I, Stephanie Carlson, hereby submit this original work as part of the requirements for the degree of Master of Architecture in Architecture (Master of).

It is entitled:
Knowledge Workers: A Psychological Approach to Living and Working

Student's name: Stephanie Carlson

This work and its defense approved by:

Committee chair: Aarati Kanekar, PhD

Committee chair: Michael McInturf, MARCH
Knowledge Workers
A Psychological Approach to Living and Working

Stephanie Carlson
Abstract

This project intends to develop a live-work building for knowledge workers through the application of the principles of environmental psychology. The site is located in downtown Austin, Texas—a technology hub with an active urban environment attractive to professionals seeking the flexibility and balance knowledge work provides. Knowledge workers perform symbol work that is neither temporally nor physically bound; however, they still operate within existing spatial constructs that do not address their unique living and working needs. Environmental psychology research can begin to suggest architectural solutions to the physical and psychological issues faced by knowledge workers. The application of this research will be determined through the examination of the tension between living and working spaces, as well as the relationship between public and private. The slow process of drawing by hand brings together the mental and the kinesthetic into a physical form, reflecting an architectural process which attempts to bring together psychology and the physicality of space into a cohesive architecture which supports the work and well-being of knowledge workers.
## Contents

<table>
<thead>
<tr>
<th>i</th>
<th>Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Waves of Change</td>
</tr>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>3</td>
<td>The Agricultural Age</td>
</tr>
<tr>
<td>5</td>
<td>The Industrial Age</td>
</tr>
<tr>
<td>9</td>
<td>The Information Age</td>
</tr>
<tr>
<td>II</td>
<td>Blurred Boundaries</td>
</tr>
<tr>
<td>13</td>
<td>Introduction</td>
</tr>
<tr>
<td>14</td>
<td>Blurring Live-Work</td>
</tr>
<tr>
<td>20</td>
<td>Knowledge Work</td>
</tr>
<tr>
<td>III</td>
<td>Supportive Spaces</td>
</tr>
<tr>
<td>23</td>
<td>Introduction</td>
</tr>
<tr>
<td>25</td>
<td>Evidence-Based Design</td>
</tr>
<tr>
<td>31</td>
<td>Stimulation</td>
</tr>
<tr>
<td>35</td>
<td>Control</td>
</tr>
</tbody>
</table>

| 42  | Restoration                               |
| 48  | Place                                     |
| IV  | Analysis                                  |
| 53  | Introduction                              |
| 54  | Weird City                                |
| 59  | Site and Program                          |
| V   | Conclusion                                |
| 69  | Summary                                   |
| 71  | Notes                                     |
| 77  | Figures                                   |
| 81  | References                                |
| 87  | Appendix: Design                          |
One machine can do the work of fifty ordinary men. No machine can do the work of one extraordinary man.

-Elbert Hubbard

Society is currently in a state of flux. The factories and rigid cultural expectations of the industrial age are giving way to advanced technology, decentralized business, and mass-customization of the information age. New ways of living and working are emerging. Those people that work primarily with computers—"symbol" workers—are finding that they no longer require a 9-to-5 office job in order to do their work.

Most literature describes this group of people as telecommuters or tele-workers, but this definition is quite narrow. It implies that they are still tightly tethered to their place of work, performing their duties at home instead of in a cubicle. However, fundamental shifts in the way people work and businesses operate require new definitions. Ellison introduces the term “knowledge worker,” a phrase that I will use to describe a broader range of working types than “tele-worker” implies. A knowledge worker, then is a person who relies on technology, typically the computer, to perform work. They include designers, software engineers, web developers, writers, small startups, and entrepreneurs. Their val-
ue lies in the ability to apply the information and skills contained within their mind.

Because knowledge work is still relatively new, architecture has been slow to catch up. Knowledge workers are typically forced to work in existing constructs like a room in their house, the coffee shop, or a park. These places are rarely an optimal working environment. The proposed live-work building design offers a solution to this new working style and will address the needs of knowledge workers at multiple levels.

Many issues faced by knowledge workers can be addressed architecturally, but many issues are psychological and behavioral. As demonstrated by the broad scientific literature of environmental psychology, there is a clear relationship between mind, body, and physical environment. How, then, can one reconcile the need for a quiet work environment with the problem of isolation? Is isolation a problem? How can knowledge workers deal with stress? How does one negotiate the boundary between work and home? Or, in general: what psychological research can be applied to architecture to promote well-being both at home and at work?

The location of the proposed live-work building is in Austin, Texas. The city has a large population of young, urban, highly-educated people and a high concentration of high-tech companies; thus there is a large number of “knowledge worker” types living in the city.

The downtown area has recently been experiencing major revitalizations. Between 2005 and 2010, ten skyscrapers were erected in the downtown area, with more planned in the next few years. The city’s goal is to bring more density, mixed use, more residences, and more businesses downtown to create a thriving city life. They want Austin to be a live, work, and play center, which I believe my project will both complement and enhance.
This document presents its arguments in three parts. Chapter one traces the broad theoretical issue of the human condition. It examines the history and future of life, work, and society through three major waves of change. Chapter two explores the emerging concept of the knowledge worker and the way in which changes in society affect how people work, relationships, and the connections between work and home. Chapter three explains the need for evidence-based design in architecture and describes the research findings of Environmental Psychology which can be applied to architecture to develop a relevant, supportive design for knowledge workers. Chapter four connects the concepts of the first three chapters with a site and design investigation.

The goal of this thesis is to explore possible architectural solutions to the physical and psychological issues faced by knowledge workers. This will be achieved through an examination of the current changing forces which influence how we live and work, understanding the current needs of knowledge workers, and determining how to apply Environmental Psychology findings to design in order to address those needs.
To understand where society is headed, one must understand what has come before. In *The Third Wave*, Alvin Toffler traces the major shifts in human civilization from the rise of small agrarian villages, to the massive upheaval of the Industrial Revolution, and finally to the revolutionary technological advances shaping society today. With each wave of change, time seems to accelerate. The transition from hunter-gatherer clans to agrarian villages took thousands of years, while the industrial age was mostly in place after three hundred years. With the rapid pace of technology today, the Information Age will likely encircle the globe in less than a century.

The transition point from one wave to the next is fraught with disorder, rebellion, fear, and backlash at every level of society. New systems obliterate the old, completely changing how a civilization lives and works and how people think about their place in the world. The new order challenges assumptions about reality and questions the very nature of the human condition.
The Agricultural Age

The first major revolution in the way humans lived and worked was the transition from hunter-gatherer to agricultural. People settled permanently in order to work the land, becoming anchored to and dependent on the earth. Families were large and multigenerational. Parents, grandparents, aunts, uncles, cousins, in-laws, and a multitude of children lived and worked together as a single economic unit. They saw themselves not as individuals, but as a component of a larger family structure.

People made little distinction between work and home because they were one in the same. Work roles both in the home and in the fields were highly flexible. The type of work one person performed varied from day to day, depending on the season, health, or the activities of other family members. Children learned from and worked alongside members of their extended family in the fields or at home. The tempo of life was determined by work and the seasons. Work followed a continual cycle of self-sufficient production and consumption which never surpassed subsistence.

The vast majority of people lived this self-sustaining agrarian life. In the towns and cities, craftsmen, tradespeople, and shopkeepers sold their goods in the marketplace. Like the farmers, these merchants typically lived where they worked, often with living space above or behind their shop. Goods were manufactured in the shop individually by hand.

People of the agricultural age had a fundamentally different view of the world and their role within it. They saw themselves as a part of nature, to the extent that they worked in harmonious rhythm with animals, plants, and the seasons. When they traveled long distances, they all meandered according to the lay of the land, following the paths set by the many people who had made the
journey before them. When they plowed the fields behind oxen, they accepted the animal’s meandering nature and ended up with curvy, uneven grooves in the earth. Walls bowed, bent, and connected to one another at irregular angles. Even Medieval streets were organically determined by geography and the collective footprints of thousands of people making paths over hundreds of years.

This way of life began to change with the advent of machines and the rise of industrialism. Traditional cultures clashed with this new revolution, but ultimately fell against new technology and new ways of thinking. The age of industry was beginning.

---

**The Industrial Age**

The next major revolution began in the 18th century with the advent of the machine. In America, the Civil War broke out partially over the larger cultural issue of whether America would remain an agricultural nation or become an industrialized nation. The North’s victory settled America’s future. As with other countries, “in economics, in politics, in social and cultural life, agriculture was in retreat, industry ascendant.”

The industrial age attacked every aspect of the agricultural age. Industrialism dramatically changed the way society functioned by becoming a complete and cohesive social system. “It produced the great Willow Run factory outside Detroit, but it also put the tractor on the farm, the typewriter in the office, the refrigerator in the kitchen. It produced the daily newspaper and the cinema, the subway and the DC-3. It gave us cubism and twelve-tone music. It gave us Bauhaus buildings and Barcelona chairs, sit-down strikes, vitamin pills, and lengthened life spans. It universalized the wristwatch and the ballot box.”

The way in which people worked was dramatically affected by the machine. Mechanization of agriculture meant that only a small percentage of the population was required for food production. Production became divorced from consumption, and people became interdependent on one another for survival. More people turned to industry for work. Large mass-production factories arose in cities and completely transformed the urban form. Factories concentrated near one another along transportation lines in the city, creating manufacturing districts. Homes, meanwhile, were located further and further away from the toxic smoke and smell of industrial production. The division between work and home continued to expand throughout the industrial age as zoning laws segregated commercial and industrial zones from residential zones.
Large numbers of workers were concentrated in a centralized space in the name of efficiency. Workers were overseen by a hierarchy of supervisors and managers in a top-down ordering system. Each worker was responsible for only a small, specific task along the assembly line, which they performed with mind-numbing repetition. This method of work was viewed as far more efficient than giving each worker the task of assembling the entire product on their own. Workers were little more than another machine along the assembly line. Thus the many roles of the agricultural-age farmer were replaced by the specialized tasks of the factory worker.

This new style of working brought huge stresses to the family unit. The family no longer worked together as one; instead, it fractured into many pieces which carried with them specific tasks. While the man ventured into a new industrial world to work, the woman remained at home performing agricultural-age tasks. Children, no longer educated by family members, were taught in factory-like schools which encouraged punctuality, rote learning, and complete obedience. Extended families broke apart to follow new jobs. Relatives likely lived in a different area of the city, or lived in a different state altogether. Thus the traditional agricultural family fell apart and was replaced by the more mobile nuclear family.

Every aspect of life was synchronized to the machine, and time became a linear construct with concrete divisions and sub-divisions. Workers arrived to the office or the factory punctually by 9:00 and left at 5:00. Children lived their lives according to the ringing of the school bell. Specific hours were set aside for meals, leisure, vacations, and coffee breaks. This is in stark contrast to the natural synchronization of agricultural life. People worked to the sun in the sky, the change of the seasons, and their own natural biological processes. Industrial society, meanwhile, “moved to the beat of the machine.”

Industrialism broke society into thousands of individual yet interlocking parts, all marching in unison to the machine. While these parts were tightly integrated by an overarching social system, the destruction of the underlying unity of society created economic tension, social conflict, and psychological malaise. Standardized products filled homes as the standardized information of mass-media filled minds. People became dependent on the marketplace to meet their needs, and thus became consumers obsessed with money and objects. The difference between producer and consumer created a dual personality. At once, a person is taught by family, school, and work to be disciplined and controlled.
while as a consumer is encouraged to seek instant gratification and to perform a patriotic service by keeping the wheels of the economy turning.

Industrialism has clearly had important psychological consequences, producing a new mental framework. The all-encompassing social framework of the industrial age gave individuals a sense of stability and understanding of their place in the societal machine. People grew up knowing what to expect from life, and what actions to take to achieve their goals. At the same time, Toffler’s Industrial Man “sensed straight-line time bearing him remorselessly toward the future with its waiting grave. And as his wristwatch ticked off the moments, he approached death knowing that the earth and every individual on it, including himself, were merely part of a larger cosmic machine whose motions were regular and relentless.”

If this view of the Industrial Man seems outdated, that is because he has been slowly dying alongside industrialism. In the past few decades social and political life has grown less coherent as the framework of the Industrial Age slowly collapses. Without social guidance, many people have fallen into extreme religiosity to infuse order into their lives, or, alternatively, have dropped out of society altogether, choosing to exist virtually. People in the suburbs have grown disillusioned with the mind-numbing traffic congestion, the endless sea of parking lots, and identical strip malls for as far as the eye can see. At the governmental level, politicians work to squeeze the most advantage from a declining industrial system. Or, as Toffler describes, “they are engaged in a squabble for the proverbial deck chairs on a sinking Titanic.”

The most interesting question is not how the last days of industrial society will play out, but what the first days of the information age will be like. Technological developments are once again leading us into a new age that seems to hold incredible possibilities.

**The Information Age**

As we enter the dawn of a new wave, we are facing a collision between the entrenched structures of the industrial age and the new forces of the information age. Nuclear families have fractured, city centers are deteriorating, and social structures have decayed. The movement to restore these broken systems is battling against the forces of progress. Industrialist assumptions like excessive job specialization, the maximization of profit at all costs, and mass-standardization of work and life are beginning to be questioned and ultimately discredited in favor of new ways of living, working, and thinking. As we grow into the information age, the need for a new architecture to reflect changing home and work patterns will become obvious.

Over the past thirty years, new patterns of work and a new economic model have developed. Many workers have moved from manufacturing and labor to technology-based work. The economy is now based heavily on the generation of information and services rather than manufactured products. However, our places of work still operate under the legacy of the industrial age. Though the ways in which work is done has fundamentally shifted, workers are expected to operate within the time and management style of the factory system. While close supervision of factory workers was necessary in the day-to-day operations of a factory, such managerial practices no longer make sense in abstract symbol work.

As work is transformed, the relationship between work and home will also change. Technology allows work and dwelling to occur close together—often, in the same space. As work becomes less location-dependent, people will be choose a place to live that matches their lifestyle, individual preferences, and desired amenities. People will likely feel more connected with and committed
to their chosen communities. Many people today don’t bother getting involved in community affairs because they know that they will soon be moving again.

Society is transforming from a culture of fragmentation to one of synthesis. In the intellectual fields, scientists are returning to large-scale thinking. Cities are realizing that a holistic approach to community is more effective than breaking community into a thousand tiny components. Overall, people are beginning to consider the long-term implications of their actions, and to understand social problems within a larger context.

Technology is transforming us psychologically just as quickly as it is transforming us culturally. Both our personal memories and our collective memories can now live on digitally. In the agricultural age, social knowledge and memories were passed down from village elders through stories and songs, but most memories died with the individual. Today, cumulative knowledge allows us to grow exponentially, resulting in faster and greater breakthroughs in the arts, science, and technology.

An astonishing amount of information is at our fingertips, with news, scientific discoveries, entertainment flashing past us at an almost alarming rate. Old information must be constantly updated within our own psyche lest we become less competent at life. Desperate attempts to keep up can lead to information overload and a feeling of inadequacy. Information becomes more and more temporary as it is so quickly replaced. “Ideas, beliefs, and attitudes skyrocket into consciousness, are challenged, defined, and suddenly fade into nowhere-ness.” The most valued workers will be those that are capable of synthesizing this dizzying amount of information and applying it to business.

Each person is now capable of creating their own reality. We are no longer bound by mass media or physical structures to define who we are. Above all else, information-age people value individuality. No longer satisfied with

An increasing number of couples are choosing to remain child-free.

Once scorned, a gay couple with a son adopted from Thailand are today seen as a legitimate family unit.
mass-produced goods, people are demanding individual customization. Thanks to technology, such a thing is not only possible, but is more efficient than industrial mass-production. Computer-driven machines capable of creating custom products demonstrates a strong parallel to methods of production before the industrial age, but using advanced technology to accomplish the same task. In fact, many aspects about the information age are congruous with the agricultural age, including decentralized production, smaller scale, renewable energy, and work near the home.

Just as the nuclear family replaced the multigenerational family, a new type of family is emerging to define the information age. The collapse of the nuclear family, which consists of a working father, a stay-at-home mother, and children, is evident: by 2000, approximately 24% of the US population belonged to a nuclear family. Instead, more people live alone, or live together with a partner without marrying. Fewer people are choosing to have children, and those that do are far more likely than ever before to be a single parent. Other family types, such as gay couples with adopted children, step-families, or grandparents raising grandchildren, are also common. The only way to describe the new information-age family is “diverse individualization.”

The information age is clearly bringing about revolutionary changes at multiple levels of society. Work is becoming decentralized, families are becoming more diverse, and people are demanding individuality in all things from products to identity to reality itself. They refuse to be bounded by space and time, and reject arbitrary social norms left over from the industrial age. These changes require a new architecture for the information age. Modern architecture of the past, itself a product of industrial-age ideologies, is no longer relevant to the society of the future.
Simply pushing harder within the old boundaries will not do.

-Karl Weick

Work and society are changing rapidly, and those changes will only be increasing in the decades to come. Despite the estimated 17.2 million people currently teleworking full-time, and millions more whom could be classified as knowledge workers, no new architecture has been developed to meet their needs. Instead, they are forced to make do with existing spaces which may be physically uncomfortable, psychologically harmful, or detrimental to work productivity. They must also contend with the frustrating collision of home life and work life. The blurred boundaries between work and home have been a demonstrated source of mental stress for knowledge workers.
Starting your own business today is as simple as turning on a laptop. Meetings with consultants, communication with clients, and work-related research can all occur rapidly and efficiently over the internet. Information age workers are no longer bound by time or geography. Despite these radical shifts in living and working, knowledge workers are looking toward agricultural age patterns of living rather than in the futuristic world imagined by utopian writers.\(^2\)

Those born in the 1970s and beyond have developed a different attitude toward living and working than their industrial age parents and grandparents. They have seen the toll that uncertainty, stress, and anxiety concerning work has taken on their parents. The new generation has placed far less importance on work and the accumulation of wealth than previous generations.\(^3\) They value work flexibility, a good quality of life, and live-work balance, rather than “long hours of work...driven by increasingly ambitious lifestyle goals.”\(^4\)

A study by the International Labour Organisation in 2000 found that nearly 10% of workers in Germany, Finland, Poland, Britain and the United States suffer depression, anxiety, and burnout due to their jobs. In the United States alone, billions of dollars per year in lost productivity in the workplace occurs due to work-related stress and depression. The result is “low productivity, reduced profits, high rates of staff turnover, and increased costs of recruiting and training replacement staff.”\(^5\)

A rebellion of sorts against these working conditions has been rising over the past few decades. Workers have found that an increase in income does not lead to an equivalent increase in happiness, and have begun to reverse the trend of workaholism. Birch explains: “A study by the Australia Institute reveals that in the past 10 years, 23 percent of Australians aged 30-59 have forgone income for the sake of a more balanced lifestyle. They have switched to a less demanding, less stressful and less well paid job, reducing hours or dropping out

---

**Blurring Live-Work**

Telework began in the 1970s in response to the dual actions of improving technology and the oil crisis. Workers were desperate to avoid expensive, fuel-guzzling commutes and instead negotiated alternative work arrangements. They returned to the home and converted dining rooms, bedrooms, or basements into office spaces, connecting remotely to work via computers, faxes, and telephones. The interest in telework has risen steadily since then. In 2005 the American Housing survey reported that 5.75 million people worked from home full time, up from 4.2 million in 2000. Today the numbers are growing rapidly as companies downsize, businesses seek new ways to save money by encouraging telework, and people leave the corporate world to start their own businesses.

The decision to allow telework has been a difficult transition for many companies. Though the nature of work has changed, the manner and location in which it is performed is still largely determined by industrial age ideologies. A rigid managerial hierarchy and close supervision of work were necessary in factory work, and these systems soon found their way into the white-collar office environment. Today, industrial age managers find it increasingly difficult to manage information age employees whose work cannot be physically quantified or even understood.

Businesses at the forefront of new systems of work have discovered the benefits of allowing alternative working arrangements such as telecommuting. A flatted power structure and more mobile workforce have allowed businesses to “lower real estate and other costs, attract or retain employees, and increase productivity.”\(^1\) By removing layers of bureaucracy, businesses are better able to compete in a rapidly changing and globalizing marketplace.

Individuals workers have benefitted the most from new technology.
Realizing the physical and mental toll unhealthy work environments can have, many workers are choosing to put quality of life before wealth.

Cities too are beginning to understand that outdated, industrial age notions concerning city planning have been detrimental to communities. The strong separation between places of living, places of working, and places of leisure and recreation has resulted in weak community ties and long travel times on congested roads. Cities are looking toward earlier, agricultural age notions of city and community by combining and mixing residential and commercial uses. Incorporating “telework/telecommuting, home-based employment, satellite offices, and neighbourhood telework centres has important implications for land use, urban form, the housing industry, transportation, and services” in residential neighborhoods.

New mixed-use neighborhoods encourage a better balance between life and work because they increase access to services and reduce commute times. They reduce suburban sprawl, save environmental resources, improve air quality, and encourage public transportation use. New Urbanist plans place residential and commercial buildings into pedestrian-friendly communities, yet few cities or communities applying New Urbanist principles have built live-work buildings that have the potential to accommodate the growing knowledge worker population.

The way in which living and working relate to one another has shifted dramatically. During the agricultural age, home and work occurred in the same sphere, with the entire family operating together. The industrial age saw a deep division in both work and family, by which there were the family members that worked, and the family members that tended the home. Work and home were “separate and relatively autonomous behavioral spheres.” We are now seeing another shift in notions of home and work, but this change has brought with it a number of problems that have yet to be dealt with socially or architecturally.

Understanding the transitions and boundaries negotiated between living and working is necessary to determine possible architectural solutions. Nippert-Eng describes this boundary work as “the process through which we organize potentially realm-specific matters, people, objects, and aspect of self into “home” and “work,” maintaining and changing these conceptualizations as needed and/or desired.” Notions of work and home exist in a continuum from integration to segmentation. At one end, work and home are one in the same, as during the agricultural age. There are no conceptual boundaries or transitions between the two, and all information is interpreted within a single mental framework. At the other end of the continuum is segmentation, in which work and home are distinct concepts with “no physical or temporal overlap between
them”, each requiring its own mental framework. This was the position typified by the industrial age.

In truth, most people today operate within the large gray area between integration and segmentation of work and home. Boundaries and transition zones are often established by changing clothes, engaging in a specific ritual, maintaining geographical distance between work and home, or erecting physical boundaries such as a door or partition wall. While personal psychological boundaries may be easy to establish, boundaries between oneself and others is often more difficult. Problems arise when boundaries cannot be controlled or are ambiguous, especially when work roles and home roles overlap. For example, the dining room table may be used as a work desk during the day, but must be cleared to make way for children doing homework in the afternoon, or for the family meal in the evening. People living or working together may have differing views of how rigid or lax boundaries should be.

Despite these problems, more people are choosing to work from home than ever before. Home is becoming a safe retreat from the world, where technology provides the necessary “work, socializing, entertainment, and education.” The most problematic result of this trend is the sense of isolation and lack of interaction with other people in society. As home accommodates an increasing number of life functions, role conflicts will only increase and be a source of stress for both the worker and family. Clearly the single-family home is not the solution to these issues.
Knowledge Work

As more workers become disillusioned with outmoded business practices, they have begun seeking other work options to fit information age work. Decentralized workplaces are starting to allow flex-time, job sharing, and telework as legitimate alternatives to the 9-to-5 office job. More individuals than ever before have decided to start their own business or become consultants. These individuals have little need to work in a formal office, purchase large and expensive equipment, or even keep standard working hours. The core component of their work is the knowledge and skills contained within their own head.

Under the umbrella of “symbol” work, knowledge workers perform a broad range of tasks in a variety of working relationships. Working styles today include “employees connected to corporate networks while working from their homes or other remote locations, such as telecenters or client offices; self-employed consultants usually working from home, or home-based business operators operating businesses from their homes; independent contractors or self-employed subcontractors who rely on ICTs (information and communication technologies) in order to carry out their work; and workers, whether directly employed or outsourced, located in back offices or call centers, linked teleantically to employers’ central offices.” 13 While these work arrangements may be preferred over working in an office, they have been proven to be a suboptimal solution.

Knowledge workers currently working at home typically face problems maintaining the boundaries between their public work life and private home life, as both of these identities must often coexist in the same space. Families may have difficulty in knowing when the person is currently acting in a public role or private role at any given time. Technology only exacerbates this blurred boundary by allowing one area of life to interfere with another. Phone calls or e-mail may arrive at any time, resulting in the worker feeling powerless against this intrusion of work into home life. The rapid cycling from one role to another can leave the worker feeling stressed and out of control of his or her life.

In addition to role and boundary issues, knowledge workers suffer from other problems unique to their circumstances. Because they are not working in the typical office setting, they lack the temporal cues necessary to indicate when work should begin or end. For the average office worker, the day is regulated by the arrival of coworkers in the morning and their departure in the evening, afternoon lunch or coffee breaks, and scheduled meetings. Knowledge workers lack these informal cues and tend to have problems with time. They often lose track of time because of the ease at which technology commands their attention, when no other temporal cues exist. They may work through the night and into the early hours of the morning without even being aware of it. A lack of temporal regulation can result in excessive work schedules bordering on workaholism.

One of the largest perceived problems with alternative work arrangements is isolation. Critics claim that being in a typical workplace builds friendships, and believe that most career networking occurs at the office through coworkers, bosses, and clients. Knowledge workers miss out on these opportunities to interact with other professionals on a day-to-day basis. However, technology allows instant communication with work and clients via email and instant messaging. Knowledge workers can maintain professional relationships and be kept inside the loop in regards to happenings at the office. Furthermore, based on extensive interviews, Ellison has found that knowledge workers are relieved to avoid office politics and tedious chitchat with coworkers. Yet work-
ing from home does engender a certain level of isolation, simply because the individual interacts with fewer people.

Despite these issues, knowledge workers have overwhelmingly maintained that the benefits of knowledge work far outweigh the problems. Above all they cited increased time with family as the primary advantage of working from home. Many take breaks during the day to take children to and from school or run errands. Though they had to make up the lost working time later in the day, workers “did not complain about distractions like these and in some cases valued the opportunity afforded by transportation chores to interact with their children.”

Overall, knowledge workers face fewer interruptions and distractions in their work day compared to the typical office employee. Instead of wasting time socializing with coworkers, knowledge workers spent more time with “clients, industry contacts, or friends and family.” They also save a considerable amount of time by avoiding a long commute, therefore having even more time to spend with family.

A live/work building for knowledge workers must maintain boundaries between work and home, encourage social networking to minimize feelings of isolation, develop formal temporal cues, and in general provide a supportive environment for knowledge work. Environmental psychology has conducted considerable research on many of these issues and other issues faced by knowledge workers.
Experience seems to most of us to lead to conclusions, but empiricism has sworn never to draw them.”

- George Santayana

The Oxford Dictionary describes architecture as “the art or practice of designing and constructing buildings.” Implicit in this definition is that the buildings are designed for people. It seems, then, that one of the primary roles of a designer should be to examine human biology, psychology, and culture in order to understand how building design affects people. Scientific research has demonstrated that building design has a serious impact, for better or for worse, on people’s behavior, performance, and physical and psychological well-being.
Evidence-Based Design

Despite a growing body of scientific research, application of evidence-based design has been disorganized and often incidental in architecture. The result is that many issues remain unaddressed, and even those issues apparently addressed often fail in application because of a superficial understanding of human needs and a lack of consideration on how buildings affect their users. Technology now allows architects to construct nearly any design conceivable, but the consequences of such new, and often radical, designs on human psychology are not typically considered and are not fully known.

The lack of consideration for human factors is not new. Modernist thinking and ideology is based on a simplistic understanding of behavior and a nearly complete disregard for psychology. Modernist architects focused primarily on efficiency, the machine aesthetic, functionalism in their designs. Functionalism in this instance typically meant that the design supports the everyday behaviors and activities of its users without any superfluous or unnecessary elements. This understanding of functionalism was based on the belief that humans could be reduced to a few constant, universal physical needs. In the industrial age, not only was the house “a machine for living in,” but humans themselves were viewed as biological machines.\(^1\) At no point did Modernists even consider other possible purposes of architecture, such as identity, territoriality, aesthetics, or social interaction.

The Modernist way of thinking about the role the built environment plays in human behavior and psychology still greatly influences architectural design today. Architects tend to derive their understanding of people based on their own informal experiences, prevailing architectural ideologies, idealistic notions of how people should be, and a superficial understanding of psychol-
ogy. This approach to design thinking is known as normative theory.

Normative theory is a value-laden approach based on “perceptions of good and bad, right and wrong, desirable and undesirable, what is working well and what is working badly.”

It is an ideology concerning what the world, architecture, or people should be. Though normative positions are often based on facts, the relationship between the normative position and the facts it is built upon can rarely be articulated by architects. Many architects view design as a process that occurs intuitively in a way that cannot be described. An attempt to understand a normative design process can often cause designers to “feel threatened by the challenge to many of their beliefs, social creeds, and design habits presented by the research findings and theory that result from controlled and repeated observation, logical analysis, and the norms of disciplined argument.”

Architects continue to cling to normative theories rather than challenge their beliefs with scientific description and explanation of known phenomena. In general, the field of architecture lacks the “well-formulated and systematic body of shared knowledge based on systematic research” of the behavioral sciences. Unlike architecture, the behavioral sciences rely on design methodologies which are used to systematically describe and explain observed phenomena. This is known as positive theory, which describes what exists without making a value judgment.

Incorporating positive theory into design would allow the profession to develop “simple but powerful generalizations about the world and how it operates that enable us to predict accurately future operations” in a more rigorous way. People and their interactions with buildings are simply too complex for a normative approach. Ideas based on common sense or limited knowledge cannot account for much of this complexity, resulting in a large gap between the intended result and the actual result. In the worst case, such as Pruitt-Igoe

Most architects take a normative approach to design, but positive theory may offer a more robust design methodology.
in St. Louis or Cabrini-Green in Chicago, this results in building failure. Thus positive theory is vital both to an intellectual discussion of architecture as well as the practice of designing buildings.

Though architects are generally unable to apply a rigorous scientific method to their assertions due to the nature of the profession, they can still utilize quasi-scientific methods to develop sound, methodical theories which can be used to make predictions. From these theories architects can derive a large number of normative statements which can then be used to generate design patterns. A strong positive theory base is necessary to build logical and consistent normative statements to address the current issues. Such a theory that bridges architecture and psychology is known as environmental psychology.

Environmental psychology emerged in the 1960s as the study of the relationship between the built environment and human behavior. Architects had begun to realize that their buildings were not working as intended for their occupants and turned to behavioral scientists for help. As a multidisciplinary field, environmental psychology relies on the research methods developed by the behavioral sciences, such as “literature search and review, systematic observation, controlled interviewing, questionnaires and surveys, population sampling, and statistical analysis.”

The application of environmental psychology is most effective at five levels: city, neighborhood, street, building, and room. By understanding the behaviors and needs of knowledge workers, and utilizing the information gained in the field of Environmental Psychology, a systematic description of a supportive live-work building can be developed. The following sections—stimulation, control, restoration, and place—examine these needs and begin to suggest areas of focus for the architectural design process. In order to develop a more rigorous theory and methodology in architecture, we as architects must turn to
the behavioral sciences as a model for evidence-based design practices. Through a careful examination of the research presented by the field of environmental psychology, design questions can begin to be proffered. Based on those design questions, a design investigation into possible solutions on issues of stimulation, control, restoration, and place.

Stimulation

Stimulation in the environment has the potential to become a large source of stress in situations in which many stimulants exist. People can only process a limited amount of stimuli at any given time. When people become overstimulated, their stress level increases and they must then resort to coping mechanisms until they can reach a low-stimulation environment. However, “once capacity for attention has been depleted owing to prolonged demands, even small demands for attention may cause an overload.” Overstimulation has lasting consequences for the individual and can affect both their home and work life. The two major sources of stimulation stress in the urban environment are noise and crowding.

Noise. A significant source of stress is noise because it is an unwelcome intrusion into auditory privacy. Sources of noise include construction work, cars and car horns, noisy pedestrians, buses, and sirens. Prolonged levels of stress due to environmental simulations such as noise has been linked to psychological disorders such as depression, anxiety, and helplessness. The characteristics of noise that produce stress include its volume and predictability, and perceived control.
The louder the noise, the more mental resources one allocates to it. The brain unconsciously tries to analyze and make sense of noises in the environment, and loud noises prove to be particularly distracting. Loud noise itself can cause physical arousal in the body, such as higher blood pressure, which in turn leads to physical and mental stress. Unpredictable noise is interpreted by the brain to be more novel or threatening, and thus requires more attention in order to evaluate it. Unpredictable noise can reduce workplace performance because of the resultant lower attention capacity. Workers have shown a reduction in tasks on vigilance, memory, and multitasking when intermittent noise is present. These effects can even persist long after the noise has stopped.

Uncontrollable noise is more stress-inducing than noise that can be stopped. In one British housing development, thin party walls between houses allowed noise to be transmitted to adjacent rooms. This was problematic because the most private rooms, the bedrooms, lined the common wall. Privacy was difficult, as neighbors could likely hear conversations, intimate acts, and bathroom activities. The noise in these houses could not be controlled and became a source of stress for the families. In extreme cases of uncontrollable noise, the person may develop a sense of helplessness about not only the noise, but about life in general.

A building situated in an urban environment must carefully consider all sources of noise. Floors, ceilings, and party walls of residences must be insulated from sound to ensure auditory privacy. Doors and windows, where sound can be transmitted easily, should be faced away from major sources of environmental noise.

Crowding. In an urban environment, crowding can be physical and visual. Visual overload can be caused by excessive diversity; an obvious example of a high-diversity environment is the typical suburban strip of “fast-food franchises, gas stations, and glaring neon signs” coupled with the visual clutter of cars, overhead power lines, bus shelters, street lights, and newspaper stands. Visual stimulation, much like noise, requires constant analysis to determine if anything in the environment may be a threat. And, much like noise, this constant attention drains cognitive resources.

Physical crowding is related to visual crowding. In public, sources of crowding include busy city streets, congested traffic, and packed public transportation, all of which have been shown to cause negative mood and anxiety due to stress. While architects cannot directly address these types of urban crowd-
ing, a building designed with elements that encourage psychological well-being may begin to alleviate some of the stress associated with crowding.

A physical feeling of crowding has been found to be lessened by greater ceiling heights and a rectangular rather than square room plan. Rooms with visual escapes, such as windows and doors, also feel more open and less crowded. Finally, movable partitions in rooms can lessen feelings of crowding by closing off spaces to allow for more privacy.

Visual crowding, meanwhile, can be mitigated through architecture. Visual crowding is often caused by high levels of complexity without a recognizable underlying pattern. When architectural elements are too numerous or too varied, the brain cannot easily make sense of its surroundings. Crowding may be relieved by limiting diversity in the building to moderate levels.

Control

In general, architects often fail to understand the importance of control in the built environment. Their buildings “have not been very good at meeting privacy and territorial needs. The reason is simple. Most aspects of these behaviors occur subconsciously.”12 For the purpose of this thesis, control is composed of privacy, territoriality, and personal space, three concepts which are closely linked.

Privacy. Altman states that territoriality and personal space are the behavioral results of a need for privacy. Privacy is the “boundary process by which a person or group regulates interaction with others.”13 This boundary is highly flexible, depending on mental state, the social setting, and the physical environment. In general, people attempt to balance openness vs. closedness and crowding vs. isolation. Privacy behaviors allow people to find that optimum range at any given time.

Privacy serves multiple purposes. A retreat from people may be necessary to avoid distraction, interruption, and noise while performing tasks that require concentration. When one’s privacy level can be controlled, information to others can also be controlled, maintaining one’s self-identity and autonomy. Privacy also mediates the need for social interaction with the desire to avoid overstimulation.

Two types of privacy with design implications are solitude and intimacy. Solitude is the greatest level if privacy, in which allows the person to be free from surveillance, scrutiny, and observation from others. When one is alone, it provides an opportunity for self-evaluation, emotional release, and “to deviate from rules and customs in a protected fashion,” without the fear of social criti-
cism. Intimacy works at the level of small groups, allowing them to be alone together. This type of privacy permits private communications and personal conversations to take place.

A successful building should be designed to allow places for solitude and intimacy. Because privacy is a constantly shifting psychological need, the environment should have gradations from high privacy to low privacy, both at the scale of the room and the scale of the building. A “series of boundaries that vary in their permeability” allow individuals to “gradually move to achieve desired interaction.”

In a work setting, privacy is both acoustic and visual. During work, the ability to control background noise, have places for speech privacy, and to be free of observation is essential. Typically this is achieved through the physical enclosure of the work space. Privacy is strongly correlated with “the number of enclosed sides of the workspace and the presence of a door.”

Providing places for solitude is important for psychological well-being. Different spaces adjacent to one another create a privacy gradient, from low privacy in the largest room to high privacy in the smallest rooms.
In the home, two types of family privacy styles have been identified. The first family type is open or informal. These families “make minimal use of the physical environment to control privacy.”17 Doors are typically left open and family members maintain few physical boundaries. Few areas of the house are considered to be the private space of any one individual. The second family type is more formal. They value clear boundaries between individual family members in order to control and maintain privacy. They “tend to designate rooms as specific territories and use closed doors to insure privacy.”18 Successful residential design should be flexible enough to accommodate both family privacy styles.

The traditional Japanese home has been designed with multiple boundaries to ensure privacy. High walls separate the private house and garden from the public domain. Within the house, walls can be moved to open up the entire house, or shut off each room individually. This degree of flexibility allows room functions to constantly change depending on the activity or the degree of privacy needed.

Personal Space. One mechanism for maintaining a desired level of privacy is personal space. It is defined as “an invisible boundary surrounding us, into which others may not trespass.”19 Personal space serves to protect against overstimulation, optimize privacy, protect against physical attacks, and control the level of communication with others. Much like privacy needs, personal space grows and shrinks according to mental state and social environment.

Four levels of personal space have been identified, each dependent on social context. An intimate distance, from 0”-18”, is typically used for physical contact or very quiet conversations. A personal distance ranges from 1.5’ to 4’, and is generally the distance that family and close friends interact. Social distance, from 4’-14’ is typical of business settings and general social contact in public. Public distance, from 12’-25’, is used for formal occasions or for public speaking.

These standards are important to keep in mind during design. In an office, placing desks twenty feet apart may give workers a greater sense of privacy, but such a public distance hinders the close social interaction common between coworkers. Similarly, furniture arrangements in the home can indicate the level of intimacy among friends and family members.
Territoriality. To be able to reach an optimal level of privacy, one must have some level of control over the environment. Territoriality signals the level of privacy expected in a given space. Unlike personal space, territory is readily visible and generally unchanging in the short term. Demarcations and physical boundaries such as “doors, fences, and signs are used to protect people from unwanted intrusion” and control levels of privacy.20 In early civilization, as well as today, privacy was a symbol of one's status. Wealthy Egyptians had vine-hung gardens, Greeks had porticoes, and the Japanese had tall stone walls as markers of territory.

There are three levels of territory: primary, secondary, and public. Primary territories are clearly marked as belonging to a single group or individual. This group or individual controls the territory on a long-term basis, and it is the central location of everyday life. Psychologically, the need to maintain boundaries is high. Secondary territories are not owned by one individual or group, but are occupied fairly regularly by multiple groups or individuals. Secondary territories include school classrooms and coworking spaces. Public territory, like a park or the beach, offers the least amount of control. It is open for use by anyone and thus is difficult to establish as a territory.

As the home is considered a primary territory and the most private domain, it “should allow a firm boundary from the outside world and...allow a family to have balanced contact with nature on the outside and family interaction on the inside.”21 Boundaries establish a separation of the family from the outside world and also allow the separation of family members if desired.

Oscar Newman’s take on territoriality and defensible space has been applied to renovating high-crime public housing and transforming them into safe communities. For example, a community of low-income row houses in New York originally featured open spaces that lacked territorial control. Newman

Within the same building envelope, there are two very different approaches to public space. A long corridor is not a defensible space and is more prone to become an area of crime. When fewer units use a circulation path, residents are more likely to take control of the public space.
used “both substantial and symbolic fencing, reduced the number of pedestrian routes through the project, improved lighting along the paths, improved the project’s image, and encouraged a sense of personal ownership by resurfacing the dwellings and using different colors for individual units.” After the renovation, residents maintained their new yards, added personal decorations, and kept sidewalks clean. By encouraging defensible space through design, Newman reduced crime and improved the community’s view of itself.

Newman has found that clear hierarchy of territories is a necessary characteristic of defensible spaces. Zones should transition from public to semi-public to private with clear boundaries between each. In apartments, there is often a lack of transition space between the public realm (corridor) and the private realm (the unit). Within the residence, a privacy gradient can increase a sense of control over the space. In Christopher Alexander’s design of Peruvian residences, spaces in the house were arranged from the most public at the entrance of the house to the most private at the rear. Such designs allow the occupants to control the desired level of privacy with both visitors and the outside world.

Restoration

Stress from both environmental and mental sources has been demonstrated to lead to anxiety, depression, aggression, and physical illness. Daily stress comes from distractions, worrying, behavioral constraints, unfavorable weather, or illness. These stresses build over time and can lead to chronic problems. The most effective long-term stress-reduction technique is through the restorative effects of the natural environment.
For knowledge workers, the draining of cognitive resources through focused attention during work can be detrimental. Attentional capacity is limited, and once those resources have been depleted, mental fatigue sets in. Mental fatigue causes “distraction and reduced performance, negative emotions such as irritability and tension, impulsiveness and hostility, or even behavior such as aggression and violence. Mental fatigue can also impede cognition, such as a lessened ability to take in information and to interpret and react.” These factors have the potential to cause problems both in a person’s work performance and their relationships with others.

In order to successfully function in daily life, attentional cognitive resources must be continually restored. Restorative environments may range from the complete nature of woodlands to the built environment of monasteries. However, the most successful restorative environments contain nature.

Attention Restoration Theory. Four elements of a restorative environment have been identified: being away, extent, fascination, and compatibility. Being away refers to environments which invite involuntary attention, which draws from a separate mental content than directed attention. This allows the mental processes of directed attention to restore themselves because they are not in use during this time.

Extent is the amount of restorative content the environment provides. Places with enough restorative content “occupy the mind for a period long enough to allow directed attention to rest.” Scale is usually irrelevant; a tiny Japanese garden may offer just as much restorative content as a large city park. However, places with natural elements offer the greatest extent.

Fascination is defined as effortless attention. Soft fascination is a moderate level of effortless attention brought about by the natural aesthetics of the environment. Soft fascination can promote not only cognitive restoration, but also positive affect and the ability to reflect on one’s problems. Hard fascination, meanwhile, engenders an intense level of effortless attention, but leaves little room for a deep restoration of cognitive faculties. Hard fascination is more typical of the built environment.

Compatibility is the congruence between a person’s needs and what activities the environment allows. This can range from “very general (to move freely, to be able to see clearly) to very specific (to get gas, to play basketball).” An accommodating environment reduces hassle and eases mental strain.

The Japanese garden offers considerable restorative content. The changing elevation of the landscape, plants, and water are important elements of soft fascination.
In an urban environment, access to nature, and thus to a restorative environment, is limited. Architects must therefore determine methods to incorporate nature into the site and even into the design of the building itself. These elements should be accessible, or at the very least visible, to users in need of cognitive restoration. Restoration offers the greatest benefits when all senses—sight, sound, touch, and smell—can be utilized. Environmental restoration reduces stress and improves mental and physical well-being, allowing for a more healthy, productive life.

Fractals. Nature has been demonstrated to have positive mental and physical effects, but why does this occur? One possibility is the specific characteristics that govern natural forms: fractal geometry. In nature, forms are generated by recursive patterns. That is, natural fractals repeat a similar pattern at multiple scales to create ordered complexity. Even the structure and operation of the brain itself is fractal-based. For this reason, researchers have suggested that “the brain is optimized to process the statistical characteristics of natural scenes.” The brain may find nature appealing because its form is more easily interpreted and understood.

Fractal geometry is at odds with most current architectural trends, which consist of “simple volumetric forms and thus deprives the senses in their constant search for meaningful information.” The roots of Modern architecture lie in a desire to escape the baseness of nature and, by association, the baseness of vernacular building. By the late 19th century a newfound understanding of germs and disease led to a strong focus on cleanliness. The desire to be “clean” became one of the driving forces in Modern architecture. However, the push toward an architecture of basic Euclidean forms has reduced the visual complexity of the urban environment. As more people live in cities and away from nature,
their lives increasingly occur within and around simple white volumes. Their brain, having evolved to process fractal geometries, cannot function adequately in such an environment.

Before Modernism, vernacular building traditions around the world incorporated ornamentation and decorative elements that directly imitate objects found in nature. However, through advances in science and mathematics we now understand the underlying principles of the natural world. A certain amount of abstraction and flexibility can be achieved instead through understanding the nature of the fundamental structure of natural forms. A building based in fractal forms and a pattern of ordered complexity should provide a level of soft fascination necessary to become a restorative environment.

**Place**

At its simplest level, place is space with meaning. A sense of place is developed through "symbolic meanings, attachment, and satisfaction with a spatial setting held by an individual or group." Of the three components of place—physical setting, activities, and meaning—architects tend to have a successful grasp of physical setting and activities. However, they often fail in understanding the meanings that places convey to people. Gustafson warns that this risks the destruction of authentic places or the production of inauthentic places. A true sense of place is “a direct and genuine experience of the entire complex of the identity of places—not mediated and distorted through a series of quite arbitrary social and intellectual fashions about how that experience should be, nor following stereotyped conventions.”

A lack of understanding of place meaning can be observed most clearly in some developer-driven architecture. Developers claim to have created a sense of place through the creation of a certain quality of space and use of a particular design aesthetic, neither of which relate to the physical, cultural, or historical context of their location. They fail to understand that meaning is the most important element of place, and thus fail to incorporate it into the design.

Edward Relph coined the term “placelessness” to describe settings that lack meaning and have no relationship to their context. These buildings or communities have no sense of place because they could be found anywhere and are, in fact, often designed to be placed anywhere with minimal adjustments to the design. This is a typical criticism of the suburban strip mall—a Walmart in Tucson is the same as one in Buffalo.

In architecture, International Style took placelessness as a virtue and set out to remove site context, culture, and even climactic considerations from architecture. Though the style was highly criticized for these very reasons, architects today still choose popular worldwide design trends over place meaning. Christopher Alexander expresses concern over “the homogenous and undifferentiated character of modern cities [which] kills all variety of life styles and arrests the growth of individual character.” The danger is that homogenous places lead to homogenous people and consequently to homogenous thoughts and ideas.

In fact, evidence has shown that place is a major component of an individual’s identity, as an aspect of social identity. Residents of a placeless community may be lacking a vital aspect of their identity. Place identity is necessary for “psychological balance and good adjustment,” as it “helps to overcome identity crises and gives people the sense of stability they need in the ever changing world.”

Over time, a person who interacts with a place may begin to define a
part of themselves in relationship to that place. When residents identify with their environment and have an emotional attachment to a place, they are more likely to put effort into maintaining that environment. Places with a strong identity, in turn, encourage social networking and community cohesion.

The design elements that influence territoriality may also define a space to begin to create a sense of place. A good design will also draw from the emotional meanings or cultural symbols of its location. Based on Wang’s traits of the Chinese courtyard typology, seven elements of the built environment that encourage a sense of place have been identified:

1. Clear boundaries. Boundaries help to delineate a place by defining the community group that resides within it.

2. Regulated but flexible plan. The plan and form of the building should reflect the social logic of the community at multiple scales, while allowing for a broad range of activities.

3. Form corresponds to social roles. Each community group can typically be divided into smaller social groups with similar social roles. Forms developed for each role help to give identity to unique social groups.

4. Layers of space. Multiple spatial layers are necessary to “re-emphasize both the interconnectedness of social roles and the separations between them.” This gives each space unique qualities, which is necessary in the development of space into place.

5. Incorporates nature. Nature is integrated into the built environment, not simply as a decorative element. Thus nature
relies on the building to grow and sustain itself, and the building relies on nature to provide environmental mediation and enhance the well-being of residents.

6. Places for meaningful rituals. The building should promote rituals and meaningful activities at multiple temporal scales through its design, whether it is a place to eat lunch with coworkers, a porch for evening socializing, or a place to gather for a Fourth of July barbecue. This heightens the relationship between meaning and form.

7. Transmits a tradition. The tradition may relate to the history of society at large, or may be unique to the community. This includes incorporating cultural meaning or symbols into the architecture, or designing for certain regional building methods or typologies.
Computers are to design as microwaves are to cooking.
-Milton Glaser

The decision to approach my thesis design problem from a hand drawing perspective was easy. I have been drawing my entire life. For me, ideas flow more poetically through this medium than any other. The slow process of drawing by hand brings together the mental and the kinesthetic into a physical form, reflecting an architectural process which attempts to bring together psychology and the physicality of space into a cohesive architecture. Through drawing I look at things in new ways, simply because working by hand allows my mind to think and wander.

A drawing can say just as much about the person who drew it as it does about the image being conveyed. What is selected to be in the drawing, what is not, and what is emphasized reveal the thought process that went into the drawing. Each line is a decision. Unlike the computer, there is no undo button in real life. Erased mistakes are still visible on the finished drawing, showing layers and history and time. Drawing is design, and drawing is me.

Much like being in nature is more psychologically restorative than viewing nature on television, I believe that drawing is more intimate to the de-
sign problem than using a computer. Computers, of course, can achieve computational and analytical feats that can be invaluable to analyzing a design. However, so much of a design is lost to the automatic functions of design programs. Design thinking is often mediated through the abilities and limitations of the computer program. For these reasons, I have taken up the demanding and physically painful task of hand drawing my design.

*Weird City*

Austin is a weird city, and people like it that way. Residents are known for their “eccentricity, creativity, and insouciant expressionism”¹, as well as being “artistic, laid-back, progressive, green-minded, and tolerant.”² The city has adopted many of the identity characteristics of Texas, including its historical, cultural, visual, material, and musical culture. Yet Austin is also defined in its opposition to the state’s culture of conservatism, environmental degradation, wealthy oil tycoons, cronyism, and backroom politics. The identity of Austin may have been forged from Texan culture, but its residents today most value the city as an island of liberalism in an ocean of conservatism. The end result a population that is fiercely independent yet willing to make sacrifices in order to create a pleasant place for everyone.

Since the city’s founding there has been considerable conflict concerning place identity. In the 1800s residents viewed Austin as both a hub of commerce and government, and a small, cozy community. Today the same argument is going on, pitting corporate high-tech companies in skyscrapers against local, home-grown businesses. Any building situated in Austin would be remiss to not engage this conflict in design.
Demographics. Austin is one of the fastest growing cities in the country. From 1990 to 2000 the population increased 39%, from 472,000 to 656,000. Estimates from 2009 currently place the city population at approximately 786,000, with over 1.7 million people living in the metro area. Due to this drastic growth, the city has reversed its views on downtown density and now actively encourages a vibrant, active downtown with places to live, work, shop, and be entertained. There has also been increased focus on transportation, from light rail to more frequent bus service to bike lanes. In the future, one may be able to live in central Austin and have little need for a car.

As the city becomes more metropolitan, native residents grow more anxious that Austin is losing its “weirdness.” This fear is not uncommon.

Throughout the United States, “growing midsize cities are searching for a balance between the prosperity of new development and the unique character of their cultural landscapes.”3 Residents worry that the homogenization of their city will cause it to lose its sense of place, and with that loss, they themselves will lose a piece of their identity.

Climate. Austin’s climate is humid and subtropical, characterized by very hot, humid summers and short, cool winters. Without proper heating and cooling strategies, the climate is uncomfortable for 97% of the year (though long-term residents usually adapt to the summer heat). Snow typically only falls once or twice a year, but rarely more than a few inches. During the day, winter temperature highs are well above freezing, generally reaching the low 60s even...
in January. Summers are typically extremely uncomfortable due to the high humidity, and mechanical cooling is necessary to prevent overheating. During July and August, the hottest months of the year, the average high is over 95 degrees and frequently reaches over 110 degrees. Average lows are in the mid-70s, still slightly above the comfort zone. Austin receives 2650 sunshine hours per year, meaning that 60% of possible daylight hours are sunny.

Based on this information, Norbert Lechner suggests specific design priorities. The primary thermal goal should be to keep hot temperatures out during the summer. Mechanical cooling is a necessary supplement because Austin is often too hot and humid for passive cooling methods. However, natural ventilation can be used in the summer to cool the building and remove excess moisture. In addition to high temperatures, the summer sun can be extremely intense. Building design should protect windows from direct sunlight and provide shaded areas for occupants. During the winter, the design should protect against the cold winter winds and allow the sun in to passively heat spaces.

Despite the high temperatures, people in Austin spend a great deal of time outdoors. Once the sun sets, outdoor seating at local restaurants becomes extremely popular. A visit to many central-Austin homes reveals backyards exploding with tall, leafy trees and overgrown shrubs. In such a hot climate, a shady backyard is an oasis.

Before the arrival of modern buildings in the 1960s, awnings, arcades, and canopies on most buildings protected pedestrians from the scorching sun. However, the advent of air conditioning and automobiles meant that fewer people spent time walking outdoors, and less emphasis was placed on passive cooling methods. The loss of vernacular shade structures meant the loss of cultural symbols. When buildings are no longer a reflection of their context, specifically climate in this instance, they lose their sense of place.

Site and Program

At the scale of downtown, the primary issue has been understanding the current tension between human-scale vernacular buildings typically built before the 1950s and the Modern and Postmodern skyscrapers built after the 1960s. These new buildings have altered the grain of downtown. Often one building will take up an entire city block, as opposed to the pluralistic facades and forms of pre-1950s buildings. The resultant building masses lack a human scale and are visually imposing. The tallest buildings, up to 56 stories in height,
Downtown building figure-ground. Buildings built in the last few decades tend to take up to an entire city block, while older buildings show a more fine grain on the downtown landscape.

Downtown districts. The proposed site, in white, borders the two most active districts.
areas with pre-1950s buildings. Congress is the cultural avenue of downtown, with high-end restaurants, theaters, museums, and art. Sixth Street, meanwhile, has live music and a high density of bars and dive restaurants. The proposed site is located in a district primarily composed of hotels, a massive convention center, and apartment buildings. This district, however, is under the most transition as increasing numbers of old buildings make way for the new.

Downtown is divided into a number of districts, each with its own unique character. Some of the areas with the most vitality and pedestrian activity, such as the Congress and Sixth Street districts, are also the more historic areas toward the south-central area of downtown. Toward the edges of downtown, heights grow more variable, with 20-story buildings dispersed among one- and two-story buildings.

Downtown Austin lacks visual cohesion. A section taken through five city blocks reveals a considerable contrast in form. A 515 foot tall skyscraper stands across the street from a 15 foot tall warehouse.
The proposed site is bounded on three sides by one-way streets, and is bounded to the north by an alley that is used by both cars and pedestrians. The site is adjacent to the bars, restaurants, and pedestrian activity of Sixth Street. A diagram of the flow of sound through the space revealed that while Sixth Street is extremely noisy, little of that sound actually reaches the site. Most of the noise is blocked by existing buildings. However, that noise may not be blocked in the vertical dimension. A tall building on the site may suffer from noise problems at the upper levels.

The site is approximately 126’ x 273’, thus presenting considerable size restraints. The buildings surrounding the site are quite variable in form. The more detailed facades of Sixth Street to the north stand in contrast to a contemporary apartment building and parking garage to the west. To the south, new loft apartments reference the false-front facades of early Texas buildings.
At the building scale, my project has five main design components: retail, residential, private work space, coworking space, and amenities. Residential consists of twenty two-level apartment units of approximately 1800 SQFT each. Most units will have two bedrooms to provide flexibility for a variety of situations, including roommates, individuals living alone, and families with a child. Each unit will have a corresponding private work space accessible from the apartment, though not directly connected to it. The private work spaces should also be adjacent to the coworking space in order to encourage communication and collaboration between resident workers and visiting workers. The coworking space will be a large, open space designed to accommodate knowledge workers that do not live in the building, but still seek a collaborative work environment. In addition, there will be conference rooms for presentations or for private group work.

Amenities include much of the programmatic elements common to most apartment buildings. A lobby area can be used by both residents, coworkers, and visitors. A gym and laundry room allow for common daily activities to occur without having to travel far, as a gym or laundromat are up to a mile away from the site. The child care center is for workers with young children; both residents and coworkers can place their child into care with the knowledge that if anything were to happen, their child would be close by. Outside, a courtyard and rooftop garden provide places to eat a meal, enjoy a nice day, barbecue, or socialize.

Retail spaces have been selected to best support the daily activities of workers and their families. A coffee shop and restaurant provide food and drinks, while a small grocery store can supply the essentials for cooking at home. There will also be an office supply store to provide the supplies knowledge workers typically need.
V Conclusion

“It has become appallingly obvious that our technology has exceeded our humanity.”

- Albert Einstein

This thesis presents the argument that architecture must develop a more rigorous and scientific approach to design. Society is undergoing fundamental changes brought about by advancing technology. As a result, work revolves increasingly around knowledge and information; hence the rise of the knowledge worker. However, we are at risk of allowing technology to dominate our lives at the expense of our humanity.

If buildings are designed for people, then architecture does a great disservice by failing to understand or acknowledge how those buildings affect people psychologically. In a sense, then, this thesis has been a search for the human. It is a look into the human condition as it really exists, not the simplified, idealized person common in architectural theory. In a world increasingly dominated by technology, the human element is often lost.

The design investigation has been one of many dualities: work and home, public and private, man and machine, the physical and the mental, science and art, logic and beauty. These are the tensions that drove the design.
However, the competition between the logic of psychology and the beauty of architecture has been the most interesting. By reading this thesis one may conclude that designing a building using principles of environmental psychology is as simple as following a formula: put a tree here, or put a door there, and so on. But those principles only go so far. The psychology ends where the architecture begins. This project attempts to exist on a tightrope spanning the two. A successful design finds a way to play these dichotomies off of one another, and to find the perfect balance; for to fall one way or the other means certain failure.
Notes

I  Waves of Change

2 Toffler, 38
3 Toffler, 67
4 Toffler, 134
5 Toffler, 33
6 Toffler, 174

II  Blurred Boundaries

2 Ellison, 25
3 Birch, Charles, and David Paul. *Life and Work: Challenging Eco-*

4 Birch, 75
5 Birch, 92
6 Birch, 67
9 Ellison, 31
10 Gurstein, 9
12 Nippert-Eng, 6
13 Gurstein, 3-4
14 Ellison, 120
15 Ellison, 103

III Supportive Spaces

3 Lang, 29

4 Lang, 16
5 Lang, 14
7 Bechtel, 324
9 Bell, 105
11 Bell, 79
12 Lang, 145
13 Altman, 6
14 Altman, 19
15 Altman, 39
17 Bell, 339
18 Bell, 339
19 Bell, 141
20 Altman, 38
21 Altman, 39
22 Bechtel, 326
23 Han, K.-T. “Influence of Limitedly Visible Leafy Indoor Plants on


26 Herzog, 160


29 Joye, 311


36 Wang, 37

IV Design


2 Long, 37

3 Long, preface

Figures

ii  
  *top*  Photo by author.
  

2  
  

4  

6  

11  
  

16  

18  

24  
  *top*  Brian Pirie. “Villa Savoye (Poissy, France).” Photograph. *Flickr*.


36 Diagram by author.

37 Diagram by author.

38 Diagram by author.

39 Diagram by author.

41 Diagram by author. (Adapted from Newman, Oscar. Creating Defen-


Photograph by author.


50 Drawing by author.

51 Drawing by author.

52 Drawing by author.

53 Diagram by author.

54 Photograph by author.

55 Drawing by author.

56 Drawing by author.

57 Diagram by author.

58 Diagram by author.

59 Photograph by author.

60 Drawing by author.

61 Drawing by author.

62 Drawing by author.

63 Drawing by author.

64 Drawing by author.

65 Drawing by author.
References


Crisp, Barbara. *Human Spaces: Life-Enhancing Designs for Healing, Working,


Appendix: Design

Examination of three possible building forms and the resultant courtyard spaces.
Sun studies of the three building forms, throughout three times of the day and year.

Third floor plan.

First floor plan.
Plan of upper and lower stories of an apartment unit.

Building section.

Perspective of courtyard between buildings.