Introduction

> Innovation as a 'result' depends on a judgment made by an actor, designer, user, public body….with the 'action of innovating' the designers must objectively mobilize – i.e., think up, express, defend, and promote – operations, reasoning, risk-taking and resources
>
> - Le Masson, Weil & Hatchuel [1]

Our book is an opening salvo on a topic that deserves much more attention: How will clinical and counseling professionals appropriate technology as an extension of their expertise? What support systems are in place to sustain exploration? Where else might they find inspiration? We focus on three areas that appear to be significant instigators of change and innovation--they include:

- The expansion of design science and design thinking as a field of study, and its role in assisting innovation across all domains;
- The synthesis of expressive therapies and new research in biophysiology and brain science as evolving fields of clinical practice, along with the burgeoning field of media psychology;
- The work of researchers and innovators in psychology who are pioneers in the use of media technology for mental health and healing. Our contributing authors represent different strands of clinical science, and provide us with examples of what the future might look like as clinical intermediary architecture evolves.

1. The Expansion of Design Science and Design Thinking across Domains

Design, defined as the study of the art and science of making things, now infiltrates all aspects of product development across domains. The term design science is attributed to Buckminster Fuller who defined it simply as systematic design.[2] Design science can be thought of as the epistemology of production and manufacturing—in other words reflection upon the process and aesthetics of making things. In our book, the term is used to denote a new horizon for the clinical arts. The emergence of design thinking among clinicians signals a growing awareness that the context and availability of therapeutic arts do not meet societal needs, as well as the desire to integrate more complex models of

practice that reflect new knowledge. Our thesis is that changing models of mind (linear for dynamic) along with the notion of embedding clinical assessments in creative authoring tools, activities that we enjoy, or avocations that are personally meaningful, are the conceptual drivers of innovation. Sports, music, painting, or gardening are among the many options.

We ground our discussion of design science in the work of Pascal Le Masson, Armand Hatchuel, and Benoit Weil (Hatchuel, Le Masson & Weil 2005, Hatchuel & Weil 2009, Le Masson, Weil & Hatchuel 2010, Le Masson, Hatchuel & Weil 2011)[1,3,4,5] who are theoreticians and historians of design science, as well as faculty members at Mines-Paris Tech. These authors provide us with an understanding of how new research leads to innovation, including how it fails to take hold due to unfavorable management practices and economic environments. As instrumental reasoning and efficiency wind down as the guiding principles of technology's deployment in society, technological design is cultivating an appreciation for creativity as an essential attribute of design thinking and planning. Le Masson and colleagues place new emphasis on the vital role of creative design activities as instrumental to innovation. Their expertise has been shaped by over 20 years of experience in the design and manufacture of consumer products, cars, and aerospace projects. Their observation that much of future manufacturing and innovation will take place from a position of deep subject matter expertise with little or no previous object identity as a design template puts clinicians on equal footing with the rest of the design community. In other words, the media membrane in which we now live and work is morphing so quickly the specs or product identity of objects that are the output of innovative design methods are being constructed in the process of their making. Another way of looking at this is that our historical moment presents extraordinary opportunities for creative thinking and creative expression to enter into the product development cycle. Design reasoning as an overarching frame of ideas about production of media tools and objects may be attractive to clinicians – who have traditionally avoided adopting technology as an extension of their knowledge and skills – because it incorporates the language of aesthetic concerns, cultural values, emotional impact, and personal meaning, thereby elevating the traditional discourse of engineering science in purely materialistic terms.

   2.   *The Maturation of Expressive Therapies and New Research in Biophysiology and Brain Science as Evolving Fields of Research and Clinical Influences*

New developments in biophysiology, brain, and neuroscience also confirm that activity based therapies for mental health and optimal functioning play an important role in recovery, remediation of addiction, and behavioral imbalances, as well as self-actualization and personal growth. The expressive therapies are the original architects of the use of *intermediary objects* in psychotherapy and psychotherapeutic processes. By definition, an intermediary object is any object, work space, or medium that continues, advances, and expands upon the patient/therapist dialogue and therapeutic relationship. Patient/client drawings, paintings, music compositions, and dance have been studied by expressive arts professionals for several decades and qualify as low-tech intermediary relational objects. The maturation of this field in regard to theory and clinical practice is providing an important substrate for psychology's sprouting design science

because lessons learned can be applied to the construction and use of psychotherapeutic mediating objects in all media.

3. The Work of Researchers and Innovators

Over the past 25 years artists, software designers, engineers, and psychotherapists have been developing an increasingly similar shared knowledge base and tool set for creating albeit different types of human learning experiences and interactions. Contributing authors in proceeding pages provide insight into how creativity and the production of intermediary objects as therapeutic agents change hearts and minds. These investigators have led the way in the convergence of bits, atoms, and neurons in the making of unique devices and therapeutic objects with clinical benefits.

Book Structure

In quick overview, the volume is divided into three parts. Below, a summary of the main ideas presented in each section:

Part I: Psychology's New Design Science

Chapters 1-3 address the historical seeds of the use of intermediary object architecture in clinical settings; the organizational challenges for the successful creation of clinical design science; and finally the knowledge surplus in search of expression that is moving psychology toward its new frontier. Why spend three chapters on positioning a discussion about uses of media technology in clinical settings by referring to historical influences, epistemology, and organizational management? The root assumptions one brings to the integration of technology for clinical practices matter greatly. In setting a context for experimentation with new media, determining the values and model of mind one wants to incorporate into design methods or goals is the core work of any design process. Questioning whether sufficient organizational structures are in place to support innovation is also salient. In Part I, we also introduce two parameters of interest which have reduced the book to manageable size. The two major assumptions that we bring into focus in the first three chapters are:

- we conceive of the majority of people who are engaging in psychotherapeutic processes as active participants in their own healing and growth, who are capable of reflecting upon their own experience and;
- we narrow the scope and discussion of intermediary object architecture considerably by only concerning ourselves with design innovations that attend to the inclusion of a greater number of creativity issues in a therapeutic process using new technology, or novel ways of using existing media.

Part II: Theory and Research

Chapters 4 through 7 feature contributing authors who share new knowledge, discuss design considerations in the making of new projects, programs, and

devices. These activities demonstrate how intermediary objects for clinical use are serving important needs. The composite of papers represents the ontology of innovative developments at different stages of experimentation. The design experiment profiled in chapter 4 is a starting place for collaboration between a music therapist and design engineer and their students in an academic setting; their students worked together to build prototype instruments. Chapter 5 describes the research and design of a first generation video game that is used in an inpatient psychiatric setting to help children and adolescents manage their anger. Chapters 6 and 7 showcase therapeutic tools that reflect decades of research, and traverse the boundaries of clinics and hospitals for use in multiple settings. These tools employ new models of mind and cross-disciplinary thinking.

Part III: Summary & Synthesis

Chapter 8 reviews the scope and aims of the book, what it did and did not cover in regard to important issues that relate to our subject, the text's contribution to the field, an overview of the major design principles we advocated in the book, and future directions for study and consideration.

We have prominently featured the notion that design science should rightfully be presented in graduate school clinical training programs as a theoretical lens for understanding and assimilating technology. This is not a simple undertaking, and will require leadership from professional associations, identification of funding sources for experimentation, and the willingness of clinicians to engage and think deeply about this subject. We acknowledge that there were many issues we side-stepped, including a cost-benefit analysis of technology use in healthcare settings, and technology's darker and more alienating nature. We review the role of design science and the framework Le Masson and colleagues have provided for thinking about how to structure and organize experimentation so that it results in a productive outcome, and discuss emerging design activities. In summary, we also state that we would like to do a second volume that focuses more on the arts, and innovations in the use of art and media technology in psychotherapeutic settings.

End Notes

[1] Le Masson, P., Weil, B. & Hatchuel, A. (2010). Strategic Management of Innovation and Design. New York, NY ; Cambridge University Press p. 329.

[2] Fuller, B. (1965). "World Design Science Decade, 1965-1976". World Resources Inventory. This material can be accessed from the web at the Buckminster Fuller Institute: Http://bfi.org

[3] Hatchuel, A., LeMasson, P., Weil, B. (2005). The Development of Science-based Products: Managing by Design Spaces. *Creativity and Innovation Management*, 14, 345-54.

[4] Hatchuel, A., and Weil, B. (2009). C-K Design Theory: An Advanced Formulation. *Research in Engineering Design*, 19, 181-92.

[5] Le Masson, P., Hatchuel, A., & Weil, B. (2011). The Interplay between Creativity Issues and Design Theories: A New Perspective for Design Management. *Creativity and Innovation Management,* Vol 20, no. 4, 217-238.

Chapter 1

The Corn Stalk Renaissance: Seeds of a Design Science

Susan Imholz

"When faced with a totally new situation, we tend always to attach ourselves to the objects, to the flavor of the most recent past. We look at the present through a rear-view mirror. We march backwards into the future"…..."the content of the press is literary statement, as the content of the book is speech, and the content of the movie is the novel"….

- McLuhan and Fiore [1]

1.0 Introduction

This first chapter looks at the historical lineage of ideas leading to psychology's sprouting design culture. If, as McLuhan told us, the content of any medium is always another medium, what is the substrate of psychology's new design science? Our thesis is that changing models of mind (linear for dynamic) along with the notion of embedding clinical assessments in creative authoring tools, or activities that we enjoy, are the conceptual drivers of innovation. *This premise shapes all that follows, along with our interest in uses of new media in therapeutic processes that include a greater number of creativity issues, and invoke a greater degree of participation and input on the part of the client.* Hence, the search for historical precursors of novel intermediary object architecture that fulfill these requirements brought us to Kansas. A significant milestone in the development of clinical design was the creation of milieu therapy as practiced by the Menninger Foundation in Topeka, KS. We have chosen Menninger as a starting place because it played a key role in nurturing art, music, and horticultural therapy--all under the domain of milieu therapy. Over the past 50 years, the expressive therapies have given us nuanced language for how patients' creative work (low tech intermediary objects) continue, advance, and expand upon the client/therapist dialogue and therapeutic relationship. Menninger also hosted researchers who launched the use of biofeedback for medical purposes, and this too represented a significant hallmark of design thinking.

The chapter introduces principles of design science as articulated by Le Masson, Hatchuel & Weil historians and theoreticians of design methods. The authors' work is cited throughout to contextualize the appearance of psychology's design science as a unique opportunity, and to advance the notion that a resurgence of creative thinking is at the core of evolving design culture.

1.1 The Menninger Foundation Mid-20th Century

Today, Topeka Kansas is probably best known for trading names with Google on April Fool's Day of 2010. In a bid to capture the attention of Google management, Topeka mayor Bill Bunten surreptitiously renamed Topeka 'Google' for the month of March 2010 hoping to gain favor as a city of choice in Google's search for 50 municipalities to participate in their Fiber for Communities[2] program. The program offered cities new Internet connectivity at speeds 100 times faster than those provided by established ISP service providers. It didn't work— in

the end Topeka was not chosen but it received nationwide attention and headline news for the effort. In acknowledgement of Bunten's folly, Google renamed its search page banner Topeka for one day on April 1st.

In the 1970s, had you asked what Topeka Kansas was known for, you probably would have been told The Menninger Foundation psychiatric hospitals, clinic, and research centers. The "pearl on the prairie" as described by Erica Goode in her 2003 New York Times article, "a place where bold ideas sprouted like cornstalks under the Midwestern sun, [The Menninger Foundation] meant the best that American psychiatry had to offer". [3] It played an important role in the development of art therapy, music therapy, horticultural therapy, and biofeedback for medical uses, all of which grew to become well established practices in the mental health community. These disciplines provide one cornerstone of the clinical and theoretical underpinnings of present and future uses of art and media technology in psychotherapy. More specifically, they elucidate how imagination and intermediary objects support psychotherapeutic processes. During its tenure in Topeka, Menninger hosted visionary scholars and researchers with unique cross cultural perspectives on mental health who explored all roads, bar none, to self-actualization. Notable guest speakers who passed through were; Ram Das, Margaret Mead, Aldous Huxley, and many other cultural scions of the time. Still, no one was more influential in shaping the character, direction, and development of Menninger Hospitals' clinical practices than Dr. Karl Menninger along with his brother Dr. William Menninger. Dr. Karl and Dr. Will, as they were casually known to staff and Topeka community members alike, were privileged to reign over successive generations of growth and expansion of psychiatry as a discipline.

From the 1920s through the 1980s the psychiatric profession in America was in many ways its most creative and innovative period. While still in the grip of psychodynamic theory as the lens through which diagnoses and cures were crafted, the field claimed wide purview regarding the complete fulfillment of human needs. It inserted itself into discussions of the planning and building of houses, schools, factories and cities. In an article that Dr. Karl Menninger wrote for the Architectural Record in 1959[4] consider the following:

> Our cities as they are, good and bad, our villages and hamlets (ugly as most of them are), our beautiful homes and our unsightly slums all mirror man's instinctual duality and emotional ambiguity. We cannot blink the essential aggressiveness, destructiveness and disorderliness which the human being seems impelled to express, but we may not overlook the evidence of constant battle against these, and the slow extension of more order, more creativity, more beauty……To some extent structure determines custom, as well as custom structure. Why did the Northern Italians suddenly begin to paint in the Renaissance? Why did the Germans suddenly begin to compose music in the 18th century? Who knows what devices and facilities and opportunities spread these things? ……What would happen if everyone in the community had a place to paint? What if the community would have the courage to believe that it could prevent more crime with youth centers than with jails? What if a city—any city—was to spend one tenth as much on its recreational program as it spends on its police system? [5]

Dr. Karl was known for his democratic ideals. Like many colleagues of his time, he took aim at the society for the human condition—"most psychiatrists throughout the world would probably concur that much human maladjustment, or let us just say crime and illness, is directly related to social structures, social pathology and social improvidences".[6] The expansive scope of how the Menninger Foundation defined mental health and wellness distinguished it from other private psychiatric facilities of this era. Among the Menninger Clinic's most notable achievements, it perfected 'milieu therapy' (see Figure1) in which every day events and interactions of patients are therapeutically designed for the purpose of enhancing social skills, work skills, and building confidence, as a new form of treatment. Moreover, the philosophical view behind milieu therapy recognized the individual as an integrated whole whose social life and work life both contributed to mental health. Dr. Karl was, in many respects, on a one man crusade to wrest mental illness from the shadows and stimulated a wave of public optimism about the possibilities of recovery from psychiatric illnesses at a time when the custom of the day was still to warehouse the afflicted. He published articles about psychiatry in popular culture magazines, and appeared on television talk shows delivering his message—a first. The Menninger Foundation had its beginning in Topeka in 1889, when physician Charles F. Menninger set up his medical practice downtown. His son, Karl Menninger, joined him in 1919. In 1925, Karl and William Menninger, the oldest and youngest sons of Charles, took part in opening the Menninger Clinic and Sanitarium. Both Karl and Will were trained in psychiatry as physicians.

In remarks to a gathering for the 50th celebration of the Menninger Foundation in 1975, Don Richards then a staff member of the Information Office, notes the milestones of its growth:

I.   Patient Name: **Date:**

Tentative Diagnosis: **Occupation:**
Outstanding Symptoms:

II. ATTITUDES TO BE ASSUMED BY NURSE
(1) Watchfulness; Reassurance; Praise; Solicitude; Friendliness; Companionship; Much Attention; Little Attention; Firmness; Persistence; Indulgence
(2) TOWARD PRIVILIGES: No exceptions; Slightly indulgent; Encouragement; Discouragement
(3) TOWARD QUESTIONS ABOUT RESTRICTIONS: Explain; Refer to doctor; Ignore queries; Listen attentively but without comment
(4) TOWARD QUESTIONS FROM THE PATIENT: Ignore; Minimize; Refer to Doctor; Refuse with explanation; Encourage; Evade; Grant when possible
(5) TOWARD REQUESTS MADE OF PATIENT: Demand w/o force;
     Show of force; Threaten; Use force; Reward
(6) TOWARD ISSUANCE OF INVITATIONS TO PATIENT: Give no invitations; Matter of fact; Solicitousness; Persuasion; Persistence
(7) COMPLAINTS OF PATIENT: Solve where possible; Divert attention; Report; Explain; Ignore; Discourage; Listen sympathetically w/o comment; Make light of….

III. HOSPITAL MANAGEMENT
(1) RESPONSIBILITIES GIVEN TO PATIENT IN HOSPITAL: None; Care of room; Assist with ward work; Ward sewing circle; Responsibility for daily task; May shave w/ supervision; May have cosmetics in room
(2) RELATIONSHIP w/OTHER PATIENTS: Isolation; Provisional participation; Voluntary social relationships; Encourage social relations; Discourage social relations; Encourage a protective interest in _____(other patient?)
(3) THERAPEUTIC AIMS: To provide sublimation; To afford outlet for aggression; To provide means of identification; To permit propitiation of guilt to afford means of obtaining love; To give freedom for fantasy expression; To afford opportunity to create
(4) SPENDING ALLOWANCE (all purposes): Per week____; Per month ____

IV. PHYSIOTHERAPY TYPE
(1) Tonic (warm sheet pack, autocondensation, ultraviolet, talc rub, alcohol rub, infra-red light)
(2) Sedative (wet sheet pack; neutral bath)
(3) Stimulative (fomentations, salt glow, needle spray, Scotch douche, massage)
     Eliminative (sitz bath, hot bath, cabinet bath)
(4) THERAPISTS ATTITUDE: Invites, Urges, Insist, Compel.

V. BIBLIO-THERAPY
(1) Type of reading material: Newspapers; Magazines; Illustrated papers, Books: Fiction; Poetry; Mysteries; Biography; History; Mental hygiene; Technical books; Travel.

VI. EDUCATIONAL THERAPY
(1) Ball room dancing; Design; Interior decoration; Journalism; Mechanical drawing; Music appreciation; Nature study; Shorthand; Typing; Sketching; University extension course

VII. RECREATIONAL THERAPY
  (1) Alone; In group of 3-4; Large group
  (2) Time (presumably no. of times per day)
  (3) INDOOR TYPE: Card games, Table games, Bowling; Dances: Ping pong; Medicine ball; Punching bag; Stationary bicycle
  (4) OUTDOOR TYPE (Mild): Shuffleboard, Walks; (Active) Baseball; Golf; Hikes; Horseshoes; Swimming; Tennis; Basketball; Football; Volley ball; Ice skating
  (5) SPECIAL: Archery; Church; Dances (off campus); Dinner in town; Dramatics; Horseback riding; Marionettes; Picnics; Shopping tours; Shows off campus; Teas
  (6) THERAPTISTS ATTITUDE: Stimulate interest; Invite; Urge; Insist; Compel.

VIII. PROJECT WORK
  (1) Carpentry; Cement Work; Electrical; Farm work; Garden; Mechanical work; Yard work; Individual project suggestion

IX. OCCUPATIONAL THERAPY (Children's Hospital)
  (1) Children: In room; at Work shop (length of time)
  (2) Finances/Allowance: $___ amount per month
  (3) Projects for: Therapists; Hospital; Relatives; Patient
  (4) Outstanding interests or hobbies: _____
  (5) Give projects offering opportunity for: Aestheticsm; Concentration; Hobbie formation; Imagination; Initiative; Intimacy; Routine; Simplicity; Strenuous work.
  (6) CRAFTS: Art metal; Basketry; Batik; Book binding; Cabinet making; Clay modeling; Cooking; Crocheting; Domestic science; Drawing; Furniture construction; Hocked rug work; Knitting; Leather craft; Linoleum block print; Literary work; Needlework; Painting; Pottery; Scrap books; Tapestry weaving; Water color; Weaving; Wood carving; Wood turning Wrought iron
  (7) THERAPISTS ATTITUDE: Invites, Urges, Insist, Compel

X. MEDICATIONS
  (1) Sedative; Laxative, Tonic, Others
  (2) NURSE ATTITUDE: Explain; Make no comments: Report
   requests to doctor; Urge; Insist

XI. DIET
  (1) DIRECTIONS: Tray; Dining room; Tube-feeding; between-meal nourishment; Regular portions; Light portions; Extra servings
  (2) SPECIAL DIET: Diabetic diet; Fat free (for liver disease); High caloric; High residue diet (for constipation); High vitamin diet; Karel diet (gluten free); Ketogenic diet; Liquid; Nonirritating; Obesity diet; Purine free diet; Salt free nephritic diet; Sippy diet (for ulcer cases); Soft diet
  (3) SPECIAL INSTRUCIONS: Needs dietary instruction; Give silverware; Give chinaware; Porcelain, Beetleware, Paper plates

XII. SPECIAL ORDERS
  (1) Basal metabolism
  (2) Diathermy treatment (high frequency radio waves, or energy to provide deep heat to tissues)
  (3) Encephalography (EEG)
  (4) Dextrose tolerance (glucose tolerance test)
  (5) Renal function test
  (6) Spinal puncture
  (7) X-ray

Figure 1. Menninger Sanitarium Intake Form - Milieu Therapy Protocol
Source: J.M. Rowan (1978) A History of Music Therapy in Topeka KS, 1881 Through 1956

The Menningers' contributions to medicine were more than matched by their contribution to professional and public education. The brothers were both prolific writers with a gift for lucid expression. Dr. Will alone contributed more than 400 scientific papers and five books….Dr. Karl also produced a prodigious stream of professional papers and became known in addition as one of psychiatry's great apostles to the public. The Menninger Foundation was established in April 23, 1941 as a nonprofit corporation eligible to receive tax-deductible gifts and bequests [providing an additional source of funds for research]…. In 1946 [Dr. Karl] stepped into a new role as manager of the Veteran's Administration Hospital in Topeka …the assignment involved the care of more than 1,000 patients and the training of more than 100 psychiatrists. This training program evolved into the Menninger School of Psychiatry, the first truly formal educational program in psychiatry and one of the largest programs in the world. About seven percent of all psychiatrists in the United States received their training in Kansas (circa 1950s). In 1943 the Topeka Institute for Psychoanalysis was established and was, at the time, responsible for all analytical training in the United States west of Chicago. Also, in 1943 the Foundation's Research Department was formed, exemplifying the organization's commitment to increasing the knowledge and understanding of the complexities of the human being……the research is broad ranging and interdisciplinary, engaging individuals with back grounds in ethology, psychoanalysis, mathematical statistics, psychiatry, social psychology, engineering, clinical psychology, psychophysiology, internal medicine, speech pathology and others. [7]

Above all, the legacy of Menninger Foundation in Topeka—inclusive of the clinic, hospitals, the research division, and psychiatric training programs—is one of defining pioneering programs in the social applications of psychiatry, marriage counseling, industrial mental health, law and psychiatry, community psychiatry, school mental health, programs for the aging, and public welfare officials.[8] In light of this very rich back-story, one can only wonder how the practice of art and media technology in psychotherapy would have evolved *in situ* if the Menninger Foundation had continued. In 2003, under mounting fiscal deficits, Menninger shut down, leaving roughly 400 employees and support staff stunned. The Menninger Clinic was adopted by Baylor University in 2003 with approximately 30 to 35 of the Topeka clinical staff members, and continues to exist in Texas under the Menninger name.

Dr. Karl Menninger's papers at the Kansas State Historical Archive in Topeka reflect a man with a panoply of interests and someone who was enriched and inspired by the arts personally. Among the stacks of his boxes are receipts for the purchase of rare plants and seed stock, music programs from concerts he attended, and playbills. In the growth and development of art therapy, music therapy, and biofeedback in Topeka, along with the Foundation's diverse research agenda, Dr. Karl was communicating his belief in the healing power of the arts and the sustaining influence they hold over the human spirit.

These beliefs were inherited from his father Charles, no doubt, who was an avid gardener and musician. Key to the creativity and innovation that flourished in Topeka at the Menninger Foundation was the diversity of community members who were invited to participate in the conversation. This is a theme we will be returning to throughout this book; environments where clinicians, artists, musicians, biologists, and technologists all rub shoulders to shape innovative clinical practices was a successful formula in the past, and is shaping the future as well.

1.2 The Seeds of a New Design Science

The professional goals and aspirations of psychology and psychiatry in the early and mid-20th century was a period in which social engineering and the macroworld of psychology and psychiatry was the focus of academia. This orientation was also supported by a philosophy that promoted communal happiness and personal wellbeing as ethical goals—a kind of *eudaemonia*—the eudaemonia of Greek and Roman times in which happiness is bound with the civic virtues of courage, moderation and justice—in short , collective wellbeing (Hamilton, 2007).[9] The portrait of the Menninger Foundation and Topeka in late 70s was of a robust institution at the height of its prominence. Its recollection serves as a starting place for thinking about how the field of mental health has evolved over the past 60 years in terms of design. Menninger & company breached the thinking vs. doing, or designing mode of functioning and changed the context, materials, processes, and environments where mental health care took place. They altered the *who, what*, *where* and *when* of psychotherapy in the creation of milieu therapy.

Design, defined as the study and reflection upon the process of making things, now infiltrates all aspects of product development from the shoes we wear to the shape of the container our morning juice comes in. Of course we are invoking design for more important reasons. Design science is also the harbinger of the epistemology of making things—design reasoning, aesthetic choices, materials, processes, and production engineering systems. As clinical psychology, psychiatry, and the counseling professions begin to explore new modes of interacting with

clients via technology, it seems logical that they would benefit from learning more about design science and its contributions to technical product development.

Throughout the first three chapters, we ground our discussion of design science in the work of Le Masson, Hatchuel, and Weil[10,11,12,13] who provide us with an analysis framework for understanding how research and new ideas move from concepts to innovative practices. They also elaborate upon the conditions by which research leads to innovation, including how it fails to do so due to unfavorable management practices and economic environments. As instrumental reasoning and efficiency diminish as the guiding principles of technology's deployment in society, technological design is shifting toward creativity as an essential component of good design. The authors' historical analysis of design methods, from the 1800s to the present, places new emphasis on the vital role of creativity as a driver of change in the field of design. Their expertise has been shaped by over 20 years of experience in the design and manufacture of consumer products, cars, aerospace and defense projects.

According to Le Masson and colleagues, design theories and methods evolve to meet the creative challenges of historical circumstances, more specifically Hatchuel (in Le Masson et al 2011) noted:

> "..that recent design theories form a consistent body of knowledge that tends to increase the creativity of design. This result seems to confirm our belief that there are historical dynamics linking creativity issues and the development of new models of design reasoning" (p.218) [13]

The authors also studied the interplay between creativity issues, design theories and design methods, and conclude that the tensions that drive innovation appear to be dynamic and persistent over time:

> "The dialectical interplay that links creativity and design theory is structured around the notion of 'fixation effect': creativity identifies fixation effects, which become the targets of new design theories; design theories invent models of thought to overcome them; and in turn, these design theories can also create new fixation effects that will then be [analyzed] by creativity studies" (p.217)[13]

This lens for viewing psychology's new design science is particularly helpful since it is not rooted to theory or content domain and enlarges the discussion of innovation integration to a systems level analysis. Their work is also useful for discussing psychology's progression into new media design because it establishes the notion that creative challenges accelerate the advancement of design methods and practices—in other words, every creative challenge has a silver lining.

We will be returning to Le Masson & colleagues for guidance and analysis of specific design problems throughout the book. For now, we just need to introduce the three questions Le Masson used in the investigative studies of design methods:

a. what new knowledge is being introduced or needed to achieve the design goals;
b. how does the design process diverge or converge with previous methods and processes;
c. what new organizational management structures are in place, or are needed to achieve the design goals.

These questions, or "tensions" as the authors call them, represent the core facets of the complex relationship between design methods and creativity issues expressed in the design literature. As an analysis rubric, the questions will be
used for evaluating the contributions of the Menninger Hospitals' clinical practices in this section, but will also anchor our discussion of new software, devices, and intermediary objects for psychotherapeutic use further on. Straight away, the rubric helps us articulate the who, what, where and when of innovation in clear terms–i.e., what shifts in knowledge, new materials, new perceptions of mental illness, and organizational practices took place in Topeka which were not being addressed in psychiatric hospitals before.

1.3 The Roots of Intermediary Object Architecture in Psychotherapy

There are many roots to the emergence of psychology's design science. As mentioned above, we focus on the Menninger Foundation in Topeka because it played an important role in the development of art and music therapy as disciplines, along with hosting researchers who are considered to be the founding fathers of biofeedback for medical purposes. In many ways the expressive therapies are the main architects of the use of *intermediary objects* in psychotherapy and psychotherapeutic processes. Patient/client drawings, paintings, music compositions, and dance

have been studied by expressive arts professionals for several decades. The maturation of this field in regard to theory and clinical practice is providing an important substrate for psychology's new design science because lessons learned about the psychological impact of artistic mediators can apply to the construction and use of psychotherapeutic mediating objects in all media. New developments in biophysiology, brain, and neuroscience also confirm that activity based therapies for mental health and optimal functioning play an important role in recovery and remediation of addiction, behavioral imbalances, as well as self-actualization and personal growth.

Spas and sanatoriums significantly predated Menninger's formulation of milieu therapy as sanctuaries where people with various mental health problems could recover, beginning with the *asclepieia* of ancient Greece. The historical record shows society turned from sympathy for the psychologically impaired to much darker attitudes during the Middle Ages and Renaissance; however in the late 18th and 19th centuries the asylums for the wealthy rekindled the notion of restorative retreats.[14] Menninger's conceptualization of milieu therapy was primarily shaped by (Kraeplin, Freud) psychodynamic theory. The detail in Menninger's intake protocol (Figure 1) shows a remarkable effort to engage patients in the social world. This was not simply an experiment in micromanagement. It was a design grounded in an understanding that the health of the individual was bound to the health of the community s/he participated in. New theories of mind which hypothesized that mental illness was not as fixed as previously thought, expanded new treatment possibilities for consideration. For Drs. Karl and Will Menninger, this meant considering the entire social world of the patient as the stage upon which therapeutic interventions could be enacted. Psychiatric treatment at Menninger's Hospitals included one-on-one sessions between patient and therapist, but milieu therapy enlarged the therapeutic environment conceptually and physically. To be clear, punitive safety measures were in force. There were locked units in the adult and children's hospitals where personal freedoms were denied or closely monitored, and electroshock (for adults) and pharmaceuticals for adults and children were ever present. A thumbnail sketch of art, music, horticultural therapy, and biofeedback at the Menninger Hospitals in Topeka, follows. More in depth histories of the expressive therapies can be found elsewhere in the literature, therefore milestones suffice for our purposes.[15,16,17] What is novel in our summation is that we are re-aligning these disciplines under the rubric of milieu therapy from whence they sprang. This is a reminder of the scope of this method and approach to mental health and its foundational role in forging a clinical design science. We highlight the contribution of each modality using Le Masson's framework of identifying the *new knowledge* that intermediary objects were giving voice to, describing how the modality *diverged* from the 50 minute psychotherapy hour, and how it extended or gave definition to new kinds of *organizational methods*, *spaces, tools,* and environments where psychotherapy takes place.

1.4 Art Therapy

A recent study has shown that the activity of observing art works considered to be beautiful by the viewer generates the same brain cortical activity as being in love (Ishizu & Zeki, 2013).[18] Neuroscience is now validating the power of engagement with art activities as brain food. In the 1930s, over 80 years ago, the Menninger Clinic in Topeka first began offering art programs for patients in their care. Local artist Mary Huntoon was invited by Dr. Karl Menninger to offer classes in painting and drawing. Additional artist in residence, Don Jones, joined the staff in 1951, and Robert Ault in 1960. These two were instrumental in forming the American Art Therapy Association in 1969.[19] They also created college courses at Emporia State College for undergraduate and graduate students. The art therapy program at Menninger occupied its own building, as did the music therapy and horticultural programs. These years were characterized by an 'if you can think it, you can do it' attitude, matched with ample financial resources.

All of the expressive therapies (art, music, dance, and psychodrama) breach the thinking versus doing divide that kept most of clinical psychology and psychiatry on the couch, or in a chair. At the same time they preserve the sanctity of the psychotherapeutic relationship between patient and therapist and acknowledge the primacy of this bond as a powerful healing force. Art making builds upon the therapeutic hour, with the inclusion and exploration of imagination—drawing upon the wealth of internal imagery we all possess but seldom call upon in service to our mental health and well being. The model of artist in residence in psychiatric settings took root across the country in many private and public hospitals. An early article Bob Ault published in the Bulletin of Art Therapy defined approaches to clinical intervention using art materials, which he grouped into four main categories (Drachnik 1976)[20]:

1. Analytic therapy—which uses the psychoanalytical model to analyze art work, and to give patients an opportunity to gain insight into their own character.
2. Functional art therapy——where the concern is with mental retardation, and physical or organic disorders, to support neurological growth and skill development.

3. Gestalt art therapy—the use of art materials to produce personal growth, education, and awareness.
4. Psycho-educational art therapy—which involves an inter-personal relationship(s) and a learning process within the structure of the activity.[21]

The personal traits that characterized Menninger's pioneers were a love of science and art. Great artistry was secondary to finding individuals who understood creativity as a well spring of restorative energy, and who enjoyed learning about the science of the human mind.

From a design perspective, the contributions of art therapy as a new psychotherapeutic professional practice included:

New Knowledge—Creativity as a specific field of study by psychology was a relatively new endeavor in the 1950s most notably defined by Guilford[22] although it had been written about in theoretical terms by Otto Rank[23], Lev Vygotsky[24] and Rudolf Arnheim[25,26] for both clinicians and educators. In psychodynamic theory and practice, putting words on feelings and developing a vocabulary for psychological phenomenon was central to the therapeutic experience; other forms of expression were considered adjunctive. Even so, art making activities developed patients' expressive abilities and provided clinicians additional insights into the lives of patients. These pursuits were highly valued by clinical staff as avocations that could be continued beyond a hospital stay, as lack of recreation was perceived as detrimental to patients' quality of life mid-20th century. Art therapy was developing a new understanding of symbolic language and semiotic analysis. This work was well documented through new professional journals.

Convergence vs. Divergence from Traditional Practices—The emphasis that milieu therapy placed on social engagement as integral to mental health opened up several avenues of exploration for clinical professionals at Menninger. In an atmosphere where new theories about causes of mental health and illness were being tested, divergence from established norms was commonplace. In the mid-20th century, art therapy was validating that imagination, imagery, and symbols were just as powerful as words as therapeutic and consciousness raising tools, taking the work of Otto Rank and Rudolph Arnheim from theory into clinical practice.

Organizational Management Innovation—The process of introducing artists into the hospital setting and integrating them into the psychiatric training program created new knowledge, and new ways of looking at and thinking about mental illness. Art therapy at the Menninger Foundation also defined new types of work places, tools, and spaces.

1.5 Music Therapy

We are fast approaching a blueprint for human health that will be defined in terms of vibrational frequencies.[27] Foregoing an annual physical, a tune-up for physical and mental health may soon be something you can perform at home with your own vibration-tuning-fork. While the concept is centuries old, it's still in need of research for efficacy. Sound and music, as it turns out, have long lasting fundamental effects on the nervous system across the lifespan as activities that influence learning, memory, and is fundamental to filtering speech and meaning from noise.[28,29,30,31,32] Music as a healing art is a continuation of a 30,000 year old shamanic tradition.[33] The nexus of music and therapeutic arts is the joining of the senses —the world of sound, with the notion of exploring the healing properties of music. Recently, Boulanger (2010)[34] has explored the use of composition tools that have been technologically adapted for use with patients with considerable physical handicaps with extraordinary results, showing that technical innovation in instrument and sound production can have far reaching effects socially.

As with art therapy, music therapy in Topeka grew from pairing artistry with the science of medicine. James Rowan (1984) documented the history of music therapy in Topeka from 1881-1956, observing that "music as therapy began to be used quite extensively in the medical facilities of Topeka Kansas in the 1940s"—his chronicle of events also included the use of music at Menninger hospitals .[35] Musicians were employed by the Menninger Clinic to entertain and provide recreational activities for patients initially; later these activities became incorporated into clinical study in the 1950s. Rowan notes that the Menninger family was a musical family. Father Charles played flute, mother Flo piano, Karl violin and piano, Edwin the violin, and William, cello. They often played as an ensemble at home and in their community.[36]

By the mid-1950s music therapy programs in Topeka were thriving at both the Menninger Clinic and Topeka State Hospital. Rowan writes that activities at Topeka State Hospital consisted of: individual vocal and instrumental

instruction, a barbershop chorus, a girls' chorus, a band, a performance group, a music listening group, dance activities, a church choir, and participation in programming the hospital's radio station. [37]

Using our design lens, the contributions of music therapy as a new psychotherapeutic professional practice included:

> ***New Knowledge***—Music therapy instigated research on the biophysiology of sound, and the role of audio processing in brain development and functioning. This surplus of creativity became a driver of new knowledge, and continued exploration. As with art therapy, the music therapy experiments at Menninger were shared with local colleges and universities (University of KS, Lawrence) in the creation of courses on this subject matter, along with the development of peer reviewed journals and the establishment of regional and professional associations that further supported experimentation and expansion of new ideas.

> ***Convergence vs. Divergence from Traditional Practices***—Abundant resources enabled the creation of a music therapy department with its own building and staff in Topeka. These were all first-of-kind environments which brought the therapeutic milieu beyond the walls of the psychotherapist's office and into communal life.

> ***Organizational Management Innovation***—The music therapy practitioners joined with psychiatrists and psychologists to explore the healing impact of musical activity and its impact on the healing process and social community. This differed from the hierarchical organization of hospitals and training programs in which doctors did not interact and take classes with other paraprofessionals.

1.6 Biofeedback at the Menninger Foundation

The same environment that nurtured art and music therapies as core components of mental health care treatment also supported the work of Dr. Elmer Green (1977)[38] whose studies were conducted at Menninger's research division. Green designed a mobile laboratory for assessing autonomic body functions (brain waves/EEG, galvanic skin response, electrical muscle activity, and heart rate/EKG) and is known as one of the founders of the field of biofeedback for medical purposes. His mobile lab was the size of a small valise—the kind of brief case that your father or grandfather carried to work. These early experiments launched the widespread use of biofeedback in medical settings. Elmer and Alyce Green arrived at the Menninger Foundation in 1964. Soon after Elmer became the recipient of one of the first NIH grants for biofeedback research in 1965. With his mobile lab Green traveled to India to study yogis and document their unusual talent for controlling autonomic body functions which were generally thought to be out of conscious awareness by the medical profession. His yogic subjects proved to be supreme masters of their physical bodies. Green documented feats like the voluntary stopping of one's heart, and witnessed subjects who could remain in a box without air well beyond several minutes.

Biographical remarks from the Association for Applied Psychophysiology and Biofeedback (AAPB)[39] note that Elmer Green began his career as a physicist, and worked in a naval weapons center on the creation of guided missiles. After receiving a Ph.D. from the University of Chicago in biopsychology, he adapted what he had learned about developing feedback systems for missiles to the body. Green theorized that the autonomic nervous system is hard to control because we have inadequate 'inputs' to conscious awareness—his mobile lab and hand held devices provided the missing link in bringing these functions into awareness. His most notable success in applying the principles of heightened conscious control to physical maladies was with Menninger patients who suffered from migraine headaches. By teaching patients to raise the temperature of their hands, they lessened blood flow to the brain, and could obtain relief from headache pain. Green also studied mind body relationships and what he called the "image making faculty" and the use of visualization in enhancing consciousness and mind-body self-regulation. Today, the Biofeedback Certification International Alliance (BCIA) boasts a membership of over 1300 members across the US. Among these clinicians roughly one third to one half are practicing in the field of mental health[40]. The AAPB formed in 1969 is a similar professional association, and has over 2000 members.

In summary, the most significant contribution of Elmer Green's work was in changing minds. The inside-out paradigm of treating illness is still a new frontier for mental health.

From a design perspective, the contributions of biofeedback as a new therapeutic tool included:

> ***New Knowledge***—The knowledge that autonomic body functions could be brought to conscious awareness and controlled by anyone opened up a world of potential applications and design solutions in healthcare.

This technology was quickly embraced by physical therapists, sports medicine, but its transfer to the mental health community is still a work in progress.

Convergence vs. Divergence from Traditional Practices—The inside-out paradigm of treating illness turns the medical model on its head. 'Inside-out' is dependent upon healers/practitioners sharing what they know with patients to empower them and to help them to take control of their own lives and disease.

Organizational Management Innovation—The arrival of hand-held devices which patients could use on their own changed the focus and orientation of treatment—more specifically the *who, what, where*, and *when* of medical intervention.

1.7 Horticultural Therapy

Returning to wilds of nature on a mountain hike, or by the activity of gardening is an affirmation of biophilia—E.O. Wilson's definition of the instinctual bond between humans and other living systems in nature. Recent studies have shown that being surrounded by greenery reduces blood pressure, heart rate, and speeds recovery from surgery.[41] Simpson & Strauss (1998) noted Dr. Charles Menninger wrote about the benefits of gardening activities for patients in psychiatric care in 1942 in the Bulletin of the Menninger Clinic, declaring that decade the dawn of the professional field.[42] VA hospitals around the country tending to distressed servicemen returning from WWII began gardening programs, some of which were geared toward public works landscaping, and in other instances the production of food in gardens supplemented institutional kitchens. The first horticultural therapist hired at the Menninger Hospital was Rhea McCandliss and with her guidance the Menninger Foundation and the University of Kansas began one of the first horticultural therapy programs to train students to work in psychiatric settings in 1972.[44,43] By 1973, horticultural therapy practitioners were ready to establish their first professional association, the National Council for Therapy and Rehabilitation through Horticulture (NCTRH). We are also beginning to understand more clearly that environmental degradation takes its toll on the emotional life, mental health, and physical health of humans. Horticultural therapy studies are currently showing us just how interconnected human, plant, and animal ecosystems are on both conscious and subconscious levels, fostering relationships with organizations as diverse as the National Park Service in the dissemination of findings.

From a design perspective, the contributions of horticultural therapy as a new psychotherapeutic professional practice included:

New Knowledge—Appreciating the healing properties of plants and

gardening, without yet having language for or research on its physiological effects, made Charles Menninger something of a maverick. He simply wanted to share the joy he found in gardening with patients believing that they too could experience what he did. To be a caretaker of plants provides a connection to the vital life force very directly, and in the 1950's it was useful metaphor for thinking about one's own problems in terms of the care received from parents and family as adequate or inadequate. In the creation of milieu therapy as a treatment modality, Charles, Karl and Will Menninger integrated all of their hobbies into the fabric of the hospital's healing arts. This reflected a clinical understanding of the value of hobbies, happiness, and pleasure as important components of mental health and healing.

Convergence vs. Divergence from Traditional Practices—Horticultural therapy, like art and music, is a return to the ancient Greek tradition of providing an idyllic sanctuary for the socially dysfunctional to restore them to balance. It also reinforced the notion healing was beyond the purview of the physician or psychotherapist alone—an acknowledgement that the surroundings in which we live our daily lives is, in a real sense, an incubator of wellbeing or illness.

Organizational Management Innovation—Menninger's inclusion of many experiments in social and artistic activity as healing aids was remarkable in breadth in comparison to traditional hospital practices of this time. This approach also valued skill building as a component of mental health. From an organizational standpoint, milieu therapy and all of the expressive arts as they were practiced at Menninger's facilities represented a yielding of control by doctors to a wider group of practitioners who were seen as equal partners in the healing process. Investing in the programs, grounds, and new kinds of work spaces was also

a means of enlarging the design conversation. The prevalent thinking of the time suggested that keeping active in the recovery process, both mentally and physically, would facilitate a return to normal life, rather than conceptualizing healing as a retreat from life, or a form of quiet recuperation.

1.8 Past to Present

A small legion of innovators are again propelling the field of mental health forward as they have in the past through the creation of new metaphors, and novel experimental environments investigating the relationship of health and illness. Today, a dominant view among many mental health professionals and researchers is that all mental illnesses are brain disorders, by passing society at large from responsibility for creating the conditions which instigate illness. While recognizing that the scientific community is now dedicated to studying the microworld of the brain, we are at the same time perfectly situated to reorient professional practices to the macroworld of social interaction through the use of new media.

Psychology's emerging design science requires both a theory of knowledge and a plan of instruction that offers a novel set of experiences to aspiring designers of new clinical tools. In the same way that the field of architecture is now more about the study of building materials alone and includes aesthetics, environmental science, and how people live in harmony with each other and the natural world—psychology now has the opportunity to consider how it is going to participate in the design of media technology as a reflection of itself from many facets.

Psychology and clinicians who practice psychotherapy still have much to learn from artists who have been exploring media technology as an expressive medium for many decades. Today, virtual communication has filled the void to solidify our sense of connectedness in our increasingly itinerant society. Not long ago it might have sufficed to say that the difference between children's play and adult play is that children are investigating reality through play and adults are escaping reality. Yet, the complexity and sophistication of gaming and virtual worlds have extended the life of investigative and purposeful play for adolescents and adults. In tandem, we understand that in a culture that overvalues individualism at the expense of collective interdependency, games and virtual worlds provide a creative outlet for exploring ambitions and fantasies that are denied expression in the context of our focused and restrictive work lives (Imholz 2008).[44] Our cyber realities give us the opportunity to investigate the nature of consciousness anew.

The National Institute for Mental Health (NIMH) has identified the 1990s as the 'Decade of the Brain', and the past ten years as the 'Decade of Discovery'.[45] In its Strategic Plan, NIMH conveys great enthusiasm for the findings of recent research studies of brain functioning, which includes brain mapping, brain circuitry, how information is stored in neural circuits, and interactions between genes and neurobiology. Further, NIMH promises to fund researchers who develop improved methods for recording cellular activity, mathematical modeling of cellular and circuital functioning, and new ways of imaging intracellular communication. In sum, the focus of NIMH for the foreseeable future is to support the developing field of epigenetics—the study of how environmental influences regulate gene expression in mental disorders. The reasoning behind these priorities as noted in their Strategic Plan:

> Currently, the diagnosis of mental disorders is based on clinical observation; identifying symptoms that tend to cluster together, determining when the symptoms appear, and determining whether the symptoms resolve, recur, or become chronic....the way that mental disorders are defined in the present diagnostic system does not incorporate current information from integrative neuroscience research, and thus is not optimal for making scientific gains. To clarify the underlying causes of mental disorders, it will be necessary to define, measure, and link basic biological and behavioral components of normal and abnormal functioning. The effort will require integration of genetic, neuroscience, imaging, behavioral, and clinical studies. By linking basic biological and behavioral components, it will become possible to construct valid, reliable phenotypes for mental disorders…Such an effort will result in research-based descriptions of the key elements of mental disorders, providing even greater traction on the potential mechanisms that can cause mental suffering and targets for more effective preemption and treatment. [45]

With the limited resources that NIMH receives from the government, choosing a research focus is a tradeoff. The support of basic brain research is very important and offers great promise for the future of applied psychology. Pharmaceutical companies are poised to gain the most from the current NIMH priorities, and it is not difficult to foresee that this may lead to an even greater dependence upon the use of drugs to treat every DSM-V psychiatric diagnosis. Yet, other competing developments in the treatment of psychological illness are also taking shape; clinical neurology is taking on patients who would only have been referred to psychiatrists or psychologists 10 years ago. The practice of "interpersonal neurobiology"[46] as an activity based approach to enhancing brain function is

closely allied with the methods of expressive therapists for the purpose of developing new brain circuitry. This treatment approach, like the ones described in later chapters, are also influenced by the epigenetic view which unwinds several assumptions underpinning the foundations of psychology and psychiatry.

Dr. Bruce Lipton[47,48] has categorized these assumptions and misperceptions this way: (1) the epigenetic view supersedes the Newtonian definition of matter, making what's invisible just as important as what we can see, and this applies to the study of mind as well; (2) if genes are no longer seen as determining factors of human potential and illness, the mind and psychological health becomes a major factor, not a minor player, in the consideration of treatment for all illnesses; (3) the epigenetic view also challenges our understanding of the world as a hostile and competitive race in which we must strive for mastery over others and the physical environment, to one in which collaboration and cooperation for the well being of society is elevated as a higher good and better strategy. All three points renew the role of the individual and psychological growth as being central to individuation and a healthy society. Here in the US, the appearance of academic centers for the study of consciousness is evidence that these ideas are taking root; the Mind Life Foundation in Texas, Mind Life Institute in Massachusetts, Stanford Center for Mind, Brain, and Computation as well as the Stanford Center for Compassion and Altruism Research, the Dalai Lama Center for Ethics and Transformative Values at MIT, and Harvard's Mind/Brain/Behavior Initiative. There are many other centers abroad.

Technology amplifies our perceptual field allowing us to view both the mircoworld of the brain, and the macroworld of social influences. Psychology's blossoming design science shows promise in terms of:

- embracing a new level of social interaction among patients and society;
- embedding assessments in activities that bring us joy and cultivate expressive skills;
- and making adjustments in thinking about the illness to health continuum.

We invite members of the broader psychology community to examine how their model of mind and approach to health and healing can be amplified by the use of new media, and to think about these issues more deeply.

The Menninger Hospital philosophy behind the creation of milieu therapy mid-20th century and the goals inherent in this therapeutic approach are very much aligned with our current hypothesis. Once again, our thesis is that changing models of mind (linear for dynamic) along with the notion of embedding clinical assessments in creative authoring tools, or activities that give us pleasure and give meaning to our lives, are central drivers of innovation. Menninger sought to bring the social community into the realm of the hospital – we are now tasked with widening the circle further by weaving the healing arts into the fabric of social life. Like Menninger, we are carried along by new understandings of mind and brain, new language and metaphors for illness and health, and new technology.

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