to the general sense of your neighbors and concentrating on the window. Was it easier to focus and determine what was ordinary and extraordinary?

G: Yes I think that makes a lot of sense. You still have the problem of things like wind not being constant. It was even less constant today than yesterday. So when do you call it an extraordinary event and how long do you hold it as being ordinary. The same thing happened when I was conversing with the bench about this book, there are places in

there which I think just get to ordinary because I have already been conversing for a while. So that has to do with the duration of the event. And obviously if you were a human editor, you would be very careful of the beginning and the ending of the thing, both what you considered extraordinary and what you considered ordinary. I sort of mumbled to the bench.

H: Great. That's all. Thank you.

**Audio Expert 1 -- 08/10/2006 Day 03 Interview**

**Hyun (H):** This is your third and last day. What did you experience outside today?

**Audio Expert 1 (G):** An intense conversation with Hyun. With a few interruptions. The background sounds were very familiar, most of them. And our conversation was interesting because it went between recognition of the ambience and discussion of the bench's story and how your work was going.

H: That's actually interesting because I was going to ask you, since this is your third day what was unusual and usual? Or became usual and unusual?

G: It was very natural to have that discussion where it occurred and it was very nice to have some spaces in it. What was unusual was how over the three days there was I sort of came to a different understanding, realization about the bench itself.

H: Would you like to give another definition or description of story?

G: I think I will probably go back to an older definition. Story occurs over time, and involves state change, but you only understand change by the things that don't change and or don't matter. So I think your description of extraordinary and ordinary and weaving extraordinary, actually Bruner's description or Kearney's description, or Ricoeur's description, and weaving ordinary with extraordinary is very relevant because you have to know what is constant in order to see something that is surprising.

H: So what was your story today that you made in the freeform?

G: Today my story was bounded by the beginning where you told me even though the recording had had happened, had begun earlier, you told me that the bench was perhaps having a bad day. And you were using your cell phone, so it had sort of three instances of communication around the bench - it had the moment it started the recording, or that I started listening, it had the moment you were on the phone describing about the uncertainty about the bench, and it had the alarm at the end. So it was nicely punctuated by that. But in between was a lot of conversation, and conversation was a little complicated to cut in a way that is fluid and also meaningful. So I thought a lot about the segmentation issue when there is human voice.

H: And the way you put these things together, are they true to the chronology?

G: Yes.

H: So I guess you already answered that it was hard to do the segmentation of the human conversation.

G: Well I think that it is now six and a half minutes and I think it could be three minutes. So but how you cut from six and a half to three is, what I'd like to do is go back and take each of the cuts I made, and cut them to half and see what I save in half and what goes.

H: So considering you have been constructing story in a time-lapse form, over the past three days, do you think that if you had more time, and if you actually had experienced twenty-four hours, would you think that your time-lapse would be just about six minutes to eight minutes or do you think it would be much longer?

G: I think first of all one needs to define why one is cutting or what the purpose of the cut is. So if the purpose of the cut is to represent the experience of the bench over a period of twenty-four hours, but to represent it in five minutes that's possible to do. And in some sense, narrativity constrains what you put into that five minutes but it is not the whole story. So one might ask in this research, what is the difference between experience and history of experience and story in the more classic sense of state change, something has happened, something has changed. Because it is not so much of the bench's persona or state changes it is really that time has passed for the bench. And the notion, the relation between time and narrative as we know from Ricoeur is a very particular one, it has to do with both the subject and the audience perception that is the story is marked by events and the audience perceives the replay or the reconstruction of those events over time, and the audience takes away some meaning from that. So one needs to define from the beginning, perhaps the story you are after is that the story is of a bench experience. Which is quite different from lets say a heroic tale, in which the bench would be the antagonist or the protagonist. So I think that may be a very key issue for your thesis.

H: So this is the second part of the rule-based. So what was different when you were actually selecting within the window ordinary, and extraordinary comparing the neighbor windows from yesterday?

G: Dialogue is very difficult. What I did was, when I thought it went on and on, it could become ordinary, if it was trivial, it depended what kind of trivial, and whether there have been some trivial, in the near neighbor slots. There was not much silence, there were many windows that really have silence. And silence of course when it becomes very scarce it is something that you really want to protect.

H: When you are listening to the dialogue in the window, were you looking at more of the meaning of more of the general expression?

G: Both. But not meaning - meaning. It is not so much significance of this piece versus that piece. But in terms of a sufficiently whole, a sufficient duration to get an idea of what was being said to gain some meaning off it, and sufficient clarity, so there are a lot of 'ums' or 'I guess I mean' whatever, for the human editor you tended to discount.

H: And your selections of ordinary and extraordinary events, do you think it has to do with how you constructed with your freeform story?

G: More so perhaps today than in the past. Although it was not exactly that partly because of the windows being evenly dispersed. There were also some windows as there have been in the past where it is extremely difficult to find anything because it is a very similar pace and the sounds are not really what we would call the background or ambience more than event-based.

H: Thank you.

**Audio Expert 2 -- 08/09/2006 Day 01 Interview**

**Hyun (H):** It's day one with Roberto. How do you pronounce your last name?

**Audio Expert 2 (R):** 'Aimi'

H: Aimi? Italian?

R: Italian.

H: Cool. I am going to ask ten questions, they are conversational, there are no right or wrong answers. Three divisions: general questions, what you did in the free-form and then the rule-based. Can you tell me what you experienced outside today?

R: Sort of like a narrative?

H: No, just what you experienced. Not the narrative. That will be in the free-form questions.

R: It was a pleasant day, weather-wise. It was kind of nice to be outside. Several people spoke to me, which was interesting. I think they were wondering who'd the guy under the tree with the blindfold on. One person thought that I was the same person who had done the experiment a few days previously, "I have seen you out here a few times". And I felt slightly conspicuous out there, I heard several people out there saying "who's the guy with the blindfold". But it was pretty interesting. There seems to be a lot of traffic there. More going on than I would have thought.

H: I noticed people don't go to you that much. They just pass by; I guess it is the way it is laid out.

R: Well two people stopped by. One person I never met before which was kind of interesting. I am not sure I would have approach someone sitting next to a computer with a blindfold on.

H: It actually looks like an installation.

R: Especially with the bench, it seems that you are supposed to sit there or maybe torture the guy with the blindfold on. I don't know.

H: It reminded me of a Warhol installation.

R: Yeah.

H: Anything unusual or usual about considering that you were blindfolded.

R: About what like I heard?

H: Yes.

R: I think it may have affected my perception of the passage of time. Like I really definitely had no idea, how far I was along I was into or not. I felt that was more significant with the blindfold on. I think

there is a sense like, if I were sitting there watching the scene I would see all these people walking by, and so I would kind of know there was a flow even though I didn't hear them. Some people make much more sound than others, so probably a lot of people passed by that who I didn't hear at all. And then some people seem more significant because of the sounds they are making. Like one person is unwrapping a sandwich or something you could hear like a paper bag. Which evaluating the scene purely acoustically made that more significant, than if I were viewing it. Where I would immediately say oh that's someone eating a sandwich - oh what's that.

H: So you didn't like notice difference in birds?

R: You know I suspect that if I had sat out there with the same amount of time not blindfolded, that I would have also have noticed the sounds. I think a lot of it comes from just spending a lot time not doing something. Coz I would normally I would be working or distracted with other stuff. So intentionally absorbing the environment is probably more significant than the blindfold. Kind of like the context of the activity I guess.

H: What is a story?

R: I would have to defer to my more knowledgeable colleagues as to the overall definition. I think a story is an attempt to make sense of the complexities of the universe, in a way that gives it handles that we can understand. If I were to tell you what happened there, the reality is what happened is billions of atoms were colliding with each other and is very chaotic and incredible complex thing and would be impossible to convey in any reasonable way, so if objects that do things, reasons for things, as a way to help make sense of some thing and kind of convey of the most important part of what happened, I think that is sort of what a story is. It condenses the reality of what occurred that is so immensely complex that no-one could possibly ever repeat it or convey it or even know it and put it into a form that is understandable by other people for the parts that is important to people, I guess.

H: Going into the freeform, what was your story that you made?

R: It was pretty episodic. Kind of like a bonanza. One episode after the other. In the first freeform section, I pretty much extracted what I thought was the most interesting parts, just put them in a direct linear order.

H: Would you say those extracted parts are true to the chronology?

R: Definitely. The chronology I put left totally in tact. And I included, It happened that one of the people I talked to in the beginning, and then there was the sound of you turning it off at the end, I wanted those to be in there to say what it was that happened. Coz I feel that kind of summarized it a little bit. Because partly I explained to you 'what's going on here?'. Then the end happened. Sort of as an introduction to it.

H: Anything particular, special about your story?

R: Structure of the story or content of the story?

H: So another question is then, if someone were to hear your story, what's your intent?

R: I guess I wanted to highlight the more unusual things that happened. I guess trying to convey some of like what I was trying to figure out what's going on what I was experiencing. Some little, over hear people saying things, at one point a woman says 'is that vermuris?' I am sure she was joking with her friend or something, but I wanted to pull my blindfold off and say 'look is it?'. As a structure, there is nothing that exceptional about my story. Kind of attempting to condense it down.

H: So it was more of an expression of time and episodes?

R: So to filter out the things that I thought were significant from it and kind of lose the rest and sort of like strain it.

H: So what was hard and what was easy making your story?

R: One of the things I thought is really difficult it that, unlike visual editing interfaces, especially in this case, so little of the content is expressed in the wave form, the wave form view almost tells you nothing. It tells you only whether the wind was blowing or not. Which aren't the parts that I remember. So there were parts where for example I knew like Glorianna had stopped by and I talked to her. So I wanted find that section, but finding that section was really difficult because my memory of when it was, was pretty hazy. It really ended up being almost randomly picking places and play. I found that frustrated and there is not a good way you can scrub through audio. To condense it in time the way you would do like images.

H: So there is a conflict between what you are experiencing and what you are seeing?

R: and the process of editing is very different from the experience of listening to it originally. Because I would have to pick a place to play it randomly and it is playing it in real time for a tiny bit and oh that's not it. So it's like almost stabbing it at random places and having moments of real time but it is different from kind of the continuous sort of experience knowing how things relate to each other. Also with that algorithm it is possible to miss things too because I can do sort of a binary search but it is useful for the saccade sounds, they are very long. Where if I find the beginning of a saccade sound I know that it is going to be to the right of that. But if it were just a little clink or some kind of individual sound, it is really hard to find. So as an editing interface, it was really different from the experience of listening to it.

H: What was easy?

R: Well saccades were easier to pick out than anything else because of their envelope, I found out even though I didn't necessarily think that they were the most relevant sound that I heard, the ease with which I could extract them I think featured them more prominently in the end result.

H: What was easy from, not the editing point-of-view, but you as a person who just experienced the sound, and then making a story of it?

R: Well, I think that interacting with people and being able to include those, gives us the structure to it that would've been much more difficult if I hadn't talked to anyone, because I think it really breaks up, otherwise it is very hard to know which sounds are more important than other sounds, especially when you enter the way of thinking about it where you enter perceiving all the sounds at once. So I think that lends out to more of a narrative that like 'I talked to this person and I talked to that person, we talked about these things', because those are also stories too, so they are like stories embedded in a story.

H: What defines your story to be episodic? Because you kept it in chronology...

R: The chronology was constant and I guess I have several real-time chunks within it, where the time is constant in those chunks. And I guess I viewed them as there to be in sections weren't as important that I removed.

H: How did you portray time? Because you were extracting segments.

R: Well in this case, the direction of time was uniformly forward but just condensed.

H: Now we go into the rule-based. We have the rules of looking at the neighbors and then within one window you have to determine what is ordinary and extraordinary. So how did you come up with what was ordinary and extraordinary?

R: So for ordinary I think I used basically the same criteria through the whole thing which is that pretty much in every window, the majority of time is what we call ordinary. It is sort of background rumble, not a lot of things you can pick out. So I pretty much for most of the ordinary just picked those things. For the extraordinary in some windows I felt like there wasn't anything that extraordinary. So there was a couple that I didn't label it. But some of them were clearly different. I think interacting with people pretty much always counted as extraordinary given the relatively small amount of time I spent interacting with people versus not, and how different that kind of sound is. Particularly the guy howling like a chimpanzee, very different. Also in those I think there wasn't that much influence from the adjacent windows, because the kinds of things were different enough that I don't think I had two extraordinaries in a row that were similar to each other.

H: So it sounds like you had this foreground and background.

R: So I basically sorted between foreground and background for ordinary as background and extraordinary as foreground.

H: So if two different birds were making sounds they would probably all be in the background?

R: Yeah, if the birds were prominent but not incredibly prominent they didn't make the cut for either ordinary or extraordinary. Because I was looking for even more ordinary than with the birds in it. But I would probably try to find a section that didn't even have that. Even if the birds were mostly chirping through the whole thing. I guess when you take a slice out of something, when I was doing it, sometimes I would take a slice that I thought was ordinary, but when I listened to it by itself, by putting it in its own frame, it seemed more extraordinary. So I needed to go back and take something even more ordinary so that it wouldn't be made extraordinary by being viewed in isolation. For example, if a bird had constantly been doing a crazy song through the entire clip that would count as ordinary but if you listen to just that little slice of it, it would seem extraordinary. So I almost want to find the instance when the bird breathed.

H: But what if there was that same bird in your neighbor windows. Would that be ordinary or extraordinary?

R: I guess that would rule it out as extraordinary, but it wouldn't qualify it as ordinary. I guess I view it as this whole level in the middle that is not ordinary enough to be counted as ordinary and extraordinary enough to be counted as extraordinary.

H: I think that is a nice observation. That is about all the questions. Thank you.

(Addendum discussion)

R: Some future work might be interesting. I asked Glorianna about this when she stopped by. She says that she'd taken some notes which was interesting that had not occurred to me. I think that it would have been very useful to be able to tag sections of the data like by pushing a button or something. Like if I could do it right after I thought was interesting in the moment. So that I could easily come back to it later. Because a lot of times I was trying to pull things out of the audio that I knew were in there somewhere but I was very very difficult to find. So being able to tag those things. And the other thing that would be useful I think is a spectrogram view, rather than a waveform view, because the spectrum of the noise is constant.

H: Well the reason for that, I am trying to understand more of the way, because we don't think in spectrograms.

R: Yeah but we definitely don't think in wave forms. Wave forms are the least perceptually relevant way of looking at audio.

H: I guess I was trying to do is 'here is the audio that was recorded and try to remember. And that brings to the tagging issue too. You know if we have a machine that aids you in tagging, then it brings up another space. I think what you say is very valid and something I should consider in future studies and to think about. I am curious if a non-audio expert would feel that way too.

R: I don't know. The wave forms are really only good at discrete attack. So if someone came by with a drumstick every now and again, that would be great.

H: Do you think that was a response because it was really hard to find?

R: Yeah because it was difficult to find. I guess it is true that people are slow to adapt to reading spectrograms but it is similar to our perceptual system, that we are able to do frequency analysis and know what pitch things are. So that we can view in a curve on a spectrogram, several things moving together at once and you perceive that as one sound. In the first free-form editing one, it wasn't clear whether I should have concatenated everything together into one short thing or just left kind of in the second task where it split, where it was marked where the element was but not actually ever put together, to preview.

H: No, the freeform one, I for example asked Glorianna to split it so that I knew exactly where it came from. But it is okay, I will review what you did I and I will get a general sense.

R: And in that if there was a way to preview what it was like to stick them all together cuz then you know what your story is. A lot of the times, you don't know what the elements is and know how the beginning is.

H: How long is your freeform story right now?

R: I think it is around eight minutes right now.

H: Do you think that if you had more time it would still be eight minutes?

R: Yeah, maybe even shorter actually. I think my goal would be to get it down to five or less. Because I know that as a listener, there are very few pieces of music or anything that I wish would be longer. So something like this, all the salient points should be made in much shorter time.

H: So do you think that if the bench were to tell you its story of not forty-five minutes of its life but twenty-four hours, do you still think that it should stay in the ratio of four minutes to forty-five?

R: No I think that it should be five minutes tops.

H: The entire thing no matter what?

R: No matter what. Because I certainly don't have the patience to absorb more, but that is just me. I say thirty seconds, and we got thirty seconds then I say we have something!

H: Thanks.

**Audio Expert 2 -- 08/10/2006 Day 02 Interview**

**Hyun (H):** This is day two with Roberto. So what did you experience outside?

**Audio Expert 2 (R):** Today was kind of different. There was sort of a soccer game going on for about a half of it that I think kind of dominated at least the second half of the experience. And fewer saccades and there were maybe fewer conversations with people, a few more random conversations than yesterday too.

H: So in your freeform, what is the story that you made today about your experience?

R: I think I still kept it chronological, but I tried to...

H: So it is true to the chronology?

R: True to the original chronology. It seems that there is no reason not to do that. I tried to devote a larger chunk to the soccer game even though there weren't that many events. You know sort of by having many less important events together to try to underline the idea that at least half the time was occupied by that. So I kind of pulled out individual sounds I found that went with the soccer thing and tried to use that as much as possible. And there were couple of sort of longer things of people walking by, there was probably a group of high school kids, all kind of talking and having fun, but it kind of merged into this constant noise...

H: How did you know they were high school kids?

R: They just sounded young you know and excited and then there was some guy walking by with a bunch of keys on his keychain or something that gave a sustained kind of thing.

H: So how do you determine how much to cut out in your audio?

R: I guess I want to cut out as much as I can. And probably if I had more time, I would go back and cut out a lot more.

H: So how long is your time-lapse today?

R: I think it may be like five minutes.

H: Do you have the same or similar thought of yesterday... that is shouldn't be any longer?

R: I think that it should be as short as possible.

H: If you had more time, would it go shorter than five?

R: Probably. It might not go any shorter than three. Three minutes is a good attention span.

H: Do you think that given this restricted time, you have five minutes of what you experienced, do you think it has more to do with really trying to get all the events and then deal with them or do you think,

the story was really about a soccer game so lets just do that and..  
what was your approach?

R: I guess given the time constraints, I was just trying to distill the events and actually most of the time and I really didn't listen to it all the way through, after editing it through. Just because it the way of using the editing tool. It is kind of difficult to hear everything until you done and if I had more time there would be listening to more of what the product is and going back and changing it. I didn't close that loop.

H: So you grasped the key things you wanted?

R: Yeah, there were certain things that I remembered and a few things that I stumbled on in editing that I knew I wanted to find, and I thought were interested listening to it.

H: Was there anything surprising about today's listening experience?

R: Well I guess it was a little surprising from how different it was from yesterday given that it wasn't that different a day, it was exactly the same time. You know different people were out, different things happen, different interactions, it was kind of interesting.

H: And as for your rule-based, did you follow the rules of comparing the neighbor windows to determine what was ordinary and extraordinary?

R: Not really. I tried not to double up on extraordinaries, although there was one case where the extraordinary events spanned the window and so I had be it extraordinary on both sides of the window. Because it seemed like it was an interesting event that it would be weird to highlight only the half of it and not the other half.

H: So how would you define your rule of what was extraordinary and ordinary?

R: Similar to yesterday I guess, the ordinary was I guess really things viewed in isolation didn't really seem to have any salient features.

H: And does this relate to your memory of when you were outside today?

R: I think in my memory of what was outside, the ordinary parts get removed from my memory. So I don't really recall that exactly. So it's more just something in isolation wouldn't seem extraordinary. So no discrete events, no big changes, something that is kind of uniform. In most of every window there is a chunk that is kind of like that.

H: So what was your rule on the extraordinary?

R: Well I think particularly in the window view, it limits the scope of it a little bit, to looking for particular size chunks. I found out that I tended to look for chunks that were between a tenth and a half of a window. I probably didn't even get as long as I have. In some ways I guess it made me feel more free to use smaller chunks because I knew I was going to have a lot of them. Also given the constraint that it only needs to be interesting in terms of that window and recent windows is different from looking for the most interesting thing in the entire

recording. So some ways it is easier because I can just stab around and find something that is interesting enough. It doesn't even have to be the most interesting thing in the window for it to be extraordinary.

H: So I guess one last question is, as a human editor and creator of a story, compared from your experience yesterday and today, obviously your actual process is faster because you know how to go about it, does that affect the maturity of the content of the story?

R: It would actually be interesting to listen to the story now. I think I am still sort of a beginner at this kind of story. So I am doing sequential things, I am tending to distill down my experience to the parts that I remember, but I am probably not yet at a level of picking out what is interesting to someone else from that. I kind of am distilling a memory for myself at this point. I think I would have to do it a lot lot more, I think people who have produced a documentary professionally or things like that probably have more of a sense for that. I would love to hear Glorianna's. I imagine her approach is really different.

H: You make a valid point. I do know that she layered.

R: So that is a totally different approach. So I think a sense of someone else's impression, this stuff would be, is a very different sense from your own memory of it. I think I am still approaching it from my own memory. But it also puts weight on things, that may not actually be there, for someone else. It is kind of like going through your own picture album and you say 'oh this is a great picture of my grandmother' but if someone doesn't even know your grandmother, they don't think it is a great picture. They'll say 'oh it is badly lit' 'it is not very evocative of anything' 'it doesn't really mean anything to me' 'who is this old lady?'

H: So I guess the commonality between you and Glorianna is the environment, and then I guess it changes because of your approach and the type of experiences you bring into it.

R: Yeah, I have some expertise in audio, but not in storytelling. So it is kind of a different view of it too. The sounds may be interesting to me but, I probably don't know how to piece them together in a way that means something to someone else in the same way.

H: Thank you.

**Audio Expert 2 -- 08/11/2006 Day 03 Interview**

**Hyun (H):** This is day three, the final day of the study. I will ask you five questions similar to the previous days. So can you tell me your experience of today, outside? Same time, different day.

**Audio Expert 2 (R):** Same time, different day. A lot less happened today, at least that I heard. And it may have been my mind set but I think it also fewer notable audio events occurred.

H: That is interesting because today, you bring in this notion of your human state.

R: Yes. Well I think the other two days I was really focused on sort of outwardly and trying to hear the new sounds and for some reason today, I was more inwardly focused, unless I was able to listen. Fewer things drew me out to pay attention.

H: So that relates to the next question. Do you think, and I don't want to lead you, but do you think because you already experienced the same environment in the past two days you heard the birds, you heard people walking by?

R: There is definitely something that is part of that. I think also that so much was going on yesterday, my experience on the first day it was all new, I was surprised at how much there seemed to be happening. The second day I was surprised at how many things I did not experience on the first day. And it seemed like there was a lot going on that was pretty interesting. So today was striking, I guess I could characterize that yesterday was towards the top of how interesting it gets out there, and today it was probably near the bottom of it. Having experienced all those extraordinary sounds that really seemed extraordinary yesterday, it was hard to categorize as things to be extraordinary today that were in the category of random birds not that notable, random people walking and things like that. Things that I might have categorized as extraordinary on the first day but after experiencing the second day, my threshold for what is extraordinary had changed.

H: For me as a human, it happens to me. Like I have very ordinary days that aren't special. And I probably won't even remember them in five years from now.

R: I found, it was probably a combination, if this had been the first day, I may have picked out more things. But I also think that something about the day too just happened to be different. There were fewer ongoing things that were sort of sustained too. Like yesterday there was a soccer game, there were several people walking by, and large groups talking amongst each other. And that did not happen to day for some reason.

H: So in your ordinary day today, what was your story? What were trying to express in your experience?

R: Well I was trying to express that not much happened. Luckily I think I said at the end of the recording, 'not much happened'. So I actually included that in the end of it. So in the recording I tried to compress

everything that did happen or that made the threshold of interestingness. This time I tried to overlay them in the sense that there were few things happening at once, but then for me to say that not much happened. After that, I tried to make the point both that nothing happened and still all these things happened and I just didn't think anything happened. I don't know if that will come through or not.

H: What was your experience between, first of all if you layered them - are the events, are they true to the chronology?

R: Some of them, I tried to make the foreground events relevant to the chronology, some of them more background, more ordinary longer sounds, I just put wherever because it didn't really matter. So some combination I tried to keep the significant things in order.

H: And your experience between layering and not layering, do you think it was more expressive?

R: It probably has more potential to tell a story that I would like to tell by layering versus, I think with the sequential you are more constrained into sort of what happened. Once nice thing about layering was that I was able to get it incredibly short. Whereas if I had done it sequentially, it probably would have been a few minutes. I think I got it down to one minute or something like that. Very very short. So I think layering is a good way to compress a lot of time in this case. Especially the background sound even within each clip are very similar too. So they kind of meld together.

H: As for the things you experienced, was there something that was ordinary that struck you again that caught your attention that might have changed its state?

R: I didn't really feel that so much today. I found myself sort of wishing sort of the sounds I had yesterday because there were so many kinds of surprising and interesting kind of things. And I sort of found out those kind of things to be missing.

H: As for the rule-based: What was hard and easy? What was easy, actually?

R: Actually about yesterday, because I don't think you asked me that either. So yesterday, there were so many interesting events that it was very easy to always find in the rule-based something extraordinary within every slice almost. Today, it was hard to find extraordinary, in fact, even though I know the rule is to not have the same extraordinary thing in adjacent windows, for one of them I had to. There was a bicycle going by and that was the only thing that was of interest in both of these otherwise just rumble and wind.

H: Did you always force yourself to have an event identified?

R: I tried to find something extraordinary in each of them but it was a real stretch for some of them.

H: Here is a random question: so you experienced three days, and if you were to tell us your story of the three days, do you think that you would equally measure each three days stories and put them together or

do you think that you will try to highlight more of yesterday because it was more exciting?

R: I guess I would want to treat it episodically and maybe have three distinct chunks where you would hear a break between them. So they don't blur together. I haven't done the layering today so it might have been interesting to do layering yesterday's and really compress it down but have a lot going on, in a very short period of time, to kind of express how chaotic it was.

H: So in the case of today's story, in your freeform, did you or did you not distinguish your story to be expressive or showing time?

R: I think today was attempting to be more expressive. Less linear. Attempting to be express the experience of the time, but not having it literally be chronological.

H: Do you have any last comments?

R: I guess I am surprised at the range, of things that happen on a day-to-day basis at exactly the same time. Pretty much the same weather. That is kind of weird. I wouldn't have expected that.

H: Did you notice that there was a dog today?

R: Yeah I did hear the dog. The dog did not make that much sound. And going over the recording there were only a couple of times where there was enough dog sound in the foreground that could be used.

H: Do you feel that there is a proximity to your experience? Remember some lady sat and there were like ten people, and some lady sat on the bench. I don't know what the conversation was about...

R: The standard is that those conversations became less extraordinary, after they happened several times, so like in this one, I edited that to just her saying hello, and then goodbye.

H: Why did she decide to sit down? Do you know?

R: I don't know, maybe because there was a bench there. It does look like if it invites you to sit. Yeah it was kind of interesting.

H: That's about it. Thank you.

#### 4. Human Interpretation Study Questionnaire

##### **Interpretation Study - August 2006**

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*Following section, your answer will be recorded in audio.*

##### **PART ONE**

1. What is a story?
2. *Here are other perspectives on story:*
  - a. *Story occurs over time, and involves state change, but you only understand change by the things that don't change and or don't matter. So weaving ordinary with extraordinary is very relevant because you have to know what is constant in order to see something that is surprising.*
  - b. *Story is an attempt to make sense of the complexities of the universe, in a way that gives it handles that we can understand. It condenses the reality of what occurred that is so immensely complex that no-one could possibly ever repeat it or convey it or even know it, and put it into a form that is understandable by other people for the parts that is important to people.*
3. How would you feel or what would it be like if your everyday objects had stories to tell you of its life?
4. What is one everyday object in your home that is ordinary, yet extraordinary? How much interaction do you have with it? (i.e. share stories about it come occasion, or just know that it is significant)

##### **PART THREE**

1. What is your general impression of the aesthetics of the stories you just heard?
2. What is your sense of time progression in the stories you heard?
3. Lets go back to the object you mentioned earlier. How would it change if it had this story aesthetic? How would you feel or what would it be like if your everyday objects had stories to tell you of its life?
4. Any comments?

**PART TWO**

***What you are about to hear is an audio sequence that represents the life of the bench.  
Listen to the audio sequence and answer the following questions regarding the story aesthetic.***

Please specify your gender:        male    –    female

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**Story 01**

How much time does this audio sequence represent real life? (*circle one*)

1 min -- 5 mins -- 15 mins -- 30 mins -- 45 mins -- 1hr -- 6hrs -- 12hrs

Who might have constructed this story: (*circle one*)

Human    –    Machine (i.e. bench)

Describe exactly what took place.

Describe the general quality of story, time and duration you just heard: (*use 3 or more adjectives*)

What was particular about this story? (ie. Something ordinary, extraordinary, point-of-view, pace, etc)

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**Story 02**

How much time does this audio sequence represent real life? (*circle one*)

1 min -- 5 mins -- 15 mins -- 30 mins -- 45 mins -- 1hr -- 6hrs -- 12hrs

Who might have constructed this story: (*circle one*)

Human    –    Machine (i.e. bench)

Describe exactly what took place.

Describe the general quality of story, time and duration you just heard: (*use 3 or more adjectives*)

What was particular about this story? (ie. Something ordinary, extraordinary, point-of-view, pace, etc)

**Story 03**

How much time does this audio sequence represent real life? (*circle one*)

1 min -- 5 mins -- 15 mins -- 30 mins -- 45 mins -- 1hr -- 6hrs -- 12hrs

Who might have constructed this story: (*circle one*)

Human – Machine (i.e. bench)

Describe exactly what took place.

Describe the general quality of story, time and duration you just heard: (*use 3 or more adjectives*)

What was particular about this story? (ie. Something ordinary, extraordinary, point-of-view, pace, etc)

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**Story 04**

How much time does this audio sequence represent real life? (*circle one*)

1 min -- 5 mins -- 15 mins -- 30 mins -- 45 mins -- 1hr -- 6hrs -- 12hrs

Who might have constructed this story: (*circle one*)

Human – Machine (i.e. bench)

Describe exactly what took place.

Describe the general quality of story, time and duration you just heard: (*use 3 or more adjectives*)

What was particular about this story? (ie. Something ordinary, extraordinary, point-of-view, pace, etc)

**Story 05**

How much time does this audio sequence represent real life? (*circle one*)

1 min -- 5 mins -- 15 mins -- 30 mins -- 45 mins -- 1hr -- 6hrs -- 12hrs

Who might have constructed this story: (*circle one*)

Human – Machine (i.e. bench)

Describe exactly what took place.

Describe the general quality of story, time and duration you just heard: (*use 3 or more adjectives*)

What was particular about this story? (ie. Something ordinary, extraordinary, point-of-view, pace, etc)

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**Story 06**

How much time does this audio sequence represent real life? (*circle one*)

1 min -- 5 mins -- 15 mins -- 30 mins -- 45 mins -- 1hr -- 6hrs -- 12hrs

Who might have constructed this story: (*circle one*)

Human – Machine (i.e. bench)

Describe exactly what took place.

Describe the general quality of story, time and duration you just heard: (*use 3 or more adjectives*)

What was particular about this story? (ie. Something ordinary, extraordinary, point-of-view, pace, etc)

**Story 07**

How much time does this audio sequence represent real life? (*circle one*)

1 min -- 5 mins -- 15 mins -- 30 mins -- 45 mins -- 1hr -- 6hrs -- 12hrs

Who might have constructed this story: (*circle one*)

Human – Machine (i.e. bench)

Describe exactly what took place.

Describe the general quality of story, time and duration you just heard: (*use 3 or more adjectives*)

What was particular about this story? (ie. Something ordinary, extraordinary, point-of-view, pace, etc)

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**Story 08**

How much time does this audio sequence represent real life? (*circle one*)

1 min -- 5 mins -- 15 mins -- 30 mins -- 45 mins -- 1hr -- 6hrs -- 12hrs

Who might have constructed this story: (*circle one*)

Human – Machine (i.e. bench)

Describe exactly what took place.

Describe the general quality of story, time and duration you just heard: (*use 3 or more adjectives*)

What was particular about this story? (ie. Something ordinary, extraordinary, point-of-view, pace, etc)

## 5. Human Interpretation Interview Transcript

### Human Interpretation Study – Interviews

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#### What is a Story?

##### Subject 1

It is either a fiction or non-fiction that someone tells about an event that is either real or made up. It can be passed down from generations; it could be something that someone makes up on the spot. It's a telling of something, whether it be visual or auditory or written.

##### Subject 2

Story is a very personal, retelling of an experience that I might have had or that I have heard about it from another person. So I often describe it as a conversion of a raw experience into something that is enunciated, you reflect upon it, and as you tell it over and over again it changes and it embellishes depending on your new experiences.

##### Subject 3

Something that is used to tell something about someone else's life or something like that to another person, like if they aren't there.

##### Subject 4

Story is a description of an event towards some specific theme. I agree that there could be a specific theme or an event that happened during some period of time.

##### Subject 5

A story is someone else's experiences, whether it happened in real life or as a metaphor. But it is someone else's experiences in life. A story won't be a story unless it is engaging to me. When I think of stories I think of kindergarten because you sit around the teacher, and there is a book, and she reads to everyone, and when I think of story I think of that always for some reason.

##### Subject 6

It is a narrative of something that has taken place, either in actuality or in imagination, or in extrapolation. Our culture tends to look at story at one level. There are other cultures that look at story at three different levels simultaneously. The complexity of what you get from it or don't get from it has a lot to do with that.

##### Subject 7

It is a series of an event in a narrative way, in which tells you things that happened that can go into a form.

##### Subject 8

A story is a description of some past or future. A story is a description of some event related from one person to another.

##### Subject 9

A verbal description or a written description of a series of events as seen by a particular person.

##### Subject 10

A story is a recounting of events that may or may not have some larger meaning to the listener or the teller.

Subject 11

A story is a sequence of events that has an overall point and has a manner of telling.

Subject 12

A story could be pretty much anything that you make up. It could be real or it could be fiction. It could tell some kind of narrative of events.

Subject 13

A story is some kind of narrative about either what's happened in the past or something that someone has come up with in their imagination.

Subject 14

A story is something that happened in the past or something that people normally tell each other.

Subject 15

A story is a sequence of events that add up to something larger than its parts.

**Subject 1**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

My bed

*Before experiencing a storied object:*

I think it can be interesting. My bed is ordinary because most people have one and it is there everyday. But it sees a large portion of my life. The stories it would tell would be currently really boring, but not always.

*After experiencing a storied object:*

Well I think part of it is that if you put anything, an inanimate object into a situation to tell a story obviously it is going to change that story somewhat. If you put a video camera there and people see it, they are obviously going to react differently than had the video camera not been there. I think the same with the bench. So I don't necessarily know if I have a definite opinion as to whether inanimate things should tell stories or not. I think that it depends on the object and the time and the story.

**What was your overall impression of the aesthetic of the stories you heard?**

Poor sound quality. There was a lot of wind that made it hard to sort of hear other things that might have been going on. In the beginning it was sort of distracting and after a while I sort of get used to the wind. But the wind was very distracting on the microphone.

*Interviewer: Was it easy to distinguish between man and machine?*

Some of them, depending on the editing. It was easier to tell when there was conversation going on. Because the person isn't going to edit mid-conversation whereas the machine may not know the difference. But there were a lot of background noise, so it was really hard to tell.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

I think feelings were more of an impression, because if you look at my answers lot of them say thirty minutes because that is one of the things the subjects had said. None of them really felt like a set amount of time but definitely a progression of time. But it could have been five minutes, it could have been five hours.

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**Subject 2**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

My mother's scissors

*Before experiencing a storied object:*

As a kid, I was always fascinated by my mother's scissors that she used for sewing. Because it had a serrated edge and always had bits of threads hanging off it from all these different garments. So it was kind of worn down and sticky. And then because she is a florist, she has a lot of scissors for cutting flowers, cutting stalks. They always held this trace that they cut, which seemed brutal what they've done. They created this really beautiful thing and they had this residue and the fact that they had residue of all the things that they cut and the threads that would have been there. And the fact that my mom is both left and right handed, means that she would flip them all the time, so they were equally worn down on each side. So you could always tell, she preferred one for one hand the other for the other. So I thought that was always interesting because she brought them with her to places, and they would come back with bits of things on them that I don't know what she's been doing with them. I guess probably because when I was a child they were completely forbidden to touch them. So I couldn't use them but I could kind of pick them up and look at them. I think that is why I was always interested in scissors.

*After experiencing a storied object:*

Well I would be curious as to how it could do that. Is it that you scan the bio and kind of goes sprinkle through all its memories and you just get this cloud and you get this vision just like when you are about to die, you life flashes before you really quickly and is that what happens to with the scissors? And then after I see that, I don't know if I was looking at that for a minute or two seconds or a year. I think there is something that people imbue objects with sentimental value anyway. Particularly objects with very little monetary value, like you have a cherished teddy or something. Obviously people like have their diamond ring and sometimes that is more sterile than if you have this totally battered teddy that other people would find worthless. Because of your emotional attachment and the experiences you had going through it together. It is like breaking into a pair of jeans. They have this memory of all the ways you sit the same way and you have your wallet in your back pocket the whole time, so it is all cut out in a particular way and they tell a particular story because you wear your jeans rolled up on one leg because you cycle your bike all the time so when you see some these jeans you are like it is telling you as an object of clothing, how this person wears them and what they do with them. It would be nice if other objects like benches can show wear and tear but you can't really tell what happened on them, when did people fall in love, when did people sit here and find out, they failed all their exams, when did someone sit here and feel completely at peace. They are things that would be nice to recapture.

**What was your overall impression of the aesthetic of the stories you heard?**

Well I think that it is something that I am not that familiar with. I think that we are over saturated and we understand what visual summary is or visual time-lapse is. We are so over-saturated with visual imagery that we are not used to sitting down and just listening and imagining that edited back in our minds. And when I think back of an experience I have I think of these moments, but it is very much visual rather than thinking like 'I heard this then I heard the sea and then I heard the cars going by'. So I think it as interesting as having an aesthetic of a mixture of conversation and ambience. I really felt like the sense of the recording was somebody listening. Some of them felt

more like the aesthetic was that it was this machine that was listening constantly all day. And others were more somebody actually physically sitting here and they are almost directing the sound.

*Interview: So you could tell which was a machine and a human?*

Well it is hard to tell because I felt which one was more edited. We have a natural tendency to try make something balanced, so you might want to have a nice mixture between a snippet of conversation, here is some ambience, lets cut it up in a very rhythmic way so that we feel that it is representational. And that you are not just going to cut off conversation because we have this particular way of like 'ambient sounds and wait until the siren sounds fade off then I will cut it' and if somebody poses a question, and they would probably like to hear the end of that. So I think that kind of aesthetic is naturally to us even when you remix something.

*Interviewer: Did those segments trigger memory when you heard sirens, birds, etc?*

I lived in front of a firehouse for over four years. So it reminded particularly of the three sirens and you could hear one quickly followed by another, and a little while later there was another one which was a different one, which I am sure was a police siren and the first two were fire engines. So that was kind of intriguing to me. And that a lot of the sounds were really similar, you could hear like the wind and then the trees and hear something else.

*Interviewer: Were you able to run off with your imagination sometimes?*

Totally because I am trying to think what time of day that is and when you hear people playing soccer I presume in my head that they were playing soccer because they were banging the ball because they were hitting the ball against the wall as well and I was like that is interesting. You got the feeling that I could totally imagine the person sitting here with the blindfold on and the curious tone the people took with them and you could really visualize and imagine what that experience was like or what that space was in some way.

*Interviewer: Did you notice that the blindfolded person was talking to the bench at one point?*

I liked the talking to the bench. I like the mixture of hearing to the kiddy voices, and laughing and of them playing. And then adults having these other conversations.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Definitely, particularly there was one story where the very start the guy says 'oh I am doing this experiment, it's going to take an hour and I am sitting here for an hour' and obviously that segment finishes with you going 'we're finished'. So I am like obviously that was an hour and that gave me a real concrete sense. Some stories pretty much sounded like, a lot of them were pretty much the same sounds. But you can tell they were sequenced differently. You weren't getting the long thirty seconds of conversation but instead of like the 'hey' and so we were moving much more quickly through this information. But then I kind of feel like maybe it's not that symmetrical, I am not thinking that it is sixty minutes so we are just going to parse it into twenty sections. What if I find the most interesting sections as the first five minutes? And the rest of it is just like condensed down into thirty seconds. So

I think that was something I was trying to work out. Well is this what the machine or the human finds the most interesting or is this the representative sample of every broken down into sections of the amount of time that was there? So I sometimes felt that maybe more the directed sounds like sirens, birds, were kind of placed more strategically than kind of just the ambient like the planes kind of goes through all the way.

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**Subject 3**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

A chair

*Before experiencing a storied object:*

I think it would be kind of boring because it would be the same thing over and over again. Because it doesn't change that much if you are a chair because you don't move. If the chair disappeared one day, probably I would want to know what happened to it when it reappeared.

*After experiencing a storied object:*

I would definitely feel different sitting down. Like I know upstairs they have the huggable bear with the cameras in the eyes, it is sort of something like that. You don't look at the bear the same anymore, 'it's like watching me' 'i'm not alone anymore'.

**What was your overall impression of the aesthetic of the stories you heard?**

I thought it was really kind of bizarre first. I guess it was interesting to think of actually like the inanimate objects being able to tell a story. It was kind of hard to get your head around that idea at first. But it seemed kind of easier as it went on to actually think about that.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

It seemed like more time passed when there were people talking. It seemed easier to because there was something to hold on to because when it was just ambient noise, it was like was that a minute, five minutes? It was hard when there was no speaking.

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**Subject 4**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

Door

*Before experiencing a storied object:*

It would be nice. The door knows who came in and who came out. The door would always listen to the inside and outside. So it could be like a

boundary, so it pretty much knows what is going on in my house and around my house.

*After experiencing a storied object:*

Right now, I picked up on a lot of random noises, not random but ambient noises. And most of the time the door might hear those sounds. But for my point of view, it could record some of my life, it could log my life. (*Interviewer: if it logs your life, does it become the object's point-of-view or your point-of-view?*) If I see that it could be my point-of-view. So although it could be an object's point-of-view, that could reflect my life. In that point-of-view, it won't really change my point-of-view. I might behave a little bit differently.

(*Interviewer: of because of the whole recording thing?*) Yes.

(*Interviewer: but how about thinking more about the expression side? If this whole recording thing was okay, that you accepted it, but how would you feel about objects having other means of communication regarding its own experiences?*) if objects can express their feelings, not feelings, but an accumulation of what happened during its day time or something, I don't know. First thing is that if it records everything and knows my behavior, then I would behave differently towards my objects. Because not only me but other people could hear about the story. So for the communication purposes with other people I might treat this object differently. Like a video camera, if you had a camera, they have eyes, so you might behave differently so you expect that other people might see that object but particularly I can't imagine that I will treat that camera as a person. But I will behave differently.

**What was your overall impression of the aesthetic of the stories you heard?**

There were a lot of wind going on, and sometimes I could not hear a lot of human voices. It seems like to me the human voice was the key point to what is going around here. But I could still hear some trucks, passing by birds singing, particularly the first two stories, I heard like a kid, a mother playing around the bench. Those are human voices but they are not words. So I could still pick up some of the sounds that indicate that there was a story going on. Also I also heard some kids playing, like some kind of sports, I don't know. Bunch of kids bouncing balls. (*Interviewer: They were playing soccer. But what was your impression? Because you pointed out particularities you heard.*) My impression is that, it is hard to explain. (*Interviewer: So you pointed out particularities, so when you heard bits and pieces of that did it remind you of something or did it allow your imagination to flow to different spaces?*) Oh yes. I felt like I am in different spaces. So for each story I felt like sometimes I was in the gym, or sometimes on the side of the street, or sometimes I was in a park, is that a valid impression? (*Interviewer: That is interesting because all of the audio originated from this exact spot.*) That is true, because I imagined certain things using different ways based on the sound.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Yes, I felt time. Little bit sometimes I have to reference based on the conversation. So some conversation took that and when the second conversation took place, then I could imagine that how much time has elapsed between the two. But also I could hear some birds singing but I

didn't know whether the birds sing in the morning a lot or in the evening. But I could feel some kind of time lapse.

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**Subject 5**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

Family first car

*Before experiencing a storied object:*

I would be intrigued. Because I always humanized the car that my parents drive in. I always feel like when you look at the front, it's a person, it has expressions, it was born in a sense, it wants to tell you that it works hard in the rain and the snow. So I was really sad when we sold that. We have cars that I don't have that kind of attachment to. It's always that first car. So I would be very intrigued if everyday objects had stories because I would love to listen to them all.

*After experiencing a storied object:*

I want it to talk to me. Like as if we would have a conversation. I don't want to heard what it heard or see what it saw. I want to talk to it. (*Interviewer: so it is more of an emotional connection?*) I haven't really talked to machines before because I have never been a study subject for that. When you talk to someone, you just learn so much more about the person, just by the way they emphasize how they define story and I think that is interesting. (*Interviewer: did you hear any emphasis from the bench today?*) No, other than when you said it felt lonely. But actually the woman you were talking to were making some really interesting commentary. But I think through her I was learning more about the bench. It is almost like the bench can't say anything but it projects itself through her to talk to me. (*Interviewer: but how about when the bench thought that the birds or the sirens were significant enough to tell.*) But those weren't significant enough for me. It just felt like someone just dropped it while she was sitting here. If it were important, I felt like that it should have been louder or not only that, the other noises that weren't important should have recede back. (*Interviewer: so it sounds like that the human conversations made you connect to the bench's story more?*) Yes those were more obvious.

**What was your overall impression of the aesthetic of the stories you heard?**

It makes me feel like I am people watching except I am not seeing the people in front of me and I am trying to figure out what is going on. Like the first one I thought there was a fire. Because I heard things that sounded like fire. Maybe it was a speaker, and some wind and some static noises or whatever. I didn't feel like there were any storyline to any of the clips. Because I would hear things drop, it sounds like it was a microphone attached to a person, or just on the bench, and records whatever signals it receives. It doesn't discriminate what is significant and what is not. (*Interviewer: how would you define significant?*) From my point-of-view, how I think of it is, if the bench wants me to feel what's going on, like the serenity of the surrounding

then it would emphasize the leaves rusting and planes going over head, maybe someone walking by. But if the bench wants me to watch as something unfolds, maybe someone is having a conversation and then suddenly they decide to go some place they want to eat then I should know that without listening to someone just shuffling their feet. To me that is significance. It just takes a lot of sounds and it chops at weird places to, I would hear the end of a clip in the middle of a conversation or hear the same thing randomly inserted into another story that just doesn't seem to make any sense. (*Interviewer: one of the goals of storytelling is to make it episodic. That is why there is no storyline. So going back to significance, how do you feel about the people you hear were just passing by and it wasn't really the bench's conversation and that they weren't sitting on the bench?*) I guess I am too far away from the people passing by then, or maybe that is just the quality of the speakers, I don't know. Most of the things I heard was fogged up by this huge-like pressuring sound. So I cant really understand what was being said, I can hear laughter, but I don't know what they were laughing about unless they are speaking directly, I can't make out exactly what's going on. (*Interviewer: did the bits and pieces, like the sirens and such allow you to imagine or let your imagination run?*) Yes. But after like the third or fourth clips, I think my imagination just stopped working because I was imagining the same things over and over again. (*Interviewer: where do you think the stories came from?*) I think it's right here. Because I just saw the person bouncing the ball and just heard it, I was even thinking you were recording it live and listening to exactly what was going on. The plane that was flying ahead was sounding exactly like the one I heard. And you mentioned MIT so I was thinking that it must be somewhere in MIT.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Other than the fact that I saw the one person bouncing the ball and I heard the plane, this could have been anywhere else on the streets or maybe not on streets, because I would have heard more noises, but by a suburb street or in a park, it could have been anywhere else. I could not have any way of distinguishing it. I think in one of the clips where you actually said in the clip 'good morning everyone', just before you said that I thought it was night. That was the only time I was thinking about time.

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**Subject 6**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

Microphone stand

*Before experiencing a storied object:*

I don't know because on the one hand it could be really cool. It would give you an objective view of your life that you wouldn't have. I am thinking about the couch or the recumbent bike, which we nick-named the barker lounge. Or in my case it would be interesting if the microphone stand could talk. Because it not only spends time in my house but it also goes out with me on the road. So that would be kind of cool. On

the other hand, it is kind of creepy. The idea that things in your house can keep track of you, kind of has that element of big brother to it, if you are not careful. (*Interviewer: I think where it becomes tricky is that it in story it doesn't remember every detail.*) Right so if you can put together the narrative, actually it would be really neat in terms of my living room since that is most of where I do my practicing, my working because you could actually come up with a story behind the song. That would be kind of cool.

*After experiencing a storied object:*

I think how you put it all together and it would be more of a verbal thing than a soundscape that you would hear. Whereas this thing where it is you get more of the ambient soundscape with the birds and the saccades, trucks in the distance and stuff like that. Whereas something like a microphone or microphone stand would be telling a much more verbal story by the nature of what it is viewing.

**What was your overall impression of the aesthetic of the stories you heard?**

By in large they tended to be freeform and somewhat rambling. But the ones, and I wasn't expecting this with human interaction, I found it more interesting because you started to, especially with Audio Expert One on the bench, it was the first one I felt that I was seeing the story from her point-of-view being blindfolded. That was kind of cool. I thought I would enjoy the ambient soundscape more and yet I found usually by the end that my attention would be wondering. (*Interviewer: when you heard different events such as birds and sirens, did it allow your imagination to run into different spaces?*) No, I found myself too much of an adult trying to make order out of them than just letting my imagination go. Probably because I was writing.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Yeah, I would say so. In fact I found it hard to try and guess how long the time was for any given thing.

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**Subject 7**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

My stove in the kitchen

*Before experiencing a storied object:*

I would feel that I could understand a little bit better when things go wrong with whatever I do with it. You know whether I am treating it poorly or treating it right, that I am giving the proper care to it, and what else I can do to take better care of it.

*After experiencing a storied object:*

With the compression of time (like a week or so), it would be easy for me. Because it saves time and for example, if I was cooking for one moment and after I finish and I didn't clean it, but I cleaned it six hours later, you know that would make me feel better to know that I cooked and made things messy but at the end I finally cleaned it up. It

is like a sense of closure that 'I am doing the right thing or the wrong thing'. (*Interviewer: what if your doorknob had mechanisms to tell you of its life?*) well it would probably tell me my times and my schedule, and how much I am in a rush and how much tension I have, the way that I press it on or I slam the door or trying to get in really quick and it would be able to tell me how was my day or how was my week or so. (*Interviewer: so then that would be more of a story about you and not the doorknob?*) Exactly. Well because it is an object and I don't know how it would have feelings like 'clean me up'. Yeah the story would be about me.

**What was your overall impression of the aesthetic of the stories you heard?**

Some of them were a little bit choppy. If I could make sense of what was happening it wouldn't bother me to be choppy. I heard birds, sirens, cars backing, and sometimes it was hard for me to distinguish whether it was a real airplane or an airplane from the soundtrack. (*Interviewer: So when you were listening to those events, did it make your imagination run into different spaces?*) Yes it situated me to where the story was happening. It put me into a place and was very rich. (*Interviewer: do you think that all the stories you heard today was about the bench here in this place or somewhere else?*) At least 60% of them were here in the bench, and couple of stories by a guy, he went through, because it sounds like a tunnel at one point where water was dripping out of it or something. That was my impression. And I couldn't locate that over here. And when it was raining, I am assuming that it can be here. (*Interviewer: so it definitely situated the whole experience?*) Yeah.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

All except for one: when you and Glorianna were talking about the bench. (*Interviewer: so it was conversation that made you think that it was more a defined time, a short period of time?*) Yeah. There was also another one that was conversational but that conversation was choppy, and I am thinking that it was more segments of what was happening that day during the periods of hours. (*Interviewer: so there you felt as if there was time?*) Yeah and also in the other stories which was quiet and then it started raining, stopped raining, then quiet again and so on.

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**Subject 8**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*  
My refrigerator

*Before experiencing a storied object:*

So like if my refrigerator told me a story and wanted to relate to me, how it fit into the universe. Like how often are you opening me Quinn? And should you be really doing that? Because in the bigger sense of things there are people who aren't eating as well as you are and I notice that you are not eating very well and that concerns me. Let me tell you a story about who uses me and what happened to them. That would be interesting. Little guilt-ridding like a mother or a car,

telling you where it's been and all the adventures it been on. Yeah that would be interesting.

*After experiencing a storied object:*

It could be smell, it probably is what a refrigerator does based upon its smells it gives you. Actually that would be interesting. Maybe in a store - replaying all the perfumes and colognes that pass by during the day. Or you could probably gain some sense of type of people that walked by. (*Interviewer: is it surprising to you that all the bench's stories happened here in the same spot?*) At first I thought it was a park actually like where I lived, because that is what I was imagining in my head. And then there was another story where I heard airplanes flying over head, and maybe I thought they moved the bench near an airport. But then as I sat and listened, I heard people going by, and then the airplane in the air while I was listening here, then I said 'okay it is probably the same bench in the same spot right here where I am sitting now'. So yeah I guess it was surprising that it was all done here initially but then afterwards it was like 'yeah I could imagine it being here, people playing volleyball over there, I could imagine kids playing with the dog over here' actually I think I even know the dog. Then I heard someone walk by with the keys jiggling and probably it was the same guy who was walking by. So it was kind of nice. After you see that story kind of morphs in your head. Before I was imagining of places I knew, or that brought back memories. But then when I realized that it was here, then the stories morphed in my head so now the location is here rather than at the other place.

**What was your overall impression of the aesthetic of the stories you heard?**

What I thought of the quality of the stories were and how they made me feel? At first I was confused because I thought it was going to be a narrative like someone talking. So after the first story started so I was waiting for speech so I thought it was background noise like someone getting ready to talk. But then when I realized what was occurring, then I could focus in on what was going on. And then as the stories progressed, I was trying to pick out and figure out 'what are these people trying to say'. Sometimes it is not obvious right away, But when you do figure it out, maybe that is what they are talking about. (*Interviewer: so when you heard different events, did it allow your imagination to run into different spaces?*) No, actually sometimes that was a distraction. But then after you finished and you didn't get anything out of it, then you went back and try to say 'maybe wait a minute, maybe that siren or maybe that car idling was the story. Although maybe someone was trying to tell a story about the bird sounds.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Yeah. In one of the stories they were setting up the game, playing the game, and then they were going or you could hear the kid saying 'look it's a dog' and then they are playing and then mom would say it is time to go, so yes you could tell there was definitely a duration of time and that something was happening through out. There were things like, there seemed to be a thunder storm or rain storm, for a longer recording you would hear it over and over and over again. But that kind of got repetitive. I guess most of the time thing was the, maybe not the humans talking. I could hear like when they were setting up a

volleyball court or something, you could hear them clanking then playing, and then stopping. So not necessarily humans involved, saying that time is progressing. I think that was a big cue. But you could get time cues from normal activity.

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**Subject 9**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

Family heirlooms: wedding rings, dresses, doilies, wooden trains that your grandpa might have made for you

*Before experiencing a storied object:*

For most of the objects in my home, these things maybe I purchased or acquired myself, I kind of assume that I know its story, sort of speak. But for things that maybe hand-me-down, or borrowed, or gifted, I think it would be interesting to know where they've been or what they've done, or what kind of interactions they've had. Family heirlooms tell interesting stories, I think borrowed children's toys could tell interesting stories, furniture could tell interesting stories.

*After experiencing a storied object:*

I think that the stories for those particular objects the type of stories would be different from the ones I have been hearing so far. Where if your grandpa builds you a toy, he is building it for a purpose, his interactions with the toy is very direct. It is unlikely that the toy really acts like a third party observer to other things going on, it very much is the focus. Where something like a piece of furniture in the case with a bench, is very much transparent to the other things happening around it. It is kind of like the flies on the wall, ability to hear things going on. So in that way some objects may be better at this particular type of storytelling but they may also you know in other ways have a different kind of story they could tell. Maybe less episodic, where one story would have a climax. So that is more of a fine-tuned idea of how an object would tell a type of story.

**What was your overall impression of the aesthetic of the stories you heard?**

Well I think I liked a lot of it and then there were things that I didn't like. The things I disliked first of all, the stories seemed to have a very uniform content which were initially less interesting. It seemed like it gradually gained more and more familiar content, things like voices and conversations. There was a level at which where I could just hear voices but not articulate a lot of conversation, that it was very pleasant because I could hear accents of things I could really imagine a lot of different scenarios that might produce what I was hearing. And it was interesting to think about what might have generated what I was hearing in those circumstances. As it became more content-filled, started to hear more dialogue, things became more concrete, I felt like I was like eavesdropping and someone talking on their cell phone type of thing, or this was a conversation or situation that was very specific and it may not really be something that I was particularly interested in. There wasn't a lot of personal freedom on my part to interpret what was happening, I pretty much knew what was

going on. So it didn't leave much to the imagination. (*Interviewer: so it sounds like you did notice those events like birds and sirens, people, and did it allow you to run with your imagination to different spaces?*) Right, at some point it was too general. Or it could have been anything but I think there is a sweet spot in between the two, a pleasant serene type of musing. (*Interviewer: did the bench situate itself?*) It did later on. It was very much present in the last two or three stories where it wasn't at all in the first few.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

In the earlier stories where there wasn't a lot of cues that I was familiar with. It was very difficult to judge how much time was passing. I felt like I was hearing rain in several occasions that kind of suggests a long period of time, going from one to another. Later on it was much easier, I pretty much know how long a conversation takes. So it is unlikely that it will vary much from what I think it would vary. So I felt like as the stories progressed my ability to judge the time that passed improved.

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**Subject 10**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

Ball, blender

*Before experiencing a storied object:*

It could be pretty interesting. It could depend on two things. One on how much interesting stuff happens to that object, assuming that it is not making stuff up which if my fridge is writing a Russian novel that would be okay. If it was something about it then I think one it would depend on what happened to that object. So for example, a ball might have had a lot of stuff happen to it over the course of its life whereas a knife block might not. But also the second thing is that it depends on how good it is at telling stories. You know a blender could tell wonderful stories if it were a gifted storyteller about what it blended. It is similar with people. Some people have very interesting things happen to them but they can't recount them very well, whereas some people have very mundane things and have a technical ability and artful ability to tell a story.

*After experiencing a storied object:*

I think it is really interesting. So there are two things. There is something more prosaic less interesting way of looking at it is that it is kind of like memory augmentation. And that you can explore, partially you run past other people's past by examining the observations of this object, which is kind of the utilitarian way of looking at it. But what is more interesting I think is, however you set up the object's what it notices and chooses and how it is editing works, I think you establish another interesting aspect of its personality. You know like it is already done in industrial design, like a blender that is a brushed metal versus a bright orange. And it feels that it has a personality to you. Like the former being get the job done and the other being sort of more playful, you'd make daiquiris

in the orange one and I don't know what you would do with the brushed metal one. Anyway I think it is interesting because it is another way of establishing a personality to an object and making it feel like it's a living thing. I think what is cool about it too is that I didn't feel like that the bench was a sentient human level thing, I felt like it was bench-like in its cognitive capacities of what it noticed, which was good, which felt more real in that way.

**What was your overall impression of the aesthetic of the stories you heard?**

I think it actually varied especially towards the end. But I would say that for the large chunk it was very imagistic or atmospheric. I guess that is to be expected. So in a sense I feel like you are transported to a different place, it's like someone put you in a place where you lie on the grass somewhere and feel like what it is like to do that. So I wasn't really feeling like there was a chain of events that I needed to pay attention to watch how things changed in a sort of plot driven way. That was fine, I felt like it was more of a painting in a way. There is a narrative to a painting, I am not saying there is no narrative to a painting, but I felt like the way it sort of things changed up and down was relevant. (*Interviewer: so like birds and sirens and other events, did it help your imagination run off to a different space?*) Yeah definitely, I felt like it was really good at doing. So what it did do, like I didn't think it was a narrative in a sense like a typical western plot structure, but it did definitely establish a pretty distinct point-of-view for sure. I felt like I was experiencing the bench's point-of-view of this perspective of life. I think that actually it was what I would experience on different benches, ones with different biases and different perspectives, some felt as if were more melancholy or older and some were younger depending on what they noticed and paid attention to, and how much time they were willing to sort of establish the prevailing environment and what's happening.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Definitely and I think that changed over time. I should also say that as each story happened I got a clear idea of what was going on overall, as if there were like three story chunks and each mini-story in that was a different perspective on a set of events. So that realization and feeling I had, influenced the way I had thought how much time things were taking. I felt like some things clued me into time, such as weather changes, where there was a weather change I felt like there was more time passing. Hearing the same person in one part of the story versus later, kind of compressed the time overall since I felt like the person wasn't returning the next day around the bench.

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**Subject 11**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*  
Money

*Before experiencing a storied object:*

It could be interesting because a story is a way of relaying a different point-of-view, and I would imagine that although not all objects of my life would have interesting stories to tell, that certain stories, for example would say, for example money, would have lots of interesting stories because they encounter lots of different kinds of characters, and they are probably involved in a lot of different people's plots, and intersections of a lot of different context. So it would be different and interesting.

*After experiencing a storied object:*

Well I think hearing the stories, it is definitely suggestive that such a storytelling mechanism could work and would be very interesting. The bench is stationary but money changes hands. And so there would be even more characters, well I thought what was most interesting about these stories was when I heard the experimenter and the subject having dialogues about the day and then I remember one of the subjects sort of ran into the people playing the game, they had a conversation, the interactions with the people were the most interesting for me, and I think that there would be a lot more of that in the sort of the money changing hands. That would be interesting.

**What was your overall impression of the aesthetic of the stories you heard?**

It was definitely very ambient and they varied a lot in terms of how editorial they were. Some of them seem to be totally unedited, where as the other seem to be very edited. Some were very machine-like, others were very social, and about people with characters. (*Interviewer: when you say unedited, what makes it unedited?*) Some of the stories had characters, had events which were segmented out, whereas other times, it seemed like the audio segments were quite arbitrary samplings of some slice of time. I heard helicopters, sirens, and birds, and people talking and people walking by, people playing basketball. It let my imagination run into different spaces, I was mainly wondering whether or not, it was at the bench or if the recording was on someone moving through space. And whether or not all those things were actually in the same location or a lot of different locations.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Some of the stories I felt like there was time passing. I felt like in one story that started out with a fire engine or the ambulance, it sort of passed the torch of from character to character. It started with the fire engine and went to like a mother and child and then went to some sprinklers and then went back to the mother and child. Where as the others were sort of all mashed together. The stories were very impressionistic.

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**Subject 12**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

My computer chair

*Before experiencing a storied object:*

I guess I could talk about my computer chair. It would probably say that I spend a lot of time on the computer. I guess it would talk about the different work that I do on the computer through out the day and how I never sleep.

*After experiencing a storied object:*

I guess it would be kind of weird because it is almost like a surveillance. But I think it would be also interesting to be able to go back to throughout your day and be like 'oh I didn't even realize like this happened'.

**What was your overall impression of the aesthetic of the stories you heard?**

Some seemed more cohesive. Like you can actually pick up a story line like there was a conversation being had or like at one point I heard a little kid like talk about a dog. Like some things were cohesive and others just sounded like they were random clips that were just edited into the story. (*Interviewer: when you heard those random clips like birds, sirens, and people passing by, did it allow your imagination to flow into a different space?*) Yeah in some of them I was trying to figure out a story outside of it. So I was making it into a cohesive kind of thing. I guess I was able to imagine certain things happening. (*Interviewer: where do you think these stories came from?*) I am not sure about the places, but I guess thinking about it now, I guess they might have been from different places. I kind of just assumed they weren't. But it definitely seemed like that they were from different times. Like the conversation between the two of them were from a different time compared to the guy who was doing the experiment. Like people were asking 'why are you blindfolded?' It seemed like those were different.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Yeah definitely.

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**Subject 13**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*

Refrigerator

*Before experiencing a storied object:*

I don't envision the things around me telling me stories. I envision them talking to me about what's happening. I envision them reacting to my presence. (*Interviewer: so it is reactive and there is no state change?*) I guess if you look at things especially things that are old, you can imagine a story or you would imagine how they were worn down or how they got into the condition that they are in. I can't... I don't... what would they tell? I think that it would be distracting.

*After experiencing a storied object:*

[audio cut due to technical difficulty]

**What was your overall impression of the aesthetic of the stories you heard?**

They're urban. All of them had people in conversations in them. They seemed also like transient places like the bench was close to a sidewalk, or street, and there were things happening around it. But there was also like an experiment going on with the bench. Because you can hear people that were participating. (*Interviewer: did you hear events?*) Yes, like birds, sirens, planes. I felt like it was here in this space until I heard kids playing on the playground or something like that. And then because it felt unlike this space, this particular spot, my imagination felt more active. Because it was like I could be kind of what's happening now or five minutes ago. [audio cut due to technical difficulty]

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

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**Subject 14**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*  
Refrigerator

*Before experiencing a storied object:*

I think I am going to choose a different one from the fridge. Because I don't think the fridge has too many things to tell at least from things that happened from some other time. Because what I was thinking about objects that tell you stories is that somehow you will be able to learn about what other people did in the past, and somehow learn from their experiences. So I think a nice thing you can learn from the fridge I guess would be how long it would take for people to use it before hand or what type of things they had in the past like the previous owners of that place, what they used to eat, and so on. So you may get inspired or you may get some ideas about what you might want to cook based on those ingredients and so on. But I don't think that the fridge is telling me something about other people but I make the inferences about other people about the things that it tells me based on the objects it is talking about. So in this case, the fridge may be talking about the food and I would be thinking about how people were because of that.

*After experiencing a storied object:*

Until now I didn't realize that it could be possible to synthesize a lot of information into one minute or two minutes that gives you an overall idea of the story itself. Yeah it gave you an overall impression. If you look at that we can say 'yes' I could see a fridge being able to give a story that is meaningful but that it is also not boring and does not interfere with what I am doing as I am using the fridge. So I think that it is do-able based on my experience from now.

**What was your overall impression of the aesthetic of the stories you heard?**

It is difficult to tell because some of them were easy to follow and some of them were more slowly and boring. Some of them were really to

the point that you can really get an idea; get a sense of what's going on. Overall the one I really liked and the ones that I didn't like, I didn't like them. (*Interviewer: so the ones that you didn't like was because not enough things were happening?*) Yeah I think they were moving too slow like the ones that had conversations. Okay the conversations were nice, it was nice to listen to someone else's conversation, but I wanted to know more and see what else was going on. (*Interviewer: you are saying that human conversation kind of freezes time?*) Yes because it is moving really slow. You cannot move apart from that. Some other stories were more about how many things were going on at the same time, you had airplanes, and then ambient noise, people talking, here and there people playing, so you kind of imagine a lot of things going on around the bench, not just two people sitting down and having a conversation. (*Interviewer: when you were hearing different things like birds, sirens, and people passing, did it allow you imagination to run to different spaces?*) Yeah I think it did. Because all of them were combined. I was able to imagine many things that were going on at the same time. (*Interviewer: so was it flavorful in the sense that it was representative of what the bench was experiencing?*) I think so. I mentioned before that sometimes I was confused about whether this was real or this was something that happened before. So for me it was hard to tell if what the bench was telling me is something that was happening right now or something that happened in the past. So just because of that you can see that it is easy for me to be able to listen to the bench of what it was saying and imagine myself as being one of the people who might be recorded. (*Interviewer: did the stories situate the bench?*) Time representation was something that was hard to tell. Unless it was going really slow and then it was really boring then you can tell time was going by really slowly. When you had the collage and had many things going on it was really hard to tell what happened because I don't want to be listening to two hours of ambient sound only because that is what happened. I only need to listen to that a little bit for me to understand that it is ambient sound and that it is a lot of things going on throughout the day.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

I think for most of them I assigned a frame to a story. Like this is the beginning and the middle and the end and this is what is happening. But then since some of them have similar things, so I can tell that something happened afterwards and something before. It was a little mixed up more than the other ones. But I did try to give it a timeframe.

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**Subject 15**

**How would you feel or what would it be like if your everyday objects had stories to tell you about its life?**

*Object:*  
Sofa, doorknob

*Before experiencing a storied object:*  
Well I don't know if I like my sofa gossiping with my doorknob, it would be like having cats everywhere. Eyes that see, ears that hear,

and little intelligences that have their own lives and their own feet to run around on.

*After experiencing a storied object:*

Well I would feel different about different appliances having that ability for one thing. There is a sort of a voyeuristic gossiping aspect of their capturing. For example, you wouldn't want them in your bathroom. You may not mind them in the living room. I do agree that these things all do have their own lives. And the way they actually report on their experiences doesn't necessarily seem to be idiosyncratic to their actual existence at least right now. I feel like I am hearing recorded audio rather than the chair's point-of-view of what it is hearing. Well it is echoing or mirroring but it is not interpreting for me. So I don't quite feel as if I've met the bench as much as I've met microphones on the bench. (*Interviewer: so in regards to that you didn't feel any distance in the stories?*) Well the different forms of editing or cutting did make things feel more or less like a story form. And the more they felt like a story form the more that I felt like that it was the bench. But the more just unrelated observational sound, the things that I didn't understand seemed more like objects than like I was dealing with a personality. (*Interviewer: so when there was some story for you to interpret, you felt more in connection with the bench's life.*) Yes I felt most connected when there was a slight explanation of what was going on verbally. But then most of it was sound. The ones that were strongly framed by verbal language I felt like I was listening on the people themselves than listening to the bench telling me about people. It was more literal and a different feeling. (*Interviewer: so human conversation takes you away separately from the bench?*) It is powerfully compelling in a way that shapes the experience and really depending on how it is edited it either brought me closer or took me away. For instance there was one story where there was some ambient and someone just briefly lets you know that it's the bench and then there is some more ambient. And I felt 'good on you bench'. If there were no human conversation, I think if the quality of the ambient sound was better it wouldn't matter.

**What was your overall impression of the aesthetic of the stories you heard?**

Well there was a pretty wide range of aesthetics. Some of them were framed by dialogue, which made things that I thought had more intellectual sense. Some of them were just like slices of experience that I tried to find connections in, and sometimes the connections were made and sometimes things would appear and reappear. (*Interviewer: when you heard different segments with birds, sirens, planes and people passing did it allow your imagination to go to a different space?*) Yes, sometimes to a degree more than others. I never really left my body over it, but there were moments where I felt like I was in a familiar place. A lot of it was that I was struggling to hear what I was understanding because unfortunately there was a lot of noise. And I don't know if it is wind noise and that was a distancing thing. But there were times when I did feel connected to the space. (*Interviewer: do you think that this type of episodic narrative helped situate the bench?*) It did in a couple of different ways. There were some stories where people verbally explained what was going on and that really had an effect on how I felt about things that happened before and things that happened after. And sometimes there was no explanation but you could tell what was happening.

*Interviewer: How about your general feeling about time progression? Did you feel time passing in each story?*

Yes in some of them I felt as if time was linear and others I knew where time was either being compressed or jumps were being made. Different stories gave me different feelings about that.

## 6. Statistical Evaluation of Part Two Human Interpretation Study (Descriptives for Each Story and Perceived Time)

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Note: the standard deviation is not applicable as the questions were nominal.

### Story1

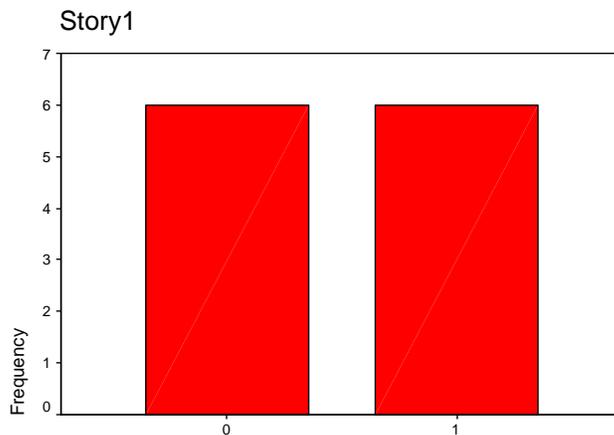
#### Story1

N	Valid	12
	Missing	0
Mean		.50
Std. Error of Mean		.151
Median		.50
Mode		0(a)
Std. Deviation		.522
Skewness		.000
Std. Error of Skewness		.637
Kurtosis		-2.444
Std. Error of Kurtosis		1.232
Range		1
Minimum		0
Maximum		1

a. Multiple modes exist. The smallest value is shown

#### Story1

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	6	50.0	50.0	50.0
1	6	50.0	50.0	100.0
Total	12	100.0	100.0	



Story1

# Perceived Time 1

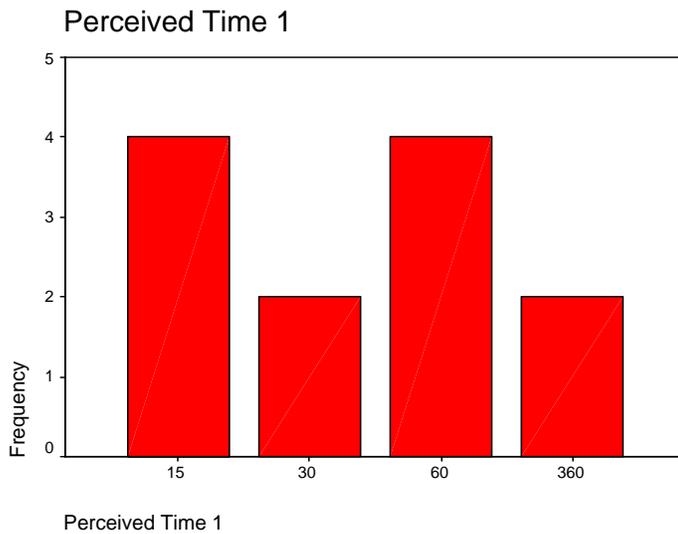
## Perceived Time 1

N	Valid	12
	Missing	0
Mean		90.00
Std. Error of Mean		36.835
Median		45.00
Mode		15(a)
Std. Deviation		127.600
Skewness		1.950
Std. Error of Skewness		.637
Kurtosis		2.377
Std. Error of Kurtosis		1.232
Range		345
Minimum		15
Maximum		360

a. Multiple modes exist. The smallest value is shown.

## Perceived Time 1

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 15	4	33.3	33.3	33.3
30	2	16.7	16.7	50.0
60	4	33.3	33.3	83.3
360	2	16.7	16.7	100.0
Total	12	100.0	100.0	



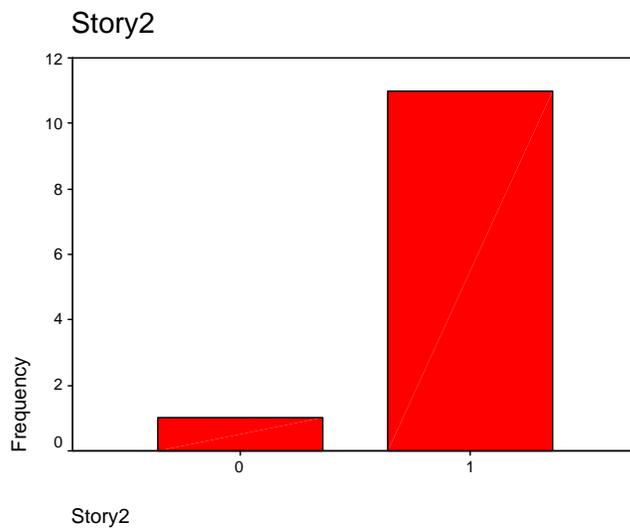
## Story2

### Story2

N	Valid	12
	Missing	0
Mean		.92
Std. Error of Mean		.083
Median		1.00
Mode		1
Std. Deviation		.289
Skewness		-3.464
Std. Error of Skewness		.637
Kurtosis		12.000
Std. Error of Kurtosis		1.232
Range		1
Minimum		0
Maximum		1

### Story2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	8.3	8.3	8.3
	1	11	91.7	91.7	100.0
	Total	12	100.0	100.0	



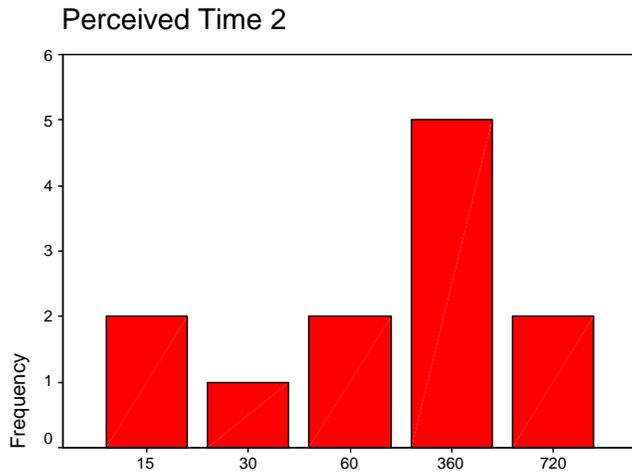
## Perceived Time 2

### Perceived Time 2

N	Valid	12
	Missing	0
Mean		285.00
Std. Error of Mean		73.786
Median		360.00
Mode		360
Std. Deviation		255.601
Skewness		.575
Std. Error of Skewness		.637
Kurtosis		-.646
Std. Error of Kurtosis		1.232
Range		705
Minimum		15
Maximum		720

### Perceived Time 2

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 15	2	16.7	16.7	16.7
30	1	8.3	8.3	25.0
60	2	16.7	16.7	41.7
360	5	41.7	41.7	83.3
720	2	16.7	16.7	100.0
Total	12	100.0	100.0	



Perceived Time 2

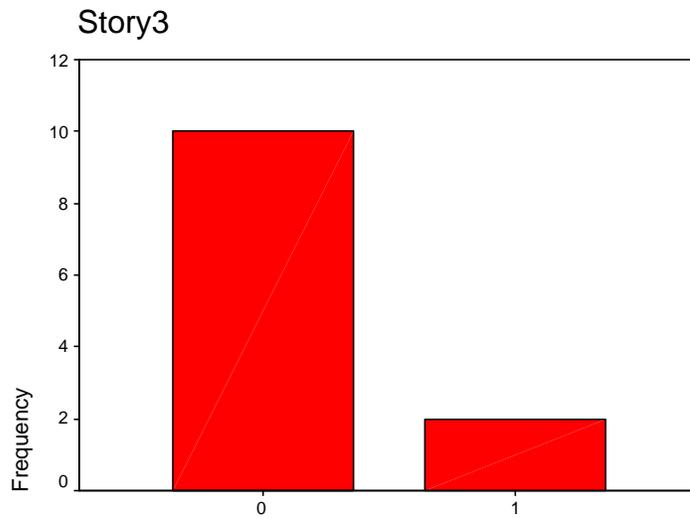
## Story3

### Story3

N	Valid	12
	Missing	0
Mean		.17
Std. Error of Mean		.112
Median		.00
Mode		0
Std. Deviation		.389
Skewness		2.055
Std. Error of Skewness		.637
Kurtosis		2.640
Std. Error of Kurtosis		1.232
Range		1
Minimum		0
Maximum		1

### Story3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	10	83.3	83.3	83.3
	1	2	16.7	16.7	100.0
	Total	12	100.0	100.0	



Story3

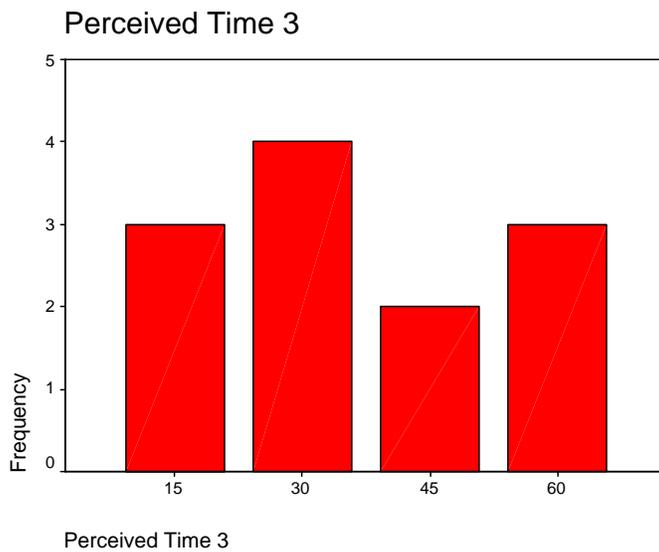
## Perceived Time 3

### Perceived Time 3

N	Valid	12
	Missing	0
Mean		36.25
Std. Error of Mean		5.042
Median		30.00
Mode		30
Std. Deviation		17.468
Skewness		.241
Std. Error of Skewness		.637
Kurtosis		-1.352
Std. Error of Kurtosis		1.232
Range		45
Minimum		15
Maximum		60

### Perceived Time 3

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 15	3	25.0	25.0	25.0
30	4	33.3	33.3	58.3
45	2	16.7	16.7	75.0
60	3	25.0	25.0	100.0
Total	12	100.0	100.0	



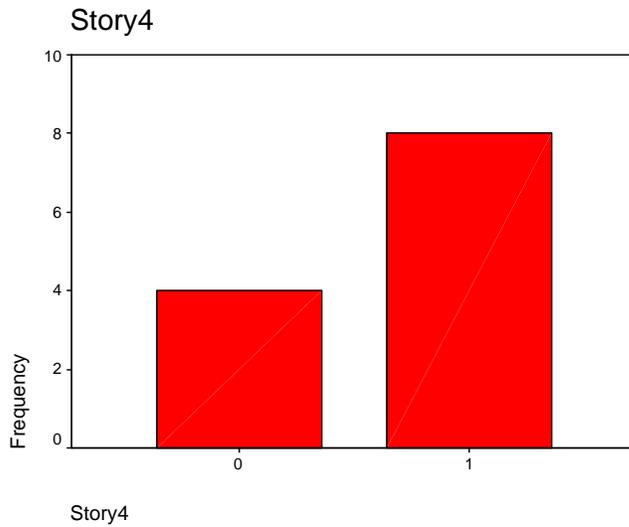
## Story4

### Story4

N	Valid	12
	Missing	0
Mean		.67
Std. Error of Mean		.142
Median		1.00
Mode		1
Std. Deviation		.492
Skewness		-.812
Std. Error of Skewness		.637
Kurtosis		-1.650
Std. Error of Kurtosis		1.232
Range		1
Minimum		0
Maximum		1

### Story4

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	4	33.3	33.3	33.3
1	8	66.7	66.7	100.0
Total	12	100.0	100.0	



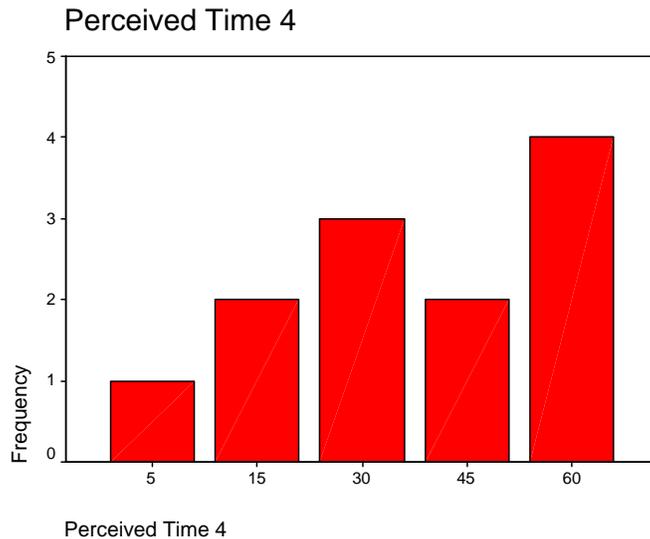
## Perceived Time 4

### Perceived Time 4

N	Valid	12
	Missing	0
Mean		37.92
Std. Error of Mean		5.756
Median		37.50
Mode		60
Std. Deviation		19.938
Skewness		-.240
Std. Error of Skewness		.637
Kurtosis		-1.347
Std. Error of Kurtosis		1.232
Range		55
Minimum		5
Maximum		60

### Perceived Time 4

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 5	1	8.3	8.3	8.3
15	2	16.7	16.7	25.0
30	3	25.0	25.0	50.0
45	2	16.7	16.7	66.7
60	4	33.3	33.3	100.0
Total	12	100.0	100.0	



## Story5

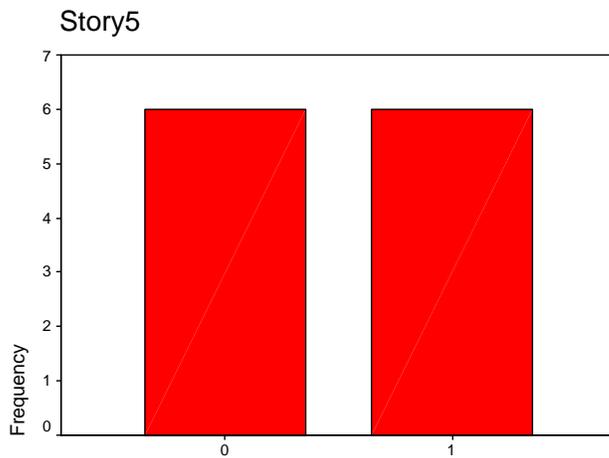
### Story5

N	Valid	12
	Missing	0
Mean		.50
Std. Error of Mean		.151
Median		.50
Mode		0(a)
Std. Deviation		.522
Skewness		.000
Std. Error of Skewness		.637
Kurtosis		-2.444
Std. Error of Kurtosis		1.232
Range		1
Minimum		0
Maximum		1

a Multiple modes exist. The smallest value is shown

### Story5

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	6	50.0	50.0	50.0
1	6	50.0	50.0	100.0
Total	12	100.0	100.0	



Story5

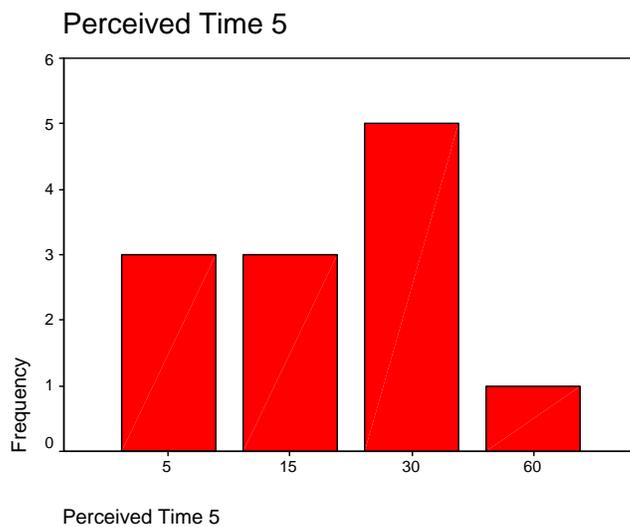
## Perceived Time 5

### Perceived Time 5

N	Valid	12
	Missing	0
Mean		22.50
Std. Error of Mean		4.585
Median		22.50
Mode		30
Std. Deviation		15.883
Skewness		1.021
Std. Error of Skewness		.637
Kurtosis		1.622
Std. Error of Kurtosis		1.232
Range		55
Minimum		5
Maximum		60

### Perceived Time 5

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 5	3	25.0	25.0	25.0
15	3	25.0	25.0	50.0
30	5	41.7	41.7	91.7
60	1	8.3	8.3	100.0
Total	12	100.0	100.0	



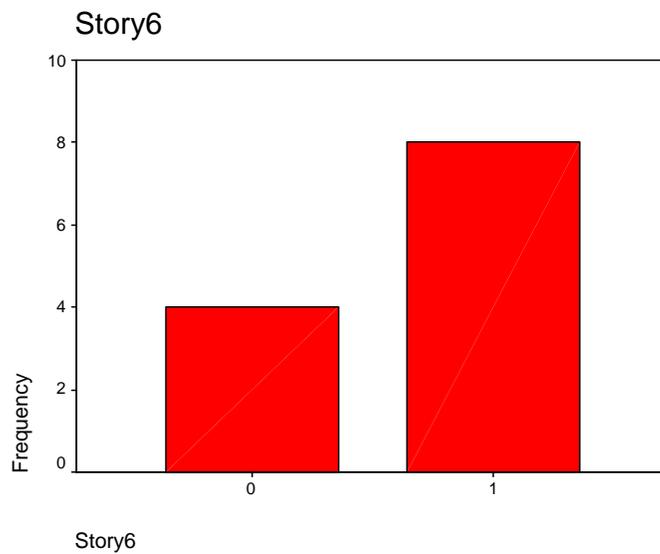
## Story6

### Story6

N	Valid	12
	Missing	0
Mean		.67
Std. Error of Mean		.142
Median		1.00
Mode		1
Std. Deviation		.492
Skewness		-.812
Std. Error of Skewness		.637
Kurtosis		-1.650
Std. Error of Kurtosis		1.232
Range		1
Minimum		0
Maximum		1

### Story6

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	4	33.3	33.3	33.3
1	8	66.7	66.7	100.0
Total	12	100.0	100.0	



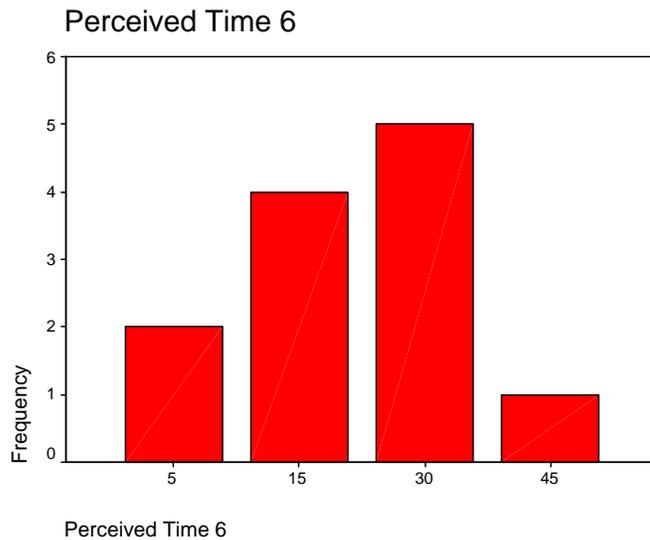
## Perceived Time 6

### Perceived Time 6

N	Valid	12
	Missing	0
Mean		22.08
Std. Error of Mean		3.506
Median		22.50
Mode		30
Std. Deviation		12.147
Skewness		.190
Std. Error of Skewness		.637
Kurtosis		-.589
Std. Error of Kurtosis		1.232
Range		40
Minimum		5
Maximum		45

### Perceived Time 6

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 5	2	16.7	16.7	16.7
15	4	33.3	33.3	50.0
30	5	41.7	41.7	91.7
45	1	8.3	8.3	100.0
Total	12	100.0	100.0	



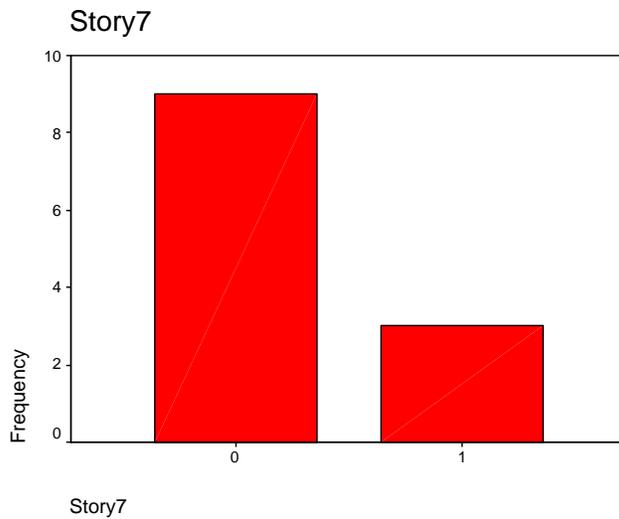
## Story7

### Story7

N	Valid	12
	Missing	0
Mean		.25
Std. Error of Mean		.131
Median		.00
Mode		0
Std. Deviation		.452
Skewness		1.327
Std. Error of Skewness		.637
Kurtosis		-.326
Std. Error of Kurtosis		1.232
Range		1
Minimum		0
Maximum		1

### Story7

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	9	75.0	75.0	75.0
1	3	25.0	25.0	100.0
Total	12	100.0	100.0	



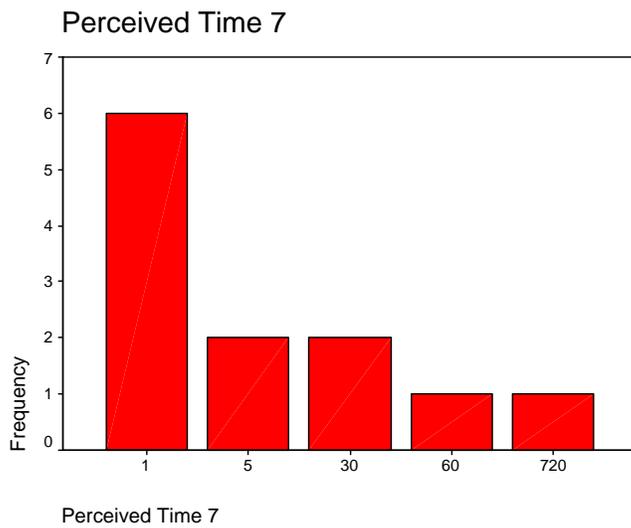
## Perceived Time 7

### Perceived Time 7

N	Valid	12
	Missing	0
Mean		71.33
Std. Error of Mean		59.212
Median		3.00
Mode		1
Std. Deviation		205.115
Skewness		3.415
Std. Error of Skewness		.637
Kurtosis		11.745
Std. Error of Kurtosis		1.232
Range		719
Minimum		1
Maximum		720

### Perceived Time 7

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	6	50.0	50.0	50.0
5	2	16.7	16.7	66.7
30	2	16.7	16.7	83.3
60	1	8.3	8.3	91.7
720	1	8.3	8.3	100.0
Total	12	100.0	100.0	



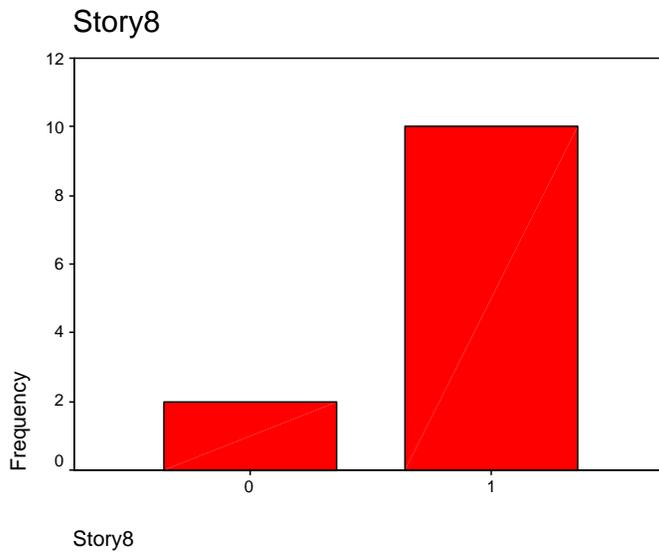
## Story8

### Story8

N	Valid	12
	Missing	0
Mean		.83
Std. Error of Mean		.112
Median		1.00
Mode		1
Std. Deviation		.389
Skewness		-2.055
Std. Error of Skewness		.637
Kurtosis		2.640
Std. Error of Kurtosis		1.232
Range		1
Minimum		0
Maximum		1

### Story8

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	2	16.7	16.7	16.7
1	10	83.3	83.3	100.0
Total	12	100.0	100.0	



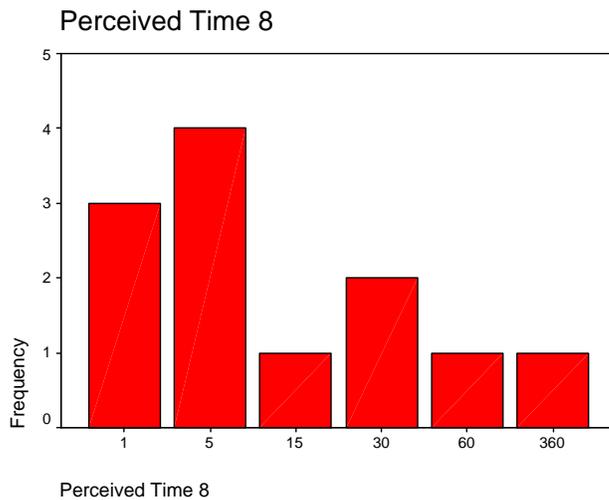
## Perceived Time 8

### Perceived Time 8

N	Valid	12
	Missing	0
Mean		43.17
Std. Error of Mean		29.254
Median		5.00
Mode		5
Std. Deviation		101.340
Skewness		3.285
Std. Error of Skewness		.637
Kurtosis		11.050
Std. Error of Kurtosis		1.232
Range		359
Minimum		1
Maximum		360

### Perceived Time 8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	25.0	25.0	25.0
	5	4	33.3	33.3	58.3
	15	1	8.3	8.3	66.7
	30	2	16.7	16.7	83.3
	60	1	8.3	8.3	91.7
	360	1	8.3	8.3	100.0
	Total	12	100.0	100.0	



A DESIGN WORKSHOP AT INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE

# Design Thinking Foundations

January 2nd -17th, 2006  
Hsinchu, Taiwan

Workshop Instructor: Hyun-Yeul Lee  
Ph.D. Candidate in the Media Fabrics Group  
E-Mail: [hyun@media.mit.edu](mailto:hyun@media.mit.edu)

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### **Acknowledgements**

The success of this workshop was possible with the thoughtful interactions and advising by Glorianna Davenport. The new design approach and theory behind the workshop originates from my dissertation work in the Media Fabrics Group, thus the workshop is named after my thesis.

This workshop was a fruitful and a learning experience as a former mentor advised me that teaching is a vocation not only about expanding and learning knowledge and skills through theory and practice, but also that it requires a big heart and patience. I have realized and learned the importance of these four qualities in teaching from my academic advisors.

The workshop participants were respectful, inquisitive, patient, self-challenging and self-motivating. As it was a learning experience for them, it was one for me as well.

The Design Thinking with Time workshop was possible through MIT Media Laboratory and ITRI NEXT Consortium.

*Up Front*

People - The researchers at ITRI are very considerate, helpful, and interesting. Be proactive and be interactive.

Work - Have an agenda. Know what you want to gain and offer during your time at ITRI (i.e. consulting, teaching, etc.)

Food - If you do not like oily food, there is a little store where you can get bread, juice and some chocolate! You can also take oatmeal and instant noodles since there is hot water on the floor of the guest house.



Weather - Hsinchu is a very windy city. You may want to have a jacket as the weather drastically changes.

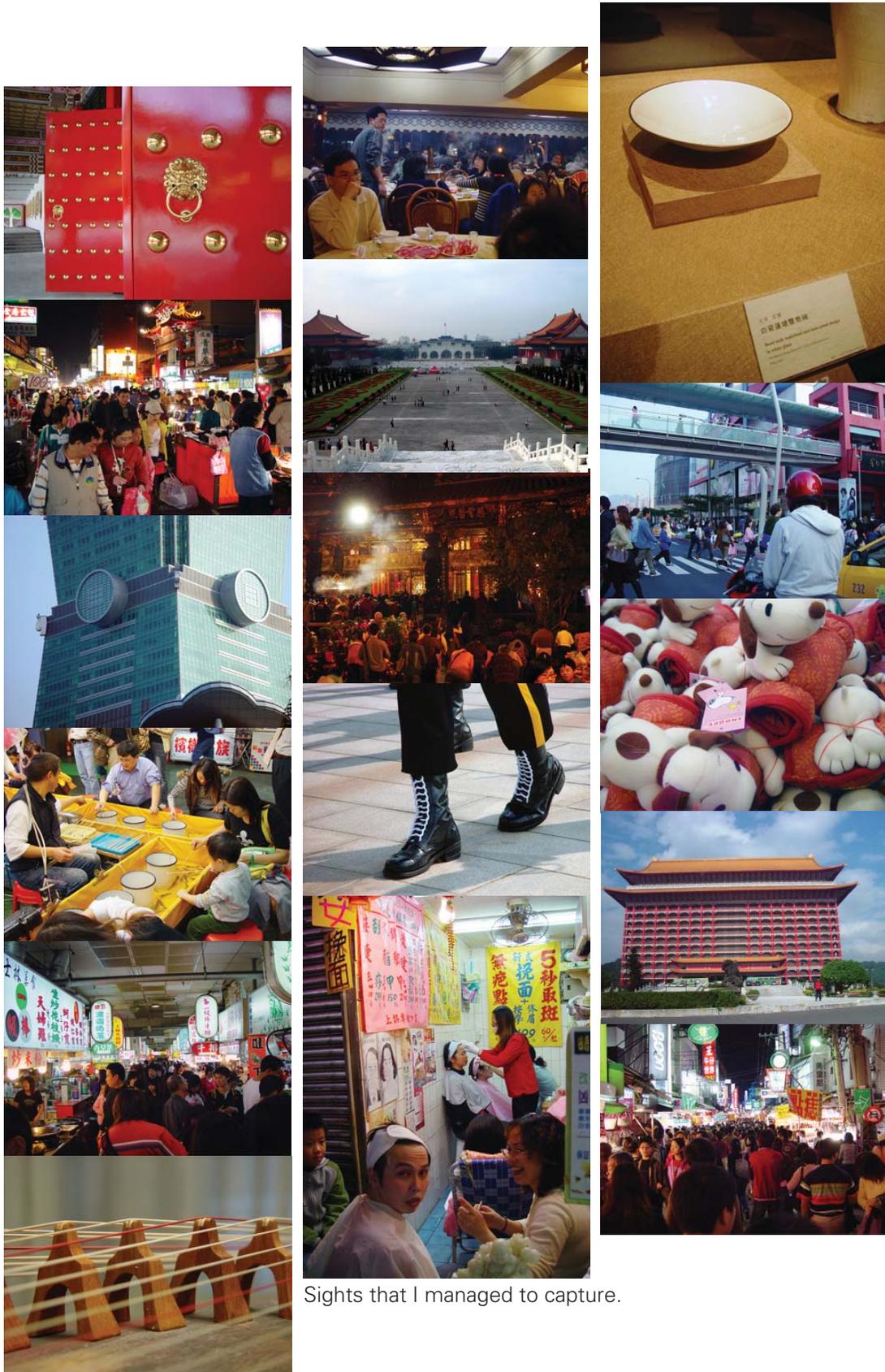
Travel - If you are a NEXT fellow travelling alone, I can recommend that ITRI Creativity Lab consider as part of their protocol to plan a trip with guidance to Taipei. My host was helpful in making reservations and one of the engineers who lives in Taipei kindly offered to tour me around for a day. If you do not know Chinese, in my opinion it would be pretty difficult getting around since English is not the country's first language. You can also join tour groups offered through hotels. If you have time, visit Taipei since Hsinchu is an older city and you may gain a different perspective on Taiwan.

Design Thinking Foundations

Food that I managed to capture.



Design Thinking Foundations



Sights that I managed to capture.

### **The Workshop Abstract**

The 3-part design workshop will expand our understanding of the theory of design methodology as it relates to the practice. We will be discussing the process of idea generation, research, and creative development; the workshop will allow us to reflect on the interrelationship between humans and objects that help define contemporary behaviors then and now. More particularly, the workshop will develop our understanding of time and feedback as these apply to idea generation and object construction. This is a hands-on interactive workshop; therefore expect to get your hands and minds busy with work!

## 8 Day 3 Part Workshop Outline

Part One: Design Thinking as we practice through Form and Function

Part Two: Objects, Time, and Perspective: Design Thinking with Time

Part Three: Experience Design: Form, Function, and Time+Narrative

### Introduction

#### Icebreaker:

Your eyes and hands working together!  
2D and 3D Formal Vocabulary

#### Monster Me!

Your Responsibility as a Designer

Your Voice

What is your Design Methodology?

What is Design?

General Design Thinking and  
Design Practice

Ecology of the Designer's  
Mind and Participation

Making Sense of Things

Designer's Stance

**On Form and Function:**  
**Designing a Doorknob**

#### Presentation and Design Critique

Media Fabrics Group Research Overview

Conveying Structure

How We Think About Structure:  
Social Presence in the Networked World  
Objects in the Physical World  
Nature

#### On Structure

#### Team work and Communication Skills

Conveying Significance and Value

Designer's Stance

An Example of One Designer:  
Dieter Rams' approach to 'Good Design'

How We Think About  
Meaning and Value:  
Objects  
Story  
Art and Design  
Sustainable Environments

#### Mind Stretching in Design

Designing Objects with Time

Designer's Stance  
Object's Stance

What is Time?

On Narrative Theory

Perception as it Relates to Narrative

Present Time:  
How We Identify  
How We Perform  
How We Capture  
How We Physically Aid  
How We Communicate

#### On Present Time: A Controlled Vehicle

Past Time:  
Beyond Form and Function  
A Hero's Journey  
History  
Breaches in Canonic Forms  
Horizon of Expectations

Objects and History

An Object that is Socialized:  
Crossing Cultures  
Meaning of Things  
Hierarchy of Needs

Time-Lapse

Sensing Technology

Feedback Loops

**On Past Time: Two Doorknobs**

**The Art of Constructive Criticisms**

#### *Legend*

**Black Text: Theory and Discussion**

**Orange Text: Practicum**

## The Workshop

The Design workshop consisted of two groups of approximately twenty people. I taught each group for three hours everyday for two weeks.

The workshop was intended to be communicative and interactive as is the practice of Design. The course of the workshop included lectures, discussions, Q&A, and undergoing the doing of making, presenting, and critique.

The workshop participants were very interesting and self-motivated. They came from different job posts and backgrounds; the group consisted of a mix of engineers, scientists, designers, economists, public relations, and managers.

My goals of the workshop was a two-fold: the role of Communication in Design and articulating the new approach of Design Thinking and Theory with Time. Communication skills are essential in Design - I tried to help them voice their thinking from both sides (designer and audience) by helping them realize a designer's intent and responsibility, presentation, and the art of constructive critiques. As for design thinking with time, it was a challenge for the participants to realize the intricacies of the temporal form as it relates to story and design. At the end of the workshop, the articulation of time as it relates to traditional design proved to be a groundbreaking mode of Design Thinking.

In retrospect, the workshop seemed to be a great success although I only had a limited amount of their time. I had great feedback such as I saw them becoming more communicative as the class progressed; the design thinking with time portion of the workshop changed the way they thought of objects in our environment; and lastly but not least, regardless of their diverse backgrounds they were all on the same page of understanding the theoretical aspect of how we may ask questions to make sense of things. Hopefully the workshop bridged their experiential gap closer between design theory and practice. Furthermore, I hoped that each student took away the newly acquired and revisited aspects from the workshop into their own settings.

*Note: The following pictorial descriptions are captured moments in time and therefore do not represent the workshop dynamics. It does attempt to show the exercised events through the course of the workshop.*

The Workshop Participants



Abe



Kit



Rita



Carrent



KP



Serena



Eugene



Lydia



Shawn



Hubert



Maria



Shu-Wei



James



Monica



Smile



Kipling



Pin-Chou



YingZ



Randle



Yu-Mei



**Icebreaker!**

Use your eyes and hands to work together to visualize an object using the 2-dimensional and the 3-dimensional vocabulary.

Object of interest: a remote control

## Design Thinking Foundations



Actually this exercise was the second part of our Icebreaker! At the very beginning of the class, we went around and introduced ourselves - such as our training, background, current affiliations, and what we liked and disliked.

Talking about what our likes and dislikes can help others quickly capture a general sense of character and cultural exposure of how we present ourselves and interact with others in a closed setting.

I recall one student named Randle professing, "I hate serious class" (his English was his second language). He continued talking about how he has a dog and how he loved racing dogs. He remained quiet afterwards.

When we broke into the core of this Icebreaker exercise, I was quite delighted to see Randle's expressions and vocabulary through his making. The exercise generically asked the students to visualize first in two dimensions, then in three dimensions of the remote control setting in front of them. Throughout the workshop Randle showed us the importance of having a sense of humor.

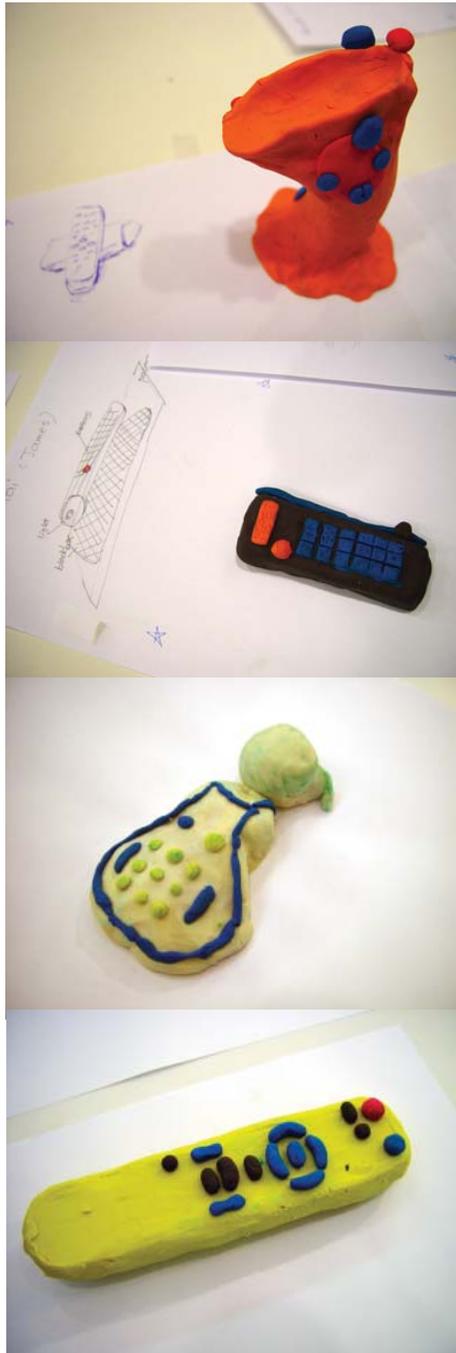
Randle was able to go beyond the 1:1 replication of what they were looking at, and incorporated his passion of a dog into his visualization. Furthermore, the other students saw his work and further pushed their expressive vocabulary in their work, in how they were seeing and making what they were seeing.

Design Thinking Foundations



*Note: Examples from the Icebreaker.*

Design Thinking Foundations





**Monster Me!**

What is your responsibility as a designer?  
Imagine your monster and tell us in writing  
about your monster!

## Design Thinking Foundations



As design communicators we cannot rely on others to realize what we are thinking and imagining. The exercise entails three parts in allowing the students to realize the responsibility as designers in communicating their ideas. I uncovered the task in each part as we progressed through the exercise; students were clearly informed of what their tasks were at the given moment.

The first part asked each individual to imagine their own monster. Then they were asked to describe this monster with much detail in written form.

Following the first part of the exercise, each student received someone else's monster description. They were then asked to translate this monster from written form to pictorial form.

In the last part, the monster visualization was returned to the original owners - the ones who wrote the monster description in written form. Once it was returned, they were to evaluate how well the other person visualized the monster in pictorial form. After the final evaluation, each individual was informed that the scoring that they just made was a reflection on how well they had originally communicated what the monster looked like in written form to the other person.

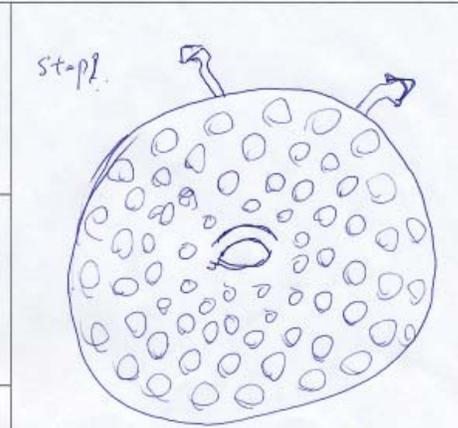
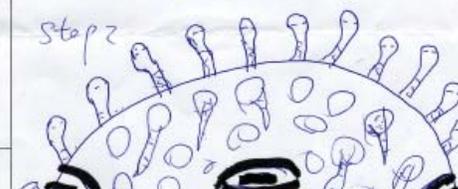
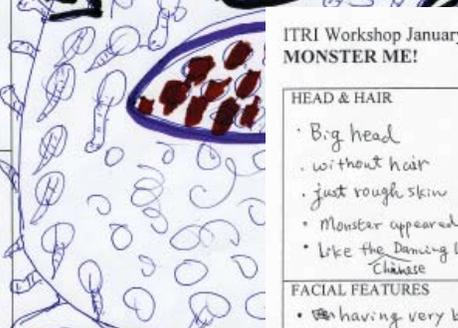


What was interesting here was that the students were initially too polite to give the other person a low score (meaning they all did well). After my pointers on how to be critical, there was a range of low and high scores. Some realized that the other person did not really translate the monster image as well as they imagined and some realized that the other visualized the monster in more creative ways than they originally thought of. This showed the class that as designers we have a responsibility in being effective and communicating as clearly as we can, and that we should also value our interactions with others.

Design Thinking Foundations

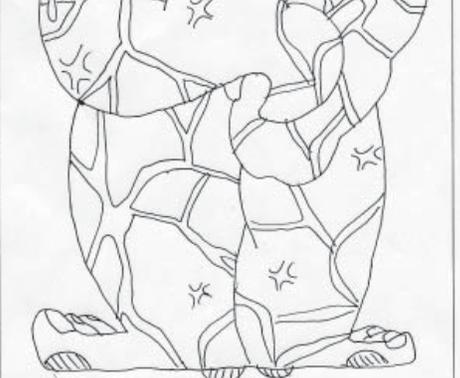
ITRI Workshop January 2006  
MONSTER ME!

NAME: shuwei

<p><b>HEAD &amp; HAIR</b> each hair is a snake, which moves forward and backward all the way. head is full of holes, where the snakes go in and out</p>	5	
<p><b>FACIAL FEATURES</b> four eyes on the face. No ears No nose No mouth</p>	3	
<p><b>BODY</b> A huge mouth right in the middle. Inside the mouth, there are many hands. No tongue</p>	3	
<p><b>HANDS &amp; ARMS</b> No hands outside the body.</p>	6	
<p><b>LEGS &amp; FEET</b> Four legs, like jaguar. So it can run very fast</p>	2	
19		

ITRI Workshop January 2006  
MONSTER ME!

NAME: Yu-Mei

<p><b>HEAD &amp; HAIR</b> • Big head • without hair • just rough skin • Monster appeared in the movie • like the Deming Lions' head Chinese</p>	8	
<p><b>FACIAL FEATURES</b> • having very big eyes • Staring at people, making people • big mouth, feel scaring. • Serious face expression</p>	9	
<p><b>BODY</b> • very strong brest • square shaped</p>	8	
<p><b>HANDS &amp; ARMS</b> • Strong • powerful • can grasp the things <del>very</del> very tight.</p>	7	
<p><b>LEGS &amp; FEET</b> • Strong &amp; powerful • without shoes • resistant to any kind of Environment &amp; chemicals • Moved slowly, but <del>see</del> firm &amp; steady</p>	6	
38 = 76		

Note: Examples from Monster Me!

Design Thinking Foundations

ITRI Workshop January 2006  
MONSTER ME!

NAME: Kyle Huang (10)

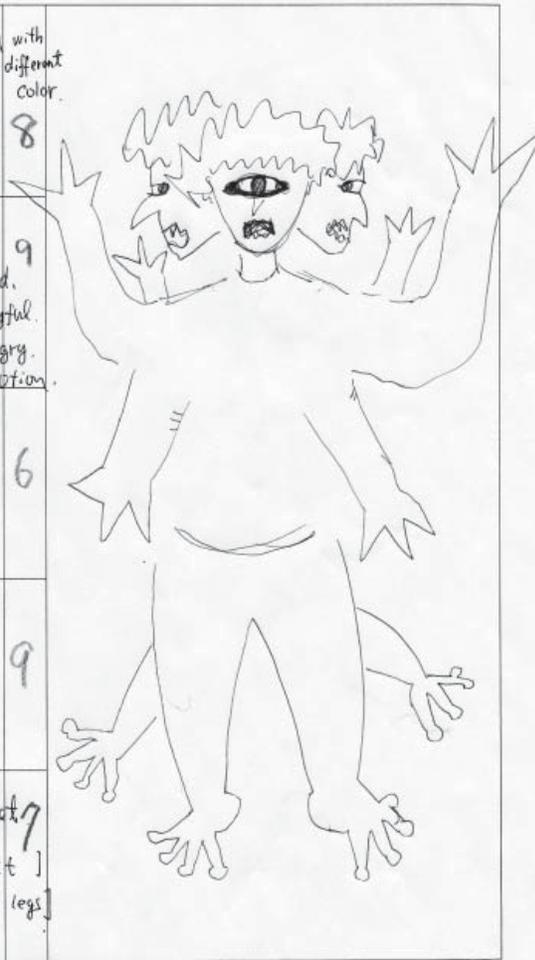
<p>HEAD &amp; HAIR</p> <p>Big head with <sup>long and</sup> Red and Green hair,</p>	10
<p>FACIAL FEATURES</p> <p>his face isn't smooth, just like a moon, <del>the</del> and full half <del>width</del> of his face was burned. his eyes <del>were</del> <sup>are</sup> green, <sup>and big</sup> no nose. have longer <del>teeth</del> teeth and big ears.</p>	8
<p>BODY</p> <p><del>he is</del> he is taller than 2 floor, his body is also full of hair, and <del>there are</del> some <del>that</del> didn't smell good.</p>	10
<p>HANDS &amp; ARMS</p> <p>Hands are bigger than a <del>... ball</del> and <del>... nose</del></p>	



ITRI Workshop January 2006  
MONSTER ME!

NAME: Shawn

<p>HEAD &amp; HAIR</p> <p>Multi-heads 3~5 head with different color. curly <del>snake</del> snake like hair</p>	8
<p>FACIAL FEATURES</p> <p>3 <del>to</del> Faces for each heads one for each face with sad. eye joyful. one mouth for each face. angry. emotion.</p>	9
<p>BODY</p> <p>sting body. (black) with spikes and small pox</p>	6
<p>HANDS &amp; ARMS</p> <p>3 finger for each @ hands. With 6 arms. very <u>wrinkle</u> skin..</p>	9
<p>LEGS &amp; FEET</p> <p>w:th frog web on the foot. Four Legs. [ Like insect ] spiders legs</p>	7





**On Form and Function:  
Designing a Doorknob**

Re-design a doorknob. Visually outline what steps you would take to arrive in redesigning the feature you have changed and developed. Why is it an interesting problem? Be prepared to discuss your general methodology and solution.



By now, the lectures have touched on the theoretical understanding of the relation of the designer's mind, designer's activity and responsibility, to how design relates to the physical world. Understanding the designer's stance is essential because it allows us to understand the importance of our interest, concern, and responsibility of a designer.

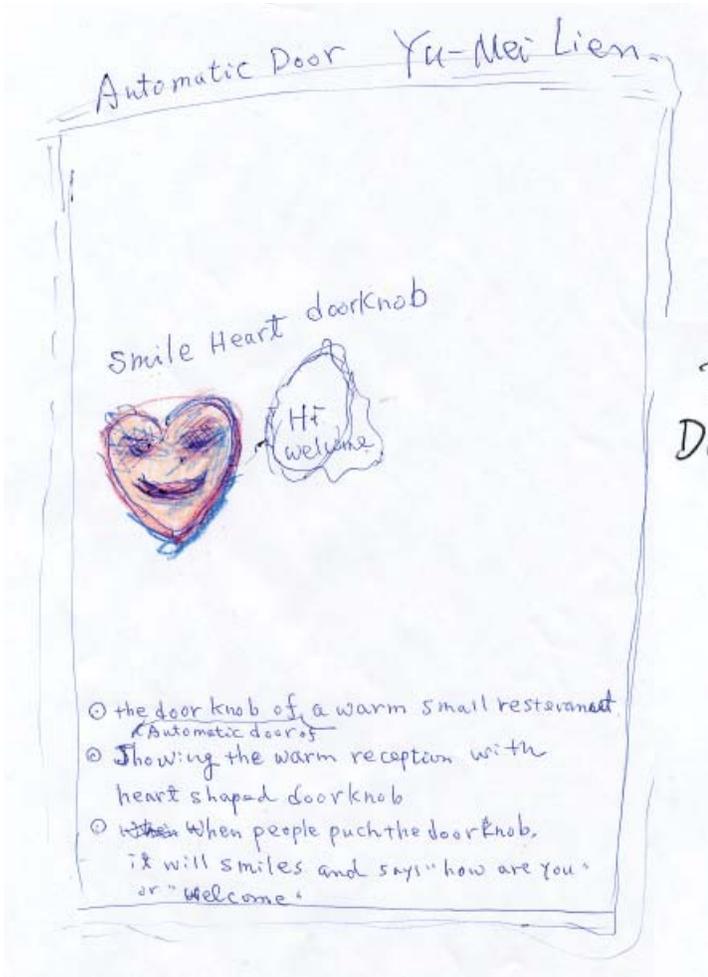
In this exercise, students were asked to re-design a doorknob. The workshop setting did not allow means for students to go out into the real world for qualitative observational studies, and therefore relied on our familiar knowledge of the doorknob, which we saw in the space. The doorknob was the object of interest for its simplicity, our familiarity, and its provocative presence.

Through different design proposals, the following aspects became salient in our discussion and related to most of the student's designs of a doorknob (in alphabetical order):

- Audience
- Beauty
- Context
- Dichotomy between digital and analog ways of life
- Familiarity
- Flexibility
- Form
- Haptics, physical interaction (i.e. touch)
- Human factors
- Human understanding (i.e. emotion, ego, warmth)
- Mechanism
- Security
- Usability and intuitiveness
- User need



It was evident that the design proposals were concerned on improving and developing the doorknob along the formal and functional aspects of the object, and that related it to the context and the audience participation.

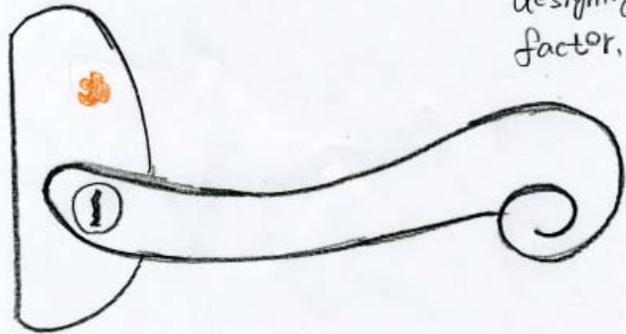
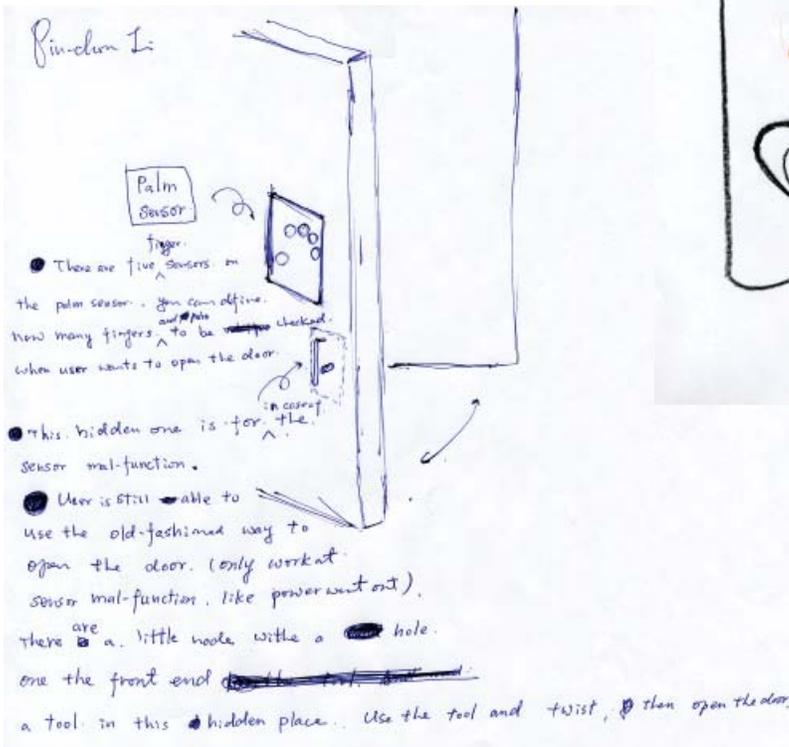


Design of Door knob

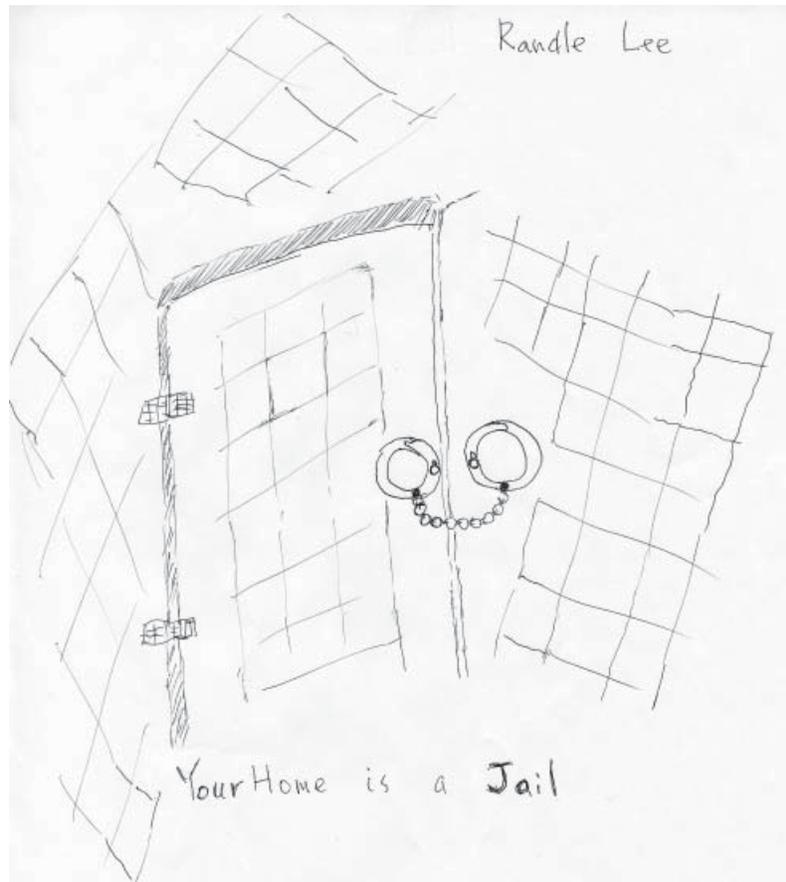
Functions:

- physical limitation
- Pivot ⇨ Focus point / Force
- = holding feeling
- instint / habits
- un lock
- indicatig
- Accessing easily
- beautiful outlook
- meaningful ✓
- playful ✓

designing factor,



Shawn  
2005.01.05



DOOR KNOB

Go in & Go out

door knob is

	a exit
	a entrance
	a direction

Inside the room / door knob is a way to go out.

① dark in the night, door knob & emit cozy light

② outside the room, the door knob project a foot print outside the door  
it indicates someone is inside the room



### **On Structure**

Design and build a structure that will hold a full soda can spanning between two tables. This structure is to be made using straws, pins, and thread only. The structure cannot be affixed to the table. Attempt to use as the least amount of straws in your structure.

## Design Thinking Foundations



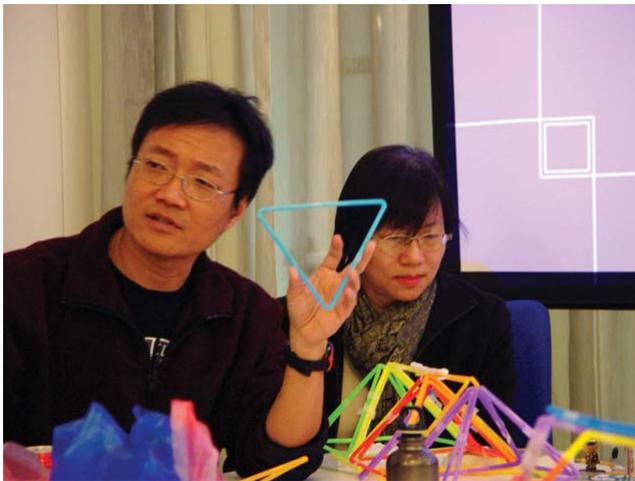
*Team work*

Teams were asked to design and build a structure to support the weight of a soda can between two tables. The success of the exercise was determined by the originality of the design, the least amount of straws used, their overall process, and team work.

It was nice to see teams that looked for and took advantage of non-specified criteria in the assignment.

The critique and discussion brought attention to certain points that were salient:

- Ways for team collaboration.
- Everyone can bring something to the table.
- Understanding the design problem.
- What do we know and don't know?
- What is the underlying concept?
- Care for time and planning.
- Simplicity in structure.
- Form in structure.
- Re-iteration in design process.
- Presentation skills and a sense of humor.

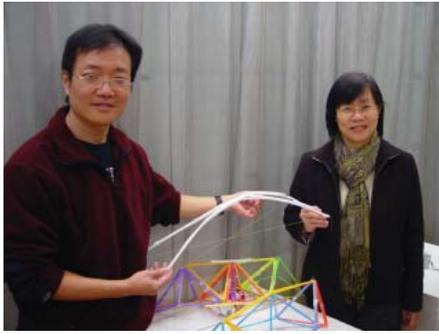


*Concept, ideation, and design process*

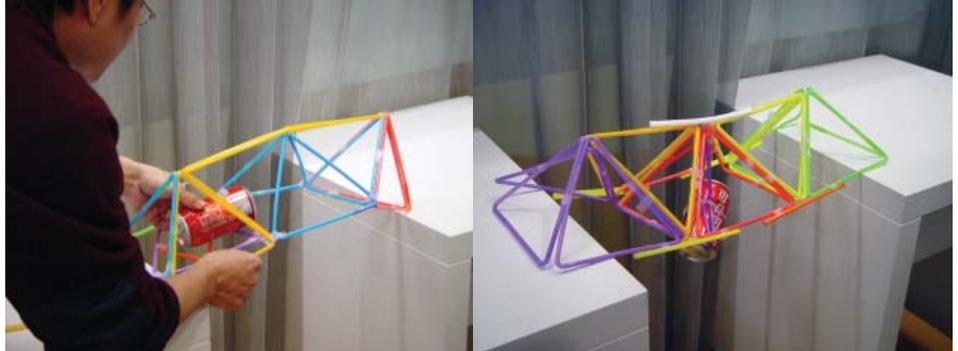


*Presentation and communication skills*

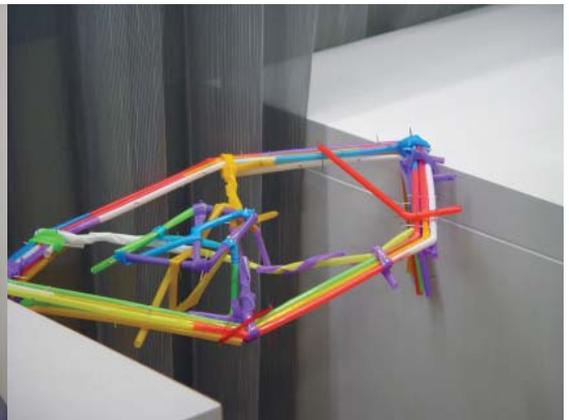
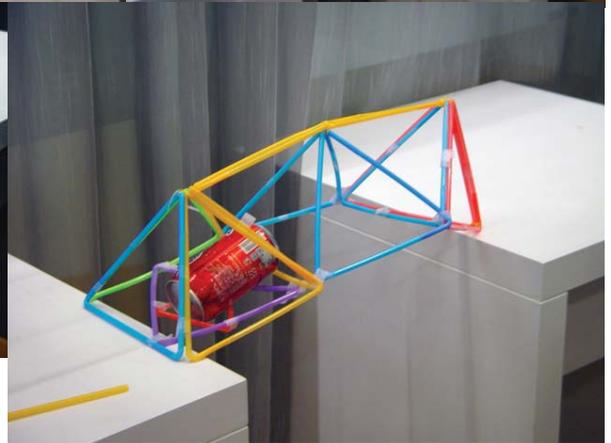
Design Thinking Foundations



Using triangles to form structure.

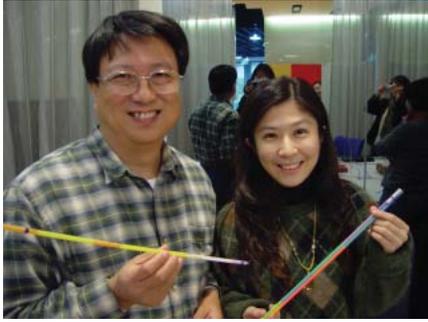


Their cheat solution was incorporated into their final solution.



Honeycomb concept

## Design Thinking Foundations



Fishing rod concept.



They simplified their efforts to using zero straws and the pins were not affixed to the table! At the end, they put a string across two tables to satisfy the requirements of the assignment.



### **Mind Stretching in Design**

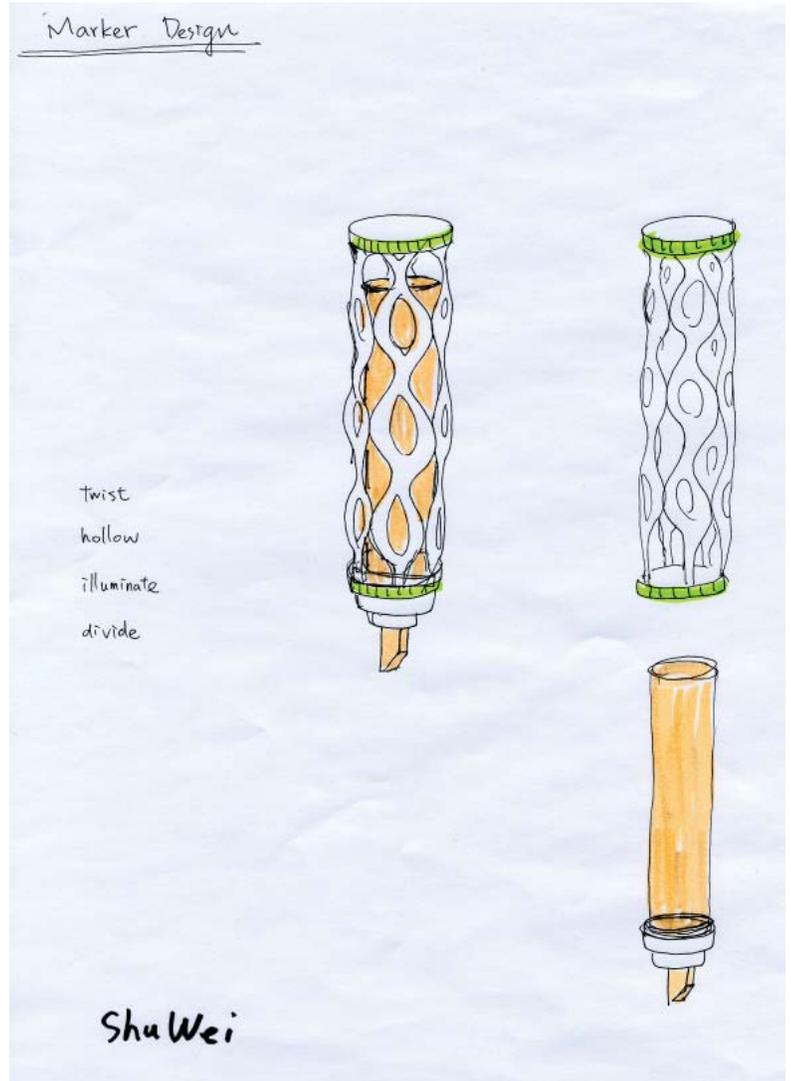
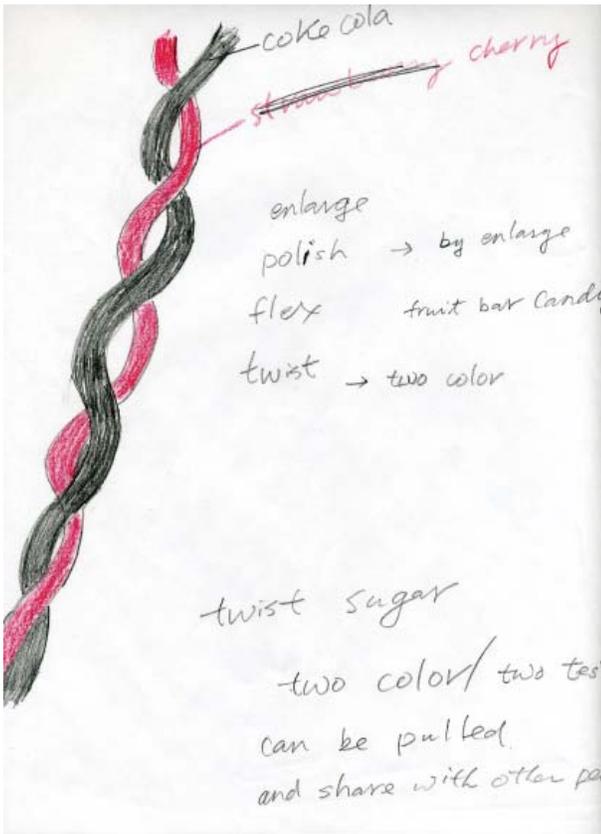
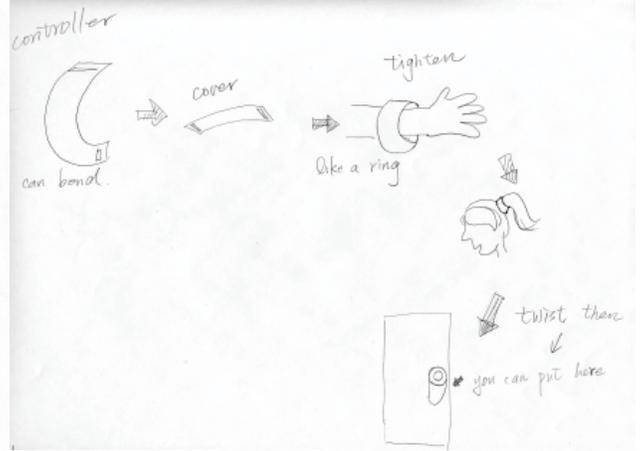
List words and phrases describing one object with value that is significantly attractive and meaningful to you.

Then find other objects (3 or more) that also carry these qualities and characteristics.

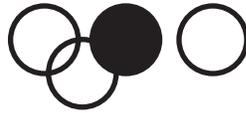
Continue on by selecting one object from your list. Draw it on paper and choose four words from the list. Try to incorporate the chosen words into the object you drew as abstract as possible to create new experiences and design features.

RT III >

Y:IT  
Divide.  
Electrify  
Draw.



This is an exercise trying to flex the mind in new ways and challenge what we already know.



### **On Present Time: A Controlled Vehicle**

Design a vehicle to move down a tightly stretched rope. The vehicle is to navigate from top to bottom in 30 seconds. Design it so that the vehicle comes close to the specified travel time.

Materials are limited to metal wire and clay. The vehicle must not damage the rope and must be portable so that you can install it repeatedly.

## Design Thinking Foundations



This was the first hands-on exercise in thinking about the notion of time: present time. It was quite interesting to watch the students problem solve.

The students come from a diversity of backgrounds from engineering, sciences, arts, and the humanities. It was interesting to observe that a third of the class had a difficult time thinking about time, and made their vehicle as a static object to look at. The second third of the class was keen on solving the engineering problem so that the vehicle would ideally meet the requirements of the travel time. This group would generally measure and calculate on paper first. The last third of the class focused on simply following their hypothesis while closely resolving the problem by trial and error.

In this exercise, Shawn was an exemplary case when it came to his final presentation - he was able to show his thought process and how he explored his ideas. He first had an understanding of the physics behind the problem. Then he tapped into the natural world and associated the vehicle problem to what he had seen in his past. For example, he thought of a pendulum, the way a monkey climbed a tree, and the manner in which dragonflies whispred through the air. He attempted to incorporate the ideas separately and together.



One of his final solutions was the dragon flies; it was simple and personal. It was made with one piece of wire, and shaped as two symmetrical dragonflies with tails. Once attached to the rope, the dragon flies travelled down the rope with such lightness and beauty almost mimicking the motion of the flapping wings, and the lightness of the ones we see in nature.

Shawn's example helped the class realize the value of a well-rounded approach and an understanding of different perspectives needed in Design.

## Design Thinking Foundations



Working in the same space is important for classroom dynamics and learning from each other.



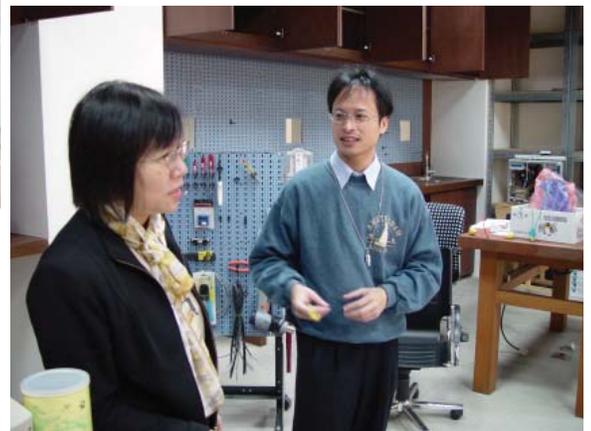
Students testing their vehicles.

Design Thinking Foundations

Pin-Chou presenting and talking about his successful trials.



James showing us his concept using a weight control mechanism.



Yu-Mei and Eugene talking about their collaboration.

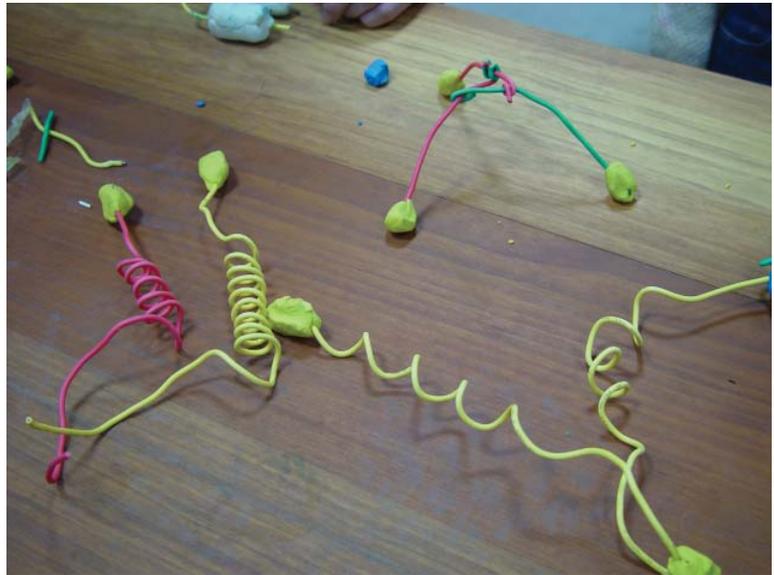


Randle talks about another student's solution and how he applied it to his by pushing it further and incorporating his ideas to make it his own.

Design Thinking Foundations



KP and Monica talk about refining their solution through trial and error.



Versions of trial and error.

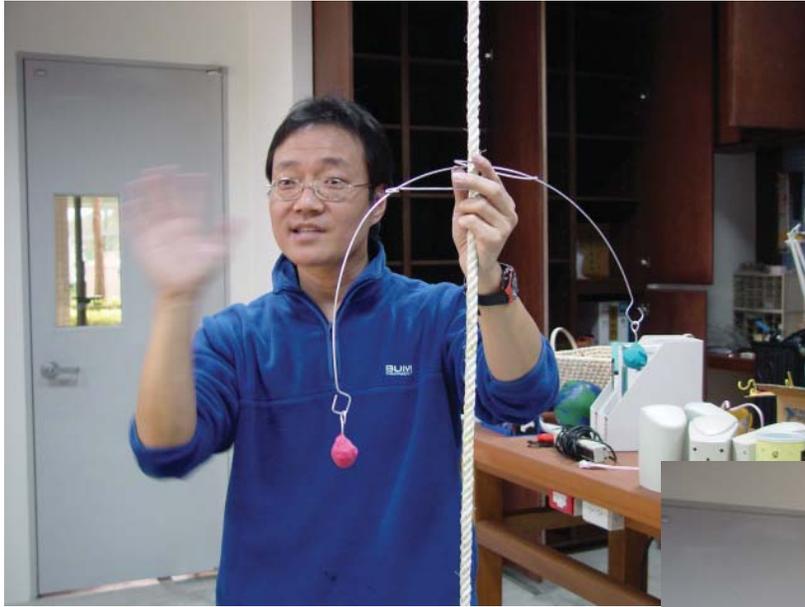
Design Thinking Foundations



Shawn presenting his thinking process.



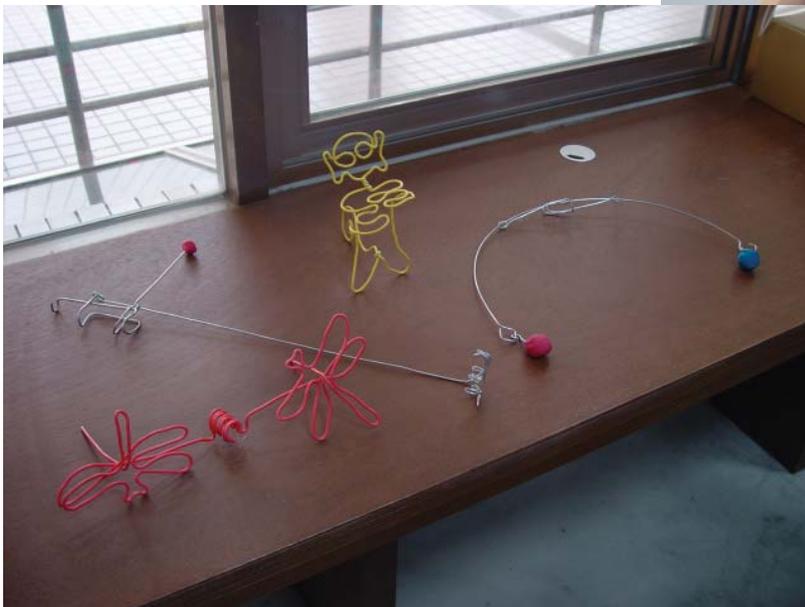
Monkeys climbing, dragonflies flying...



Pendulum concept.



The hand grasping the soul concept.





### **On Past Time: Two Doorknobs**

Design a scenario that includes 2 doorknobs that incorporate: form, function, and time+narrative.

Prepare a scenario through drawing in detail and other media if necessary. There will be a final presentation, so be prepared to use all the aspects of design thinking that we explored in this design workshop.

We want to hear your story!

## Design Thinking Foundations



The interworking mechanism between teams allowed for an awareness and a perspective of how to participate and generate a helpful and relevant discussion in addition to effective ways of presenting their design concepts.



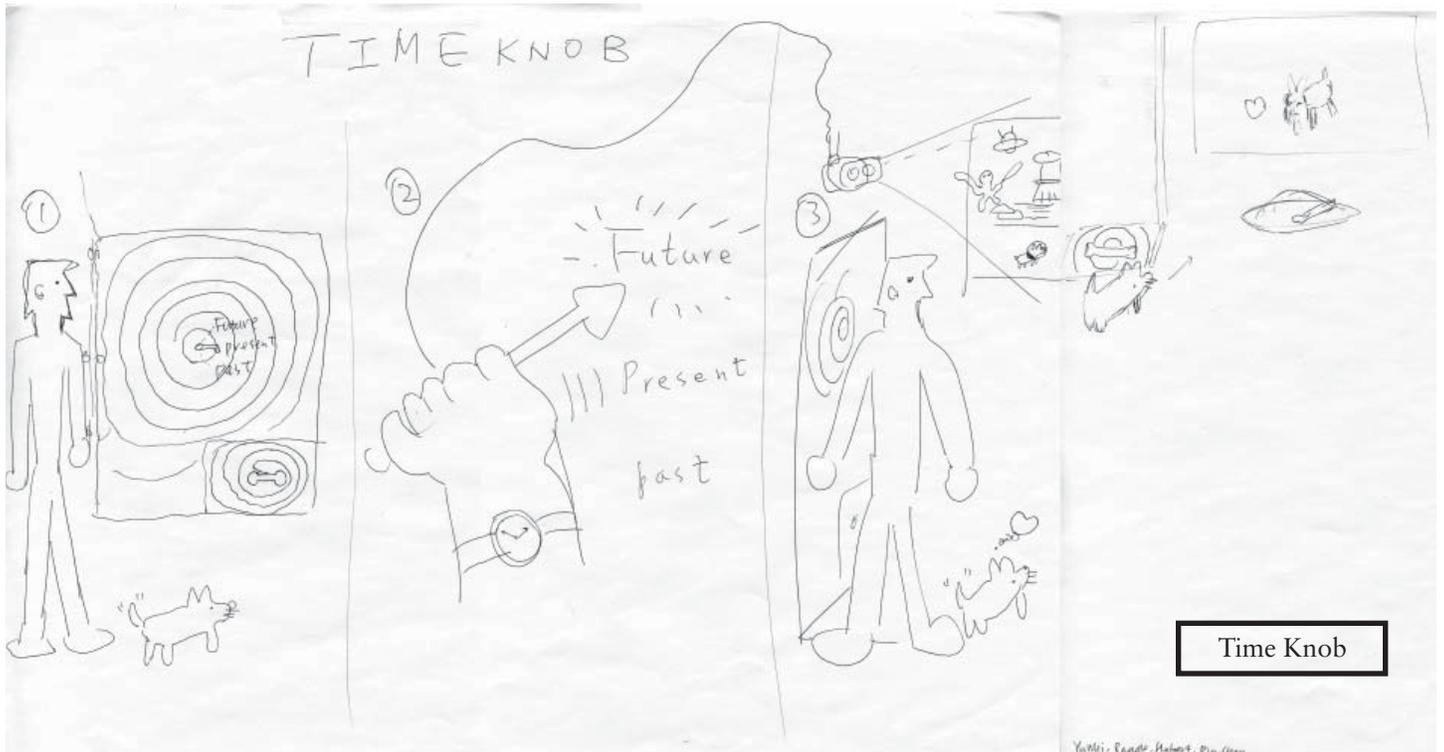
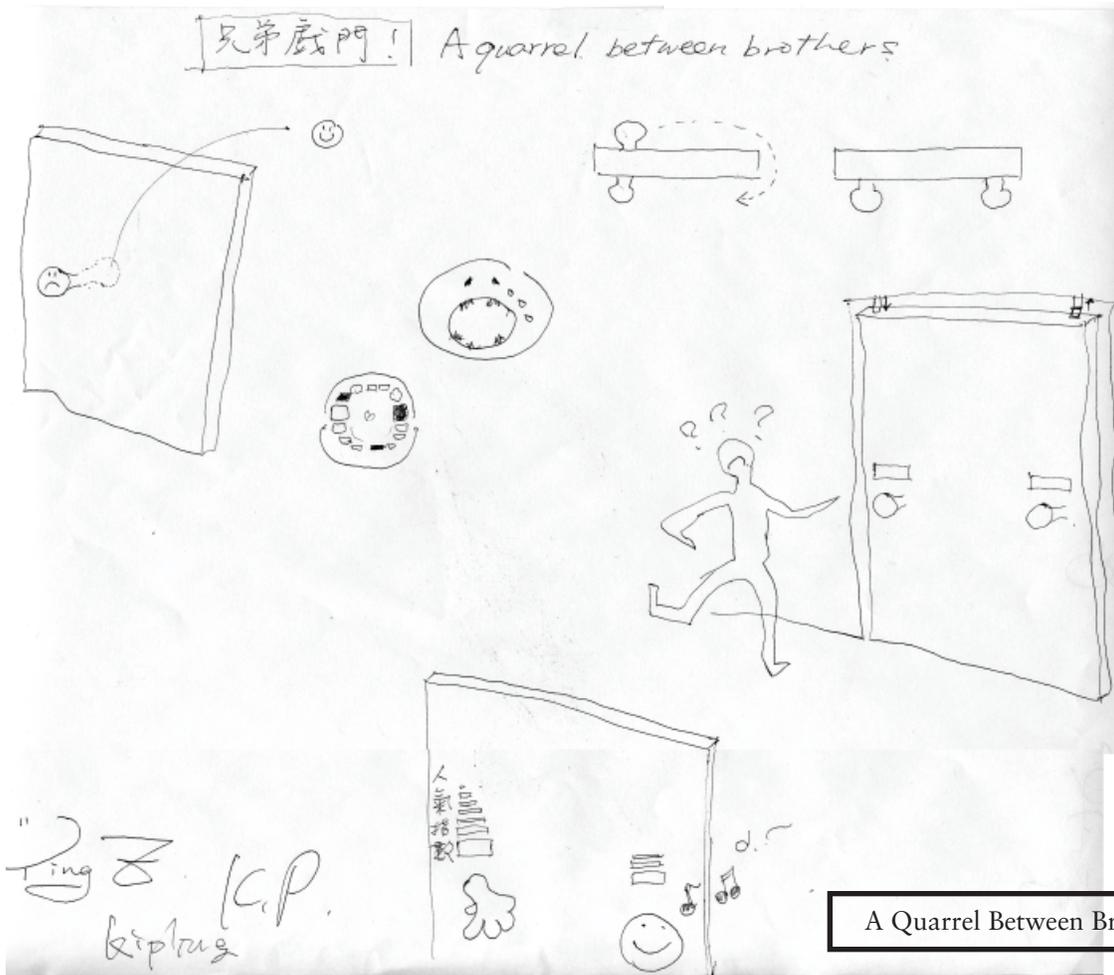
As for the design scenario of two doorknobs, students were able to shift their design thinking by integrating and satisfying form, function and time+narrative in their concepts. Students were aware of the spatial context and were able to ask why a doorknob should exist beyond its utilitarian form and be integrated into the flow of the ways in which we live in our space across time.

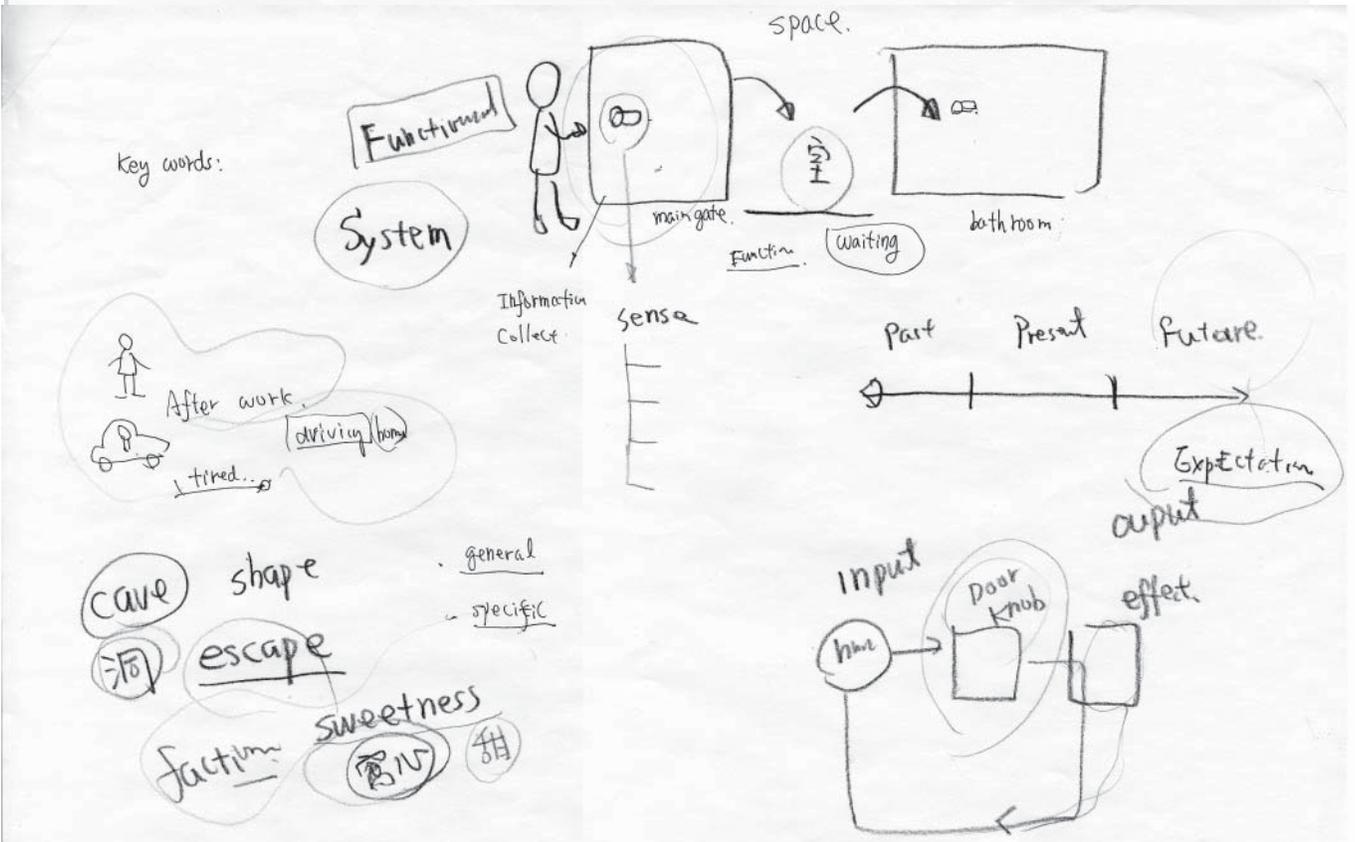
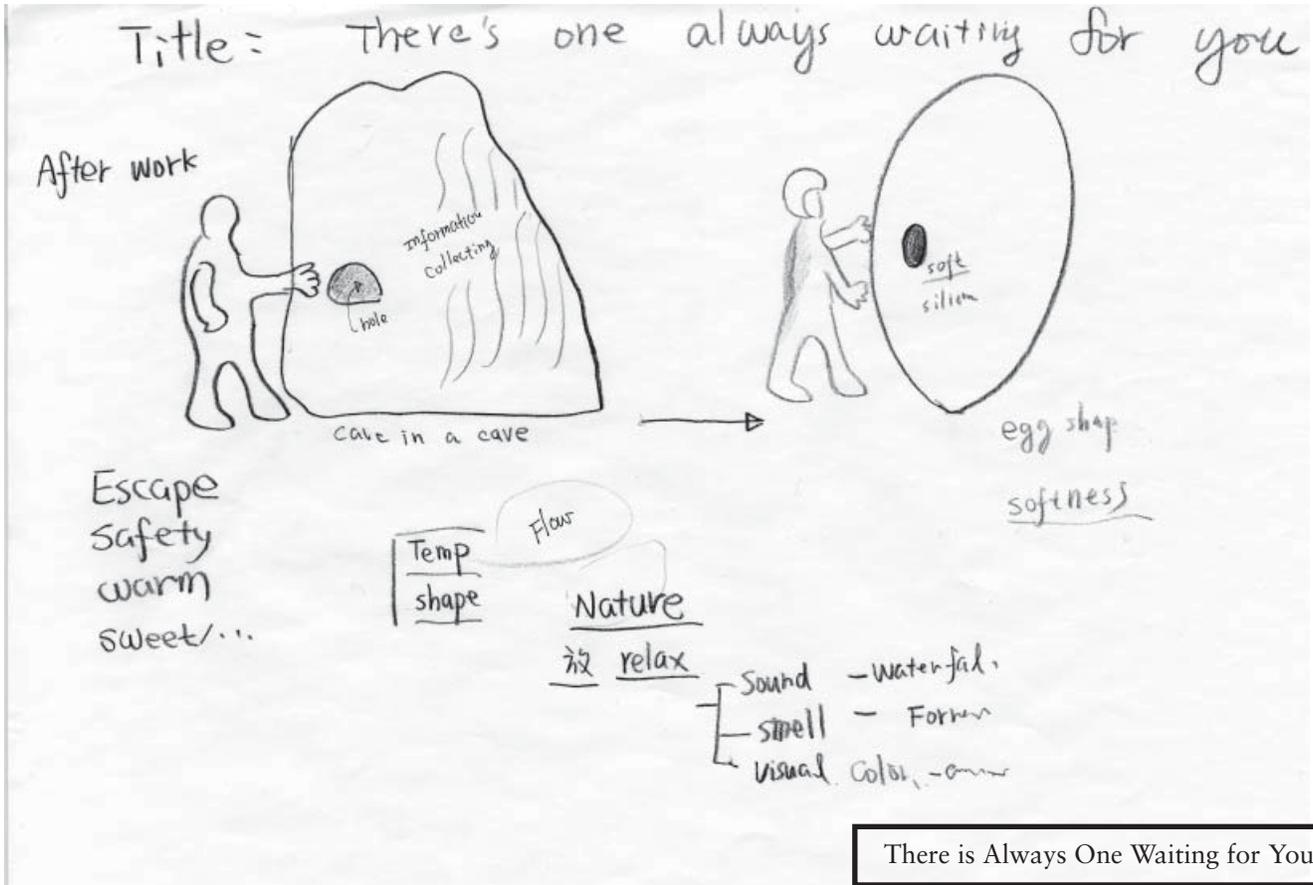


Through the workshop, students participated in critiques but the students were engaged in asking questions to clarify rather than to give constructive feedback that may also generate a discussion.

In order to better understand the art of a constructive critique, I divided the class into three teams. I assigned a specific role to each team during the critique: one team was to present; the second team was to give a constructive critique of the presentation; the third team was to give a critique of the second team that gave the critique of the presentation.







### *Correspondence from Students in the Workshop*

*Student 1:*

*It feels really great when you get to meet someone who can actually understand the situation you are facing and share her/his own experiences with you.*

*Student 2:*

*It was a wonderful experience for me to attend the design class. It really impacted on my daily routine. Usually, I kind of work alone, and not really co-work with other people. In my lab, each individual has his own charge, and we tend to pass task to next person when yours is done. Communicating and cooperation are not happening everyday in our lab. We have limited time and person to operate too many small scale projects. Well, I like the way we focus on communicating and cooperating. That helps. Too bad we have too less time to learn more. But I appreciated that I have this opportunity to attend this class and meet you. Thank you so much. I look forward hearing from you soon, and enjoy your stay in Asia.*

*Student 3:*

*Maybe you have experienced that someone to tell you that your workshop bring her/her very much idea or touch them very much. But I still want to tell you, to an programmer of ITRI, your workshop really opened a new world to me. Of course, I still have to thank all the classmates.*

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Chapter Three:

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