Wicked tactics - UX/XD:
World-building in post-virtual space

Heather Renee Barker[1]

[1]California State University, Long Beach, California

ABSTRACT: Wicked Tactics – UX/XD explores and describes strategies for design in a post-virtual world. Wicked - as in wicked complexity, tactics as actions that cross strategic fields to create stunning solutions and User eXperience / eXperience Design (UX/XD) as a user-driven design methodology assuming humans interface everywhere. As the semantic web parses meaning from the big data of the internet of everything, designers explore affinities between social/philosophical and mathematical/programming expressions to move beyond stylistic parametric expressions to meaningful parametric expressions.

"Every age has its own ideas; it must have also words adapted to those ideas." –Victor Hugo

We have a disconnect. New technologies have created a new age with its own ideas. Contemporary design terminology must be adapted to those ideas (semantic shift). Ultimately, the goal is to develop a common language - shared by makers of objects, spaces, and means of communication: a language of our contemporary condition. This work takes up the cause to reframe the language and processes of design in order to develop new strategies and to generate novel solutions.
In the post-virtual world, we reside in seamless space where the tactics and strategies for designing human-computer interface are based on *human experience*. You are likely interfacing with the digital realm right now; thus, a part of your body-based consciousness is concurrently residing in the shared space of the internet. This phenomenon is creating a new human: the Internet of Me (IoMe). Designers of space are expected to provide solutions for the distributed experiences of new humans in post-virtual space. These solutions require building worlds before designing buildings. Architectures must become epigenetic/control spaces satisfying the spatial, functional and experiential needs of a post-virtual society.

KEYWORDS: Parametric Modeling, Design Strategy, Social Media, UX/XD, World-Building

INTRODUCTION

This is a theory addressing design processes adapting to a new context. This work will:
1. define and describe the changed context,
2. search for language and procedural affinities across the spatial divide and
3. derive processes and methods from that context to generate novel solutions conditioned to our time.

Why is it relevant? *This work intends to redefine architecture in form and scope, in material and purpose.*
This theory assumes human perception is augmented through technology and human presence resides in a seamless physical/virtual space of experience. Creating new design processes will continue to challenge the makers of space to recognize architecture as a complex adaptive system. Beyond designing a physical space to support technology for virtual communication and experience, we must design architectures as interactive solution spaces of human, physical and virtual agents – to serve the needs of new humans in post-virtual space.

1.0 WICKEDNESS

1.1. Wicked complexity in social space

The rules have changed. Architectural practice is experiencing a radical shift. The building types of architecture (as a functional definition) no longer exist. We now learn in hospitals, heal in hotels, vacation while doing scientific research, teach while on vacation, socialize while working and work just about everywhere. Designing spaces is designing for massive unknown variables. The technologies that have enabled an *Internet of Everything (IoE)*, including buildings, objects and humans, have also caused a fundamental rupture in the system of designing and constructing environments. New systems, tools and languages suited to IoE are developing at a rapid pace and introducing new levels of complexity heretofore unheard of. *In the Internet of Everything, those same systems, tools and languages inevitably become part*

of architecture. Now and in the future, beyond creating buildings that satisfy firmness, commodity, and delight, architects (and others) will engage in *world-building*. Once a term of sci-fi, fantasy or game space; the boundaries between virtual and real space have dissolved and we operate in a seamless, post-virtual space for which world-building is well suited. Architectures are now expected to create a context to develop a narrative, to embrace complexity and interactivity and to be co-authored and revised during the process of construction. Post-virtual architectures are conceived and constructed to offer spaces of experience, communication, collaboration, entertainment, learning and commerce.

The complexities inherent to designing/planning for social spaces have been defined as 'wicked' (Rittel, Webber). The fundamental difficulties in designing solutions for such complexity are well-described in their *Dilemmas in General Theory of Planning*. In that work, the authors clearly delineate the need for new methods to approach wicked complex issues. Wicked problems demonstrate both causalities and objectives that are ill-defined and interrelated. Wicked problems are a complex field of open and interactive systems where *no definitive statement of the problem is possible* and the process of collecting information to define it depends on the approach one intends to take to solve the problem. "Wicked problems have no stopping rule" (Rittel, Webber) and therefore any solution is assumed to be iterative: re-defined and re-applied until the context changes to the point when a new wicked problem emerges. Simply asking a question acts as an agitator in a field of noise that will then demonstrate emergent properties. Therefore, approaches to wicked problems must also be non-telelogical, interconnected and aware that every intervention is absorbed by, leaves a mark on, and becomes part of the wickedness. Fortunately, there are models for reconciling such complexity and emergence.

1.2. Wicked complexity in post-virtual social space
In the post-virtual world we have crossed the threshold into seamless space. New humans spend the majority of the day with part of their body-based consciousness concurrently residing the shared space of the internet (Wolf) (Pew). This phenomenon is creating a new human: the Internet of Me *IoMe* (Barker). As humans, we define ourselves through our experiences and our knowledge. Experiences can be customized; therefore, designing the experience is designing the person. In 'world-building', we not only design places, we design behaviors. In a successful 'world', systems, forms, rules and rewards are all accounted for: allowing the agents to become the objects and the known to become the knowing. It is a living system.

1.3. Managing wickedness
There are structures and models for managing vast amounts of complex, undefined data with multiple unknown variables; examples can be found in linguistics, programming and mathematics. In order to discover analogous models that may be applied to the design process, we look for similarities in intent and method.

It is essential to engage in deep and detailed research in order to establish a rich and nuanced field of relevant information for any design project. The first challenge is to model all relevant information into a data field. An important assumption is that all information considered relevant to populate a given system-model is somehow related. The degree to which the information is related will define the density of the model and the complexity of the structure of that model. That field of information must be modelled as a *declarative representation* - where the model is initially independent of the tactics and analysis to be applied to it.

The wickedness of the information suggests representing a new type of space beyond 3, 4(time), or even 5(virtual) dimensions. The notion of a space containing more points than 'normal' space begs the question, could new wicked spaces be discovered? *Projective space* and *Riemann surfaces* provide mathematical models that may provide strategies for representing such an information model.

Once the field of wicked information is established, *discovery algorithms* (used to parse the vast amounts of unstructured information in order to identify patterns in Big Data) could be applied. Applying the same algorithms, to a declarative representation of all the information pertaining to a given design project, could reveal patterns to inform novel design strategies for spaces of massive unknown variables.

2.0 IoME HUMANS

2.1. Internet of me and augmented cognitive processes
The terms *digital self* and *quantified self* are frequently used to describe the contemporary phenomenon of individuals, augmented through technology, evaluating and sharing personal and biometric data to achieve desired outcomes. Tools to monitor bodily conditions such as heart rate, sleep patterns, physical activity, and stress levels are synthesized with the tools to monitor social conditions such as popularity, perceptions, opinions, and mood. The monitoring is physically untethered, yet constantly connected to the internet of things and social media. *We have developed into an Internet of Me*. The immediacy and availability of the data collected about the self has changed basic human behaviors and the fundamental awareness of the self as it relates to society.
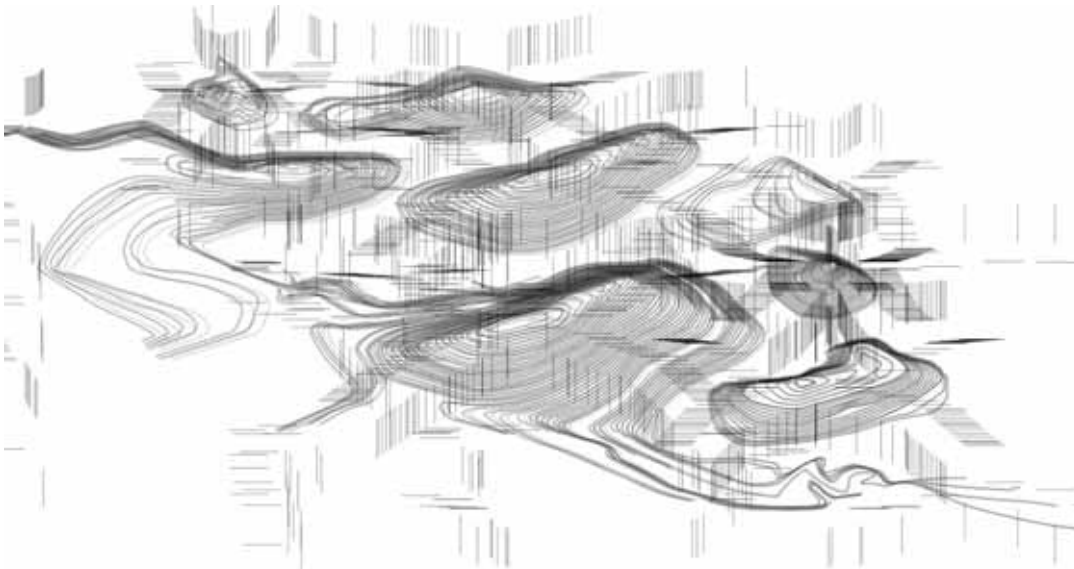
Figure 1: Wicked Data-Space Modelling. Source: (Author 2015)

2.2. At home in post-virtual superspaces

In the post-virtual world we have crossed the threshold into seamless space. Within this space, tactics, technologies and strategies have developed to optimize the human-computer interface. The success of those interfaces is measured on a scale of *user experience* – perceptions and behaviors.

The data of our quantified selves and our interactions in post-virtual superspaces can be interconnected and cross-referenced. As technology is grafted to our bodies, it is also grafted into our offices, hospitals, schools and homes. Advances in technology have allowed for the dematerialization of the interface device; integral and indistinguishable from body and space. Therefore, at home in our virtual superspaces, the data from our bodies, behaviors and environments is a dynamic part of the internet of everything. Where then, do our architectures begin and where do they end; and how do you define the scope of a project?

2.3. New humans and new behaviors

New technologies of monitoring, communication, data-gathering and analysis effectively allow humans to 'outsource' a large portion of their cognitive, behavioral and functional activities. Various applications maintain personal contacts, organize meetings and events, quickly share information with a group, analyze finances, monitor activity, communicate with clients and provide remote access to our colleagues, tools and data. This outsourcing is also known as *agency* and many apps have become agents – acting on our behalf in efforts to improve productivity or increase time for leisure (Pieper). Many of these activities previously took place and were facilitated through buildings. As the boundary between the data space and the physical space becomes imperceptible, architecture must be redesigned to act on behalf of IoMe humans. Can we create an architecture of agency?

Another behavioral change in the IoMe humans is *community building*. Communities are created according to elective affinities, especially when there is no hurdle to direct communication. The nature of 'place' has completely changed and our experience of space is radically altered. Our senses and awareness exist simultaneously in various places – literally. We have a sense of expanded perception and we engage in behaviors at one location that have been instigated in another. New architectures will need to be developed to house communities and accommodate remotely solicited behaviors. The role of architecture is no longer just to house, but also to facilitate distributed behaviors: a post-virtual space to pass through in order to support the creation of communities.

3.0 UNRECONCILED LANGUAGE AND INFINITE SEMIOSIS

3.1. Language in programming, languages of meaning

Computer science is deeply engaged with parsing the unprecedented amount of information generated as big data in the *internet of everything*. Designers, searching for a design methodology in this new era, explore affinities between social/philosophical and mathematical/programming expressions in order to discover appropriate strategies and generate new meanings. The shared tools of programming and parametric modelling afford opportunities to visualize and distinguish patterns that were previously undiscoverable. Through a re-alignment of vocabularies, a parity of meaning can be achieved. This enables architecture to

move beyond stylistic, parametric expressions of form, to meaningful parametric expressions of interactions and behaviors. Opportunities are revealed *through the process* of resolving the language disparity as the synchronization of technological semantics and social semantics transpires. Ultimately, the goal is to develop a common language - shared by makers of objects, spaces, and means of communication: a linguistic/mathematical language of our contemporary condition. To create seamless spaces that elicit experiences and facilitate behaviors, design must resolve philosophical concepts with affinities in mathematical expressions. An example of such would be Barthes' *structural analysis of narratives* and the meaning parsing algorithms of *latent semantic indexing*. Although these two thought models come from the apparently disparate areas of philosophy and computer programming, they share clear thought affinities and could, if integrated to inform structure and meaning, become the basis for new methods and tactics of design. There are numerous other cross-disciplinary affinities, the descriptions of which exceed the scope of this document.

4.0 UX/XD - METHODOLOGY AND TACTICS

4.1. User eXperience / eXperience Design
As terminology that has evolved from human-computer interaction (HCI), UX/XD is the human-centered focus of design to improve the interactive experience. The growing field of experience design includes computer programming, event design, interaction design, marketing and architecture. UX/XD is a *scenario-based process* that includes human perception, psychology, behavior and involves higher-level information assimilation skills. Anthropocentric approaches to design are a phenomenon of the Enlightenment and the view of man and man's reason as dominant in a constant and unfeeling natural world. Now, it is widely recognized that design for the body, based on ergonomics, must expand to include and recognize the primacy of the psychological experience of self - which includes bodily as well as other perceptions.

A UX/XD process is grounded in research and looks to identify unmet needs through a deep and detailed analysis of a user group. A scenario, usually developed as a visually enhanced narrative, develops a comprehensive data field for the user context – rich in sensory and empirical information, interdependent in space and time. The process is an empathetic analytical process and asks *why* as often as it asks *how*. For example, *why/how* does a user enter a building, *why/how* can a user feel comfortable in a space, *why/how* can the function of a development be determined to be efficient. The "whys" ask questions of culture, psychology, economics and perception. The "whys" are where to find meaning, opportunity – and value.

Figure 2: Tactics across fields to create new strategic space. Source: (Author 2015)

4.2. Wicked tactics and strategic spaces

Once a wicked and plastic information space is established, clear methods for navigating that space to achieve desirable ends must be established. Tactics are behaviors conceived to achieve goals in an unknown future and place. UX/XD methods address behaviors, needs and interfaces of new humans living in a post-virtual world with the intent of developing a strategic space.

> A tactic is a calculated action determined by the absence of a proper locus [and] the space of a tactic is the space of the other. [A tactic is deployed] on and with a terrain imposed on it and organized by the law of a foreign power. [One who deploys a tactic] must vigilantly make use of the cracks that particular conjunctions open in the surveillance of the proprietary powers. It poaches them. It creates surprises in them (de Certeau 36-37).

Strategies and Tactics differ in key aspects: Strategies create their own space but tactics are conceived outside of an established space with the intent to find opportunities in the un-resolved areas of any system (deCerteau).

Employing tactics is consistent with the initial distinction between the declarative representation of the information field and the methods for interpreting and navigating that field. Tactics are disruptors that can cross strategic fields to generate novel solutions. New tactical models generate new strategic spaces and new worlds. Resulting strategic fields and narrative spaces are bound in a 'world'. Architecture is now called upon to build such complex worlds.

Wicked tactics look for opportunities in the vast complexities of a strategic field, and may act deliberately outside the strategic space, relying on the *butterfly effect* and interrelatedness of the system to achieve desired behaviors. These tactics build strategies that are agile enough to *design for adaptive agency* in an *interactivist, multi-agent system*.

5.0 ARCHITECTURES – BIGGER THAN BUILDINGS

5.1. Experience field and epigenetic spaces

Architectural solutions should be conceived to include the entire experience field of the user: redefined in form, scope, material and purpose. Instead of 'creating' or 'constructing' space; the process of creating architectures has taken a performative and semantic shift. Architects should now focus on *conditioning space to achieve behaviors*. Conditioning assumes non-teleological strategies, a gentle and responsive engagement with the environment and the user to design for emergence (Berger).

Designing for emergence includes anticipating change in the range of bodily and non-bodily perceptions within post-virtual space. Architectures are now expected to create an interactive, adaptive context to facilitate behaviors and experiences. In the mathematical field of topology, models have been developed to define continuous relationships between topological spaces that maintain all the topological properties of a given space. We can begin here to develop models of continuous spaces of experience. This is architecture without boundaries. Designing buildings is only part of the task. Architects must design environments: epigenetic control spaces of artifacts and agents for IoMe humans.

5.2. Tools of design

Design assumes purpose. New tools and new materials can create purpose. Architecture has always valued *material knowing:* a belief that a material should be "what it wants to be" depending on its inherent properties, the tools available to manipulate it and the cognitive capabilities to challenge expectations and cultural norms. Post-virtual design embraces materiality and precision enhanced by include human haptic, psychological and environmental perceptions.

When synthesized, parametric and BIM tools along with new fabrication processes and UX/XD methods provide a comprehensive tool-set for designing architectures of seamless space. We have developed proficiency with our digital tools; but what about the tools of meaning? What is the role of material and the body and how does proprioception work in plastic space? Does that sense of the body (presence) in space affect meaning? It is time to revisit and adapt human-centric design processes based on perceptions and experiences of new humans, augmented by the digital and material precision of new technologies.

6.0 PARAMETRICS OF MEANING

6.1. Meaning through narrative and form

A thing is meaningful to you if you have a stake in it – and meaning is closely tied to value. Meaningful architectures are valuable architectures. Meaning is created through experiences, relationships and behaviors. The communication of meaning is done through narratives: oral, written, visual and kinesic. Therefore, narrative and meaning are inter-related. Narratives have structures or formalisms that facilitate

communication and meaning. *Finding the right formalism to communicate a desired meaning is essential to create meaningful architectures.* In order to design for meaning, the design process must also integrate epistemological and ontological questions into the research and scenario building process. The study of the nature of meaning and knowledge as well as fundamental questions of being and reality take on new relevance in the act of creating meaningful and valuable space.

Much architectural discourse has been centered around form and meaning with a range of perspectives on the primacy of one over the other. The forms of the artifacts of our environment (architecture) get built in to our experiences and narratives, and are assigned meaning; regardless of the intent (or lack of intent) of the creator. Many designers willingly ascribe the task of the creation of meaning to context and chance. As ever more architecture is conceived through parametric design tools, the chasm between the human needs and digital space must be bridged to create meaning and valuable architectures. The result of disregarding meaning in the design process is that parametrically generated forms become purely stylistic and will not retain value or become relevant artifacts of culture.

6.2. Chasm between digital tools and the creation of meaningful architectures
Fundamental to creating an artificial intelligence (AI), is creating a language of *knowledge representation.* Such languages are structured according to human reasoning and allow for the structuring of vast amounts of data. As creators of architectures, developing parametric processes to generate form is also a kind of knowledge representation. Bits of code are created to direct the behavior of forms according to predetermined properties and processes. Models of code and mathematics based on processes associated with the creation of meaning can be built into the parametric process of architectural design. Often though, parametric design occurs without narrative intent or a world-building objective. This had led us to the current state of *parametric as a style* and form for form's sake. There is a beauty of novelty and precision but these architectures often leave a deep void of emptiness of meaning. In the best cases, these buildings may demonstrate a mastery of the tools and materials of design. A demonstration of a virtuosity of parametric architecture remains unachieved. Virtuosity assumes proficiency of skill, yet also requires the ability to elicit complex emotional responses. Virtuosity assumes a design for interaction and affect.

In post-virtual space, it is necessary to design within the feedback/feed-forward loop of *interaction theory* (Gallahger). Human experiences and behaviors can now be reciprocally modelled based on mathematical processes. The intent is to bring those more meaningful processes into parametric design. Again we look to mathematics and programming for models to deal with the complexities of design the post-virtual space. We see promising examples in algorithm design, such as *semantic evaluation* (translating intuition to computer language), *stochastic processes* (sets of random variables that behave indeterminately over time) *and soft-systems methodology* (a framework to deal with wickedly complex problems). Additionally, *forward compatibility architectures* that design for future input and change like multi-paradigm *extensible semantic languages* (that enable elegant expansion to allow for changes in the problem question) and *fuzzy sets* (that define variable relations amongst individuals) analogous to Gallagher's interaction theory.

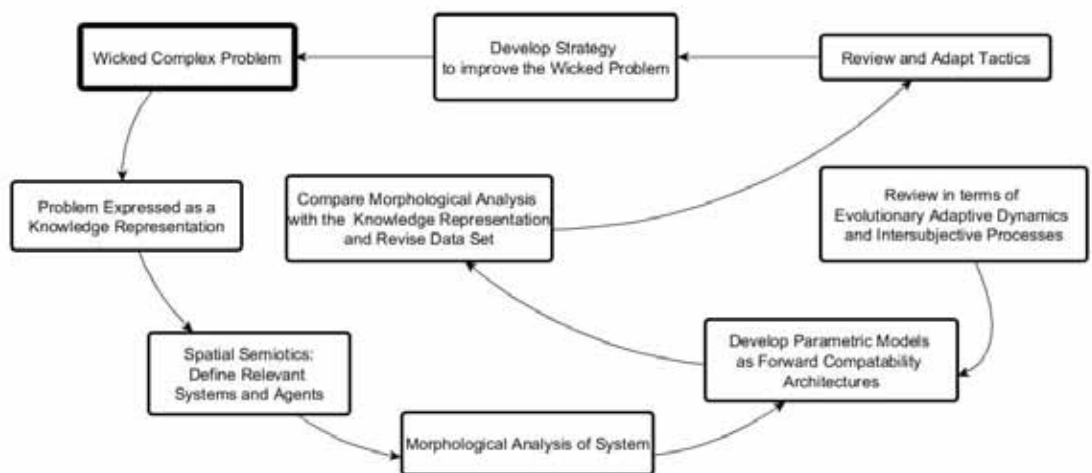**WORLD-BUILDING WITH SOFT-SYSTEMS METHODOLOGY**

Figure 3 : Process for designing a complex adaptive system. Source: (Author 2015)

7.0 RESULTS/APPLICATIONS

7.1. New methods and tactics

This work has identified a selection of non-teleological, new methods and tactics for design of post-virtual architectures. Selecting and combining the appropriate tactics to will depend on the nature and wickedness of the field to which they are to be applied. Linking *situational semantics* (Barwise, Seligman) (Kratzer) structuring possibilities, *spatial semiotics* (Osgood) establishing the symbolic meanings of and in space and *Kansai engineering* (bringing emotion to objects and technology) could be an example of setting a tactical field to develop a strategic space. This tactical approach will generate a strategic space to create an architecture in terms of meaning, personal and social context, aesthetics, haptics, performance, human perception, value, technology and performance.

7.2. Redefining architecture(s)

As material and immaterial architectures are synthesized and built, the digital precision of computer science and parametric modelling and the hyper-biological perceptive sensory apparatus are acting concurrently - creating meaningful spaces in time. A new direction in *architecture* is taken. Spaces are designed to interact and adapt in time and for a variety of uses while sharing information with and creating information for the data space. Within these superspaces, meaning is constantly created based on the experiences of the users and becoming part of the collective data consciousness. The design of these spaces is non-teleological and it requires great skill to deliver a performative solution. Post-Virtual Spaces and architectures are *adaptive environmental interfaces – superspaces;* shaped through parametric tools based on human experience.

REFERENCES

Asur, A., Huberman, B. A., Szabo, G., Wang, C., & Hewlett Packard. (2011, February 8). *Trends in social media : Persistence and decay* [Scholarly project]. In *Twitter Trends*. Retrieved June 15, 2013, from http://www.hpl.hp.com/research/scl/papers/trends/trends_web.pdf

Atkin, Albert, "Peirce's Theory of Signs", *The Stanford Encyclopedia of Philosophy* (Summer 2013 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/sum2013/entries/peirce-semiotics/>.

Barthes, R., & Heath, S. (1977). *Image, music, text*. New York, NY: Hill and Wang.

Barwise, Jon, and Jerry Seligman. *Information Flow: The Logic of Distributed Systems*. Cambridge: Cambridge UP, 1997. Print.

Berger, Warren. *Glimmer: How Design Can Transform Your Life, and Maybe Even the World*. New York: Penguin, 2009. Print.

Bohm, D., & Peat, F. D. (2000). *Science, order, and creativity*. London u.a.: Routledge. Print.

Bohnacker, Hartmut, Benedikt Gross, Julia Laub, and Claudius Lazzeroni. *Generative Design: Visualize, Program, and Create with Processing*. New York: Princeton Architectural, 2012. Print.

Brennan, K., Resnick, M., & MIT Media Lab. (2012). *New frameworks for studying and assessing the development of computational thinking* [Scholarly project]. Retrieved June 15, 2013, from http://web.media.mit.edu/~kbrennan/files/Brennan_Resnick_AERA2012_CT.pdf
    Paper presented at annual American Educational Research Association meeting, Vancouver, BC Canada

Cetina, K. K. (2009). The synthetic situation: Interactionism for a global world. *Symbolic Interaction*, *32*(1), 61-87. doi: 10.1525/si.2009.32.1.61

Congdon, Christine, Donna Flynn, and Melanie Redman. "Balancing "We" and "Me" - The Best Collaborative Spaces Also Support Solitude." *Harvard Business Review* Oct. 2014: 50-57. Web.

Cukier, K., & Mayer-Schoenberger, V. (2013, May/June). The rise of big data. *Foreign Affairs*, *92*(3), 28-40.

Davidow, B. (n.d.). Skinner marketing: We're the rats, and facebook likes are the reward: Our internet handlers are using operant conditioning to modify our behavior. *The Atlantic*. Retrieved June 10, 2013, from http://www.theatlantic.com/technology/archive/2013/06/skinner-marketing-were-the-rats-and-facebook-likes-are-the-reward/276613/

Dean, J., Corrado, G., Monga, R., Chen, K., Devin, M., Le, Q., ... Ng, A. Y. (2012). *Large scale distributed deep networks.* [Scholarly project]. Retrieved June 15, 2013, from http://static.googleusercontent.com/external_content/untrusted_dlcp/research.google.com/en/us/archive/large_deep_networks_nips2012.pdf

Debord, Guy-Ernest. "Introduction to a Critique of Urban Geography." *Nothingness.org*. N.p., n.d. Web. 17 Jan. 2012. <http://nothingness.org>.

De Certeau, Michel. *The Practice of Everyday Life*. Berkeley, Calif.: U of California, 2008. Print.

Duggan, M., Brenner, J., & Pew Internet. (2013, February 14). The Demographics of Social Media Users. *Pew Research Center's Internet & American Life Project*. Retrieved from http://www.pewinternet.org/Reports/2013/Social-media-users.aspx

Eco, U. (1994). *The limits of interpretation*. Bloomington, IN: Indiana University Press.

Florida, R. (2002). Rise of the Creative Class. *Washington Monthly*. Retrieved June 22, 2013, from http://www.washingtonmonthly.com/features/2001/0205.florida.html

Gallagher, Shaun. *How the Body Shapes the Mind*. Oxford: Clarendon, 2005. Print.

Goffman, E. (1959). *The presentation of self in everyday life*. Garden City, NY: Doubleday.

Goffman, E. (1971). *Relations in public; microstudies of the public order.* New York, NY: Basic Books.

Goldstein, J. (1999). Emergence as a construct: History and issues. *Emergence*, *1*(1), 49-72. doi: 10.1207/s15327000em0101_4

Google. (2013). Flu Trends. *Google Technolgoy for Social Impact*. Retrieved June 15, 2013, from http://www.google.org/flutrends/

IBM Industries & Solutions. (n.d.). Apply new analytics tools to reveal new opportunities. *IBM Analytics – IT Business Intelligence*. Retrieved June 15, 2013, from http://www.ibm.com/smarterplanet/us/en/business_analytics/article/it_business_intelligence.html

Joas, Hans. *G.H. Mead: A Contemporary Re-examination of His Thought*. Cambridge, MA: MIT, 1997. Print.

Knorr-Cetina, K. (1999). *Epistemic cultures: How the sciences make knowledge*. Cambridge, MA: Harvard University Press.

Koller, Daphne, and Nir Friedman. *Probabilistic Graphical Models: Principles and Techniques*. Cambridge, MA: MIT, 2009. Print.

Lefebvre, H. (1991). *The production of space*. Oxford, OX, UK: Blackwell.

Massey, D. B. (1984). *Spatial divisions of labor: Social structures and the geography of production*. New York, NY: Methuen.

Mead, George Herbert., and Arthur E. Murphy. *The Philosophy of the Present: Lectures upon the Paul Carus Foundation, Third Series*. Chicago, IL: Open Court, 1932. Print.

Monroy-Hernandez, A., & Resnick, M. (n.d.). Making projects, making friends: Online community as catalyst for interactive media creation. In K. Brennan (Author). doi: 10.1002/yd.377 NEW DIRECTIONS FOR YOUTH DEVELOPMENT; NO: 128; WINTER 2010 copyright WILEY PERIODICALS; INC: Published online in Wiley Online Library (wileyonlinelibrary.com)

Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. (1975). *The measurement of meaning*. Urbana-chicago-london, IL: University of Illinois press.

Pine, B. J., & Gilmore, J. H. (1999). *The experience economy: Work is theatre & every business a stage*. Boston, MA: Harvard Business School Press.

Princeton Survey Research Associates International. (2012, August 12). Pew Research Center's Internet & American Life Project. *IPoll Results*. Retrieved from http://pewinternet.org/iPoll results.aspx

Raison, Timothy, and Paul Barker. *The Founding Fathers of Social Science: A Series from New Society*. London: Scolar, 1979. Print.

Rifkin, J. (2000). *The age of access: The new culture of hypercapitalism, where all of life is a paid-for experience*. New York, NY: J.P. Tarcher/Putnam.

Rittel, H.W.J and M. M. Webber, Dilemmas in General Theory of Planning. *Policy Sciences 4* (1973), 155-169. Amsterdam, Elsevier Scientific Publishing Company

Ryall, M. D. (2013, June). The new dynamics of competition: An emerging science for modeling strategic moves. *Harvard Business Review*, *91*(6), 80-87.

Saussure, F. D., Baskin, W., Meisel, P., & Saussy, H. (2011). *Course in general linguistics*. New York, NY: Columbia University Press.

Sha, X. (2011, August 02). *Recherche-Creation*. Lecture presented at University of California Humanities Research Institute (UCHRI) Seminar in Experimental Critical Theory, Section VII, ReWired: [Asian+TechnoScience+Area] studies in University of Hawaii, Manoa.

Shannon, C. (1948). A mathematical theory of communication. In *The bell system technical journal* (July,October ed., Vol. 27, Pp.379-423,623-656). Retrieved June 15, 2013, from http://cm.bell-labs.com/cm/ms/what/shannonday/shannon1948.pdf

Shiffman, Daniel, Shannon Fry, and Zannah Marsh. *The Nature of Code*. San Bernardino: Shiffman, 2012. Print.

Simonite, Tom. "Software That Augments Human Abilities." *MIT Technology Review* Mar.-Apr. 2014: 65-66. Print.

Skinner, B. (1948). *Verbal Behavior*. Lecture presented at William James Lectures in Harvard University, Cambridge. Retrieved from http://www.bfskinner.org/bfskinner/PDFBooks_files/William%20James%20Lectures.pdf

Soja, E. W. (1989). *Postmodern geographies: The reassertion of space in critical social theory*. London: Verso.

Thompson, J. B. (1995). *The media and modernity: A social theory of the media*. Stanford, CA: Stanford University Press.

Tschumi, Bernard. *Questions of Space: Lectures on Architecture*. London: Bernard Tschumi and the Architectural Association, 1995. Print.

Tuan, Y. (1977). *Space and place: The perspective of experience*. Minneapolis, MN: University of Minnesota Press.

Vygotskiĭ, L. S., & Cole, M. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Waber, Ben, Jennifer Magnolfi, and Greg Lindsay. "Workspaces That Move People." *Harvard Business Review* Oct. 2014: 69-77. Print.

Wilson, E. O. (1998). *Consilience: The unity of knowledge.* New York, NY: Knopf.

Wolf, G. (2009, June 22). Know Thyself: Tracking every facet of life, from sleep to mood to pain, 24/7/365. *Wired.com.* Retrieved June 15, 2013, from http://www.wired.com/medtech/health/magazine/17-07/lbnp_knowthyself?currentPage=all

Woodbury, Robert. *Elements of Parametric Design.* London: Routledge, 2010. Print.