BUILDING COMMUNITY:
DESIGN IN THE ORGANIZATIONAL MIND

BY B. JOSEPH PRESS

BACHELOR OF SCIENCE
MANAGERIAL ECONOMICS
CARNEGIE MELLON UNIVERSITY, 1988

MASTER OF SCIENCE
ARCHITECTURE STUDIES
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, 1997

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ARCHITECTURE: DESIGN TECHNOLOGY
AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

JUNE 1999

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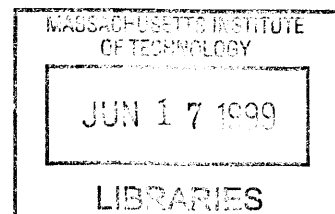
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ABSTRACT

In the search for meaning, the architectural profession legitimately seeks culture to sanction its products. However, in business organizations, culture is complex and tacit– richer and deeper than any of its external manifestations, including architecture. To compensate for culture's incoherence, the profession assumes facile access to culture through existing artifacts and spatial usage. I contend this response limits the profession's ability to engage social complexity, imbue architecture with cultural relevancy, and establish competitive advantage. This dissertation aims to provide insights into architectural form and process in relation to organizational culture.

Schön contends tacit frames revealed in design activity circumscribe organizational culture. Further, the institutional and cultural status of these frames requires engaging in a collaborative design process. 'Appearances of form' in design activity demonstrate the presence of frames and simultaneously enable speculating about their tacit nature. Similar to the construction of frames, the design of an evolving physical object reveals how prior knowledge is assembled to facilitate sense-making. Design in a social setting- characterized by negotiation, conflict, and agreement- sparks the frame restructuring required to coordinate disparate agendas through organizational learning.

Designing within the 'collective memory' and supplemented by the theory of type, design can leverage its potential to enlighten and improve organizational culture. Beginning with what designers share, the practices of Louis Kahn demonstrate cultivating an 'archi-type'– form containing both cultural and architectural knowledge. To imbue each with 'good' form, the architects collaboratively creating organizational space to direct architectural form and redirect cultural action.

By seeking shared understanding through form, architectural design stimulates organizational reflection, learning, and agreement. Implanting these virtues occurs by an architectural design process stimulating the emergence of culture though 'bricolage'– the synthesis of current and future concerns with an omnipresent past to guide daily interaction. As form emerges, the architect encourages an organization to reassess the frames circumscribing its cultural activity. Heightening the appreciation and awareness of culture instills communal practices of cooperation, respect, and learning. To achieve such acumen and influence, however, requires 'reframing' our professional agenda to reinvigorate the cultural significance of architecture and the design process.

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ACKNOWLEDGMENTS

Without family, embarking on this dissertation would have been impossible. Primarily, it was the acute intelligence, continual insistence, and culinary sustenance of my wife Aliza that enabled me to arrive to this significant juncture in my career. I hope one day our unborn daughter will be able to read and understand these pages. More importantly, she should have a comparable intellectual and personal experience in her lifetime. The support and encouragement of my parents over the years gives this work a special significance- the culmination of an education initiated almost 15 years ago. Finally, my parents-in-law went beyond all expectations with their continual assistance and warmth. Finishing the dissertation in their presence provided the opportunity to build a special relationship with them as well as the immediate family.

To my pleasant surprise, this dissertation is the result of a genuine collaborative effort. I was extremely fortunate to have the opportunity to work with a dissertation committee who continually displayed a penchant for innovation, uncompromising intellectual rigor, and a remarkable depth of knowledge (in addition to a great deal of patience). Working with Bill Porter, N. John Habraken, and Alexander Tzonis was an experience which I will carry well beyond these pages. I look forward to continuing my intellectual and personal relationships with all three in the years to come. Supplementing our effort were two very close friends currently in the consulting world- Greg Schooley and Henrik Schürmann. They both helped enormously to make the dissertation relevant to the business community. Facilitating the link between theory and practice was my brother Matt, who supplied the knowledge necessary to make the connections possible.

A dissertation cannot rest on an individual alone, especially one living in Paris without the necessary resources. While in Delft, Asaf Friedman's hospitality and research assistance made the dissertation logistically feasible. Liane Lefaivre's encouragement always perked up any difficulties. John Heintz and the DKS group at Delft Technical University acted as a forum to air, refine, and generate ideas. Michael Leininger of MIT Rotch Library was invaluable as a 'virtual' library. My link to MIT and supporter throughout the process was Renée Caso. Judy Feldman and Alex Bryne of the MIT Philosophy Department also deserve thanks for their philosophic contributions. Finally, I should mention those in practice who rebuffed my initial attempts to combine research and work- if they had acquiesced, the dissertation would not exist and I would have missed a significant personal and intellectual experience.

Paris, France
February 1999

To my Father

THE PROFESSIONAL QUANDARY

In the search for meaning, the architectural profession legitimately seeks culture to sanction its products. Unlike in the past, contemporary culture is complex and tacit– richer and deeper than any of its external manifestations, including architecture. By assuming facile access to culture through its spatial use, I contend the profession actually limits its ability to make real cultural contributions and provide relevance to physical form– particularly in business organizations. If the 'form' of the organization– its external cultural manifestations– is distinct from its physical form, how can this disjointed relationship provide insights into organizational culture while improving the design and implementation of its architecture? An avenue of exploration is put forth by Schön, who contends organizational culture is defined by tacit frames. Further, he argues the design process itself reveals these frames. To leverage this opportunity, this dissertation aims to provide insights into architectural form and process in relation to organizational culture.

1 THE PROFESSIONAL QUANDARY

1.1 CULTURE AND ARCHITECTURE

1.1.1 Building Community

Architectural design– the achievement of collective agreement concerning the transformation of the physical environment– is a potent human experience. The allocation of the physical world opens a window to personal and cultural priorities. An evolving design object stimulates learning by providing a continually changing situation. Finally, the inclusion of multiple actors requires actively seeking intersubjective agreement.

The potency of design lies in its kinship to cognition– both individual and social. Manipulating a physical object literally reflects the influence of subjective perception and decision. To reconcile physical evidence with intention and peers, the perceiver must modify purpose and action. Finally, a community of designers must coordinate social interaction to expedite social action.

These three profound activities– reflecting, learning, and coordinating– are intrinsic to architectural production's social dimensions. The evolving design object is public, demanding personal investment and reflecting individual concerns. External 'appearances' of form elicit a variety of interpretations from different design participants, stimulating intra and inter personal learning. The resultant negotiations, conflicts and resolutions seek to achieve collective agreement.

The socially oriented cognitive roots of architectural design provides society the paradigmatic practices necessary to build community– both physically and culturally: A community that establishes shared meaning to concrete actions and situations; A community that understands the significance of adaptation through learning; And a community that readily embraces the difficulties of reconciliation amongst its members to agree on coordinated action.

1.1.2 Meaning in Architecture

Rather than revel in the laudable practice of using architectural design to actively build community, the profession continually seeks to legitimize its products.[1] The search for meaning in architecture is unrivaled: Medicine provides care for the body, law provides justice for upholding the values of a community. Pure art, on the other hand, can even avoid the issue of meaning altogether. What does architecture provide? Shelter does not require architects. Monuments emerge from events society deems commemorable. An answer does not easily come from the public it serves: are we to provide function or aesthetics, or both? When the discipline enters the realm of good form, quality spaces or warm places, we enter the realm of polemic rather than clarity.

What spurs our professional anxiety? Certainly the nature of the architectural object is one cause: The architectural object stands alone, yet within a larger urban field. Its face is public, yet enables privacy. Atemporal existence is mitigated by temporal needs. The repository of architectural knowledge in an object remains illusive for the field at large. Connections to stylistic traditions of the past are severed. The public corrals architects seeking invention by demanding relevancy and responsiveness to the complex of social customs.[2] Students dream while professionals build.

Although the corpus of architectural theory is the result of many quandaries, one stands above all others: architecture's complex relationship to culture. The connection is not so obscure– cultural definition rests partially on physical delineation and location; cultural activity unfolds in a physical environment; cultural products commonly contain physical attributes. This dialogue between culture and architecture– its origins, viability, and potential– will circumscribe this dissertation, and potentially yield insights into architecture's quest for a *raison d'être*.

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[1] This question was lucidly stated by Professor Stanford Anderson in his lecture entitled "History and Memory in Architecture" at the 1994 Architecture Seminar in Jerusalem, Israel.

[2] Alan Colquhoun, "L'idea di tipo" *Casabella* 44/463-464 (Nov.-Dec. 1980): 16-19, English summary 117.

1.1.3 Social and Disciplinary Memory

The quest for meaning in architecture, argues Stanford Anderson, is the result of a widening gap between culture and architecture.[3] In the past, meaning was clear when social memory– a community's homogeneous cultural associations– and disciplinary memory– architectural dimensions, elements, and expertise– served a common purpose: The realization of culturally relevant artifacts. In such cases, architecture embodied culture by reflecting and augmenting the internal norms of a culture through physical form, thereby achieving meaning for architecture.

Anderson uses architectural historian Richard Krautheimer's investigation of the Holy Sepulchre to demonstrate 'meaning'- the synthesis of culture and architecture.[4] Here, the death of Christ and pilgrimage to his tomb give cultural significance to an existing architectural artifact. The architectural elements of the original– as expressed through plans and descriptions– became prototypal to enable the transference of cultural meaning to any community sharing the same cultural or religious associations. Application of the prototype to different surroundings causes transformation, yet the form remains faithful to its disciplinary memory- fulfilling the requirements dictated by a social memory. The new structure represents a united memory; a meaningful cultural object.

The relationship between social and disciplinary memory in the process of building local iterations of the Holy Sepulchre is synthetic– one in the service of the other.[5] Architectural components are at the service of cultural needs. While builders were certainly debating questions of vaulting, spacing, dimensioning, proportioning, these concerns were secondary to the religious needs of the community. Culture, through its dominant theories and clear practices, assisted solving architectural problems.

1.1.4 Dialogue, Schism and Response

Krautheimer sees the separation of social and disciplinary memory after the 12th century.[6] He notices the erosion of cultural bounds on architecture, draining the edifice of 'content.' Anderson views this development as architecture's disciplinary birth. Deepening architectural knowledge and experience compensates for the draining of symbolic import. Without a dominant social need or desire, the prototype is "...transformed through attention to more general architectural principles- disciplinary principles-placed in the service of contemporary life."[7] The process of clarifying attributes unique to architecture- dimensions, spatial relationships, physical elements and their relations- substantiate a professional consciousness; what Anderson calls a 'disciplinary memory.'

Anderson supports his claim by examining copies of the Palladian villa. Although focusing on architecture and the experience of approach, these copies maintain a memory of the prototype. However, in both the Holy Sepulchre and Palladian villa, we see not a shift from culture to architecture or vice versa, rather a creative relationship emerging from their inherent differences. In the former, culture initiates the dialogue. In the latter, it is architecture.

The long-standing equilibrium relied on the existence of both culture and architecture. However, as secular governments replaced religious institutions and the Enlightenment diversified tradition, culture's coherence submerged.[8] Conversely, the discipline's growth developed accurate reproduction

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[3]Stanford Anderson, "Erinnerung in der Architektur-Memory in Architecture," *Diadalos* V(December 1995): 22-37.

[4] Richard Krautheimer, Introduction to an "Iconography of Mediaeval Architecture," *Journal Warburg and Courault Institutes* , vol. V (1942-1943) p. 1-34.

[5] Krautheimer writes: "... no medieval source ever stresses the design of an edifice or its construction, apart from the materials used. On the other hand the practical or liturgical functions are always taken into consideration ;..." ibid., p. 1

[6] Prototype shifts to archetype: Rather than provide an original example from which others will be developed, the original is now a model from which others are copied. One reason for this shift is representation techniques. Representations, either built or pictorial, now seek precise reproduction of the original. After the 15th century, the shift is complete. Although scale and material alter, the constituent elements, proportions and their relationships remain unchanged. ibid., p. 20.

[7] Anderson, "Memory in Architecture..." p. 34.

[8] The concurrent development of anthropology is evidence of society's interest in reclaiming the clarity of culture.

techniques. New tools increased standardization and encouraged professional competition, eventually diluting the close association of patron and architect.

As imbalances between social and disciplinary memory quickly became a schism, the so-called 'revolutionary architects' officially announced the 'search for meaning.' Anderson contends they invented a social memory "...of, by and for the independence of the discipline."[9] Platonic archetypal forms grounded architectural form in culture's timeless shapes. Such creations reflect the yearning for architecture to understand culture, while concurrently affirming the discipline's autonomy. Contemporary architecture responds with equal vigor to the search for meaning.[10]

Unlike the previous situation where culture provided theories and practices to guide architects and architectural production, the contemporary situation is reversed: The profession explicitly develops theories and knowledge to provide coherence to the discipline. The inhabitant's culture, while still exists, is now tacit. Absence of a coherent and explicit culture to guide form sparks architecture's search for meaning. Although this has led to the development of disciplinary memory, it is a body of knowledge and expertise distinct from culture. The loss of social memory as a counterweight to disciplinary development leaves the profession is without a guide for making appropriate and responsive form. Without simultaneously developing ways to understand the social context, we limit architectural relevancy and potentially jeopardize professional competency.

1.2 A SEARCH FOR MEANING

1.2.1 Organizational Culture

Nowhere is the separation between culture and architecture and the search for meaning as acute as in organizational architecture. Similar to religious coherence, organizational practice was once similarly clear and explicit- thus guiding architectural design. However, the current demands of dynamic organizations and architecture's attempt to physically inscribe them dramatically reflects a memory schism- one which poses questions of professional competency.

The social memory of the organization is best embodied by the theories and practices of the bureaucracy. According to Weber, it is the most efficient way of running large organizations.[11] He postulated the need for job specialization -where jobs are broken down into simple, routine and well

Figure 1-1
Bureaucratic Organization

defined tasks to ease employee specialization (figure 1-1). Division of labor delineates authority and responsibility- identifying a clear hierarchy of authority. Rules and regulations are applied to ensure uniformity and guide the actions of employees regardless of personality or preference.

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[9] Anderson, "Memory in Architecture..." p. 34.

[10] Professionalism is my term to describe the profession's receptivity to culture, reinvigorating a frail, yet intact link between culture and architecture by transmitting the legacy of disciplinary memory "...imaginatively in the service of society." Anderson, "Memory in Architecture..." p. 35

Narcissism claims justifies architecture should either stay wholly within the discipline or selectively choose what social aspects are to be addressed. Architects in this genre are preoccupied with disciplinary knowledge and its formal manipulation rather than seeking the social demands placed on form. See Alexander Tzonis and Liane Lefaivre, "The Narcissist Phase of Architecture,." The Harvard Architectural Review 1 (Spring 1980): 52-61.

Populism fulfills culture's needs as they are presented to the architect- encouraging professional collaboration and subservience rather than seeking insights into culture. Architects avoid professional responsibility to understand culture's tacit practices. See Alexander Tzonis and Liane Lefaivre "Introduction" Architecture in Europe Since 1968: Memory and Invention (London: Thames & Hudson, 1992).

[11] Max Weber, The Theory of Social and Economic Organizations trans. A. Henderson and T. Parsons (Oxford: Oxford University Press, 1947).

Updating Weber's philosophy into the industrial revolution was Taylor.[12] Under Taylorism and the system of 'scientific management' efficiency, standardization and discipline where achieved by using 'scientific' methods. Job simplification broke down jobs into basic tasks. Job specialization distributed tasks between several workers, each of whom performed one set of action. Job planning was given to management, as well as training and monitoring. Similar to Weber, Taylor recommended selection of workers would be on the basis of their fitness for the job rather than on the basis of friendship of personal influence. Unlike Weber, Taylor contended that motivation was primarily based on financial incentives: the more produced, the higher the pay. Employee participation was narrow, with information given on a 'need to know' basis.

1.2.2 Organizational Architecture

Laing contends office architecture clearly reflects 'Taylorism.'[13] More modestly, it can be argued that the organizational climate of 'efficiency' and 'productivity' of the early 20th century influenced the design of office buildings. As a 'social memory,' it certainly maintained the union of architecture and culture, enabling local physical manifestations of agreed upon management philosophies.

One example of office building design characteristic till today is the Larkin building (figure 1-2). An interior space for lower level employees is surrounded by the offices of upper level management. In addition to displaying the need for supervision, employees are organized based on task specialization. The work flow itself logically groups responsibilities to facilitate smooth production.

Spurned by the elevator, new construction methods in concrete, and rising real-estate costs, organizing office interiors based on clear work practices physically moved even higher. For example, Laing describes the Lever House as a thin slab office tower on a podium base, establishing a paradigm to dominate office construction for quite some time. A corridor spine of circulation served cellular offices. With advent of air-conditioning and fluorescent lighting, deeper plan buildings developed, but the organizational schemes remained- internal organization based on the cultural norms of work and its strict hierarchies, job titles, and job specialization.

Figure 1-2
Larkin Interior

1.2.3 Searching for Relevance

The first acknowledgment of organizational culture's depth and complexity- and the first evidence of a schism of memory - first appeared in 1959. The Quickborner team of West Germany analyzed work patterns and pointed to the need for better communication through visual connections. The 'bürolandschaft' was born: All walls were removed, layouts were deepened, and concentric rings of communication lines characterized the new interiors (figure 1-3). In 1967, bürolandschaft came to the US in the form of 'office landscaping.' However, both movements failed. Duffy claims the 'bürolandschaft'
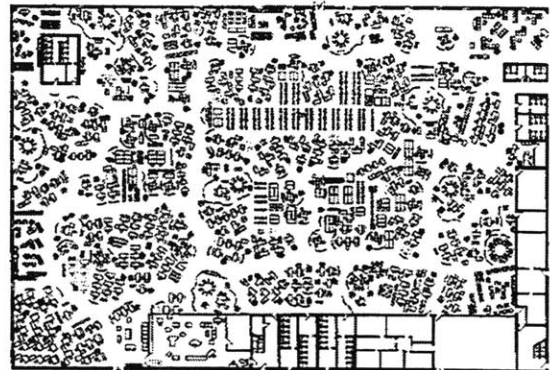

Figure 1-3 *Bürolandschaft- GEG Versand*

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[12] F. Taylor, *The Principles of Scientific Management*(New York: Harper, 1911).

[13] Andrew Laing, "New Patterns of Work: The Design of the Office," in *Reinventing the Workplace*, ed. John Worthington (IoASS Architectural Press: York, England, 1997).

failed to live up to its expectations due to an infinite network of communication patterns. In Europe, it did not to provide for individual concerns for privacy, environmental control, and personal identity.[14]
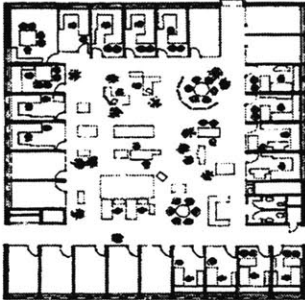
Figure 1-4 *'Combi' office*

The unresolvable tension between corporate allegiances and individual aspirations was a significant problem of both 'bürolandschaft' and 'office landscaping'. Seeking a solution led to the Herman Miller 'Action Office'- a kit of parts responding to the varied tasks for office work while reconciling the inevitable conflicts between privacy and communication inherent to the bürolandschaft schemes. In Europe, the response was quite different. The 'Combi' office sought to balance the relationship between individually and corporate identity by providing space for both (figure 1-4). In an extreme response, Herman Hertzberger designed the 'Centraal Beheer Offices' - an office seeking to mitigate the tension between corporate and individual aspirations by providing 'hives' of activity.[15]

The formal separation of disciplinary and social memory in organizational culture- between the physical aspects of the office and its management- was announced in 1985. Spurred on by the revolutionary impact of information technology, Stone and Luchetti, neither architects nor writing in an architectural journal, claimed: "Your Office is Where you Are."[16] For the first time the axiom "one seat per person" was questioned. The article and the technology it reflects, Laing argues, enables space and time in the office to be used in new ways- sparking a fundamental rethinking of office design.[17]

The most recent example of office innovation is the new British Airways (BA) headquarters in England (figure 1-5). Here, Swedish architect Neils Torp created a 'glass village' with an enclosed treelined 'street' with shops, bank, travel center, florist, fitness center, and beauty salon. His design provides opportunities for individual work while simultaneously encouraging group interaction. Private areas are further away for the more public areas of the street. Intimate zones have rooms for small groups, and facilities for assemblies. CEO Bob Ayling comments:
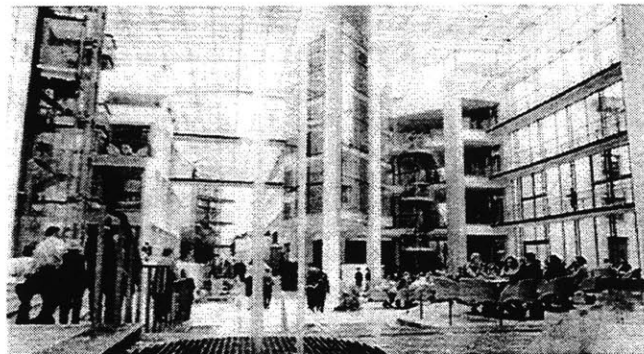
Figure 1-5 *BA HQ at Waterside, England- Interior*

"In the old building, it was different. People worked in rooms and had their own space. If you went to visit them, it was like going on to somebody else's territory...In this new environment, I can walk around and have three times as many meetings."[18]

In this 'new' approach to office design, Duffy claims the design team "...deliberately linked decisions about the physical environment with inventing a new business culture..." Through streets, villages and colleges, a variety of settings are created to 'work effectively.' Through such commendable attributes, the design avoids becoming another 'outmoded white collar factory.'[19]

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[14] F. Duffy, & C. Cave, "Bürolandschaft Revisited" *The Architect's Journal* 26 (March 1975): 665-675.

[15] Andrew Laing, "New Patterns of Work..."

[16] Philip Stone and Robert Luchetti, "Your Office is Where you Are" *Harvard Business Review*, March-April (1985): 102-116.

[17] Andrew Laing, "New Patterns of Work..."

[18] Tony Dawe, "Desks Become Redundant," in the section "The Workplace Revolution" *The Times*, 20 July 1998, p. 3.

[19] F. Duffy "Working at Waterside" *Architectural Review* (August 1998). 204/1218: 44-45.

Despite the commendable result, the design process at BA belies the simplicity of architecture's ability to influence and participate in the new business culture. Success at BA depended on an innovative leader."[20] In the briefing phase, specialists on human behavior analyzed work practices and gathered the opinions of users.[21] Motivating the employees to embrace the changes was accomplished by numerous training programs. However, these were implemented primarily as a result of the new management policies.[22] Providing meaning to the work spaces of the new HQ was secondary.

In the reality of the new business culture, the drivers are changing technologies, globalization and fluctuating demographics- not architecture.[23] Rather than simplify the architect's task, these developments underscore the complexity of the contemporary organizational culture. Consultants that once recommended a clear chain of command and defined responsibilities now espouse 'teamwork' and 'empowerment' to provide flexible organizational structures individuals capable of a broad range of tasks. The clear communication and authority that once guided architectural form remain illusive.

1.2.4 The New Functionalism

Due to these complexities, the profession once again seeks guidance. Reminiscent of how the revolutionary architects created a social memory linked to architecture through elemental form, our current description of the BA facilities relies on space to claim relevancy in organizational culture. Although cultural activity occurs within architecture, a causal relationship is not sufficient to justify a direct connection.[24] However, architecture's tendency to attribute behavior to architectural features underlies a new functionalism. Rather than 'form follows function,' architecture's latest musings reflect implicitly states: 'space follows behavior.'

The new functionalism is widespread: A 7,000-square-foot, $4 million "living laboratory" at Carnegie-Mellon University develops personal environmental controls to increase employee comfort to improve work performance.[25] 'CleverSpace' provides clients with"...greater productivity in the workplace." A recent renovation at Anderson Consulting in London includes an area called 'Chaos' for brainstorming; another called 'Zen' for relaxation. DEGW's 4 different workspaces offer "...organizations the capacity to both *add value* through ways of working and to *minimize* costs."[26]

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[20] Ayling's decision to "...go without a desk undermined everyone who was against the idea Dawe, "Desks Become... p. 3.

[21] A London firm of premise consultants sent eight observers to observed and spoke to staff. "We really got to know about their problems...They had rotten buildings; they couldn't meet or eat or drink effectively. ..Some said 'get me out of my box' by most were unhappy about giving up their offices. they regarded them as a sign of status." ibid.

[22] "The real art of persuading people to accept the changes was to convince them that it was what they wanted." ibid.

[23] David Buchanan and Huczynski, *Organizational Behaviour: An Introductory Text*. 3rd ed.(Prentice Hall: London, 1997).

[24] Architects commonly contend a place can reduce stress if architectural attributes such as human scale, alternative kinds of environments, comprehensibility, and aesthetics, are an integral part of a design . Susan Saegert, "Stress-Inducing and Reducing Qualities of Environments," in *Environmental Psychology: People and Their Physical Settings, 2nd*, ed. Harold M. Proshansky, William H. Ittelson, Leanne G. Rivilin (New York: Holt, Rinehart and Winston, 1976) pp. 218-223.

[25] A good way to keep valued employees is to make the work environment a comfortable and productive one. Each desk is powered with a personal environment control unit, allowing the occupant to adjust the flow of air, the temperature, and the lighting to his or her personal preferences. Volker Hartkopf, research director claims responsive work environments "...makes it possible for people to do intelligent work." *paraphrased from* Lisa Napoli, "Research Center is Laboratory For Intelligent Workplaces," *The New York Times*, December 10, 1997.

[26] Francis Duffy and Kenneth Powell *The New Office* (London: Conran Octopus, 1997) outline the following 4 'types':
1. DEN- a place for logistics and information requiring low interaction and intermittent occupancy. Like the traditional 'office,' people come for short periods to check mail, download/upload information, make calls and retrieve documents
2. CLUB- areas for meetings requiring high interaction and intermittent occupancy with peer groups. Like the traditional 'conference room,' activities are time-constrained and goal oriented, requiring shared information and consensus.
3. HIVE- a space requiring low interaction/continuous occupancy. Similar to the 'workspace' or 'cubical' in modular offices, these activities are goal oriented, but more individual in character such as report-writing.
4. CELL- a place for activities requiring high interaction/continuous occupancy, but of variable duration and intensity. Like a 'small conference room' or 'studio,' work here is goal or project driven environment, often business related

For a critique of this approach, see Paul Stansall, "An office is not a hive" *Architects' journal* 208/5 (30 July 1998): 46. He asks if "...such a tight fit between building layouts and working patterns is necessary."

Such innovative rethinking, writes DEGW's director of research, "...is the major means by which architectural design can provide buildings and workplaces that better support user's emerging organizational needs."[27]

These examples implicate the spatial manipulation of cultural activity as the profession's folk theory– an unquestioned belief shared by a community and pervading professional action and priorities. The best evidence of this is how a folk theory defies common sense: Satisfaction is not solely dependent on personal environmental controls, it requires personally fulfilling jobs.[28] Productivity in the workplace is dependent on interpersonal communication, task skills and teamwork, not architecture. Activities in space typically occur in spite of the label designating their function. Supporting emerging organizational needs requires an intimate ongoing relationship, not temporal and general solutions.[29]

Folk theories shape the tools of a society, and architecture is no different. Drawing inspiration and insight from John Zeisel and the 'Environmental Behaviorist' movement, DEGW's initial approach begins with collecting data through interviews, questionnaires, and workspace analyses.[30] In the second phase, analysis and refinement, DEGW incorporates users in the 'design' of the environment by prioritizing data information collected. The third stage proposes alternative workplace strategies through the presentations of concepts and schematic plans, spatial budgets, descriptions of worksettings, and any potential managerial policies for effectively managing the proposed facility. The final stage, 'managing implementation,' requires, effective communication, facilitating employee involvement, and offering training are all devices to insure successful implementation.[31]

All of DEGW's stages reflect how folk theories shape the priorities of a society. Space and the physical environment are the primary venues for providing the architect organizational insights. Space utilization studies are conducted over time, questionnaires focus on how users think the workplace performs, and analysis is of existing space usage. Zeisel's precedent even goes further by analyzing artifacts- quantitatively and qualitatively- to enlighten how spaces are used, if they meet inhabitant's needs, and feelings towards the environment. He claims observing spatial activity reveals the interrelationships between people and their activities by indicating how the environment supports or hinders these activities and how the physical setting impinges on social behavior. As we shall later see, the physical evidence of a culture is a mere reflection of its true inner causes.

Such reflection does not deny architecture's relationship to culture. Minimally, culture unfolds in physical space. Certainly architecture can contribute to the well-being of inhabitants that occupy

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[27] Tony Thompson. "Supporting Organizational Change... p. 113.

[28] Due to the 'Hawthorn effect', people tend to react differently due to knowledge of being observed. Ultimately, it was determined that a variety a factors contribute to work productivity, not only environmental conditions. F. Roethlisberger and W. Dickson, *Management and the Worker* (Cambridge, MA: Harvard University Press, 1964).

[29] Beyond intuition, a strong argument against architecture's folk theory comes from the education community. The effect of the built environment on learning, as measured by student performance, is minimal . For example, architecturally repulsive characteristics like windowless or underground facilities have little, if any effect on student performance. Additional facilities, such as a gymnasium or cafeteria, does not significantly alter behavior. Even the only positive influence on students, building condition, may be attributed to financial resources, not the built environment. Glen Earthman, Linda Lemasters "The impact of school buildings on student achievement and behavior: A review of research'" *PEG Exchange: The journal of the OECD Program on educational buildings* 30 (February 1997): 11-15.

[30] The 'environmental behaviorists' take their name from Kurt Lewin who in 1951 proposed that behavior is a function of personality and environment [B(P,E)]. John Zeisel, proponent of the 'environmental behavior' movement, posits an approach to provide architects insights into how the environment influences behavior. His research paradigm concentrates on four areas. Analyzing artifacts, quantitatively and qualitatively, enlightens how spaces are used, if they meet inhabitant's needs, and feelings towards the environment. Observing spatial activity reveals the spatial relationships between activities and interrelationships between people. It further indicates if the environment supports or hinders these activities, and how the physical setting impinges social behavior. To reveal architectural needs and desires, intervention techniques including interviews, questionnaires and games are commonly deployed. Questions often concern broad environmental issues in an attempt to reveal tacit cultural dynamics The final domain of investigation is found in an organization's archives, either codified in records, or generated by non-verbal drawings. John Zeisel. *Inquiry by Design: Tools for Environmental Behavior Research* (Monterey, CA: Brooks/Cole Publishing Company, 1981).

[31] For an overview of DEGW's methodology, see Tony Thompson. "Supporting Organizational Change.... pp. 112-123

space. However, contending a unique relationship exists between architecture and culture is tenuous. Culture- and human behavior- is much to complex to succumb to such reductionism.

More significantly, I contend we limit our ability to actually engage culture more robustly. Assuming a strong relationship between organizational culture and architecture leads to architectural design based on the culture as it presents itself to us, or what we believe it to be.[32] By investigating culture primarily through its physical environment we are limited to what we see and uncover. How accurate can a version of culture be? This question reveals an assumption embedded in our folk theory: culture's coherence and malleability. If culture is less obvious than we assume, then adherence to the profession's folk theory may actually limit our capabilities by minimizing cultural engagement.

1.3 ORGANIZATIONAL FORM

1.3.1 Organizational Behavior
The unquestioned nature of architecture's folk theory and its impact on architectural intervention, masks the true nature of culture by defining it in familiar terms. In the pursuit of bringing the culture closer to coherence with its physical setting, our folk theory predisposes architects to research organizational environment through its physical attributes. The field of 'organizational behavior' focuses on the behavior of an organization in its entirety, not through the lens of the physical environment. Such a holistic approach exposes the viability of a direct relationship between culture and architecture: Assuming organizational culture to be coherent, definable and available for architectural-like manipulation is incorrect.[33]

Organizational theorists propound two dominant themes: culture consists of explicit manifestations and implicit tendencies. Smirchich describes the difference as culture being something an organization has versus culture emerging through daily interaction.[34] Both are necessary to understand organizational culture generally, and both have implications for architecture specifically.[35]

1.3.2 Explicit Culture
The explicit culture of an organization can be seen as the situationally specific system of publicly accepted behavioral norms, language, stories and images.[36] Emerging primarily from an organization's history and experiences, explicit culture permeates most of a consistent group's social and personal functions.[37] The existence and validity of explicit culture is demonstrated through organizational socialization. This process of transmitting cultural elements to employees includes the correct way to perceive, think and feel in relation to problems encountered by the company.[38]

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[32] Amos Rapoport, a contemporary of Zeisel, summarizes the philosophy succinctly: built environments communicate information or clues about the spatial, temporal, social and other forms of ordering society's priorities, hierarchies and lifestyles. The methodological implication is three-fold: First, architecture and culture are closely related– architectural products are more relevant if we have access to cultural knowledge. Second, understanding culture can be culled from the physical environment. Third, manipulating those signs in the built environment influences culture. Amos Rapoport, "Vernacular architecture and the cultural determinants of form," in *Buildings and society: Essays in the Social Development of the Built Environment*. ed. Anthony King (Routledge: London, 1980), pp. 283-305.

[33].Organizational theorists themselves cannot agree on the fundamental issues. They also question culture's value as an explanatory tool. The variety of theories "...are inconsistent with each other and fail to provide clear guidelines for measurement."[33] David Buchanan and Andrzej Huczynski. *Organizational Behaviour: An Introductory Text*. 3rd ed. (London: Prentice Hall, 1997). p. 512.

[34] L. Smirchich, "Concepts of Culture and Organizational Analysis," *Administrative Science Quarterly*, 28/3 (1983): 339-358.

[35] The experiences of the ' corporate culture' management fad of the 80's highlights their critical relationship. The movement focused on external culture rather than the internal culture that is actually practiced, yet is so hard to grasp. Providing insights into internal culture therefore remains a promising challenge.

[36]The variety of definitions exist. These and the following attributes summarize the theorist's espousing explicit culture. For an overview, I recommend chapter 1 in Andrew D. Brown. *Organisational culture* (London: Pitman, 1995).

[37]Edgar Schein, *Organizational Culture and Leadership* (San Francisco: Jossey-Bass, 1985).

[38]Edgar Schein, "Coming to a New Awareness of Organizational Culture," *Sloan Management Review* (Winter 1984): 3-16.

External cultural manifestations are by-products of culture, not containers of culture: As Legge writes: "The offspring of the concept of culture...are symbols, language, ideology, belief, ritual and myth."[39] Management produces logos and other symbols to define the long term vision of the organization and reflect key beliefs, values and principles. Just as literal artifacts such as tools, furniture, appliances and clothing do not carry intrinsic meaning, public manifestations of culture are given meaning by figurative artifacts created by the organization. Mission statements, business metaphors and jargon act as internal guides to facilitate employee cohesion and obviate ambiguity. Stories, myths, and heroes set cultural expectations, influence understanding of situations and events, and create team loyalty.

Due to its public nature, explicit culture can be desired culture. Hence, management has an interest in manipulating the public system of external cultural manifestations and their transmission to encourage positive interpretation of work circumstances. The enculturation process begins with the founders and practices of senior management. As 'culture carriers' they set the tone and standards of acceptable behavior and values, critical dimensions for the resultant corporate culture. As Peters outlines, leadership is to lead by example, both verbally and physically.[40] A recent example is Ayling- now available to all the staff rather than hiding away in a luxury office on the top floor.

However, transmission is superficial without implementing enculturation effectively. Human resource management provide a clear statement of cultural values by reflecting a companies priorities in employee responsibility, skills, promotions, pay, and personnel.[41] To complement the practical side of cultural dissemination, a company uses rites, ceremonies, and rituals to distribute its core cultural elements amongst its workforce.[42] Planned activities, including rites of passage, degradation, integration and renewal all communicate cultural messages revealing the expected norms and behavior of the organization. Informal distribution of culture include artifacts such as tools, appliances; physical layout and amenities.

Despite agreement from management gurus and experts to the contrary, research on the manipulation of explicit culture and organizational change reveals inconclusive results. Although it is possible to identify some of the external influence on an organization's culture, such as leadership, business environment, leaders and employees- the variety of other variables and the synergies between them make 'designing culture' a tenuous proposition. For architects, not only seeking culture through architecture is questionable, claiming to contribute substantial value to culture is dubious. Further, depending on external manifestations of culture actually places architects in a precarious positions rather than enabling them to engage the undefined and unstated world of 'implicit culture.'

1.3.3 Implicit Culture
A second group of organizational theorists, contends that 'deep' or 'implicit' culture provides meaning to explicit culture and its manifestations. Gareth Morgan describes its relationship to external culture:

"...the slogans, evocative language, symbols, stories, myths, ceremonies, rituals and patterns of tribal behavior that decorate the surface of organizational life, merely give clues to the existence of a much deeper and all-pervasive system of meaning."

One may say that the 'form' of the organization- its external manifestations- emerges from the socially influenced and determined practices of cultural participants. The existence of 'implicit culture' provides an explanation to why cultural change and manipulation is hindered: Its depth does not offer management many levers to shape or use it as a tool of control. Such a position asserts that culture is a mental state, incapable of managerial manipulation.[43]

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[39]K. Legge, *Human Resource Management: Rhetorics and Realities* (Macmillan: Basingstoke, 1995).

[40]T. Peters and R. Waterman, *In Search of Excellence* (New York: Harper Row, 1982)

[41] Dispensed through implementation of work processes, training programs, recruitment, selection, reward and pay systems

[42] H.M. Trice and J.M. Beyer, " Cultural Leadership in Organizations." *Organization Science* 2/2.1990

[43] Management is more sensitive to explicit culture, employees to implicit culture.

Identification and manipulation is primarily difficult due to the social character of implicit culture. The dynamic and unpredictable origins of socialization is what undermines attempts to control it. Implicit culture is shared, socially shaped, and action oriented. Groups coalesce and maintain allegiance based on establishing acceptable behavior and language. Legge views implicit culture of groups as shared culture, consisting of "...a system of shared cognitions, of knowledge and beliefs, or as a system of shared symbols and meanings, cognitions..."[44] These provide insights into the contents of an individual's self-constructed 'perceptual world.'[45] This world, its set of expectations and predispositions, has profound consequences for intergroup interaction and affects an individual's self image.[46]

Guiding the formation of implicit culture are the unwritten rules of social conduct. What is said or thought privately is due to social concerns such as power, status preservation and unwritten rules of conduct. The inherent tensions between individuals within the group leads to the negotiation of implicit culture. Social dynamics imply the conscious or unconscious co-construction of implicit culture. If explicit culture is what is said and done publicly, implicit culture is what is said or thought privately, and perhaps displayed publicly. One domain is personal: Given the competitive nature of an organization, some things are explicitly not said to preserve status or positions. Occasionally unstated sentiments emerge in behavior and interaction. A second domain is purely social: Groups coalesce and maintain allegiance based on establishing tacit behavior and language, unbeknownst to the members.

Writers contend that implicit culture emerges through social action; the negotiating and sharing of symbols and meanings.[47] The activities required by daily interaction guides the formulation of acceptable behavior and language. The process of 'enactment' is where participants 'manufacture' culture through social interaction. Buchanan and Huczynski describe this activity where employees 'manufacture' culture in daily interaction in the workplace.[48] The process of 'social creation', creates individuals terms, forms, categories and images to interpret the work situation in personal terms, not using descriptions provided by the culture at large.[49] Personal enactment provides the individual terms, forms, and categories to interpret social situation and to inform appropriate action. Continuing the theme of action, these descriptions contain prescriptions for action. One manifestation is the categories and labels deployed in a social setting. The price of manufacturing culture is being controlled by it.[50]

1.3.4 Frames

Donald Schön and Martin Rein avoid the complex polemics of categories by claiming action and positions rest on underlying structures of belief, perception, and appreciation, called 'frames.'[51] Their definition showings how frames influence perceptions and interpretations in the organization by inducing action. Deployed routinely by inhabitants to make sense of organizational complexity, frames emerge through a process Schön refers to as 'naming and framing,' were a few salient features and causal

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[44] K. Legge, *Human Resource Management:* ... p. 186.

[45] Buchanan and Huczynski. *Organizational Behaviour* ...p. 55.

[46] For example, people sharing a category will be judged to be similar to each other. See Henri Tajfel and Joseph P. Forgas, "Social Categorization: Cognitions, Values and Groups," *Social Cognition: Perspectives on Everyday Understanding* Ed, Joseph P. Forgas (New York: Academic Press, 1981), 113-140. Further, categorization also affects an individual's self image: "...group membership influences the attributions we make about our own and others behavior, intentions, and values." See Marilynn B. Brewer and Roderick M. Kramer "The psychology of Intergroup Attitudes and Behavior" *Annual Review of Psychology* 36 (1985): 219-243

[47] Buchanan and Huczynski. *Organizational Behaviour* ...p. 515.

[48] ibid., p. 514

[49] I contend both of schools of thought explicit and implicit. Further, it is fair to say that management is probably more sensitive to explicit culture and employees to implicit. Granted both are also effected by the converse, just to a lesser degree. For a similar approach, see Meyerson and Joanne Martin, "Cultural Change: An integration of Three Different Views," *Journal of Management* Studies, 24/6 (Nov. 1987): 623-647.

[50] Legge argues that culture is "... the shaper of human action..."Legge, *Human Resource Management:* ..., p 186

[51] Donald Schön and Martin Rhein *Frame* Reflection BasicBooks: New York (1994). p. 23.

relations are identified and named to provide coherence to a perceptually complex and indeterminate reality.[52] Schön argues the frame is not used by choice, but by necessity:

> "There is no way of perceiving and making sense of social reality except through a frame, for the very task of making sense of complex, information-rich situations requires an operation of selectivity and organization, which is what 'framing' means." [53]

The resulting 'social reality' shapes the organization by determining the facts held by stakeholders. Fact description in turn implies action prescription.[54] Subjectively constructed facts influence three prominent aspects of culture: argumentation, action and resilience. Inhabitants stake out positions based on how they construe the facts of a situation present themselves. Action and decisions emerge to either change or modify those facts to suit positions.[55] Appeal to a different set of facts or reasoning falls short due to the commitment a stakeholder invests in his frame and the facts it contains.[56] Given the large investment in frames, divestment is difficult, if not impossible.

Schön and Rein argue an individual's action frames are variations on the institution's actions frames to whom they belong. Institutional action frames structure complex situations, either in the organization or confronting the organization from the exterior, to inform the actions of institutional actors. These frames contain the beliefs, values, styles and perspectives of an institution which inform thought, and in turn dictate action.[57] Institutional action frames are complex clusters of related frames, including frames in the culture the institution is found in called metacultural frames.[58] Due to the cultural nature of frames, "... we are usually unaware of their role in organizing our actions, thoughts, and perceptions."[59] The tacitness of frames is the primary inhibitor of frame awareness and change- a major stumbling block to understanding and ameliorating an organization's culture.[60]

1.4 DISSERTATION

1.4.1 The Design Metaphor

To intervene intelligently into organizational culture, one must understand the frames that shape it. Due to the tacit and cultural nature of frames, this is a difficult proposition. Initiating frame awareness can occurs by reconstructing frames from *descriptions*- texts, debates, and speeches- and *actions*- laws, regulations, and routines.[61] Schön further argues that frame reconstruction draws upon the 'design' of policy. He demonstrates the role of frames in organizational culture by investigating how frames reveal themselves, change, and eventually embody cultural agreement in the tacit world of

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[52] Donald A. Schön, "Generative Metaphor: A Perspective on Problem Setting in Social Policy." in A. Ortony ed. *Metaphor and Thought*, (Cambridge: Cambridge University Press ,1978). p. 264. Dewey describes this state of perceptual complexity as the "problematic situation." See John Dewey, *Logic: The Theory of Inquiry*. (New York: Holt, Rinehart and Winston, 1938).

[53] Schön and Rein *Frame Reflection* ... p. 30.

[54] Schön and Rein (1977) describe this process as the "normative leap from data to recommendations, from fact to values, from 'is' to 'ought'" quoted in: Donald A. Schön, "Generative Metaphor: ..." p. 265. The same sentiment is described as: "..frames determine what counts as a fact and how one makes the normative leap from facts to prescriptions for action." Schön and Rein *Frame Reflection*. p. xviii.

[55] Known as a self fulfilling prophesy: Phillip Zimbardo et al, "A Pirandellian prison." *New York Times Magazine* April 8, 1973. pp. 38-60.

[56] Schön, "Generative Metaphor... p. 269.

[57] J. March and J. Olsen, *Rediscovering Institutions* (Glencoe, Ill: Free Press, 1989). As quoted in Schön and Rein. p. 33.

[58] "... broadly shared beliefs, values, and perspectives familiar to the members of a societal culture and likely to endure in that culture over long periods of time, on which individuals and institutions draw in order to give meaning, sense, and normative direction to their thinking and action in policy matters." Schön and Rein *Frame Reflection*. p. xiii.

[59] ibid., p 34

[60] "...the frames that shape policy decisions and underlie controversies are usually tacit, which that they are exempt from conscious attention and reasoning." Schön and Rein *Frame Reflection* ... p. 23.

[61] Schön and Rein *Frame Reflection*. p. 34.

policy making. He proposes a metaphor– the emergence of policy in organization is comparable to the design process of an architect or engineer:

> "Actors in the policy drama design policy much as architects or engineers design material artifacts. They compete and cooperate to set policy problems, and they invent policy solutions that evolve as a result of the actors' transactions with the policy situation. When policy objects are put out into the larger environment, they tend to take on meanings unanticipated by their designers, as other actors see and respond to them in light of their own frames..."[62]

Schön's basis for comparison begins in the object-like qualities of the policy itself. Various actors with a variety of agendas vie to shape the design object. As a consequence "...the object evolves, in form and meaning, and in ways intended and unintended, as a resultant of their actions."[63] The resulting form speaks more definitively than words about the frames in use and the actions they prescribe. Such evidence of frames is an external reference for interlocutors, grounding discussion in empirical fact.

A design object that consistently defies the frames deployed to describe it engenders confusion and subsequently learning. Ideally, engaging the frame to make sense of a defiant situation encourages "...reflecting *through* the situation to the frames implicit in our understanding *of* it.[64] In addition to demonstrating tacit frames, the richness of features and relations found in the concrete situation of design activity encourages the cognitive work of frame restructuring: regrouping, reordering, and renaming.[65] Schön argues that information-rich situations are particularly adept at "... countering our procrustean tendency to notice only what fits our ready-made category schemes."[66]

In a social setting, a design object naturally causes disagreement. A frame's inadequacies to account for the situation at hand is augmented by reconciliation with the frames of others. Placing the design object in a community of designers counters frame immutability and tacitness by sparking the cognitive work of frame restructuring. As the situation initially resists mapping, participants must immerse themselves into the concrete situation itself. This 'hands-on' approach with the situation and other designers can lead to the creation of synthetic frame inventions- new entities emerging from the coordination of old frames.

Schön's policy design views communication breakdowns, antagonism, and conflicting interests–staple occurrence in any politically charged atmosphere– as essential to reformulation of frames and the potency of his metaphor. A design object and its inherent conflicts opens the opportunity to learn about the actors, and to encourage them to learn about themselves towards achieving agreement and cooperation. The resulting shared frames -or as Schön describes them as 'synthetic frame inventions'- emerge 'phoenix-like' from the conflict by proposing a set of new relationships between the facts that each perceiver can identify with. The result is a "... new description of the phenomenon, one in which the previously conflicting descriptions are restructured and coordinated."[67]

1.4.2 A New Agenda

If the form of organizations–its external practices- are shaped by tacit frames, then for architecture to have any organizational relevance it must access these frames. Schön articulates the potential of design lucidly- the design process reveals frames. Our ability to design in a politically charged context is the key to reestablish the link between culture and architecture, and even reinvigorate the

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[62] ibid., p. xix.

[63] ibid., p. 81.

[64] Schön and Rein *Frame Reflection* p. 174

[65] Schön, "Generative Metaphor..." p. 277.

[66] ibid., p. 270.

[67] Schön provides an example. In the case of the conflicting housing frames, an integrated image is created, called 'sites-and-services.' Here, two previously different and conflicting ways of viewing the housing problem coexist. The new metaphor has a gestalt-like quality that enables both positions to see themselves in it- similar to a design that sustains different, yet satisfactory, agendas. Schön, "Generative Metaphor..." p. 275.

professional role in organizational and office design. The professional challenge of becoming designers of both culture and architecture is tantalizing, yet reachable. Ultimately, our competitive advantage is not a final product, nor an analysis of an existing situation, but the design process itself.

These three essential frame operations- revelation, modification and agreement—exemplified in "taken-for-granted world of policy making" are fundamental aspects of architectural design and theory. Architectural form literally reflects the frames in mind by demonstrating their actions on shaping form. The object defies simple definition, causing frame restructuring. The object in a social setting- an explicit aspect of architectural design, necessitates actively creating a shared frame.

The use of design literally to reveal, modify and coordinate frames is particularly well suited to architectural design. Allocation of the physical environment and artifacts concerns most cultural inhabitants. Even in the virtual workplace, defining where work occurs has high stakes. Policy design is more susceptible to political needs, not individual conviction. Architectural design deals with the a concrete reality whose information-richness encourages the cognitive work of restructuring: regrouping, reordering, and renaming. Policy design, although dealing with prescriptions for action , does not deal with obdurate physical elements. Architectural design is an social act- multiple actors with various expertise influence the shape of the object- thereby engendering conflict, negotiation, and compromise. Policy design is influenced by the status of designers rather than expertise, leading to capitulation.

Additionally, the institutional status of the action frame necessitates collective engagement and collaborative design. Unlike the frames of individuals that can be unearthed in somewhere through conversation and other forms of interaction, the institutional action frame is inferred only from group behavior. Cultural participants act together in ways that are consistent with their self perceived institutional roles. In so doing they take specific actions read by others that are consistent with an institutional action frame. The search for institutional action frames requires establishing an empirical correlate—another justification for collective engagement and collaborative design.

Hence, for architects, the metaphor of the policy debate as design is potent. It describes design as occurring by and through negotiations, cooperation, and competition.[68] It places the architect squarely in the midst of political turmoil, necessitating deft political skills coupled with sensitive leadership.[69] It places the design object outside of the architect's total control, where each player in the 'designing system' has a different interpretation and influence on the object. It demonstrates the role of language as posturing device, and accentuates lucidity over equivocation. In short, the metaphor can stimulate a critical reframing for our professional identity.

1.4.3 The Challenges

Our professional quandary is enlightened by the practices of Louis Kahn, who refers to the source of form as 'institutional beginnings.' He further contends that the architect, by cultivating "...the *form* of an institution offers the means to propose beginnings."[70] Cultivation implies a process engaging participants in a broad inquiry into their form- architectural and organizational. By proposing beginnings, the resultant emergent form imbues architecture with cultural relevance and simultaneously gives the architect a purpose- jointly reflecting upon the daily behavior of inhabitants.

However, architecture's folk theory- space as architecture's inside link to culture- prevents the discipline from engaging the frames critical to understanding organizational culture. If we continue to focus on our products, or the products of others, we will continually seek avenues for meaning, artificial ways to bring architecture in coherence with the cultures it attempts to circumscribe. Form as result may

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[68] "Given the divergent interests and powers of the actors involved in it, the social process of designing is inevitably political... designing is a social process, and the designer is characteristically a collection of actors, each with its own interests and intentions, its own slant on the object, its own image of a desirable future state, and its own names for the things and relations it takes to be important." see ibid., p. 165-187.

[69] "The effect of constructing hybrid frames that more adequately reflect the full reality of a problematic situation may be to bring fundamental dilemmas-conflicts of abiding truths-to the surface." ibid., p. 186.

[70] Stanford Anderson, "Public Institutions: Louis I. Kahn's Reading of Volume Zero." *JAE* 49/1 (September): 18.

contain history, but form as process reveals the conflicts, agreements, delays, and struggles that shape the object. Inanimate objects are not animate, and certainly cannot reanimate themselves. Manifestations of culture cannot speak so clearly about their emergence.

To shift our focus away from the static physical environment, we must also revisit our understanding of 'design.' Within the profession, design is seen as an exclusive activity aimed towards invention. Not only is this at odds with engaging in active collaborative design to cultivate form through cultural context and precedent, it ignores the critical cultural issues which circumscribe both the design process and use of its products.

The schism between culture and architecture is real, providing another reason to develop a proactive intervention, where architecture informs culture; and culture informs architecture. As was recently noted by the Space and Organization Research Group of MIT, leveraging the disjunction between culture and architecture is not only a potent way to engage culture, and infuse architecture with meaning. to leverage this schism. In fact they argue that the relationship between organization and space is most productive when they are dynamically coherent rather merely coherent.[71] Their research shows that the existence of a critical distance enables an explicit dealing of the architectural in relation to the cultural. When some degree of productive tension among them, a dialogue is reestablished. The emerging discourse forces the articulation and resolution of key issues found in both domains, opening the possibility for reconciliation and improvement.

Engaging in an inclusive design process with a broader agenda is the key to relevancy in the organization and investing cultural meaning to architecture. Cultivation attempts to use design in such a manner to inform architecture by articulating culture. Certainly this poses a new challenge for the profession– to augment, clarify, provide coherence to culture while simultaneously increasing inventiveness, relevancy and accuracy of architectural form. Developing an approach that relates architectural activity to the implicit nature of organizational culture- improving the performance of both- will be the aim of this dissertation.

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[71] Turid Horgen, Michael Joroff, William Porter, and Donald Schön *Excellence by Design: Transforming Workplace and Work Practice*, (New York: John Wiley & Sons, 1999).

APPEARANCE OF FORM

Understanding the frame is essential to reestablishing architectural relevancy to the organization. The concept has a long tradition in the field of cognitive science. However, this discipline does not address Schön's observation that frames are difficult to define. Due to their tacit and cultural nature, he recommends seeking evidence of frames in the actions and stories of people. In architecture, physical evidence of frames exists by what Habraken calls 'appearances of form.' This residue, along with a designer's 'story' accompanying design activity, facilitates understanding how the frame operates and is constructed in mind. A case study using both form and description will exemplify frames in action. By partially revealing frames, design activity enables us to propose or infer the nature of their tacit structures. The notion of syntactic features reconciles the tacit and cultural nature of frames with the desire to make frame descriptions more explicit. Additionally, this approach potentially provides the architect with a guide to achieve robust architectural and organizational form.

2 APPEARANCE OF FORM

2.1 THE FRAME

2.1.1 In Cognition

To better understand the frame and its potential for architects, it is useful to examine an earlier frame conception. Minsky describes the frame as "a data-structure for representing a stereotyped situation..."[1] The frame, like a 'chunk' or 'schema,' is an instance of mental symbolic processing.[2] Since manipulating actual bits of the world is both cumbersome and unfeasible, the mind creates representational schemes– symbols– to represent the world. Despite a subjective overtone, symbols are ultimately social– conveying experience or thought by referring them to a known class or group of phenomena.[3]

The frame also reflects the cognitive necessity to bundle the lessons of experience into coherent units of thought and the need of the mind to access these bundles when necessary.[4] Actively organizing a situation, past experience, or future action operates as a necessity in all well-adapted organisms.[5] Within any situation, numerous dimensions and aspects exist, each suggesting different routes for perception and engagement.[6] Memory naturally breaks up actual experience into relevant components to minimize complexity and maximize information to facilitate rapid comprehension, decision and action. Through the frame we are able to bring past experience to bear on present concerns by organizing knowledge in ways that make it available for other situations.

2.1.2 Label

In Minsky's terminology, the frame is identified by a label to provide the mind a convenient way to index the knowledge contained within it- what Rosch refers to as 'cognitive economy.'[7] Labels have personal significance to ease accessibility, organizing experiences in terms of a use, goals or other relatively important features.[8] This is reinforced by memory experiments show that subjects tend to recall what is meaningful for them, rather than the actual details of an image, object, or statement.[9]

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[1] Marvin Minsky, "A Framework for Representing Knowledge," in *The Psychology of Computer Vision* ed. Patrick Winston (New York: McGraw-Hill, 1975), p. 211.

[2] "...[a schema] is a spatially and/or temporally organized structure in which the parts are connected on the basis of contiguities that have been experienced in space or time. A schema is formed on the basis of past experience with objects, scenes, or events and consists of a set of expectations about what things look like and/or the order in which they occur. The parts, or units, of a schema consist of a set of variables, or slots, which can be filled, or instantiated, in any given instance by values that have greater or lesser degree of probability of occurrence attached to them. Schemata vary greatly in their degree of generality -the more general the schema, the less specified, or the less predictable, the values that may satisfy them." J. Mandler, "Categorical and Schematic Organization in Memory," in *Memory Organization and Structure* ed. R.C. Puff (New York: Academic Press, 1979)

[3] Lev Vygotsky, *Thought and Language,* trans. and ed. Alex Kozulin (Cambridge, MA: The MIT Press, 1996). p. 7.

[4] Cognitivists claim "..our capacity to think, feel, communicate, and act arises because of our capacity to process symbols." With these symbols, the mind is able to achieve 'high-level' cognitive functions: Problem solving, reasoning, language and other basic cognitive operations involve the explicit manipulation of symbols. David W. Green et al., *Cognitive Science: An Introduction* (Oxford, England: Blackwell Publishers Ltd., 1996). p. 27.

[5] F. Bartlett, *Remembering,: A Study in Experimental and Social Psychology* (London: Cambridge University Press, 1932).

[6] "The object does not sit as a docile model with its attributes neatly separated and thrust out for us to admire and portray...The object and its aspects depend upon organization; and labels ... are tools of organization." Nelson Goodman, *Languages of Art* 2nd. ed (Indianapolis: Hackett Publishing Co., 1976).pp. 30-32. Due to the ambiguous nature of objects, philosopher Nelson Goodman's claims that "perception without conception" is an untenable proposition. Nelson Goodman, *Ways of Worldmaking* (Indianapolis: Hackett Publishing Co., 1978).p. 6.

[7] Eleanor Rosch, "Principles of Categorization," in *Cognition and Categorization* eds. E. Rosch and B. Lloyd (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1978), pp. 27-48.

[8] The rapidity of memory decay also emphasizes the significance of memory for meaning. Although an event can be closely reconstructed soon afterward, as time goes on reconstruction is difficult to agree upon. Although forgetting or disregarding certain aspects of experience is necessary to avoid detail overload, it reveals what is meaningful for a perceiver or receiver. See M. Williams and J. Hollan, The process of retrieval from very long-term memory. *Cognitive science* 5(1981):87-119.

[9] John R. Anderson, *Cognitive Psychology and Its Implications* 3rd ed. (W.H. Freeman and Co.: New York, 1990) pp. 112-122.

More often, encoding is based on prior memory- what we are already familiar with is deployed to make sense of new situations. Since memory's selective attention also breaks experience into pieces, we commonly reconstruct experiences based on partial experiences or even the memories of others. For example, an amorphous object will be compared to familiar objects with similar sizes, shapes, and colors.[10] Despite the idiosyncratic nature of labels, they enable efficient and fluid communication by being recognizable, predictable and familiar to ourselves and others.

2.1.3 Attributes and Values

The label refers to the contents of a frame– a collection of attributes representing what is important about specific entities.[11] Attributes commonly come with a default value. For example, memory for meaning concentrates on the import for the receiver rather than exact wording– a serious phenomena in terms of social contexts, where we interpret rather than hear.[12]. Default values loosely attached to the attribute so it can easily be displaced by new information perceived from the situation. Violations and fulfillment of expectations and priorities provide memorable experiences. We remember what was exceptional about the event, labeled by a prominent and meaningful attribute.

Both the attribute– the particular characteristic of an object– and a value– the specific instance of the characteristic- enable the perceiver to put forth an adequate assessment of perception and experience. Often attributes remain unstated, yet become obvious when empirically based values are chosen to fill attribute assignments. While attributes and values facilitate 'sense-making', they can also impose meaning and action. Seeking meaning through preexisting attributes clearly prejudices what is perceived- or not perceived.

2.1.4 Propositions

Frames project experience onto a situation through a proposition– a statement of how we expect the world to behave.[13] Although some propositions are more accurate than others, Popper argues they are still only tentative statements, not an objective description of the truth.[14] Hence we may also see propositions as expectations to explicitly acknowledge their dependency on memory. This is different than claiming propositions are hypotheses. Hypotheses assume and imply well formed notions to be tested. Expectations use prior information to compare the existing situation to a previous frame.

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[10] Anderson, J. R. (1983).*The architecture of cognition*. Cambridge, MA: Harvard University Press.

[11] Mitchell contends a frame simply a list of defining attributes [from Mitchell, William (1990) *The logic of architecture; design, computation and cognition* Cambridge Mass: MIT Press pp. 97-98.]:

frame:	general frame for a chair	particular instance of a dining chair
label:	'chair'	'dining chair'
specialization:	furniture	chair
number of legs:	4 (default)	none- tubular metal frame
number of arms:	0, 1, or 2	2
seat:	same as back (default)	leather
back:	same as seat (default)	leather
style:	based on context- modern	style: Breuer/Bauhaus
good for:	sitting (default)	good for: eating at table

adapted from : N.A. Stillings, Mark Feinstein, Jay Garfield, Edwina Rissland, David Rosenblum, Steven Weilser, and Lynne Baker-Ward, *Cognitive Science: An introduction*, (Cambridge, MA: MIT Press 1987).

[12] "The superiority of memory for meaning indicates that people normally extract the meaning from a linguistic message and do not remember the exact wording.". Anderson, *Cognitive Psychology* ... p. 116.

[13] The proposition contains the minimum amount of information that can stand as an independent assertion. First-order propositions are expectations containing individual knowledge of the world, that can be tested against reality and revised their understanding in the light of such tests. Second-order propositions are expectations derived from someone else's position which is not necessarily refuted by knowledge. See. Anderson, *Cognitive Psychology* ... pp. 123-125. Aristotle defines the proposition as: "...a form of words that affirms or denies something *of* something...Every proposition says wither that something applies, or that something necessarily applies, or that something possibly applies." Aristotle, *A New Aristotle Reader*, ed J. Ackrill (Princeton, NJ: Princeton University Press, 1987). p. 24-25; in the section "Prior Analytics: Book I" chapters 1 and 2, lines 16 and 25 respectively.

[14] Popper claims "The empirical basis of objective science has nothing 'absolute' about it. Science does not rest upon rock-bottom." Karl R. Popper, *Logic of Scientific Discovery* Reprint edition (London: Routledge, 1992), p111

Intuitive understanding can be seen as expecting certain phenomena, rather than formulating a hypothesis regarding what we expect to occur and then testing it. The change in terminology may seem superficial, but it is important to fold the significance of making expectations into design discourse. [15]

Converting attributes and values into propositions of how the world behaves, or how we propose it should behave, legitimizes action.[16] By assigning values to attributes, attributes to labels, and labels to situations, a perceiver proposes how a situation is and what his interaction with it should be. This process, which Schön calls 'naming and framing' underlies how frames describe and prescribe, merging sense-making with action to 'frame' a 'social reality.'

2.2 ARCHITECTURAL FORM

2.2.1 Frame Evidence

The tacit and cultural nature of frames necessitates seeking evidence of frames, not frames themselves. Architectural design naturally provides physical evidence of frames, enabling reflection and discussion. In a simple design definition, 'form' emerges from the dichotomy between ideas in mind and the concrete situation (Figure 2-1).[17] The string of representations describing the evolution of the architectural design object assists the designer to negotiate the differences between mind and object. For observers, the 'appearance of form' reflects the abstract images and frames in mind.
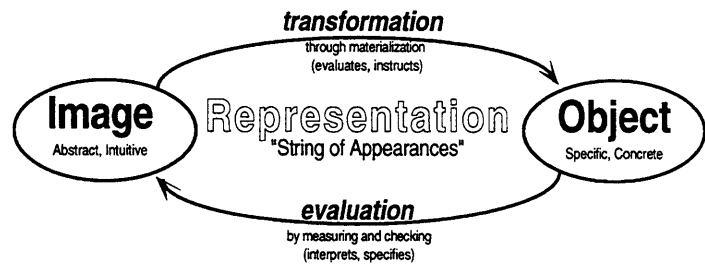
Figure 2-1
The 'Appearance of Form'

Additional evidence of how frames 'make sense' of situations comes in the form of 'stories.'[18] The 'stories' people tell— recantation, description or assessment— is a common and convenient way of collecting, organizing and recalling the information contained in frames, as Schön writes:

> "From a situation that is vague, ambiguous, and indeterminate (or rich and complex, depending on one's frame of mind) each story selects and names different features and relations which become...the critical features of the description."[19]

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[15] Based on Bryan Magee, *Modern Masters: Karl Popper* (New York: The Viking Press, 1973).

[16] A variation on propositions as facts are propositions as rules: We might be tempted to generalize rules to codify what we expect to occur in a given situation. But since these are determined by empirical investigation, they cannot be absolute. Therefore, they are closer to propositions we make about the world. This is an important distinction because rules have an implicit absolute character to them which cannot account for the variations of their application in practice. Using the term propositions embraces the tentative nature of what we expect to be the case, thus allowing for permutations and flexibility, characteristics most commonly found in the built environment.

Formulating rules has serious limitations, particularly in light of precedent in design activity. Primarily, it is difficult to acquire detailed and reliable knowledge to construct rules. Rule-based systems do not remember past problems incurred and as a result do not learn from there mistakes. The emphasis on generality versus specific instances limits. They are not robust: when presented with a problem that does not match any of the rules, they fail to respond. See S. Slade, "Case-based reasoning: a research paradigm," *AI Magazine* 12:1 (1991) 42-55.

[17] Based on N. J. Habraken, *The Appearance of the Form : Four Essays on the Position Designing Takes Between People and Things* (Cambridge, MA: Atwater Press, 1985). pp. 45-48.

[18] Schön provides an example: one 'story' depicts urban housing in the United States as characterized by 'blight.' Another describes the same situation as a 'natural community.' The prescription for the former is expert intervention, in the guise of a planner, to return the patient to health. The latter prescription is to reinforce, not redesign, by providing lower income families proper service and support to encourage comfort. Each story places the features it has selected within the frame of a particular context- blight and its removal, natural communities and their reinforcement.

[19] Schön, "Generative Metaphor..." p 264.

'Framing' the situation to facilitate description implicitly establishes the propositions held by perceivers. Similar to the 'appearance' of architectural form, descriptions enlighten these propositions, and the actions they incur.[20] Therefore, combining the explanatory potential of both may yield insightful glimpses into the tacit world of the mind, and ideally how it deploys frames.

2.2.2 Case Study Overview

From a methodological perspective, access to the mind is not an easy task. Both a postori reconstruction and physical evidence alone reveal little about the internal processes of judgment and action. However, Perkins argues concurrent introspection does reveal significant insights into design action. With strategies to avoid disturbing fluid activity, asking creators to describe form manipulation synthesizes the explanatory powers of emergent form with an evolutionary 'story'- thereby offering a potent methodology to demonstrate the role of frames on thinking and action.[21]

In the Fall of 1986, the Design Inquiry group of MIT used introspection to better understand design activity. Presented with a drawing containing walls and numbered entrances (figure 2-2), a designer was asked to explore the impact of the different entrances on the interior organization:

"You have been asked by the library association of the Commonwealth to look at their generic branch library plan. They use this plan for libraries throughout the state, typically in suburban locations. The library can be oriented in any way on sites of varying shapes and configurations, and is normally a one-story building. When the site is tight, they design a special one, including multiple stories. They have had problems with entrances, and so they have come to you, as a consultant, to analyze their entrances for them and give a set of guidelines for the architects that will have to design these buildings. They want to know what each entrance implies as to the sitting of the building, the massing, the internal organization, and whatever you feel is significant in how the building gets designed."
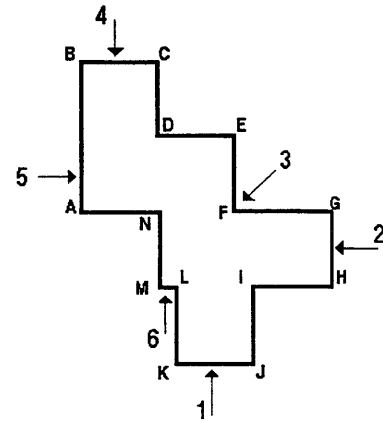
Figure 2-2- *Library Footprint*

The protocol itself is the exploration of the design problem through sketches and a verbal description of her activity. A practicing architect and studio professor, Roberta (a pseudonym) has been instructed by a proctor to talk more than normal for the sake of the experiment. Her verbal reflection enables a better understand of her process, while simultaneously encouraging her own reflection.

Given the linguistic and graphic documentation of design activity, the purpose of the case is to provide evidence of frames in mind. Although the design task concentrates primarily on architectural morphology, the case nevertheless demonstrates the impact of frames in architectural design. As stated, the problem requires additional information by supplied by the designer. This opens an opportunity to view a designer's previous knowledge and its influence on the decisions and actions taken. Overall, the case did provide evidence of frames. Its weakness was the focus on an individual designer. Without the activities of collaborative design, evidence of frame restructuring and learning is limited.

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[20] The result of each story's different view of reality guided "...the writing of legislation, the formation of policy, the design of programs, the diligence of planners, the allocation of funds, the conduct of evaluation." Schön, "Generative Metaphor..." p 264.

[21] See Perkins' concise overview of methodological perils. David Perkins, *The Mind's Best Work* (Cambridge, MA: Harvard University Press, 1981).pp. 9-40. Perkins outlines 3 strategies to promote a complete record (say whatever is on your mind; speak continuously; speak audibly), and three to discourage overexplanation (Don't worry about incomplete sentences; Don't overexplain or justify; Don't elaborate past events). These 'better practices' are a response to the critique of introspection of Nisbett and Wilson, with a caveat: "There is an art to helping people share their minds with an investigator,..." Perkins, *The Mind's Best Work* , p.32.

In this case study, three primary frames are revealed as dominant in each of three design cycles. The first is invoked by the use of the term 'library.' A word can be seen potentially the most basic frame—necessary for both communication and thought. Had another term been used, the same image would have been explored quite differently. The second dominant frame emerges from the designer's perception of the problem. She sees in the morphology of the first entrance an implicit axis. The third frame emerges from the design activity itself— not imposed by the problem. Roberta builds a frame drawing on both the term and her perceptions to establish a plan which determines the final form.

2.2.3 The Suburban Library

Roberta's first design action draws on the 'semantic frame of reference' provided by the problem statement: "So in regard to the larger program of the library -you have all the basic functions of libraries, books, storage and reading areas..." By unpacking the word 'library' enables Roberta, as William Porter writes, to access compositional elements necessary for a designer to engage a problem. Accessed knowledge such as books, storage and reading areas, underlie professional concepts and categories. Proper nouns and names provide physical support to generate further interventions into the place, presenting "...themselves for possible inclusion and placement in the design."[22] Schön refers to these as 'functional types'– sources of information to supply premises and attributes in chains of design activity– such as libraries have a control desk, stacks.[23]

The ability of Roberta to access professional knowledge required for continuing her assignment-, books, storage and reading areas- is partly due to the nature of the term library. 'Library' is what Rosch calls a 'basic level'– a term enabling spontaneous labeling of objects for rapid identification, comprehension, and immediate inference to guide decisions. The basic level denote elements, parts of a physical system, spatial distribution, and levels of intervention by residing within an implicit semantic hierarchy.[24] Moving upwards toward generality, Roberta describes the library as a case of a superordinate category of civic buildings: "As I hear your problem, it's much more generically a problem about entries into civic buildings ..."
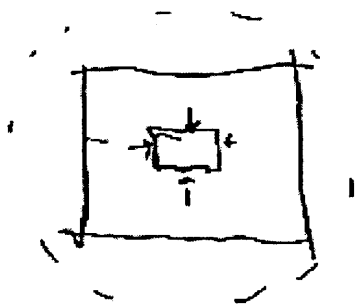
Figure 2-3
Library in the Site

Once the problem is identified, a semantic hierarchy provides both general and specific information. Roberta moves toward specificity– downward in a semantic hierarchy– in describing the library as a 'suburban library.' She can now place the building within a site. "As a library in a suburban site, it probably stands alone in the site...it can be a more formal entry because there isn't a great deal of other buildings - It's an object sitting within a larger landscape." Her definition results in the first step towards acting in the design situation- a formal entry. Her initial drawing shows a rectangle (the library building) within a larger rectangle (the site). During the making of Figure 2-3, she reinforces her initial attitude: "...you're probably talking about a more formal entry which wants to be called out as a special event, in that landscape." The 'special event' will play a large role in guiding Roberta's subsequent design activity.

[22]William L. Porter, "Notes on the Inner Logic of Designing: Two Thought-Experiments" *Design Studies* 9/ 3 (July 1988):169.

[23]Donald A. Schön, "Designing: Rules, Types and Worlds" *Design Studies* 9/3 (July 1988):181-190.

[24]Eleanor Rosch, Carolyn Mervis, Penny Boyes-Braem, Wayne Grey, and David Johnson, "Basic Objects in Natural Categories," *Cognitive Psychology* 8 (1976):382-439.

2.2.4 Axis-Entrance #1

Roberta begins by drawing the facades she would face when in front of entrance #1 (figure 2-4). By drawing her view from the entrance, she notices that the massing is 25 feet wide everywhere. This implies a great deal of circulation and most importantly, justifies a strong axis running throughout the building- and framing her design activity.
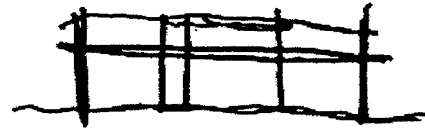
Figure 2-4
Entrance #1 Facade

The axis is reinforced by her perception of the plan itself. She draws a 'dominant kind of circulation,' making the case for the axis by extending it to the end of the building (figure 2-5). even though this is not in the axis line. The axis, she claims, will organize the back wing, conceivably trying to bring it closer into the main portion of the building. The entrance and the initiation of a perceiver to the axis, establishes a formal lobby. Roberta proceeds to imagine a path along the axis, organizing both views and functions. She moves along the path past a lobby and desk. A newspaper area and a larger reading room. As she explores these last two rooms, the orientation of the building towards the sun is raised. Reading areas closer to the southern side of the building. The book collection protected by high northern walls to protect the books. Although most of the rooms face south, she raises the possibility of work areas that could receive northern light.
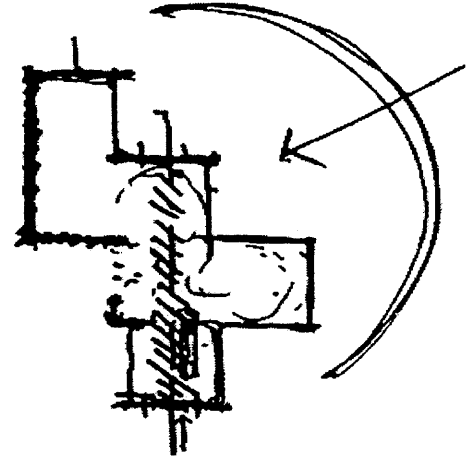
Figure 2-5 *Axis*
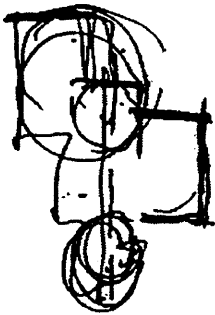
Figure 2-6
Dogbone

The impact of the 'axis' frame becomes evident when Roberta begins the new plan figure 2-6. As she explores the new location of the reading rooms, she describes the design as a 'dogbone organization': The lobby and reading area are organized along the axis; books and collections are in the middle. As she expands the book area to the right, she moves the wall beyond the original footprint. The moderator informs her it is too much of a change, but the action itself causes her to begin thinking about the influence of the axis on the external form of the building. Roberta states that an axis in the middle has an influence on the form. Unlike most responses to call out the axis down the middle, she prefers to set up a direction and create something that moves laterally off of it. Rather than engaging the external form directly, she returns to the interior to gain insight into how the external features might be informed by this new lateral movement off of the main axis.
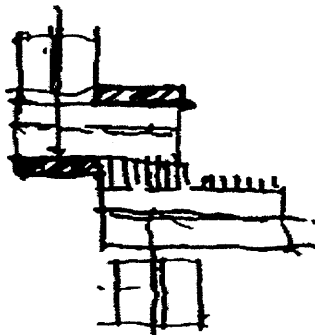
Figure 2-7 *Roof System*

As a result, she draws arrows off of the main axis to establish a series of directions out from the axis. In figure 2-7, her lines off of the axis organize roof forms. The emerging design reveals a 'tightness' in the middle of the roof. She proposes a vaulted roof to address the problem of the roof complications emerging from the directions off the axis. The vaulted arches can also be applied to the ends of the axis, thus calling them out as special events. In the middle of the roof, a flat area emerges between the arches– reminiscent of the Kimball Art Museum. Similar to Kahn, Roberta uses this as an opportunity to bring more light into the building, through the special events at either end.

The design activity sequence terminates when Roberta begins to explore the three-dimensional repercussions of her actions in figure 2-8. The resulting form- a series of vaulted roofs indicating a 'formal' entry- demonstrates the role of frames on action. In particular, this design sequences shows how perception informs the frames that prescribe action. Although Roberta draws on the term library to provide additional functions, these attributes are secondary - the 'axis' frame influences decisions regarding their placement.
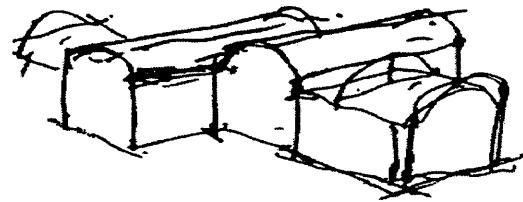
Figure 2-8
Axonometric

2.2.5 Directionality- Entrance #3

A third design sequence draws upon the library frame and perceptual aspects in the design situation, as it is perceived by Roberta. The emergent 'plan' directly impacts her decisions and form by simultaneously creating and solving a situation she perceives as critical to a successful design.

Roberta now considers Entrance #3, turning the plan 90° clockwise (figure 2-9). She begins with the two orthogonal directions from which one could approach the building. In contrast to entrance #2, into which one has to move in early, the two optional approaches to entrance #3 make one "actually walk by a piece of the building" before entering, and that means that "3 is more interesting". We might assume that this implies a 'less formal' entry and that would be a shift from Roberta's earlier claim about the building calling for a formal entrance. At this point Roberta makes a small 'contextual' sketch to illustrate the approaches as well as an edge of the site, here referred to as 'the public direction.'
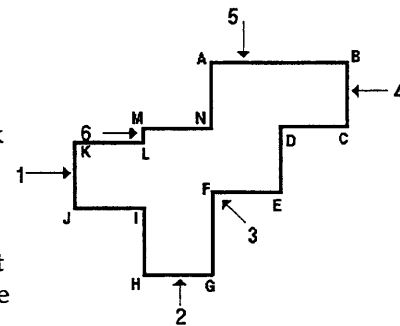
Figure 2-9 *Rotated Library Footprint*
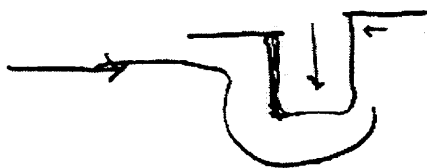
Figure 2-10 *Walking past the building*

Roberta now chooses one of the optional approaches by negating the other: she turns her page to face the other way and finds that coming from this direction "I'm already by too much of the building." Drawing figure 2-10 causes a reflection that clarifies her previous statement. "Walking by a piece of the building" is interesting, but not in all cases– some distances are too long to walk."

"I wouldn't come in parallel to the EF direction because I think you've gone by too much of the building". In her next move she switches to her own feelings about movement toward the building, or its movement toward her: "You end up having to float a great deal before you can actually get to the library." 'Floating' probably means that there is no clear relationship between the approaching person and the building, or part of it. We can better understand this when she spells out her reasons for preferring the alternative direction of access to the building, which "seems to be more comfortable as a direction to move in, because I have that building edge adjacent to me." The edge, which surfaces here once more as an important positive quality prevents the 'floating' of the previous situation.

Entrance #3, projected out from the footprint, is "a more dominant piece" (figure 2-11). The projection reminds her of Richardsonian libraries where "...a stair...somehow marks the entry. In Richardson's case, it's a flat facade which curls out." After drawing a flat facade with a stair case projecting from it and an indentation for the entry next to entrance #3, she amends the sketch to reflect the nuances of her situation.

Figure 2-11 *Richardson Entry*
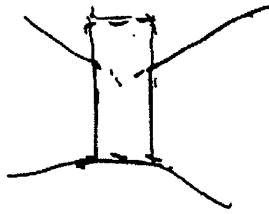
Figure 2-12
Severe Entrance

Roberta begins to design after exploring the introductory and 'contextual' issues of entrance #3. Although the arrow indicating entrance 3 is diagonal, she reiterates her objection. A diagonal entry doesn't seem to be congruent with what she believes to be a criteria for the design for entries ": entries need to be more transitional...even in formal buildings, the entrance should be transitional--a sense of moving through" While sketching figure 2-12 of such an entrance, she lists three more objections: She has "...a prejudice about trying to come in on a corner; The space isn't oriented to receive someone that way; A 45 angle in an orthogonal layout is "just very severe"

Rather than approach the problem as given, she assumes a perpendicular entrance [perpendicular to EF]. As she sketches the volumes of the footprint to while the entry-space leads directly - they are two perpendicular here: "The building moves away from me" she claims, describing what happens when she enters form the direction which emerged as best in her preliminary analysis. Her understanding of the building is to be perpendicular to the axis the entrance establishes.
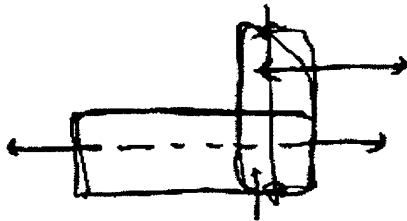
Figure 2-13 *Directionality Dilemma*

A dilemma begins to emerge: the movement implicit to the entry axis is perpendicular to the movement implicit to the building. She is now confronted with spaces in two directions, which is seen as a difficulty that causes her to evaluate "3 is a more difficult problem" She explains the difficulty in what will become a key issue in the entire exercise (figure 2-13). Her complications are compounded since these two very important directions and "When I design I try to also choose a dominant direction"

Her next series of moves deals with "this whole directionality" Sketch figure 2-14 starts by repeating the previous one, then continues by introducing two more rectangles, each one partially overlaps with the initial rectangles, to completely cover the footprint. As a result, the footprint is now divided into 6 squares, which Roberta outlines with circles. She draws the center-lines of all four rectangles, with arrows on both ends. The horizontal center-lines are solid, the vertical ones are dotted. She calls the solid lines "the larger directions".
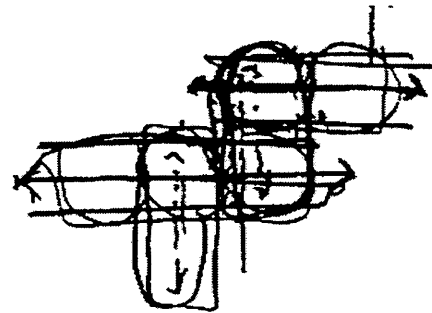
Figure 2-14 *Roberta's Sketch*
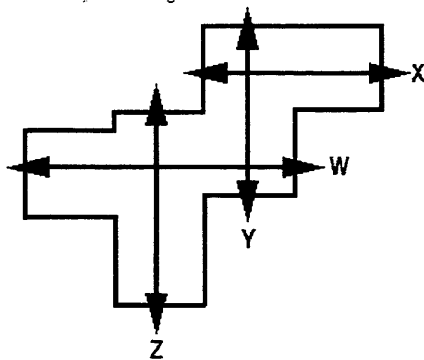
Figure 2-15
'Directionality Drawing-after Roberta's sketch

Y and z in figure 2-15 are "... secondary directions within the space, so the entry is actually moving in along the secondary directions." Having the entry -path aligned with the secondary direction poses a problem,: It's important to allow that direction to happen, but to sense the larger movement-so that becomes an important piece [y], but...second to this and this [w; x]...There's a primary system going this way (E-W), and somehow a secondary system (N-S)." She takes another look at the entry direction, marks it on her sketch and identifies what seems to be a conflict between her primary direction and the entrance being on the secondary direction : "There's a dilemma for me, because when you come in you have a tendency to want to move straight, because of the way you come in along G and F." and "...everyone's kind of coming to that point."– the intersection of W and Y.

Roberta looks for another instance of 'directionality' She redraws the footprint (figure 2-16): "There might be a way to work with the other dominant direction..." She posits that the primary versus secondary systems might be represented by "the structure and roof direction" versus the way light is brought in or the way furniture is arranged. She submits: " I sort of have the sense that would be the stronger orientation so that as I moved in, I would understand something about moving in a long way, all the way out." She establishes a control point near the entrance, which on her sketch takes the shape of a small square, similar to her representation of Richardson's library. Beyond the control point, Roberta replaces the storage as pivot with a newly found solid wall which "will help give the larger lateral direction, the other movement to turn you, as you move in." The conflict between piece and movement has been solved by the wall, which is slightly extended into the footprint to create a 'pivot' effect.
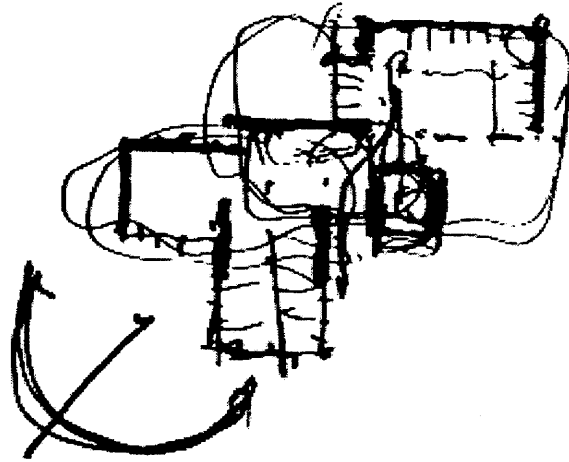
Figure 2-16
Design Activity-
solving the directionality problem

The next step is to "supplement the design part...with different references for libraries". She seeks a typological form that's very domestic, house-like, with pitched roofs. She refers to simple small Cape Cod type houses to reinforces her use of New England libraries. She then checks with the researcher if her task is in Massachusetts and goes on to inform us that she did most of her design work in New England. This is relevant not only for the project, but the information she is bringing to the project, since all would be different if either were in a different region If it were in New Mexico, I'm sure I would have to reconsider what the whole form of it was."

She uses a basic characteristic of Richardsonian libraries- two stories- and her problematic entry to initiate a series of series of detailed and vivid design moves. She transforms her old control point into a stairway and relocates a control area in the lobby. The upper level starts with functions (stacks, shelves, work space) and continues to building elements (bridge) complemented by how one would experience the space "you can move along that edge, sometimes you can look out, the bridge looks down into the lower part..."
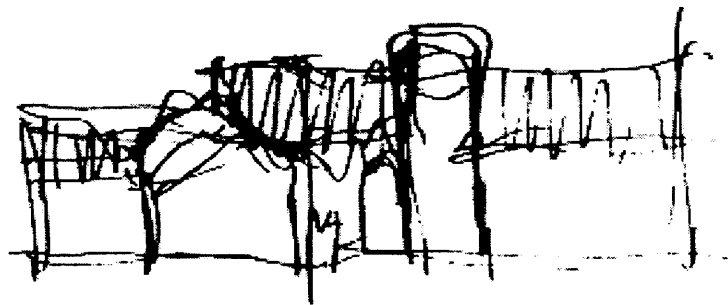
Figure 2-17
Elevation- showing the stairwell

The second floor and stairway enable her fluid design activity and the creation of architectural form. Both results emerge as solutions to the problematic nexus Roberta refers to as 'directionality'– the origin of the entrance bottleneck, justification of her subsequent move upwards, and legitimization of an entry tower. In Figure 2-17, the roof and exterior stairwell are clear evidence of a frame in mind. However, unlike the library frame, evoked by the problem statement, or the axis frame– evoked by her perceptions– 'directionality' is an ad hoc plan developed in design activity, drawing upon precedent.

This case is particularly useful in demonstrating the tacitness and descriptive resistance of frames- even to the frame holders themselves. When Roberta is asked about the meaning of the primary and secondary system of the 'directionality' she sees, her response is: "I'm not so sure." In fact, the question

itself is what causes her to attempt a more precise definition, which in turn provokes the fluid design activity: "It might be the larger structure and roof direction, and the secondary might be more how I bring the light in, or it might be the way you arrange bookshelves, furniture, something like that..."

Her initial inability to articulate the 'directionality' she sees sheds light on the cultural basis of the frame. Partially drawing legitimacy from her genuine perceptions, the frame also reflects the design culture she was trained and works within: One that espouses a close relationship between architectural morphology and spatial behavior.[25] Design of form was guided by strict spatial and circulation definitions. It would seem that unbeknownst to Roberta, her directionality problem is very much a part of the culture itself. Although she cannot articulate clearly the frame she imposes on the design situation, the subsequent definition and actions- manifest in form- are strong evidence of the frame's existence and impact.

2.2.6 Frame Variety[26]

Through direct action and influence on form, three frames are witnessed in the design protocol. A 'basic frame' is indicated by a word containing information to justify subsequent action. Due to the seclusion of a 'suburban library,' it must be a 'special event.' This should not be confused with a simple word defining a 'suburban library' as having as one attribute a formal entry. Her frame describes and prescribes- making it a direct influence on action, yielding a vaulted entry and stairwell in two design sessions.

More directly imposing action is the 'perceptual' frame. By organizing stimuli into meaningful figures, this frame facilitates meaningful activity. Rather than random observation, 'seeing' means adapting a situation to suit or legitimate a certain kind of interaction. Roberta's "...very strong axis moving through the building" is immediately followed by imposing a "...a dominant kind of circulation coming through the center." This in turn guides subsequent actions and decision- she creates a roof form to match and reinforce the axis both internally and externally.

Similarly, the plan emerging from the circumstances encountered in design activity demands action: Roberta's "... whole directionality *must be* ... deal with..." The designer is suddenly faced with a situation- unrelated to any initial encounter- requiring her to create the stair tower- an action plan freeing her to explore the rest of the design.

In addition to a basic, perceptual, and plan frame, two other generic frame types influence form by containing specific action procedures. A 'vision' is a desired state defining actions to resolve discrepancies with the current situation. By projecting a desired situation onto the current state, the differences craft a set of procedures to change the current state into the desired and envisioned state.[27] Roberta cannot 'see' the possibility of a diagonal entry, so she changes it to suit what she considers as being plausible.

Although seemingly a projection into a future state of affairs, a 'vision' is closely related to past experience. Cases explicitly reach into precedent. These are past experiences related to the current context, deployed to inform situationally specific activity. Case-based reasoning focuses on how prior experience assists making sense of new situations.[28] Embedded in the case as frame are the procedures attached to successful experiences, or the lessons to avoid past failures. Roberta's tacit operating procedure is similar to her past work: "I've done most of my work in New England. If it were in New Mexico, I'm sure I would have to reconsider what the whole form of it was."

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[25] I refer to the MIT design culture of the 70's and 80's, best characterized by the work of Maurice Smith. Its primary manifestation was the use of two and three dimensional linear systems to guide and analyzethe activity and experience of the users within architecture.

[26] For a more extensive discussion, see Appendix A: Frames

[27] In this way the vision acts as a 'difference engines' establishing procedures out of differences versus out of the goal or situation alone. See Marvin Minsky *The Society of Mind* (Simon and Schuster, New York 1985 p. 78

[28] Janet Kolodner *Case-Based Reasoning* (San Mateo, CA: Morgan Kaufman Publishers,1993).

Identifying relevant cases occurs by current similarities to experienced problems and past solution procedures. One of Roberta's first moves to identify the situation she is faced with: "As I hear your problem, it's much more generically a problem about entries into civic buildings...you're talking about a more formal entry." This assessment supplements her earlier contention that the entry must be a 'special event.' The entry can generally be seen as one typically recurring problem in design, which Colin Rowe refers to as elemental types-prototypes for solving general classes of design problems.[29]

Slightly different than the frames explicitly influencing form are sets of prior knowledge which can potentially develop into frames to prescribe action. Images in mind are one example, condensing exemplars and previous visual experiences via shape details. The vault of the Kimball Museum is one example, providing a shape sufficient to invoke the reference for Roberta's use. Unlike images, artifacts influence human interaction by use, dimension, and specific features. Similarly, attributes of the physical environment encapsulate the experience of place. Kevin Lynch sees the critical aspects of place as containing a paths, edges, points and landmarks.[30] The location and dimension of each attribute enables orientation. Roberta makes numerous comments to indicate her use of attributes of place to guide movement: "With a library, sense of arrival, and where you orient yourself, and where you go next, is important." Roberta also uses place as a means to support formal decisions: "...seems to be more comfortable as a direction to move in, because I have that building edge adjacent to me."

For architects, place as orientation system enables virtual exploration. Related to this activity is the script- a stereotypical event sequences describe routine activities to predict appropriate action.[31] Roberta envisions a certain sequence of activities occurring as a means to justify her design activity. "I like the circulation desk alongside, rather than the first person you face when you come in, because I think people are more relaxed in spaces like that." Scripts depend on another descriptive frame, roles. Commonly we assign people to predefined stereotypes or patterns of expected behavior. For example, Roberta assumes the role the librarian will play in envisioning a stereotypical library transaction. Later, in a different design sequence, the proctor invokes the 'deranged client' stereotype- relevant within the architectural community- to demand Roberta's engagement of the diagonal entry.

2.3 CULTURAL COHERENCE[32]

2.3.1 Imagination

Design aptitude is coordinating seemingly disparate frames. Design creativity manages and synthesizes the unexpected synergies between preexisting frames. Both generate unforeseen ideas and products– imaginative activity. Constructing knowledge as frames, and the resultant effect they have on form, goes beyond both the frames in mind and the situation at hand. The plan is one prominent example of imaginative activity: "... influenced by existing knowledge frameworks in the same way that any task involving the use of categories and concepts would be influenced by those frameworks."[33]

How can the frame, and particularly its inherently static structure, account for such activity? Minsky's frames are strictly propositional- they account for only one set of propositions. However, we have seen how the mind 'creates' rationality out of intrinsically irrational situations.[34] Conversely,

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[29]Other prototypical problems include the transition between ground plane and building, public and private dilemma, and the community and privacy dialectic. Peter Rowe, *Design Thinking* (Cambridge, MA: MIT Press, 1987). p. 87.

[30] Kevin Lynch, *The Image of the City* (Cambridge, MA: MIT Press, 1960).

[31]Roger Schank and Robert Abelson, Scripts, Plans, Goals and Understanding (Hillsdale, NJ: Lawrence Erlbaum Associates, 1977).

[32] "The most fundamental values in a culture will be coherent with the metaphorical structure of the most fundamental concepts in the culture." George Lakoff and Mark Johnson. *Metaphors We Live By* (Chicago: The University of Chicago Press, 1980). pp. 22-24.

[33] Ronald Finke, Thomas Ward, Steven Smith, *Creative Cognition: Theory, Research, and Applications* (Cambridge, MA: MIT Press, 1992). p. 114.

[34] George Lakoff, *Women, Fire, and Dangerous Things:* ... pp. 116-117.

frames are actively recalled from subjective memory, not objectively constructed. Internal synergies make wholes are more potent and effective than the parts since independent units difficult to describe. Exploration and construction occur in consistent ways that legitimize action.

The issue of imaginative activity is enlightened by viewing examining frames in culture. Although concepts, categories and classification schemes seem to be objectively determined, each culture establishes systematic order of their world through such devices. Whether modern chemistry or the witchcraft of the Azandes, social and physical realities are "...too complex, too relative, or too exotic to be approached with conventional conceptual maps or standardized instruments."[35] Levi-Strauss strongly argues for both magical and scientific thought resting on the demand for order, improvised by the mind's creative capacities.[36] The significance of imaginative activity lies in defining culture-actualized by guiding decisions, behavior and actions of its inhabitants.

2.3.2 Coherence

The rationality of imaginative activity- on a cultural and personal level, requires something to order it logically.[37] General and systematic terms lend themselves to discussing frames in a Minskian sense. However, as Schön points out, a frame's logic is both tacit and culturally based. This reflects the designer's striving to be rigorous and logical– not random or incoherent– to legitimize action.[38]

Therefore, missing from Minsky's frame formulation is an element to describe its internal and implicit structure. The existence of a syntax- an implicit interrelationship between propositions attributes, and between attributes and labels- enabling the frame to be treated as a coherent whole.[39] The term syntax not only describes an underlying structure, but also indicates its implicit nature. Constructing ways to understand how communication and interaction between propositions occurs begins with syntax.

2.3.3 Syntactic Features[40]

Despite the difficulty of defining the syntax of frames, its use in exploring frames is critical. The task of the designer is to postulate syntactical features to account for the resilience of frame in culture. A variety of potential syntactic features exist. Metacultural frames in particular, and frames in general, maintain consistency and coherency by drawing upon a term to describe a set of propositions. In Schön's earlier work on frames, he argues that problem-setting and situational descriptions depend on a metaphor for coherence:

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[35]See E. E. Evans-Pritchard, Witchcraft, Oracles and Magic Among the Azande (Oxford: The Clarendon Press, 1965). Also see Peter Winch, "Understanding a Primitive Society"in Perspectives on Africa : a reader in culture, history, and Representation eds. Roy Grinker and Christopher B.Steiner. (Cambridge, MA : Blackwell, 1997), pp. 312-326.

[36] Lévi-Strauss does not equate the two– clearly the expectations of modern science are fulfilled more often than in witchcraft. Strauss contends that the difference between knowledge procured today and in the past is "...not a function of different stages of development of the human mind but rather of two strategic levels at which nature is accessible to scientific inquiry: one roughly adapted to that of perception and the imagination: the other at a remove from it. It is as if the necessary connections which are the object of all science, Neolithic or modern, could be arrived at by two different routes, one very close to, and the other more remote from, sensible intuitions ... the scientist creating events (changing the world) by means of structures and the 'bricoleur' creating structures by means of events." Claude Lévi-Strauss, The Savage Mind trans. George Weidenfeld (Chicago: The University of Chicago Press, 1966) Translated from the French: La Pensée Sauvage, (Paris: Librairie Plan, 1962). pp 10, 15 -22.

[37] Constructing frames rests on a simple assumption: The mind's power of producing representations from objects desires to be none other than sensible. The faculty which enables us to think with sensible intuition is called 'understanding.' As expressed by Kant: "Without sensibility no object would be given to us, without understanding no object would be thought. Thoughts without content are empty, intuitions without concepts are blind." E. Kant Critique of Pure Reason trans by N. Kemp Smith. (New York: Random House, 1958) original published in 1781.

[38]As Goodman states: "Mere acknowledgment of the many available frames of reference provides us with no map of the motions of heavenly bodies; acceptance of the eligibility of alternative bases produces no scientific theory or philosophical system; awareness of varied ways of seeing paints no pictures. A broad mind is no substitute for hard work." Nelson Goodman, Ways of Worldmaking (Indianapolis: Hackett Publishing Co., 1978). p. 21.

[39] Lakoff refers to this as the structure of internal cognitive models. He argues that the structure of the ICM space is based primarily on the body, finding bodily metaphors to chains, metaphors, and metonomy. I believe the body is one organizational mechanism, among others. See Lakoff, Women, Fire, and Dangerous...

[40] For a more extensive discussion, see Appendix B: Syntactic Features

"... the metaphor which accounts for centrally important features of the story-which makes it understandable that certain elements of the situation are included in the story while others are omitted; that certain assumptions are taken as true (by default) although there is evidence that would appear to disconfirm them..."

The convenience of the metaphor lies in the reference to a culturally meaningful word which invokes a frame, its implicit relations and actions. The 'generative metaphor' deploys a culturally salient term to bind propositions together in unforseen ways. Such development hardens the resilience of frames since members of a culture are not conscious of the frames they inherit or create in the course of activity. Herein lies their tacit nature: such agreement occurs organically in the course of action.[41]

Coherency also comes in propositions, metonomy, examples , linear chains and even the body. Propositions exude the most basic syntax- sentence structure. The process naturally and perhaps unintentionally turned into 'facts' in the process of condensing experience into manageable parts to be used in other situations. A proposition is a value linked to an attribute, or an attribute linked to a label. Roberta's 'fact' linking direction to movement is a good example. Over time and through experience, related propositions reinforced each other. Emergent synergies between related propositions strengthen the resilience of a frame, becoming epistemological commitments in a mental universe.[42] It would be difficult to convince Roberta that graphic direction might not imply movement.

Facts can rise to metonomy- one proposition or attribute as primary- by acting as label. In such instances, one 'fact' organizes an entire frame. Given the selective nature of memory and perception, frames are typically encoded via an attribute, value, or subcategory used to represent the entire frame- facilitating inferences or judgments.[43] For example, Roberta's proposition that "Continuous movement with the entry and building is necessary" dominates her actions– thus acting as a metonym. Her problem is compounded by the building direction is impossible given the entry location. Even stronger than her simple dislike of diagonals, this proposition anchors all the observations she makes: the diagonal conflicts with the orthogonal building. Most significantly, it informs her perception that "the entry has three competing directions: long, secondary, and diagonal, resulting in 'total chaos.'"

Metonomy culls legitimacy through experienced or imagined examples. The example, far from being simply an illustrative device, can act as a pivot for organizing related propositions. The Richardsonian library clearly plays a dominant role in Roberta's design activity, ultimately providing a roof and second level. Examples commonly preserve information by organizing propositions sequentially "...like beads on a string ."[44] A linear chain enables a designer to foresee the impact of certain activities, leveraging one role of the frame- cognitive efficiency and economy. Scripts, for example, are held together by a linear chain. Logic is another example of a linear chain. Based on the knowledge of the ordering, one continues linearly towards a logical conclusion. Similarly, causation- the manipulation of an agent that achieves a new state- establishes an infrastructure through links. In design, seeing and provoking causal chains is a mechanism to facilitate design moves.

Lakoff argues the most common grounding of our conceptual system is in the bodily experience of the world.[45] The body's basic organizational scheme is as a container, described by an in/out relationship and characterized by a bounded surface.[46] The external appearance or shape of a container, in

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[41]Ludwig Wittgenstein, Preliminary studies for the "Philosophical Investigations" generally known as *The Blue and Brown books*. (Oxford: B. Blackwell, 1958).

[42] Minsky, "A Framework for Representing ..." p. 254.

[43] Lakoff, *Women, Fire, and...*

[44] Anderson, *Cognitive Psychology* ... pp. 109-110.

[45] Mark Johnson *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (Chicago: The University of Chicago Press, 1987).

[46] Lakoff builds upon Reddy's model of the conduit metaphor, where words are containers of and communication consists of sending meaning in them as a conduit. See Reddy," The Conduit Metaphor...

particular its outward appearance, is another important feature. Spaces must be "...oriented to receive someone..." and forms can actually "...call people back in." The body also acts as center, additionally defining periphery, and proximity. For example, the library must have a central area. The body can establish relationships by connecting ourselves physically, visually, or emotionally through relations such as up-down, front-back, and near-far.[47]

2.3.4 Cultural Basis of Syntax

If syntax can describe the tacit and resilient nature of frames, it also sheds light on the frame's cultural nature. In understanding the organization, the public nature of frame syntax assists identifying shared, used, and sanctioned frames. For example, the most basic syntax-the propositions composing frames -are in sentence form. The paired relation between an attribute and a value, based on a linguistical syntax, underscores the explicitly social nature of the frame's description and prescription.

Metaphorical labels also enable communication by emphasizing purposes, values, and normative images present in the culture. In addition to legitimizing the frames in a community, the metaphor facilitates understanding of tacit frames as well. Metacultural frames organized around metaphors make their underlying relationships and resulting actions clearer to both cultural outsiders and insiders. Simply assigning a metaphor helps bring the frame to the surface, and is an essential step in making the relationships explicit. Referring to one word enables the frame holders to evaluate if it is an accurate description the implicit relationship defining the frame in their own terms. By applying a metaphor the inhabitant can see how a frame influencing behavior and thought.

Culture also determines metonomy- what aspects of frames are thought to be the most important, or the most widely accepted. As a result of a label's inherent polysemic condition, the social context to required to indicate the primary sense. However, this is relative to the level of abstraction: As abstraction decreases, the necessity of context diminishes. As we become more concrete, context is less insightful since we can refer directly to the object.

Culture provides an individual a variety of examples as external references to stimulate discussion, debate or agreement. Many ideal examples are culturally defined. Similarly, paragons enable comprehension in terms of individual members who represent either an ideal or its opposite. Since these influence actions and decisions by emulation, consciously changing these examples may bring about different behavior. Logical thought and sequential activities processes are exemplary to most cultural inhabitants. Rationality via cause and effect predicts patterns of events- demonstrated publicly and shared culturally. Scripts too are inherently social phenomena: "... culturally shared knowledge is organized into prototypical event sequences enacted in simplified words."[48] Culture also helps by providing names that tell us what our expectations should be and what script to follow-codifying culturally specific behavioral protocol.

The body is the most basic shared syntax. In addition to acting as a container, our bodies provide perceptual and motor apparatus, mental capacities, and emotions- all acting to logically convey propositions. The body guides interaction with physical environment include moving, manipulating, objects, and eating. Our interactions with other people, either socially, politically, religiously, or economically, also influence the choices of attributes and propositions. These connections and compositional structures all offer opportunities for sharing imaginative systems of knowledge to encourage intersubjective understanding.

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[47] Lakoff also argues that bodily position and activity corresponds to and invokes emotions. Pictures of body positions or facial expressions can reminds of physical encounters. Upon seeing an image we can relate to the emotion it will invoke by referring to its metaphorical bodily position. Running makes the heart beat faster so seeing an image of a runner provokes a natural instinct. See Lakoff, *Women, Fire, and Dangerous...*p. 270.

[48] Dorothy Holland and Naomi Quinn *Cultural Models in Language and Thought* (Cambridge: Cambridge University Press, 1987).

2.3.5 The 'Form' of Frames

In addition to lacking an explicit organizational feature to account for imagination, the frame as mere attributes does not account for the fact that an object can support quite different interpretations. Clearly perceivers will not change frames completely or at all if it is not necessary to improve their description of the world or to achieve agreement. And to achieve agreement, frames do not have to be made congruent with one another. Cultural frames allow parties to find a sufficient amount of agreement to make joint activity feasible.

An essential aspect of any frame description then is to identify a point where frames can be reconciled enough to make the design process work and to provide enough 'slack' to allow for a variety of frames and their modification in the future. Schön outlines the critical issue as follows: "We need a way of talking about the objects of designing-what we design with-that allows us both to take cognizance of multiple ways of seeing things...and to make sense of strivings for commonality."[49] Although frames cannot be delineated precisely, the attempt to do so is valid in itself. To facilitate this effort, I propose modifying the frame definition to: label [syntactical feature (attribute <value>)]

Although several frames may operate simultaneously, each associated with an actor's concerns and agenda, the design process requires the various actors to converge on instructions for building– expressed in the language of objects.[50] Attempting to cultivate a 'FormLanguage' potentially enables stakeholders to infuse meaning to form as it emerges from the process itself.[51] A 'FormLanguage' should enable communication between design and designer, and more importantly designers within a culture. It can offer provide a relatively fixed point to mediate disagreement– distinguishing between mere misunderstandings and seemingly intractable positions. The result should provide inhabitants objects and tools to monitor and improve their own infrastructure, both literally and figuratively. Ideally, it should build partnerships within culture characterized by learning, respect and understanding, not mere recognition, tolerance, and acceptance.

The inherent qualities of architectural design make it a powerful way to stimulate organizational reflection, learning, and agreement. The underlying cultural basis of frames presents the architect with a potential device to fulfill these challenges, and potentially facilitate new organizational practices-by sparking and concretizing the emerging form of frames. Once evidence of frames exists, building the semantics of the 'language'- the precise vocabulary needed to make the frames sensible and clear to the community. To describe and delineate the frames underlying architectural and organizational form, we must delineate a frame's contents. In the following chapter I shall describe how design activity reveals the contents and provides insights into the syntactical nature of frames.

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[49] Schön, "Designing: Rules, Types and ..." p. 189.

[50] William L. Porter, "Notes on the Inner..."

[51] William Porter first introduced the term *FormLanguage* in: William Porter, "What relation does knowledge of form and knowledge of the nexus of form, language, and computation have to do with professional practice?" *Pin-Up: MIT Department of Architecture Newsletter* (Cambridge, MA: MIT Dept. of Arch., 11 November 1995).

Please see Appendix C for a more extensive discussion.

CHAPTER THREE
DESIGN WORLDS

Evidence of frames through the 'appearance of form' is only the beginning to reestablish organizational relevancy to architecture. In this chapter I will analyze how fluid design activity is akin to frame construction, thus revealing the contents of frames. Similar to the construction of frames, the design of a constantly evolving physical object requires the inclusion of prior knowledge to facilitate comprehension. Although we may not be able to access frames directly, we can improve our understanding of them by examining the actions and decisions taken in the design of an object. I will present a case study showing how the dialogue between image in mind and design object enables a 'reconstruction' of frames. For the individual designer, this methodology demonstrates design's inherent strength to enlighten tacit frames. However, design in a social setting- characterized by negotiation, conflict, and agreement- sparks the cognitive work of frame restructuring necessary for learning. Seeking a shared frame through collaboration leverages the potency of design to stimulate collective reflection. The resultant patterns of activity can provide the organization new practices characterized by cultural awareness, learning and agreement.

3 DESIGN WORLDS

3.1 WORLDS

3.1.1 Mental Models

Bringing frames together into a dynamic space for assemblage, application, and exploration- a fundamental skill characterizing design aptitude- is actually necessary for reasoning: "... individuals reason on the basis of mental simulations that call for the construction of models representing typical sequences of affairs."[1] Rosch's concept of reference-point reasoning echoes the significance of models. They are used to make approximations, plan, compare, and judge.[2]

Craik argues that human beings translate external events into internal models and reason by carrying out thought experiments on internal models.[3] The results are translated back into actions or recognition of a correspondence between them and external events. Johnson -Laird's research on linguistic structures supports Craik's intuitive stance, claiming "The limits of our models are the limits of our world."[4]

The term 'model' acknowledges the mind as being the organizer of external phenomena- a model must be built. Mental models therefore represent the interaction of information from different knowledge domains by specifying "...a set of individuals, a collection of objects, a series of events, a group of relations, and a set of possible operations."[5] The assemblage of parts leads to imaginative synergies via the personal and cultural biases influencing the ideas and technologies.[6]

3.1.2 Design Worlds

Schön similarly posits an exploratory space to explore design knowledge.[7] However, Schön's 'design world' goes beyond the implicit neutral space of the mental model by explicitly acknowledging how the evolution of the exploratory space itself impacts a designer's actions. The model not only impinges on design activity, but evolves through design activity- a constant process of shaping and reshaping.[8] Such evolution changes the 'world' a designer engages and the subsequent actions deemed appropriate.

The design world also explicitly addresses the mental objects- the frames- a designer chooses to work with and the ways to work with them. Design aptitude is managing the interactions between the frames a designer brings to his world. Both the frames and the model's to bring them together for exploration and interaction are actively constructed, as Roberta's design world (figure 3-1) demonstrates:

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[1] Amos Tversky and Daniel Kahneman, "Probability, Representativness, and the Conjunction Fallacy," *Psychological Review* 90/4 (1983): 293-315.

[2] Carolyn Mervis and Eleanor Rosch, "Family Resemblances: Studies in the Internal Structure of Categories," *Cognitive Psychology* 7:573-605.

[3] Kenneth Craik, *The Nature of Explanation* (Cambridge, England: Cambridge University Press, 1943). p. 51.

[4] "People reason using mental models rather than formal logical systems" P.N. Johnson-Laird "Mental Models" *Foundations of Cognitive Science*, ed. Michael I. Posner (Cambridge: MIT Press, 1989). p. 471.

[5] Ronald Finke, Thomas Ward, Steven Smith, *Creative Cognition: Theory, Research, and Applications* (Cambridge, MA: MIT Press, 1992).

[6] ibid., p136.

[7] Schön uses the term 'type' to describe the holding environments for design knowledge. They are "...used to make the design situation coherent, to frame it so that the designer can reason about it." Given the preference for the term frame in cognitive science, I will not conflate type with frame. Schön himself uses the term 'frame' in later writing on policy. It would seem that his use of type is to differentiate the framing process of a design situation, which may actually be closer to the mental model and design world- "In order to formulate a design problem to be solved, the designer must *frame* a problematic design situation: set its boundaries, select particular things and relations for attention, and impose on the situation a coherence that guides subsequent moves. Moreover, the work of framing is seldom done in one burst at the beginning of a design process. Designing triggers awareness of new criteria for design: problem solving triggers problem setting." Donald A. Schön, "Designing: Rules, types and worlds" *Design Studies* 9/ 3 (July 1988): 181-190.

[8] "Designers construct their design worlds not only through the shaping of materials but through the interlocking processes of...selective attention, grouping, boundary setting, and naming." Schön, "Designing: Rules..." p. 183
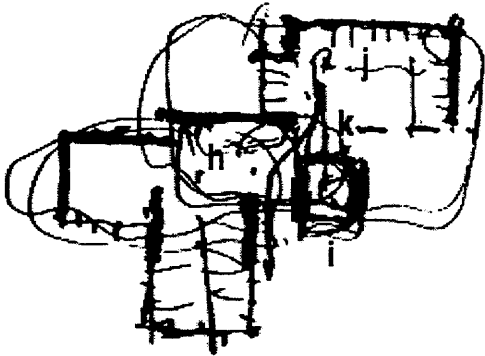
Figure 3-1 *Roberta's Design World*

"...Maybe as you move in, this would actually be your control area (h), and this would be a stairway(i). You could actually move up, [a stairway's function is to move up, enabling her to continue her exploration by creating an upper level] *and some larger piece of the massing, and have shelves up there, along the edge.* [The shape and dimension of shelves are suitable to be placed along the edge. Typical location is having stacks above as well as below] *Sometimes you can look out, sometimes you get a work space. You can move along that edge, up in the stacks(j).* [the edge is suitable for movement due to its longitudinal shape] *There'd be some kind of bridge there [k], that looks down into a lower part..."* [an attribute of bridges is to look over and into deeper space].

The interaction, dynamics and biases of attribute interactions are evident from Roberta's design world, realized through pen and paper. She incorporates key functions for the library through bodily movement as a function of an 'axis' and 'edge.' Lodged in culture, these frames create a design world achieving synthesis and coherence- shaping a world for thought and action in familiar terms.

3.1.3 Constructing Right Versions

Similar to frames, design worlds emerge from a priori knowledge, experiences, and priorities. As Goodman writes: "Worldmaking ... always starts from worlds already on hand; the making is a remaking."[9] The decomposition process – of taking apart and putting together— is balanced by a composition process – composing wholes and making connections. Both acts depend on remaking preexisting worlds. Making of worlds is therefore not about metaphysical origins, but the processes of building a world from others.

Further, the drive for coherence in a design world- a designer's coordination of frames- is similar to the logic of frames: Each strives to be consistent and rational- in Goodman's terms, 'right versions.'[10] The coherence of a 'right version' states that versions can be true in different worlds since conflicting true versions cannot be true in the same world. Such logic underlies the actions and decisions taken in a designer's world. Given the kinship between frames and design worlds, we may view design worlds as an instance of active frame construction.[11] Although we may not be able to access frames directly, we can better understand them by closely examining the actions and decisions taken in the designer's world.

3.2 STARMAKING

3.2.1 Armchair Astronomy

The construction of right versions relies primarily on the concrete realities found within the situation. Despite the creative effort to convert experience into objects, the empirical world remains the raw material supplied to the mind and the community. For example, if I see a light in the distance, I might designate it with the symbol: 'כוכב'. If I am with friends who speak Hebrew, they will agree with me that the light I am pointing to is a 'כוכב'.[12] If I am with a group of English speakers, they will not

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[9] Goodman, *Ways of Worldmaking* ...p. 6.

[10] Goodman argues against the unbounded creation of worlds and extreme relativism: "....while readiness to recognize alternative worlds may be liberating, and suggestive of new avenues of exploration, a willingness to welcome all worlds builds none... *A broad mind is no substitute for hard work* ." ibid., p. 21.

[11] Goodman hints at a close relationship between frames and design worlds:"...we make right versions, right versions make worlds. And however distinct worlds may be from right versions, making right versions is making worlds. This is a conspicuous case of how talk of worlds and talk of versions coalesce." Nelson Goodman, "On Starmaking" in McCormick *Starmaking...* p. 145.

[12] "Out of a process of mutual indications common objects emerge– objects that have the same meaning for a given set of people ..." Herbert Blumer, *Symbolic Interactionism; Perspective and Method* (Engelwood Cliffs, NJ: Prentice-Hall, 1969. p. 11.

understand the term. However, if they see the light in the distance I am pointing to, they will understand that the term 'בוכב' designates the empirical event.[13]

The empirical world lies at the heart of both an individual and a community's 'world.'[14]. The world of everyday experiences— the actions and experience of people as they meet the situations that arise in their respective worlds— is the empirical basis for understanding.[15] Understanding converts empirical event into something an object in the mind that is used for subsequent thought and action. Scientific theories account for physical behavior, symbol systems physical objects.[16]

3.2.2 Describing the 'Stars'

Although Goodman may legitimately claim that the depiction of human beings' empirical experience is as it appears to the perceiver, Israel Scheffler vehemently argues against his implication that existence is dependent on depiction. He claims Goodman mistakes a feature of discourse for the subject of discourse.[17] The term 'star' was created by human beings, however the empirical entity we refer to by invoking the term 'star' predates our existence. "Star-concepts were surely not ready-made..[but] it doesn't follow that the stars were therefore made by us."[18] Perhaps, Scheffler muses, those distant lights in the sky may actually be awaiting description.

Although a seemingly small concession, the necessity to agree on such description sharpens the act of 'worldmaking.' The legitimacy of these objects is accrued over time, condoned by experience. Similar to the emergence of shared language, Wittgenstein demonstrates its basis in the empirical world where participants implicitly agree on terms without explicit discussion. A carpenter says only 'board', 'brick' and his assistant knows precisely what action is required.[19] Their interaction demonstrates how language has highly contingent or situational meanings: If the carpenter and his assistant were in another situation, the words would not have the same meaning. By providing objects and actions for the assistant, words merge language, thought, and reality through empirically based agreement.

By clarifying strong relativist claims like "we make the stars," Scheffler hones the notion of 'object' to adhere to primarily physical qualities, not abstract.[20] His stars, Unlike Goodman, Scheffler's stars imply that empirical objects exist apart from the frames we use to describe them. Given independence,

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[13] "If you see a *ketch* sailing by and your companion says. 'Look at that handsome *yawl'*, you may be faced with a problem of interpretation....[perhaps] he does not use the word *yawl* quite as you do, and has made no mistake." (pp.196) Both individuals see the same thing and both are familiar with the event.   When faced with the problem of interpretation, I can ascribe the differences to semantics and begin to determine more accurately how my companion is using his words. This is the empirical basis of Davidson's concept of charity. If both individuals see the same thing and both are familiar with the event, we assume that we agree on certain elements in our "descriptive worlds." My expectations are based on my familiarity with the situation and my companion; there exists a knowledge based assumed to be shared and that gives rise to my expectations. When faced with the problem of interpretation, I can ascribe the differences to semantics and begin to determine more accurately how my companion is using his words. We can thus begin the process of translation.   Donald Davidson, "On the Very Idea of a Conceptual Scheme" in *Inquiries into Truth and Interpretation*, (Oxford: Oxford University Press, 1985).

[14] Blumer contends that the term 'world' is more suitable than the word 'environment' to designate the setting, the surroundings, and the texture of things that confront them. It is the world of their objects with which people have to deal and toward which they develop their actions." Herbert Blumer, *Symbolic interactionism; ...* page 11

[15] ibid., p. 35

[16] Karl Raimund Popper Conjectures and Refutations : The Growth of Scientific Knowledge (London: Routledge, 1992).

[17] Israel Scheffler "The Wonderful Worlds of Goodman," In Peter McCormick ed. *Starmaking: Realism, Anti-Realism, and Irrealism* (Cambridge, MA: MIT Press, 1996). p. 138.

[18] ibid., p. 139.

[19] Ludwig Wittgenstein, Preliminary studies for the "Philosophical Investigations" generally known as *The Blue and Brown books*. Oxford, B. Blackwell, 1958. page 77-78

[20] Reflecting the Pragmatists Mead and Dewey, Blumer sees objects as anything that can be designated, indicated to, pointed at or referred to, ranging from : physical objects as a chair, tree; social objects such as mother, students; imaginary objects as ghosts; abstract objects as liberty, justice, compassion. We will see later that the physical object has quite a different impact on the construction of worlds than abstract objects. The former's ineffable qualities constantly demand change, whereas the latter's vagueness allows for both reshuffling of existing frames or the denial of contradiction. Blumer, *Symbolic Interactionism...* p. 2.

objects and the empirical world resist descriptions by confronting our assertions.[21] This resistance, writes Blumer "... gives the empirical world an obdurate character that is the mark of reality."[22]

3.2.3 Cognitive Conundrums

Schön argues that object independence is a powerful means to integrate conflicting features and relations within frames. In fact, he contends frame restructuring occurs best:

> "... in the context of particular situations whose information-richness gives us access to many different combinations of features and relations, countering our procrustean tendency to notice only what fits our ready-made category schemes."

The distant light in the sky therefore provides a rich source of features and relations to spark the 'cognitive work' required for restructuring: reordering, regrouping, and renaming.[23] By engaging in a concrete situation; simultaneously reflecting on the phenomena and their experience of it towards "...the construction of a new description of the phenomenon, one in which the previously conflicting descriptions are restructured and coordinated."[24]

Schön echoes a view of the design process as a dialogue (figure 3-2).[25] An intuitive and ill-defined idea or image in mind interacts with a concrete reality. Restructuring occurs when the object instructs the 'transformation' of the image to reality. The image in turn calls the object back by evaluating if it affirms or denies intentions.
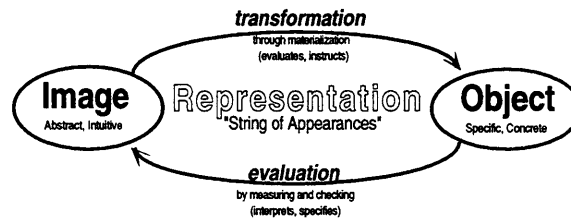
Figure 3-2 *Image-Object Dialogue*

This dialogue, and the notion of frame restructuring, reflects a general cognitive process.[26] When confronted with new situation one selects from memory a frame. The perceiver then matches this frame to the given situation, attempting to make sense out of situation at hand. If the situation conforms to the frame, comprehension is achieved. If the frame does not match- a common occurrence in inherent complexity of the empirical world- modification of the frame occurs to account for situational nuances. In ideal cases, frame restructuring leads to the permanent change of frames in mind. Such change achieves what Simon refers to as learning.[27] However, change and restructuring is not easy achievement.[28] Frames, like people, are resistant to change.

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[21] Despite Scheffler's refutation, Goodman is unrepentant, exclaiming: "*I am not sorry* for what I have written....I ask him which features of the stars we did not make, and challenge him to sate how these differ from features clearly dependent on discourse." (italics his). Some insight is gained by his conflation of physical and abstract worldmaking: "We make chairs, computers, books, planes; and making any of these right takes skill, care, and hard work. [Despite these efforts] A chair is likely to wobble...and no one has been able to make a plane that flies far on batteries.. In short, we do not make starts as we make bricks; not all making is a matter of molding mud. The worldmaking mainly in question here is not making with hands but with minds, or rather with languages or other symbol systems." Nelson Goodman, "On Starmaking" in McCormick *Starmaking...* p. 145.

[22] Blumer, *Symbolic Interactionism...* p. 22-23

[23] Donald A. Schön, "Generative Metaphor: A Perspective on Problem Setting in Social Policy." in *Metaphor and Thought*, ed. Andrew Ortony, (Cambridge: Cambridge University Press, 1978). p. 277.

[24] Schön "Generative Metaphor... p. 275.

[25]N. J. Habraken, *The Appearance of the Form : Four Essays on the Position Designing Takes Between People and Things* (Cambridge, MA: Atwater Press, 1985). pp. 45-48.

[26] "When one encounters a new situation ... one selects from memory a structure called a frame. This is... adapted to fit reality by changing details as necessary. ..Once a frame is proposed to represent a situation, a matching process tries to assign values to the attributes of each frame...." Marvin Minsky, "A Framework for Representing Knowledge," in *The Psychology of Computer Vision* ed. Patrick Winston (New York: McGraw-Hill, 1975). p. 212- 213.

[27] "Learning is any change in a system that produces a more or less permanent change in its capacity for adapting to its environment.." Herbert Simon, *The Sciences of the Artificial 3rd. edition* (Cambridge, MA: MIT Press, 1996). p. 100.

[28] Changes in frame structure proceed "...at their own pace." Minsky, "A Framework..."

3.2.4 Design Shifts[29]

Herein lies another potent aspect of the design situation- frames are routinely restructured in the course of design activity- thus opening an opportunity for learning. Reminiscent of Habraken's dialogue between image and object, Porter observes 'design shifts,' where an idea can work or not work based on a subtle shift within the drawing.[30] Since the interaction of attributes, labels, and values facilitate the fluid design activity of a design world, these shifts expose the contents of frames in mind.

Such shifts are a natural result of the mind naturally searching for relevant information to help understanding.[31] Frame provocation and conflict occur due to the inherent instability of frames- their inability to be completely accurate or predict all the nuances of a situation. As a concrete situation appears to us, we notice many dimensions. Normally, the designer rapidly and easily accesses different information in the midst of fluid designing. When a shift occurs , it indicates the knowledge in mind not quite fitting into a design situation. Such 'failures' seek resolution by filling incomplete attributes with other information in mind- opening a window onto the entire frame.

Design shifts are varied. The most basic shift is when the mind indexes existing information to facilitate comprehension. For example, the mind 'notices' inconsistent patterns of behavior in the process of comparing a new situation to indexed expectations. Noticing relates to Porter's concept of appreciation, where design is "... a dialogue between the architect's appreciation of a site...and his images, prototypes and principles..."[32] The dialogue is initiated by noticing a difference between a priori knowledge and the situation at hand. For example Roberta notices the symmetry of the facade and claims it will dictate a great deal of circulation without even looking at the plan. Noticing and appreciating reflect the mental operation of reminding- recalling the knowledge within a frame via its label, attributes, or values. For example, reminding formally introduces the Richardson library to Roberta's design: "It's a piece that comes out, so it reminds me more of Richardson libraries."

Roberta quickly determines the inappropriateness of the Richardson library to her current context. The inevitable inadequacy of frames to account for all aspects of a situation can also incur surprise, when what we expect does not occur. When surprise cannot be accounted for, a discrepancy between what is known or expected, and the appreciation one has a situation exists- an anomaly. The existence of anomalies- situations not accounted for by frames in mind--sparks the process to understand why failure occurred. By admitting or acknowledging that certain aspect of existing information are insufficient to account for the nuances of a situation, can yield a question to explore the situation at hand, and their existing knowledge.[33] Seeking to update expectations for future situations yields generalizations to overcome the limitations of experience and memory. After applying the Richardson library roof form to the design, Roberta quickly realizes she does not know the location of the library, and asks a question to confirm it is in New England.

Her rhetorical question shows how rectifying inconsistencies does not usually generate a question. Rather, it invokes preexisting expectations- assumptions assumed to be appropriate to settle discrepancies. Assumptions emerge from noticing aspects of a situation that enables us to infer knowledge. Inferences deploy prior meaning to provide intelligent reactions. The library definition provides a strong example of how inference works- Roberta draws upon the term for domain knowledge necessary to design.

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[29] Please see Appendix D: Design Shifts for a more extensive discussion

[30] "Move a line or a corner just a bit, and the whole design no longer seems to reflect the more general set of ideas being pursued William L. Porter. "Notes on the inner logic of designing: Two thought-experiments" *Design Studies* 9/3 (July 1988):176.

[31] Anderson, JR. and Pichert, J. (1978). Recall of previously unrecallable information following a shift in perspective. *Journal of Verbal Learning and Verbal Behavior* 17:1-12.

[32] Porter. "Notes on the inner.." p. 169.

[33] "one important way we learn is by realizing that we had the wrong frame in mind." R. Schank, *The Connoisseur's Guide to the Mind.* (New York: Summit Books, 1991). p. 52.

To facilitate comprehension, not only do we infer from preexisting knowledge, we inherit from the situation itself. Attributes within a situation, or its past interaction, limit and define what is relevant or feasible. As we try to understand something that confuses us, we draw from the situation to make a set of behaviors coherent. The design problem as presented supplies these attributes- such as the suburban context. Further, as the situation evolves it provides aspects to guide the formulation of goals or the desired outcome of situations. Inheriting attributes also comes from associating information within collections of related frames linked together through labels, attributes, and values. By indexing a key attribute residing in the situation, analogy maps the current situation into these frame systems. For example, Roberta's invokes a 'cave' to convey "... an overall feeling, or mood for a place." One attribute of the design situation pulls the entire design world into a web of related qualities.

The search for related frames- a natural tendency of "... reasoning and understanding, whose main business... is maintaining coherent and consistent frames of reference ...."[34] often changes a situation to make it coherent. The best example is Roberta's disregard for the diagonal entry- she straightens it out to conform to her view that the entry must be directionally related to the building. Confirmation and coordination picks out meaningful information in a situation to legitimize a selected frame. In another example, Roberta ignores the design parameter of one-story in deploying her knowledge of Richardson libraries- to facilitate solving the frame she has created rather than revising the frame itself. The result in the design is a two-story library.

Excuse is an extreme case of denial, commonly invoked to avoid dilemmas, conflict, and crisis. Dilemma refers to the existence of two equally legitimate and relevant frames. Roberta encounters a dilemma between the two competing directions. A dilemma can become a conflict when two actors hold seemingly contradictory frames, and are commitment to their frame. Within individual design activity, conflicts commonly occur between the situation at hand and the designer's appreciation of it. Within collaborative design, conflict can occur between opposing frames held by design participants. The height of conflict is crisis-the massive failure of an existing frame.[35] Although crisis is extreme, it emphasizes the significance and potential of the design shift: Articulation of frame contents and the potential for frame restructuring can lead to learning.

3.3 FRAME RECONSTRUCTION

3.3.1 Methodological Approach

In the preceding chapter, the design protocol demonstrated how form and its accompanying verbal description provide evidence of frames. Now I will focus on design shifts in the protocol to expose the contents of those frame. The generic frame structure {label [feature (attribute<value>)]} draws fillers for vacant slots through the interconnections between frames. This movement is commonly viewed as the chains of reasoning which characterize fluid design activity[36] Such design shifts will be used to identify links between frames, links from the labels, attributes and values- enabling an approximate 'reconstruction' of frames in mind.

3.3.2 Reconstructing an 'Entry'

In her preliminary design activity, Roberta first associates a functional definition to the library: "...you have all the basic functions of libraries, books, storage reading areas." Her next step is continue her associations in a semantic network. Her library inherits the attributes of the superordinate category, civic buildings. Moving downward, she accesses civic buildings, whose entrances are formal. This value is reconfirmed by the location: "as a library in a suburban site, it probably stands alone, so that it can be a more formal entry." Inferred from the suburban site, the entry must be a 'special event.':

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[34] David Perkins, *The Mind's Best Work* (Cambridge, MA: Harvard University Press, 1981). p. 99.

[35] Schank, *The Connoisseur's Guide....*

[36] Schön's description of design being characterized by chains of design reasoning is similar. However, its relevance lies in our ability to define the links themselves: their character, label, where and how or links to other objects or frames occur.

"an object sitting within a larger landscape. as a result, you're probably talking about a more formal entry which wants to be called out as a special event."

    1. entry (style<formal, special event>)

She infers from a script stating that the librarians must be able to keep track of books coming in and going out. Therefore, Roberta infers that the entry should enable single-point control is important:

    2. entry (control <entry should enable single-point control>)

Another script stating that people will have to move all the way through the entire building to get to the resources they need in the current spatial arrangement. From this, she infers that having the entry at either end is more difficult:

    3. entry(location <not at ends>)

Roberta arrives to the axis of the library by exploring the library facade: "The first thing...I'm thinking about the outside a little bit, as I come in this direction, what facades am I seeing." Her drawing causes her to notice the symmetrical massing: "I think it's a bit odd that everything's about 25 feet wide everywhere, for a library..." This observation justifies applying an axis to the plan: "it seems like there's a very strong axis moving through the building. There's going to be a dominant kind of circulation that's coming through the center."

    4. entry (organization <axis>)

In viewing entrance #3, she sees a dominant piece projecting outwards. "It's a piece that comes out, so it reminds me more of Richardson libraries where you have...a stair...somehow marks the entry [drawing, #2B]." Her perception accesses a precedent, Richardsonian libraries, a characteristic of which she introduces to her design world- the entry should somehow marked:

    5. entry <identification (clarity)

Roberta starts looking at entrance #3 by using her body to understand the attributes of this entrance. She notices it is more interesting, because "I actually walk by a piece of the building before I come in." This reveals a positive trait for the entries role in the arrival of visitors. A shift occurs when she turns the page as part of her procedural frame to explore the experiential qualities of each entrance. Upon doing so, we come to understand another value of the entry by confirmation: "3 doesn't work so much ... because I'm already by too much of the building." The amount of time moving past the building is too much to fulfill the attribute of arrival as entry:

    6. entry (arrival<not located where visitors must walk by too much of the building >)

Coordinating the different attributes and values demonstrated by her design activity, we may 'reconstruct' her entry frame as the following:

      'entry'
      1. (control < single-point control is important to keep track of books >)
      2. (location <not at ends because movement through the entire building is undesirable>)
      3. (style < formal, to be called out as a special event>)
      4. (identification- a piece that comes out to somehow marks the entry>)
      5. (clarity <the entry cannot by too obscure>)
      6. (arrival <not located where visitors walk by the building before entering>)

Syntactically, Roberta's 'entry' is primarily dominated by the facts she ascribes to the term 'entry'. She determines arrival, clarity, location and identification to be critical attributes to an entry. As was previously demonstrated, she holds strongly to a premise that the entry direction must be complementary to the overall direction of the building. This syntactic structure enables Roberta to map her facts entirely onto the problem at hand without resorting to questions regarding the desired quality of the entry. The result is a set of criteria 'framing' her subsequent interaction with the design situation. The list becomes a potent frame through its inherent conflicts with the design situation and the actions she takes as a result of those discrepancies.

3.3.3 Conflict- The Diagonal Entry

In figure 3-3, a difficult aspect of the problem- the diagonal entry- causes Roberta's frame to emerge:

1. The arrow direction implies movement, which she questions "Do I really have to come through the corner that way?

2. She appreciates that one walks by a piece of the building before entering 'suggesting' that the public services sit on the outer edges

3. The protrusion HG reminds her of a Richardson stair as entry marker

4. She assumes the time walking past the building should not be too great

5. From past experience, she inherits a proposition stating a building edge ameliorates entrance- parallel to GF is 'more comfortable' to EF
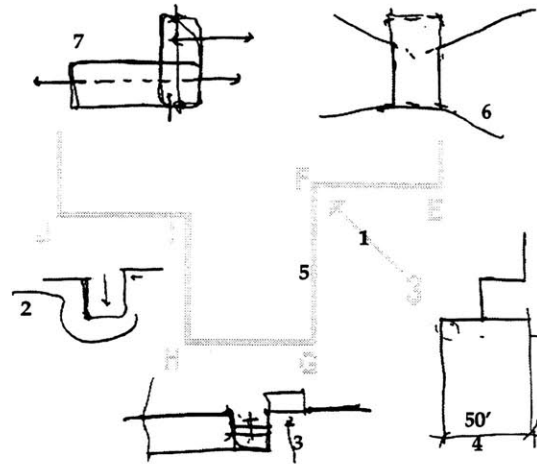
Figure 3-3 *Conflict Stages*

6. The diagonal entry presents a crisis: "...the space isn't oriented to receive someone that way." Given the orthogonality of the building, it is severe -entries need to be transitional.

7. A dilemma between two competing directions of movement- one must choose a dominant direction, architectural identified.

Frame Reconstruction

'entry'	*syntax*
1. (movement <linear >)	body- The entry as container to bring people
2. (experience<visitors walk by the building>)	in and act as transition; clearly
3. (identification- <demarcation by physical	identified and logically located
element>)	metonym- strong proposition claiming
4. (location <the entry cannot be too obscure>)	linear movement reinforced by
5. (arrival <building edge increases comfort>)	physical attributes
6. (disposition <reception, transition>)	
7. (primary direction <roof>, secondary<light>)	

Roberta's final move is to change the diagonal direction to conform the situation to her understanding of the entry related to the geometry of the building. This action is taken as a result of her 'framing' of the design problem, one which requires a choice of a dominant direction. The result is the development of the stair tower- illustrated as the evidence of a frame in the previous chapter. Through the dual process of description and prescription, we see how the contents of a frame determine the actions taken.

3.3.4 Design Lessons

Frame reconstruction is based on the frame attributes which come to the surface. The constant change and modification of the design object confirms Habraken's notion that design artifact changes continuously. It also shows how the object acts to reveal frames and their contents. However, Roberta's design shifts are primarily a reshuffling of preexisting frames, not frame restructuring[37] She comes to the problem with a preconceived notion of entry. She applies procedures, precedents and other a priori knowledge structures regularly. The missing aspect in this design protocol is the second critical dimension of architectural design- design as a social act.[38]

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[37] Schön writes that efforts for coordinating independent frames may enable them to converge on a new frame, "But there is nothing in the strategy of truth-through-the-lens-of-a-frame that suggests how such a possibility might be realized." Donald Schön and Martin Rein *Frame Reflection* (New York: BasicBooks, 1994). p. 43.

[38] A designer is a misleading term since 'the design' is actually a collection of independent actors. Schön *Frame Reflection*..p. 87

If design is characterized by multiple designers, then their primary means to influence an evolving object is through cooperation, negotiation, and agreement-making.[39] Although the aspects of the object are necessary to revel frames, the design object is not fully leveraged to achieve restructuring and learning unless numerous designers surround the object. Without these negotiations, conflicts, and compromises, the potency of the design object to encourage change is neutered:

> "In a design process, each party reveals his view of the object, and perhaps also his interpretation of the other's messages. So long as the parities are jointly committed to making an object, they find it difficult to avoid dealing with their differences of perception and interpretation. They are continually objectifying their differences. At the same time, the concrete situation, the materials, and the object in transition give the actors hooks on which to hang their attempts to invent adjustments that may resolve their differences-at the limit, synthesizing elements of their conflicting frames."[40]

Since frames are resilient and resistant– even in light of contradictory evidence in a situation– the inevitable miscommunication and divergent readings inherent to social activity can only be counteracted by a significant changes of knowledge. The object within a 'designing system' transforms it from a mere artifact to a potent opportunity for collective frame restructuring. Multiple actors, divergent agendas and seemingly untranslatable languages, demands continuous effort and interaction to achieve the intersubjective understanding.[41] Designing in a contentious environment is inevitably political, providing unique and unforgettable events– a rich source for learning. The inherent conflicts ultimately causes frame failure– transforming frames in mind to frames in culture.

3.4 AN ARCHITECTURAL EDUCATION

3.4.1 Communication

Schön contends that designers achieve the seeming objectivity of a consensual design world by communicative inquiry. Stimulated by the design object, required by its location in a social system, design activity sparks the active construction of shared meaning.

Similarly, Michael Reddy contends that without the necessary work of converging meaning, communication is bound to go astray.[42] To illustrate the process of constructing a shared language, Reddy explores a thought experiment (figure 3-4). He proposes a world where individuals live in total isolation, except for the 'Hub'-a machine which transfers objects back and forth amongst the inhabitants. Although the contents of their respective 'worlds' cannot be sent in the machine, representations of the tools they create to cultivate their environment can. When one inhabitant creates something he would like to share, he places a drawing of it into the 'Hub.'[43]
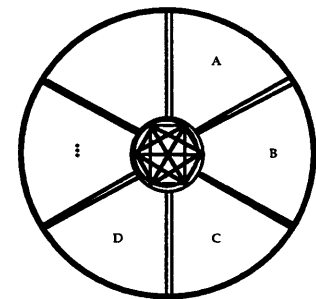
Figure 3-4
Toolmaker's Paradigm

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[39] N. J. Habraken, *Concept Design Games : A Report submitted to the National Science Foundation Engineering Directorate, Design Methodology Program* (Cambridge, MA: Dept. of Architecture, Massachusetts Institute of Technology, 1987). p. 1-1.

[40] Schön *Frame Reflection..*p. 178.

[41] Reddy "The Conduit Metaphor..." p. 295.

[42] The Tower of Babel story provides a good example of when meaning is not shared. The story goes that men all speak the same language, and decide to build a tower out of bricks to reach god. God is not happy about this, and as punishment he descends: "ונבלה שם שפתם אשר לא ישמעו איש שפת רעהו" (approximate translation "to confound their language so they may not understand one another's speech.") The 11th century biblical commentator 'Rashi' often provides examples, allegorical, metaphorical and actual, to provide clarity to problematic phrases. To illustrate the unclear phrase he provides the following allegory: "One asks for a brick and the other brings him lime: the former attacks him and splits open his brain." see *Chumash and Rashi's Commentary: Bereshith* trans. Rabbi A.M. Silbermann (Feldheim Publishers: Jerusalem, 1934). p. 45.

[43] For example, Person A develops a wooden rake to clear the wood in his environment without destroying plant life. He send a drawing of the rake to Person B, whose environment is primarily rocky. B builds a rake with a stone end, leading him to infer that A is quite strong. To make the device lighter, he makes two prongs at the end, and sends a drawing of this back to A. The

Communication through representation only requires engaging in a process of trial and error to decipher the drawings. Initial hypotheses are eventually discarded as they fail to account for received messages. Eventually, the struggle to make sense of each other's instructions raises the inhabitants to "...a new plateau of inference about each other and each other's environment."[44]

3.4.2 Learning through Discord

While demonstrating the need for active and joint construction of a shared language, his approach also enlightens the role of design as facilitator of shared understanding. In the 'toolmaker's paradigm,' inhabitants actively decipher received plans to achieve shared understanding. Testing the drawing, making modifications, and eventually sending a revised plan back eventually facilitate reaching a level of mutual understanding by revealing characteristics of each environment.

The process is driven by the need to comprehend seemingly illogical messages. Failure to comprehend requires inhabitants to change their expectations of messages, modify representations, and ultimately assumptions about the sender. Person B attributes the drawing description to Person A's physical prowess, ultimately disbanded in light of the failure to account for the different composition of Person A's environment. The failure to account for an interlocutors message stimulates the mind to update what it expects from the world- learning.

Similar to design shifts, failure occurs when the frame cannot account for locution. This initiates learning, which "...arises from wondering about discrepancy from what is known or expected, and the reality one confronts."[45] Learning requires failures to necessitate a change in preexisting knowledge.[46] We learn from experiences by altering existing expectations when they are insufficient to address the multiplicity of a new situation. Learning adjusts and sharpens expectations—acquiring new criteria to increase the strength of propositions.

The achievement of communication is intrinsically tied to miscommunication- a common occurrence of design activity. In the 'Toolmaker's Paradigm,' Person A changes his representations to achieve agreement- agreement within himself and with others. The internal agreement is the modification of his frame constructed to describe Person B. The frame of the drawing, weighted towards material differences, achieves intersubjective agreement.

Learning through dissonance occurs not only through revealing frames in mind, but acts to establish the collective agreement characteristic of language and shared frames. Although the existence of stars or rakes provides an external reference, the process of agreement occurs by a community wrestling with the interpretations engendered by the object in their own terms. The rake in Person B's world has different meaning than when in Person A's world. Within a 'designing system,' the object has social life, transforming it from isolated artifact to a potent source for collective frame restructuring - the achievement of a shared frame via learning.[47]

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exchange continues but their instructions never agree. In the midst of A's frustration, he identifies the problem- each environment contains different material. He sends a plan noting the difference between wood and rock, and the messages are understood. Reddy "The Conduit Metaphor..." p. 292.

[44] ibid.

[45] Schank, *The Connoisseur's Guide ...*

[46] "...the process of matching a scene to an acceptable subset of all such constraints may result in a certain degree of 'strain,' as an attribute is expanded to include the new ... [values]. Ultimately, strain goes to a breaking point, and failure of the matching process ruptures the... [matching process]." Minsky, "A Framework for Representing Knowledge..."

[47] Even within the seemingly narcissistic idea of 'worldmaking', built-in contradictions act to encourage a dialogue– either between person's from different worlds, or between author and reader: "Readers often find in my work-to their delight or disgust- many quips and cracks, puns and paradoxes, alliterations and allegories, metaphors and metonymies, synecdoches and other sins. If there are as many routes of reference as I think, perhaps some of these devices are not mere decoration or unsuccessful attempts to keep the reader awake but part and parcel of the philosophy presented and the worlds made." But to find delight in Goodman's contradictions, a reader must exist, engaging the document in a social way– extracting meaning through communication. Nelson Goodman, "On Starmaking" *Synthese* 45 (1980): 211-15. reprinted in *Starmaking: Realism, Anti-Realism, and Irrealism* , ed. Peter McCormick (Cambridge, MA: MIT Press, 1996). p. 147

3.4.3 Design in the World

Frame restructuring- the learning necessary to achieve intersubjective understanding -is fueled by the disjunction between the object and its environment, between the physical and the social. The object provides an obdurate empirical experience. The community provides the necessity for their agreement. Without a group of people, the object can remain subjectively interpreted. Without an object, misunderstanding, mistranslating, and miscommunication can run rampant.

Combining both situations in a collaborative design situation transforms the design shift into a trigger for frame restructuring and learning. Design as social act leverages the experiential qualities of object engagement. Abstraction holds out the opportunity for frame reshuffling, not learning. Reshuffling can be imaginative appeasement, surrender or capitulation. Learning is modification, opening the possibility to modify frames towards integrated images. Design as a social act also describes the social life of objects in terms of the inherent dissonance in a community. As Dewey writes: "... all experience is ultimately social: that it involves contact and communication."[48] Learning through experience– experiencing the social through the concrete– underlies educational experience.

To leverage frame revelation and restructuring- two inherent characteristics of design activity- the architect must gain further insight into frame coordination and agreement. In the following chapter, I will argue that the architect can facilitate the emergence of culture and its frames through designing architectural form. In addition to generating physical form, the architect can provide explicit form for the organization by identifying the frames underlying culture's external manifestations. Grounded to a physical object, the 'shared' nature of this form will encourage clearer action and communication for the organization and the architect, thereby imbuing architecture with meaning.

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[48] John Dewey, *Education and Experience*, First Collier Books Edition (New York: Collier Books, 1963). p. 38.

ARCHI-TYPE

Residual representations and the subsequent negotiations of frames enable designers– and ideally an organization– to achieve the shared intersubjectivity of a cultural model. Coordinating disparate frames to achieve this end does not imply modification towards complete congruence. Rather, identifying dimensions of the 'collective memory'-what individuals already have in common- sets an agenda to coordinate the naturally different activities, interpretations and agendas of organizational culture. Once again, the design process can be used to reveal these initial overlaps. When supplemented by the architectural theory of type, design becomes a means to establish a shared frame. The design activity of Louis Kahn draws upon these insights to demonstrate how architectural design stimulates the emergence of form- architectural and organizational. This process I describe as cultivating an 'archi-type'- a collaborative process to raise, accommodate, or change frames towards achieving agreement in a schematic architectural solution. The result is a guide to direct architectural intervention and redirect organizational action. Through the creation of organizational space, the 'archi-type' exploits the dynamic relationship between workpractice and workplace to imbue each with 'good' form.

4 ARCHI-TYPE

4.1 THE COLLECTIVE MEMORY

4.1.1 Cultural Models

Form, syntactic structures, cultural metaphors, and the social availability of experience structure our representations of the world. Additionally, they sustain a 'cultural model'- the basis of social agreement and action, intersubjectively shared, used, and sanctioned.[1] Members of a culture expect its inhabitants to *know* the model. Interpretations made about the world on the basis of a cultural model are obvious facts to culture's inhabitants.[2]

As D'Andrade writes: "What makes something a cultural model is the use of it, not how it is learned."[3] He continues by claiming that although personal frames are learned through personal experience, since they are learned in connection with others or external artifacts they inherently belong to the social world. Similar to Schön's observation, D'Andrade sees cultural models as difficult to define due to their implicitness "... informants usually cannot produce an organized description of the entire model... the model is like a well-learned set of procedures rather than a declarative body of recountable fact."[4]

4.1.2 Artist in Culture

Like frames, Hutchins claims that all cultural models, whether embodied in artifacts, images or other propositional schemas, are mediating structures inherited from our culture.[5] Within design, Alan Colquhoun similarly argues that a 'collective memory' exists as a necessary and unavoidable fixture of design. Thus design activity can be a starting point for frame coordination by enlightening the shared aspects underlying their cultural models.

Such a position is contrary to the common notion of design supposedly free from precedent.[6] Colquhoun offers an example to reveal the weakness of this presumption: When the craftsman forms an object, whether a religious object or a utensil, an image of the final form guides his process and product. As the craftsman makes his artifact corresponded as closely as possible to the image in mind. Artistic endeavors are therefore imbued with more than mimesis and intuition: "... artistic works are in some sense impersonal and connected with a complex of social customs. They are not created by individual artists working in a cultural vacuum."[7]

The image in mind exists within the society the craftsman resides in, enabling him to draw upon it for inspiration. Society offers the image not only for the craftsman's disposal, but societies as well-influencing an artifact's entrance into society through an 'exchange' value to establish collective meaning. The inheritance of the craftsman is not by choice, but imposed by the cultural at large to ensure shared meaning to intrinsically empty artifacts, sanctioning their use and application.

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[1] D. Holland and N. Quinn, eds. .*Cultural models in language and thought.* (Cambridge: Cambridge University Press, 1987)

[2] Lakoff provides the example of the word 'Tuesday', one must have formed a conceptual model that includes days, weeks, months, years etc. The concept 'weekend' requires the notion of a work week. In both of these cases, a conceptual frame has been invented to used to monitor the passage of time. D'Andrade provides another example, for those who know baseball, a wild pitch is obviously a ball. A consequence of the intersubjectivity of cultural models is that much of the information relevant to a cultural model need not be made explicit, because what is obvious need not be stated. If the announcer says that the pitch was wild, he need not say it is a ball.

[3] Roy G. D'Andrade "Cultural Cognition" In *Foundations of Cognitive Science,* ed. Michael I. Posner (Cambridge: MIT Press, 1989), p. 824.

[4] ibid.

[5] E. Hutchins, "The Technology of Team Navigation," in *Intellectual Teamwork: Social and Technical Bases of Cooperative Work* eds. J. Galegher, R. Kraut, and C. Egedo (Hillsdale, NJ: Erlbaum, 1988). pp. 13-14.

[6] The inclusion and transformation of precedent through a frame is also counter to a rational and linear problem solving process.

[7] Alan Colquhoun, "L'idea di tipo" *Casabella* 44/463-464 (Nov.-Dec. 1980): 16-19, English summary 117.

If culture relies on an 'exchange' value to impart meaning, then forms will attract meaning regardless of our desire to claim objectivity.[8] Colquhoun contends we cannot be free from the forms of the past. If we assume to be free, we lose control over a dominant feature of imagination and communication.[9] Colquhoun argues for the establishment of a 'value system' to account for past forms and solutions, in an attempt "...to gain control over concepts which will obtrude themselves into the creative process."[10]

4.1.3 Exclusion

The collective memory and the meanings it carries are operationalized by the designer, and reveal insights into how we may leverage their existence. Similar to applying frames for comprehension, adaptation comes from exclusion and confirmation, not reduction.

> "...intuition must be based on a knowledge of past solutions applied to related problems, and that creation is a process of adapting forms derived either from past needs of from past aesthetic ideologies to the needs of the present."[11]

By excluding temporally irrelevant details the design opportunistically recreates and refreshes themes in the collective memory, reaffirming the past in a new light. Due to the continually evolving cultural basis of meaning, exclusion "...is a process which we have to adopt if we are to keep and renew our awareness of the meanings which can be carried by forms. The bare bones of our culture ... must become visible to us." Visibility occurs by necessity and by design through the recasting of contemporary meaning through precedent– the framework in which we operate.[12]

Since the architect works within society, he inevitably draws upon knowledge lodgment within the collective memory. The architect, as integral part of culture, brings forth aspects of the collective memory through his work and how it relates to culture via the predominant cultural models. Since he cannot operate within a cultural vacuum, cultural 'visibility' occurs through architectural production–providing key insights into the shared aspects of culture.

4.2 INCOMMENSURABILITY

4.2.1 Methodological Overview

Design activity reveals not only the impact of frames and their propositions, but dimensions of a collective memory. As Schön writes, individuals who hold conflicting frames hold those frames about *some* reality. Surely within this *larger* reality perceptions are shared. These shared aspects lay the foundation for coordinating disparate worlds towards agreement.

One real aspect of the library problem causes a great deal of stress among designers. Entry #3, a 45 degree angle in the center of the footprint, directed towards an internal corner, sparks different frames, design worlds, and solutions. Although the different problems and solutions are not surprising, more significant is how each 'sense-making' device reveals common concerns– supplying the grist for cultivating cultural models though architectural design.

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[8] Gombrich's critique of Kandinsky demonstrates the fallacy of intrinsic meaning. He shows that an arrangement of forms such as Kandinsky is very low in content, unless we attribute to these forms some system of conventional meanings not inherent in the forms themselves. They can only be interpreted within a particular cultural genre or context. Since they are not inherent in the forms themselves, content necessitates attribution of these forms to a system of culturally conventional meanings. This is accomplished in part by the associations of meaning we have in our minds.

[9] Alan Colquhoun "Typology and design method" first published in *Arena* 83 (June 1967) reprinted in Oppositions Books, *Essays in Architectural Criticism: Modern Architecture and Historical Change*, (Cambridge, MA:, MIT Press, 1981) pp. 43-50.

[10] Colquhoun cites the work of Kandinsky or Schoenberg as examples. In their work traditional formal devices are not completely abandoned, but transformed. Ideologically repulsive iconic elements are excluded– Kandinsky rejects representational elements; Schoenberg the diatonic system of harmony. ibid., p. 50.

[11] Alan Colquhoun 'Typology..." p. 50.

[12] ibid.

4.2.2 Incommensurability[13]

Designer #1 (figure 4-1): "It's not easy to do choreographically since there is a re-entrant, receding form. Entrances generally need to be concave. Now the [interior] corner is somewhat weakened-- maybe some size so that it's more than a wall [k]. And then that starts to be transformed... larger definition at least of the receding part.... In that building nothing works at 45 degree angles. In that territory, -- a 45 degree at that point, and then later abandon it--it's an appliqué. Perhaps if the building itself would have the 45 degree as part of its geometry [h]. somewhere it would become an octagonal form in which that direction becomes part of the large organization behind it. It would be less difficult to do it, because the nature of the building would respond to the 45 degree geometry itself. But even in that case, I think one would have to be very careful that that 45 degree is responding outside to something which then completes that [i] with enough gusto so [the] territory in front of it works."
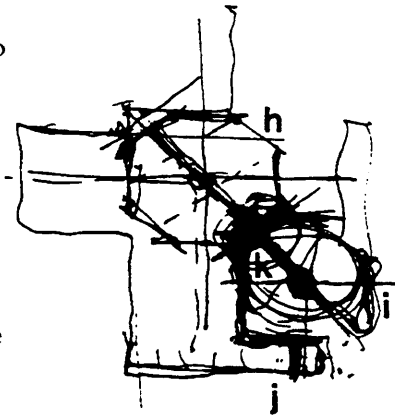
Figure 4-1 *Designer #1*
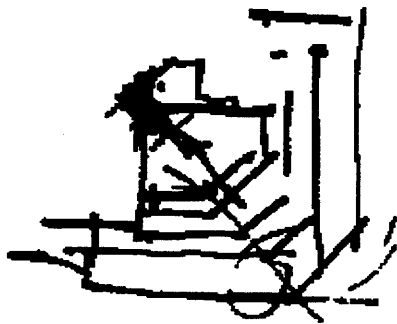
Figure 4-2
Designer #2

Designer #2 (figure 4-2): "I could make it work... Anything works right? So we are talking about the relative quality of experience -- the values I have about the important of this space beyond the building, as to its relationship to organizing inside the building. I could see it working if there was something that the direction was actually relating to, then there might be some relation...that [direction] before you approach the building so you made some kind of clear indication that there is a reason to go that way... [and] once I was inside take advantage of the fact that I am doing that, so maybe there is a sense that the building is opening up more that way. Otherwise, its just kind of a funny disassociative kind of entrance to the building."

Designer #3 (figure 4-3): "You can tailor the program for 3 and make it the only way to enter the building. It's more difficult, and not as efficient since you are coming in the middle of the form, but also it could be the most interesting. I mean, if you're in an area that you are terribly concerned about control and you don't have the staff, 3 isn't the best. If you're in Concord and you want something very relaxed and casual, coming in on the middle is [better]. I'm coming right in the middle of things, which says, I'm going to have options. With 1, I have to go through the entire building, which means a lot more circulation. 3 may be a more inviting building...you would create form to make it more readable.-- there's enough space around 3... OK, you come in [t] and your reading is here [i] and the stacks are here [j] so that you divide it into two three, or four areas, if you want to enter into the center of the building."
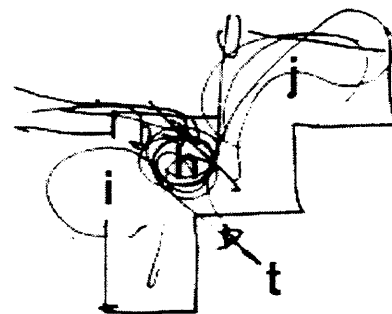
Figure 4-3
Designer #3

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[13] This case focuses on architectural issues since the designers are architects. We can image more culturally specific issues would emerge if non-architects engaged in a similar process.
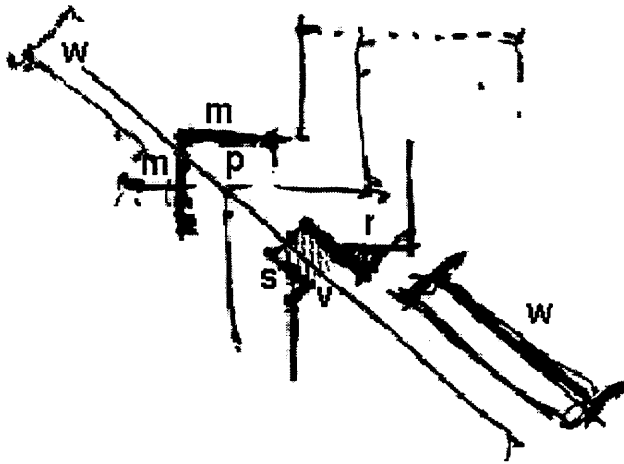
Figure 4-4
Designer #4

Designer #4 (figure 4-4): "I hate to come in on a diagonal. With a library, sense of arrival, and where you orient yourself, and where you go next, is important. I'd try to set it back but also project something out... That seems to be OK [the walls, m] because it's a containing form...and then with these pieces [m] reorient you back to the movement in the building. So the entry, with some of that direction of movement effecting some kind of arrival place on the inside [p],... I would hate to put the circulation right there. I like the circulation desk alongside, because I think people are more relaxed in spaces like that. I'd probably put some kind of magazine area, or informal reading area, which can take a fair amount of traffic against it....to reorient these directions back.

To come back to that footprint it allows some kind of activity space to be associated with the entry, maybe one larger [r] one smaller [s], to help the real movement in. I'd probably make ... that some kind of overhang [v]...If I really want that direction, I could do something with the landscape, to help try and generate the larger direction, so I understand what's happening [adding w, outside the footprint], It's difficult, because now not only do you have the longer direction and the secondary direction, but you've got a third direction, which leaves total chaos, in terms of understanding how you move through the building and the larger spatial organization of the building, I come in this way, now I'm turning left, and going around or turning right, and then left, and then right again. Coming in on the diagonal at that particular point- right in the middle- is right where all three directions are being introduced. It's probably the most confusing, for an entry point."

4.2.3 Alternative Conceptual Schemes

In the Entry #3 designs, we witness a variety of different descriptions and solutions to the problem. Each designer conceptualizes the entry and their 'design world.' The actions taken range from internal hexagons, angular shapes and elongated 45 degree forms. These results point to the existence of 'alternative conceptual schemes' – different conceptions of the world.[14] Each had there own set of attributes and values terms to describe the difficulties. Additionally, labels or ways of referring to the problems also differed. One might see this merely as semantic differences, but the vocabulary and forms seems to describe indicates real differences of opinion, as summarized below:

Designer #1	Designer #2	Designer #3	Designer #4
label- *re-entrant corner*	label- *disassociative*	label- *Three*	label- *direction*
1. Location of the entry in the 'geometric center' of the building is positive 2. Never seen a good solution that attempted to make the entrance in a 're-entrant corner' 3. In this building nothing works at 45 degree angles 4. No way to open up the area as an entrance 5. Potentially 'appliqué'	1. Movement outside the building must have relationship to movement inside the building 2. Difficult to cut something away from the building 3. Never seen one like that- improbable. 4. Not an option 5. Significant problems with relationship to interior organization 6. Will require signage	1. Entry not important 2. Wholly dependent on the program 3. Nice entry for Concord-like suburb 4. May be a more inviting building 5. Most interesting, but the most difficult 6. Coming in on the middle is a more casual, more relaxed 'poetic' entry 7. 'poetry is for poets'	1. Dislikes diagonals 2. Continuous movement with the entry and building is necessary 3. Diagonal conflicts with orthogonal building 4. Entry has three competing directions: long, secondary, and diagonal, resulting in 'total chaos' 5. Impossible to understand direction

[14] Donald Davidson, "On the Very Idea of a Conceptual Scheme" in *Inquiries into Truth and Interpretation*, (Oxford: Oxford University Press, 1985).

4.2.4 Charity

Viewing design activity in terms of different frames would seem to make incommensurability a significant problem. Different designers clearly assess entrance #3 in quite different ways. Schön's own experience with the library experiment lead him to similar conclusion:[15] However, contrary to Kuhn's position, translatability is not such an intractable problem.[16] Davidson claims we are routinely 'charitable-' agreeing with some of the aspects of other's respective worlds by assuming sensibility to alternative conceptual schemes.[17] The concept of charity renders wholly untranslatable languages as implausible: the need for some connection denies the languages' autonomy and therefore the existence of alternative conceptual schemes as well. Alternative conceptual schemes are not so distinct as first thought, perhaps only being words apart, not worlds apart.[18]

The differences between each designer's linguistic and formal descriptions of the diagonal entry are overshadowed by their similarities. The form itself provides clues for charitable acknowledgments of similar interpretations. Three designers unanimously seek elements to link external and internal movement: Form in the exterior should be matched by form in the interior. We can see the shared desire of a mediating device to reconcile the differences between the building and entry direction. Consensus can be envisioned regarding the creative possibilities of the entrance- due to either the need to reconcile conflicting movement or the location of the entry in the center of the building. Finally, we can conceive of agreement based on providing examples from the context, or developing a program to make the diagonal entry advantageous.

To coordinate frames is to seek shared concerns and push them into a dynamic coherence- establishing sufficient agreement to withstand disagreement. Clearly the different designers will not, and should not, completely agree. The issue in a social setting is how to develop a system of complementary interaction. To achieve this state, a more robust aim is required, particularly since in design activity "...various actors must at some point converge on instructions for building that are expressed in [a] language of objects."[19]

Colquhoun offers a potential avenue. He sees within type "... a tool by which we can recuperate the architectural tradition without having recourse to the history of styles."[20] By being concerned with what already exists in the collective memory, type links the architect to both culture and architecture. Type leverages its location within a network of social concerns to provide a methodology of frame coordination and organizational intervention- thereby reestablishing the architectural tradition.

4.3 LEARNING FROM TYPE

4.3.1 Overview

As a methodological program, type offers guidance for frame coordination. Unlike the static and iconic forms we commonly associate with the contemporary use of type, Vidler argues the original intent of type theory was methodological: "It is clear that...eighteenth century theorists...were

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[15] "...in the judgments about the suitability of entrances, different participants make use of different rules, which lead them to occasionally similar and occasional different conclusions." Schön, "Designing: Rules, Types..."

[16] I. Scheffler, *Science and Subjectivity*. (Indianapolis: Bobbs-Merill, 1967).

[17] Without charity, Davidson contends, we cannot have a theory of meaning since our only alternative would be to assume that the other party is irrational. Davidson examines this in a thought experiment: "The idea is that some language, say Saturnian, may be translatable into English, and some further language, like Plutonian, may be translatable into Saturnian, while Plutonian is not translatable into English... How do we know that the Saturnians are actually translating Plutonian? The Saturnians claim that the Plutonians are making sense, but we have no evidence of this since Plutonian is wholly untranslatable into English. Further, there is no reason why we would simply accept the Saturnians at their word. Evidence to measure the accuracy of translations is insufficient. Charity becomes the only means by which we can accept that what the Saturnians are doing is actually translating. By avoiding the conclusion that the Plutonians are irrational, we can begin a substantive dialogue. see Davidson, "On the Very Idea...

[18] ibid., p. 189.

[19] William L. Porter, "Notes on the Inner Logic of Designing: Two Thought-Experiments" *Design Studies* 9/3 (July 1988): 179.

[20] Alan Colquhoun "L'idea..." p. 117.

referring not simply to a designation, a static classificatory term, but rather to an active principle, a mode of design in itself..."[21] Type theory also demonstrates how the abstraction of contextually grounded antecedents can clarify cultural activity and sustain agreement. Like the cultural model, type is difficult to define. However, this ambiguity is advantageous: the conventions of implicit agreement are revealed through instantiation. Through building and designing- acts inherent to architectural activity- the shared priorities and behavior of cultural models emerge to open windows into culture's collective memory.

4.3.2 Ambiguity

Type theory has only flourished through its amorphous character. In her survey of the contemporary definitions of type, Bandini writes"...no agreement has been reached on the exact meaning of the concept... But rather than suffering from such vagueness, typology seems to thrive on it."[22] Fortunately, the implicit nature of type, in particular its ineffable qualities, confounded theorists who sought support for a moral authority through dogmatism and reductionism.[23] From a cognitive perspective, type's ambiguity embodies one of the most enduring enigmas in the discipline- the intrusion of the past into the specific demands of a concurrent design problem. In many ways, type also embodies the conflict between society and the individual designer.

Figure 4-5
Laugier's Natural Hut'

The initial grounding of type strongly reflects such an epistemology. Despite identifying Vitruvian-like elements of architectural form, Laugier's 'natural hut' lacks a roof, floor and enclosure (figure 4-5). These omissions enabled Laugier to use the hut as didactic tool rather than archetype.[24] Laugier explores man's basic need for dwelling, use of local materials and assemblage according to physical logic: Man's basic need for dwelling spurs architectural action. Fallen branches in the forest form columns, vertical and simply adorned, as trees in nature. Assemblage is according to physical logic; beams are horizontal and entablature is sloped.[25]

30 years later, Chamoust called to "...return to the source, to the principles, and to the type."[26] Despite a consistent pattern of seeking divine and fundamentalist sources for type, Quatremère de Quincy was able to realize the agenda set before the architectural community by Laugier.[27] de Quincy

[21] He supports his point by claiming the 18th century encyclopedia- the venue for expounding theory- explicitly engendered the development and refinement over time of concepts in general, and the notion of type in particular. The two most influential, compete, and homogenous theoretical statements on architecture in the first half of the 19th century were in dictionary format. The dictionary was not only the common means for disseminating information, the encyclopedia's its breath provided a didactic tool for students, professionals, and the lay public. Unlike the singular treatise or contemporary essay, the encyclopedia format enabled the issue additional and revised volumes. The dictionary, and its more elaborate version, the encyclopedia, provided an appropriate medium to place the notion of Type- Both were designed to grow and evolve. See Anthony Vidler, "Introduction to Quatremère de Quincy's 'Type'" *Oppositions 8* (Spring 1977): 147-148.

[22] Micha Bandini, "Typology as a form of convention" *AA Files*, 6 (May 1984): 73.

[23] A. Vidler, "The idea of type: The transformation of the academic ideal 1750-1830" *Oppositions* 8 (Spring 1977): 95-115.

[24] Stanford Anderson, 'Types and conventions in time: Towards a history for the duration and change of artifacts" *Perspecta 18* (1980): 109-117.

[25] "Man wishes to make himself a dwelling which covers him without burying him. A few fallen branches in the forest are the suitable material for his design. He chooses four of the strongest that he raises up vertically and disposes in a square. Above them, he places four others horizontally; and on these he raises others which slope and come together at a point on the two sides." Marc-Antione Laugier, *Essai sur l'architecture*, (Paris, 1953). Quoted in Vidler, p. 114).

[26] "[Chamoust]...claims to have found trees growing on his estate in just such a precise combination." Ribard de Chamoust, *L'Ordre François trouvé dans la Nature*, (Paris, 1783). p.5. As quoted in Vidler, The idea of type... p. 97.

[27] Laugier himself succumbed to materialist tendencies by emphasizing the beauty and purity of column, entablature, and

plainly states the virtue of the hut: irreproducibility- type is an ideal, never realized, never visible, and never imitated.[28] Type as abstract and atemporal facilitates making propositions about the world, not absolute truths. By concentrating on the 'original reason' in cultural terms rather than form, de Quincy set type theory in a new direction- social construction. Type as a social phenomenon creates a convention woven into the fabric of society via collective agreement to convey and ensure meaning.[29]

4.3.3 Instantiation

The reality of built form inspired de Quincy to formulate a methodological counter-point to the imaginative type. Where the type is vague, the model is the material entity itself; precise and given.[30] The vagueness of type does not diminish its significance: It serves as guide for instantiations of the model and draws out the collective memory. Without the model, the uniqueness of each situation cannot transform the type into situationally specific architecture, and in the process reveal an instance of the type.[31] Cultural nuances lead to variation, and idiosyncratic manifestations leverage the ambiguity and imprecision of type. For example, many copies of the Holy Sepulchre are dramatically different from the prototype they claim to follow.[32]

By acknowledging the difference between type and model, de Quincy implies design as a kind of dialectic: between abstract concept and the actual instantiation, or between underlying cause of form, and the specificity of the work. The image in mind is the type residing in the collective memory. The object is the architectural instance located in an idiosyncratic social and empirical context. The danger of design, de Quincy notes, is to confound type with model. Model as type creates imitative servility; the material precedent is replicated precisely.[33] Type as model mitigates its potential to be a repository of cultural knowledge. An even greater concern is disavowing the type: without it, de Quincy predicts an architecture devoid of the rules and constraints imbuing form with social meaning.

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pediment versus the hut as nexus of context, need and material. Other failures abound: Principles were architectural rather than social; Nature divinely provided archetypes to be copied literally. The image itself was sanctified, resulting in a graphic definition of type. Such inclinations are evident in contemporary architectural theory: Vernacular architecture seeks primitive man in primitive societies to discern architectural purity. I contend the longing for simplicity by the contemporary professional community reveals a disdain for the complexities of modern society rather than relevant architecture insights.

[28] A.C. Quatremère de Quincy's 'Type' in *Dictionaire di architecture encyclopedia méthodique* vol III, part 2. (Paris, 1788-1825), trans. Vidler, *Oppostions 8* (Spring 1977). "On en use aussi comme d'un mot synonyme de Modèle, quoiqu'il y ait entre eux differénce assez facile à comprendre. Le mot Type présente moins l'image d'une chose à copier ou à imiter complètement, que l'idée d'un élément qui doit lui-même servir de règle au Modèle...Le Modèle entendu dans l'exécution practique de l'art, est un objet qu'on doit répéter tel qu'il est. Le Type est, au contraire, un objet d'après lequel chacun peut concevoir des ouvrages qui ne se ressembleraient pas entre eux. Tout est précis et donné dans le Modèle, tout est plus ou moins vague dans Type. Aussi voyons-nous que l'imitation des Type n'a rien que le sentiment et l'esprit ne puisse reconnaitre, et rien qui ne puisse être contesté par la prévention et l'ignorance. C'est ce qui est arrivé par example à l'architecture. En tout pas l'art de bâtire régulier, est né d'un germe pré-existant. If faut un antécédant à tout. Rien, en aucun genre, ne vient de rien, et cela ne peu pas ne point s'appliquer à toutes les invention des hommes. Aussi voyons-nous que toutes, en dépit des changement postérieurs, ont conservé toujours visible, toujours sensible, au sentiment et à la raison, ce principe élémentaire, qui est comme une sorte de noyau, autour duquel se sont agrégés, et auquel se sont coordonnés, par la suite, les développement et les variations de formes dont l'objet était susceptible. Ainsi, nous sont parvenus mille choses, en tout genre, et une des principales occupation de la Science at de la Philosophie, pour en saisir Les raisons est d'en rechercher l'origine et la cause primitive."

[29] Sylvia Lavin, *Quatremère de Quincy and the Invention of a Modern Language of Architecture*, (Cambridge, MA: MIT Press,1992).

[30] de Quincy's 'Type'... p. 149.

[31] The range of permissible variations and permutations within the type is socially determined and expressed each time an instance is made....Each iteration, when successful, constitutes one episode in the ongoing life of the type." N. J. Habraken, *The Structure of the Ordinary: Form and Control in the Built Environment* ed. Jonathan Teicher (Cambridge, MA: MIT Press, 1998). p. 284

[32] Copies range from approximate replicas to Sto. Sepolcro at Barletta, where only the name remains: "Most of the elements of the prototype are present, but they have been entirely re-grouped." Richard Krautheimer, "Introduction to an iconography of Mediaeval Architecture." *Journal Warburg and Courault Institutes* V (1942-1943) p.. 14-15

[33] The term 'copy' today implies precision. Precision to the modern architect entails professional precision, weighted heavily towards architectural and not social terms. Such a tendency uses architectural concerns as a filter for cultural context and local inclinations. The result, is to drain the edifice of its 'content' by omitting "...the elements which were important to the Middle Ages: the content and the significance of the building." in regards to the larger and immediate culture. Krautheimer, p. 20

4.3.4 Social Origins

To sustain a fruitful dialogue between type and model, de Quincy's infused Chamoust's call for origins with the secular and scientific wisdom of a nascent field- ethnography.[34] The typological approach is an enlightened search for origins, revolving around the actions of people with intentions, conventions, and intelligence. de Quincy sought the unique characteristics of the individual artifact, and its emergence through cultural conventions.[35] To understand the architecture of different countries, he instructs us to look at the cultural context for insights: the nature of each region, its historical notions and monuments, and finally its construction means.

This epistemology lead de Quincy to believe in the universality of primitive architecture based on social organization, in particular work activity. Tents provide 'gatherers' constantly on the move a mobile dwelling. Hunters living near their livelihood necessitate natural dwellings- caves. Farmers, who are both active and sedentary, require fixed huts for living and storage. Although anachronistic, de Quincy's types symbolize the "...social configuration that accompanied [form], and most importantly to the character and mode of production..."[36] Additionally, history and culture anchor the types to the contingency, conventionality, and temporality of the human condition.

4.3.5 Convention

Gottfried Semper further explores cultural activity in relation to type by viewing the primitive hut in terms of its usage, or 'use-types.'[37] The hearth, platform, roof, and enclosure represent an anthropological projection into the hut that merges Laugier's disciplinary concerns with the ethnography of de Quincy. Semper 'use-types' identify techniques and material replete with social meaning,[38] The hut for him embodies prototypical activities, with prototypical materials and construction methods. Similar to de Quincy, Semper's four elements were not to be understood as mere physical elements nor as a true physical model. For example, the Bedouin tent is shelter as enclosure; the hearth within as sacred symbol of the culture.

Semper's elements are in the service of human needs, physical and spiritual. Anderson argues both technique and material are culturally and temporally defined, thus existing in a state of continual flux. Reflecting Colquhoun, he contends by bringing form into being, the architect unavoidably reflects the temporal nature of culture. The work itself represents "...a reciprocity among the maker, the made and the society of which they are parts."[39] The implication of the architect is two fold. The architect imbues material with meaning through artistic manipulation.[40] The artifact, conversely, is a public document- not a source of authority, but normative reference- to be "... read and interpreted as a text, keeping in mind changes, additions, distortions, and transformations."[41]

The social life of the artifact and its architectural reconstruction is facilitated through cultural norms and conventions. Since society is built on convention and ultimately judged by it, reconstruction must involve the sufficient attention to systems of reference internal to the culture. Similarly, architecture is equally dependent on custom. Type is the discipline's convention to synthesize social and

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[34]Werner Oechslin, "Premises for the Resumption of the Discussion of Typology" *Assemblage* 1 (1986) 51-52.

[35] His 'degrees of moral imitation' include analogy, intellectual relationships, application of principles, appropriation of styles, combinations, reasons, systems, etc. Unfortunately, as a 19th century European academic, his palette for imitation was classical

[36] Lavin, *de Quincy*. pp. 90-91.

[37] G. Semper, *Der Stil in den technischen und tektonischen Künsten oder Praktische Aesthetik*, vol. 1 (Frankfurt A.M.: Verlag für Kunst und Wissenschaft, 1860). Quoted from Anderson, "Types and Conventions ...."

[38] Ceramics and the hearth; tectonics (carpentry) and the roof; the textile arts and enclosure; and stereometry (masonry) and 'piling up' which may usurp the carpentry of platform and the fabric of enclosure. ibid., p. 114

[39]ibid., p. 116.

[40] "Der Stoff gewinnt erst seinen Werth durch Künstlerische Gestaltung!" (author's translation: Material gains its value through artistic manipulation). Here Semper is revealed for the criticism he is commonly held accountable for, materialism.

[41] ibid., p. 116.

architectural custom. Type is not separable from our own internal norms, unlike some theorists who espouse divine or natural inspiration. Once type is viewed as an architectural convention, we must review how the architect's hand facilitates its disciplinary and broader cultural emergence.

4.3.6 Knowledge

Rafael Moneo's conventions are explicitly social and renewable, emphasizing the notion of type as "...no less than to understand the meaning of architecture."[42] For Moneo, the architectural object is not a single, isolate event because it is bounded by the world and its history.[43] This leads to Moneo to pose a 'Colquhounesque' challenge: Questions of typology- reconciling the individual artifact with its existence in the social system of similar objects and names - spur each generation to redefine the essence of architecture in their own terms, establishing the conventions to guide contemporary practice.

Moneo articulates two characteristics of the formal structure of type, each implying a dependence on social knowledge.[44] Naming the architectural object forces typification- placing an object into a class objects described in a culturally agreed way. Identifying an architectural element like 'column' or a building such as 'museum' places the object into a group of objects with common formal structure. Type is implicit in language since vocabulary locates an object within the culture.

If the architectural object is named, then something exists in the social context to warrants its repetition. Certain attributes, determined through social activity, enable and demand repeatability. A library is repeated due to the social tradition of lending and reading books. As cultural activity endows architectural forms with repeatability, it enables certain attributes to be repeated. We learn about the enduring cultural qualities through those objects that warrant certain formal repetitions, ranging from objects or parts of objects. For example, repetition makes claims on the status and kind of technology within a culture.

Sensing the potential of type, Moneo posits an innovative, yet contentious proposition- initiating design with type. The work of architecture in a social system is not only "...*described* by types, it is also *produced* through them."[45] Through transformation, the initial generality of the type returns to the specificity of the single work. Moneo however succumbs to a seductive implication of his proposition, arguing that such process holds the potential for the architect to achieve his greatest achievement- contributing a new type to the discipline. Given the dependency of type on societal action and knowledge, such a possibility is clearly impossible. The architectural object does synthesize the singleness of the instance with the shared properties of the type. However, Moneo confuses the individuality of the work and the situation it emerges from with the individuality of the architect. Moneo's self-contradictory stance raises a difficult point- how can the architect use type to facilitate creative and insightful design intervention?

4.3.7 Intervention

Rather than transform or create types, Habraken posits the role of architect is to "...creatively participate in the society which brings forth that type."[46] In the context of cultural complexity and diversity, type enables the architect to "learn from our cultural heritage, not to deny present day realities, but to establish a continuity between tradition and renewal." The implicit social agreement of type reflects the shared values of the society in which we work, type provides professionals and lay

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[42] Rafael Moneo, "On typology" *Oppositions 13* (1978), 1- 45.

[43] ibid., p. 44.

[44] Type for Moneo is a group of objects with a common formal structure, defined not only by architectural convention, such as spatial gestalts or building construction, but includes social activity as well. Moneo, "On typology" p. 24.

[45] Transformation, similar to de Quincy's imitation and Colquhoun's exclusion, initiates design activity with type. Subsequently, he can transform it through extrapolation, changing use, distortion of scale, or overlap- but the process starts with the type. ibid., p. 23.

[46] N. J. Habraken, *The Structure of the Ordinary: Form and Control in the Built Environment* ed. Jonathan Teicher (Cambridge, MA: MIT Press, 1998). p. 284

people common ground.[47] Further, it grounds the architect in a larger cultural framework, assisting him to transcend strictly professional concerns. For clients, type "... offers a frame of reference to discuss with our clients where to start and what to transform."[48] Type facilitates professional interaction by coordinating trades. Most importantly, type connects to a professional body of knowledge and work. Types articulate design parts such as beams, columns, lintels, walls; each have their own identity not necessarily defined solely in terms of material and technology. Types as spatial organization indicates how spaces relate to one another, in addition to the activities they promote. Type as a physical system locates physical parts. in terms of the ways they relate to each other when distributed in space- not defined by merely attributing activities or applying simple functional terms.

Since type is the physical manifestation of the collective experiences of a community, Habraken claims type comes into existence through the act of building, not description. Physical realization is critical to leverage the multiple advantages of type: Antecedents enable type's robustness, by identifying what is shared by a community - actions, material, and location in broader systems. Agreement on type is based on these shared priorities, identified to support intersubjective communication and speculation. Abstraction of type enables culturally and contextually specific instantiations, while providing 'slack' for divergence. In short, type's ability to be used as an innovative intervention device rests on activities to encourage agreement through appropriate abstraction.

4.4 IN PRACTICE

4.4.1 Volume Zero
Deploying design and the forms it engenders to raise types to consciousness places the architect in a unique position, but with unique responsibilities. The lifework of Louis Kahn demonstrates an architect and an architectural process to confront the emergence of the discipline and the submergence of culture by deploying the lessons of type. Kahn infused an anthropologist's investigation within architectural design: He sought the underlying patterns of behavior through creating form. His approach is distinctly different from both the environmental behaviorists and participatory design movements which followed him. In the former, analysis of pre-existing form yielded insights apart from the design act, complicating the process rather than facilitating it. In the latter, the architect is detached, limiting not only cultural awareness and the legitimacy to lead, but results in disappointment and dissatisfaction from unfulfilled and unrealistic expectations.

As described by Stanford Anderson, Kahn's uniqueness as an ethnographer was his search for beginnings not in nature but in form- what man creates:

> "...every time I start to read Volume I, I linger on Chapter One, ... Of course my idea is probably to read Volume Zero,...to peer into this terrific thing-man, who has this great capacity for putting into being things that nature cannot put into being."[49]

Projecting backward through Volume I, a creation of man, enabled Kahn to peer into man. Projecting forward through Volume I enabled Kahn to extend both himself and man into the future. This duality, writes Anderson, enabled Kahn to engage the present to fulfill Colquhoun's challenge to breath new life into our cultural forms. Kahn did not seek truth nor project it: He sought to excavate propositions to win agreement. His search for beginnings was to inform design activity today, not to replicate the past.

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[47] For example, the house type in Tunisia surrounds a courtyard to enable families to gather in a communal space (as well as for light and ventilation). In Paris, the entresol separates the commercial from the residential in apartment buildings, simultaneously enhancing a shop's facade and creating high gateways to inner courtyards.

[48] N. John Habraken, "Type as a social agreement," presented at the Asian congress of Architects, Seoul (1988), 1-20.

[49] Louis Kahn, *What will be has always been: the words of Louis I. Kahn*, ed. Richard Saul Wurman (New York; Access Press/Rizzoli, 1986) p. 245, from a speech by Kahn at Tel Aviv, Israel, December 20, 1973. As quoted in Stanford Anderson, "Public Institutions: Louis I. Kahn's Reading of Volume Zero." *JAE* 49/1(1995): 10.

4.4.2 Institution and Form

Kahn was primarily concerned with two of man's creations, the institution and architectural form. The intimate relationship between the institution and architectural form ignite Kahn's approach: articulation of the 'institution' frames the design of form, and through form the institution is understood. As Anderson writes, "Kahn's search for institutional beginnings provides the source of what calls 'form.' The accommodation of form to present contingencies is what he calls 'design.'"[50]

His interest in the institution was for what motivates a group into cohesion, what a given community shares- not its physical manifestations. For example, the sense of agreement that a man with special sensitivities should be near children is what makes a school a school. The school's form emerges from this special relation between two people, later described as teacher and student.

Only by seeking the origins of institutions, "...the patterns of human associations and their reasons for being, can an architect build properly- whether the great institutions of a society or the more humble institutions of house or street."[51] In his example of the school, Kahn posits that by articulating ".. the domain of spaces ideal for school would make the designing of an institution of learning challenge the architect and awaken him an awareness of what school wants to be..."[52]

4.4.3 Form Drawing

Kahn's innovation lies in his use of architectural form to aid the 'search for beginnings.' Rather than initiating the design of the Unitarian Church in Rochester New York with stained glass, Kahn creates a central place, keeping it undefined "...since it is too sacred."[53] His next move is to surround the space with an ambulatory, which is in turn surrounded by an arcade. The school itself wraps around the emerging diagram, concretely providing access to the central functions of the church.
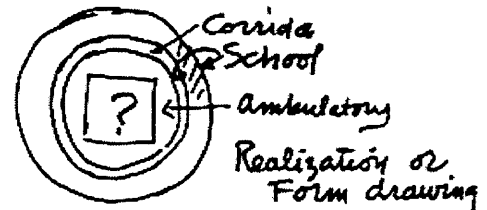
Figure 4-6 *Form Drawing*

The result is what Kahn calls the 'realization' or 'form drawing.'[54] In Figure 4-6 we see the dialogue of type in action: terms like ambulatory and arcade are merged with the contingencies of the model to organize religious activities. In its current state, the preliminary sketch is neither type nor model, rather a shorthand emphasizing cultural knowledge.

Gradually, 'circumstantial demands' solidify the form drawing. In his 'first design,' cultural activity dominates architectural concerns in determining form (figure 4-7). His cultivation of the 'form drawing' gradually moves closer to embrace architectural information, yielding "a close translation of the realization in form." The central space now becomes a chapel. The school surrounds the central space providing access to a number of classrooms.
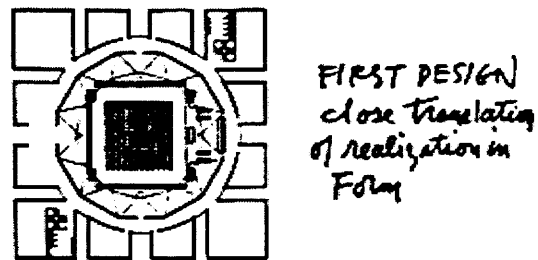
Figure 4-7 *Close Realization of Form*

[50] Anderson, "Public Institutions..." p. 18.

[51] Anderson, "Public Institutions..." p. 10.

[52] Eugene Feldman and Richard Saul Wurman, eds., *The Notebooks and Drawings of Louis I. Kahn*, 2d ed. (Cambridge, MA: MIT Press, 1973). p. 262. As quoted by Anderson, "Public Institutions..." p. 18-19.

[53] Louis I. Kahn, "Philosophical Horizons," *AIA Journal* 33/6 (June 1960): 100. Quoted by Anderson, "Public.." p.19

[54] H. Ronner, *Louis I. Kahn: Complete Works 1935-74*, Basel: Birkhäuser, 1977, p. 118. Reproduced in Anderson, "Public..." p. 19.

This move requires him to test the validity of a disjointed relationship first proposed between the chapel and the school (figure 4-8). Through a 'test of the validity of form' he realizes disjunction is not desirable. By disintegrating the school he organically surrounds the chapel in a way more conducive to encouraging an informal relationship between the two. Through form he explores the legitimacy of his original concept while simultaneously posing a new relationship.

The emergent form is what Kahn refers to as the 'design resulting from circumstantial demands.' It contains more architectural information, facilitating transference into a plan for actual building. Concurrently, it concretizes a new relationship between the religious activities of learning and prayer. Agreement enables Kahn to explore 3 dimensional form and its facades (figure 4-9).
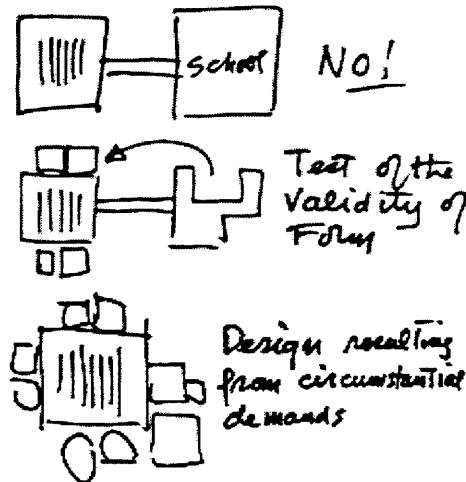
Figure 4-8 *Test and Circumstantial Demands*
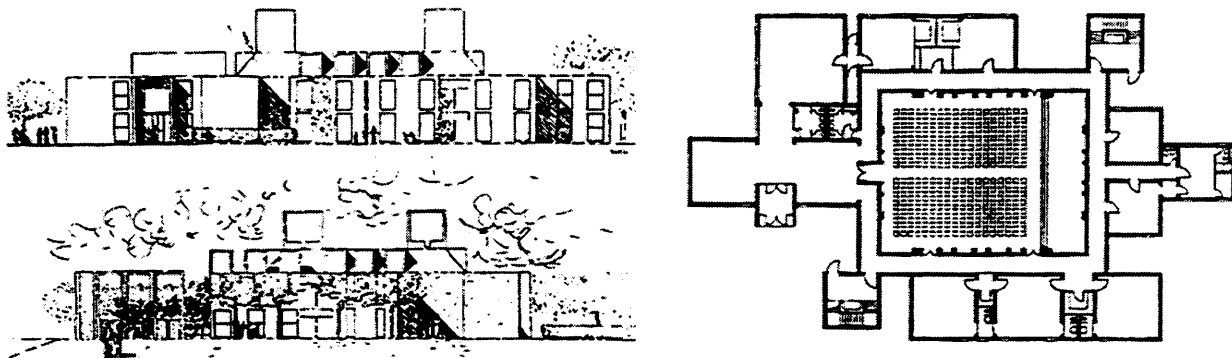
Figure 4-9 *Elevations and Plans of the Unitarian Church in Rochester New York*

4.4.4 Search for Beginnings

Since appeals to origins commonly lead to fundamentalism, or ambivalence, Anderson prefers to describe Kahn's organic development of form as 'a search for beginnings.' In his subtle hands and mind, Kahn engages in an exploratory investigation that is non-authoritarian, not rigid, yet proactive. Unlike versions of fundamentalism based on authority, his search does not possess a Rosette Stone. Unlike versions of anthropology, his search does not possess a *tabla rasa*.

Kahn's ability to conduct an exploratory search into origins rather than succumbing to a rigid and deterministic intervention can be attributed to the raw material he excavates: the client, the program, and the institution that houses them both. The inherent ambiguity and complexity of these entities defy simplistic or over deterministic formulations. Unlike analyzing the physical environment for the origins of behavior, these entities literally 'talk back' and refine the design object.

As key aspects of inhabitant's behavior emerges, we simultaneously reveal how this ties up organizational activity, which in turn reveals the underlying system of meaning. Such insights provide the infrastructure to the external manifestations of the institution, its culture. Anderson's use of Kahn's term 'form' to describe the organization leverages the expectations and experiences residing within organization which ultimate provide its external shape. By cultivating "...the *form* of an institution offers the means to propose beginnings."[55]

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[55] Stanford Anderson, "Public Institutions... p. 18.

Proposing affords innovating by establishing intimacy. Denial of initial innovation yields to accommodate invention through a reflexive dialogue with the contingencies "...of time and place that give differentiation and contemporary effectiveness to the institution."[56] Innovation accomplishes specific purposes demanded by the situational contingencies. It does not occur before these contingencies are expressed, mitigating the application of invention insensitive to context. Architecturally, securing intimacy through agreement opens the opportunity for the creation of innovative form.

The search for beginnings, seeking the roots of institutional form, is intimately related to the cultivation of architectural form. Through a syncretic process towards articulation and clarification, the architect spatially inscribes the narrative of the organization. Since the institution for Kahn acts as mediating entity of agreement and custom, its articulation makes itself subject to criticism and reformation. The search is informed by criticizing, then creating the institution in our time. Kahn held schools, churches, and libraries accountable to their higher purposes, "...institutionally and architecturally, both the cause and the fruits of that search."[57]

4.5 CULTIVATING AGREEMENT

4.5.1 Archi-type

Kahn's intervention reflects realization of affirms Colquhoun insight regarding the potential of type to creatively intervene in society. His 'form' navigates between cultural – or in his words 'institutional'– and architectural knowledge. He draws from both type and model- embracing ambiguity, activity and agreement while addressing real concerns and contingencies. This beginning is a simple organizing idea resilience enough "... to stand the later introduction of the complexity of how the place might actually work.[58] The gradual emergence of form ideally encourages agreement not only between the architect and client, but amongst institutional representatives- providing form for the institution itself.

Kahn's process of form cultivation - both architectural and organization– I describe as an 'archi-type.' The prefix identifies the use of architectural design as an intervention device, the suffix acknowledges type's epistemological program, and the term itself echoes the Jungian 'archetype'- a shared entity residing in the collective memory.[59] Further, the 'archi-type' broadens the focus of a prototype and its narrow application to engage a wider range of issues.

The 'archi-type' is primarily a shared cultural frame containing architectural and organizational knowledge to redirect organizational action and inform architectural intervention. By exploiting the dynamic relationship between workplace making and work practice, an 'archi-type' deploys design as a diagnostic tool for organizational intervention while guiding the creation organizational space.

Pursuing the development of 'archi-type' process to facilitate the transition from archetype- illusive propositions residing in the collective memory- to prototype- a first trial or original example from which others will be developed- to model- the precise instance of the work. Achieving such a synthetic approach is dependent on the ability of the architect to guide and coordinate the frames emerging throughout design activity- not an easy task.

4.5.2 Synthetic Inventions

Cultivating an archi-type rests on the ability to coordinate the variety of frames which emerge from the process. Finding the areas for overlap enables an institution to 'agree to disagree' aims to achieve Schön's 'synthetic inventions.' Cultivating an 'archi-type' would seem to be a potent method to achieve agreement since the designer brings the fundamental dilemmas- conflicts of truths-to the

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[56]Anderson, "Public Institutions..." p. 20.

[57]ibid., p. 21.

[58] Porter, "Notes on the inner logic of designing.." p. 172.

[59] Jung refers to the collective memory the collective unconscious. C.S. Jung *The Archetypes and the Collective Unconscious* 2nd. Ed. (Princeton: Princeton University Press, 1968).

surface.[60] Ideally, the result is what Habraken calls a 'shared image.' Reminiscent of the implicit nature of the cultural model and type, the shared image enables activity without explicitness. In building, it supports a "...well rehearsed choreography of men and materials...[61]

Frame coordination should sustain the naturally different activities, interpretations and agendas of organizational culture while avoiding internal contradictions. Similar to the design process itself, new frame inventions emerge from the attributes of the old and conflicting frames. The result is a new description of the phenomenon, where previously conflicting descriptions are restructured and coordinated. The frame-synthetic invention realigns the features and relations from earlier frames with a new internal coherence or clarity required for action. To support a new description of a situation, one which transcends the previously conflicting descriptions, restructuring and coordination via a new syntactical feature casts them in a set of new relationships.[62]. Similar to a good design, multiple positions can now coexist, sustaining the pursuit of different, yet complementary agendas.[63]

It is the social nature of syntactic structures that opens vistas on frame restructuring. In the case study, potential connections abound: The 're-entrant' metaphor doesn't allow opening the area as an entrance. Perhaps describing the entry as poetic may open the area. His concern that attempting design solutions will be 'appliqué'- not related to the building- can be overcome by suggesting a direct formal and programmatic connection between the exterior and interior of the building. Just as designer #4's proposition that "Continuous movement with the entry and building is necessary" dominates her design world, we may embrace this 'fact' by realigning the initial movement in the building with an upper level. Designer #2 has 'never seen' a successful solution to the problem he faces, limiting his ability to create a design world. Providing a new example might alleviate his difficulties. The 'poetic entry' is a consecutive sequence of activities, consisting of approach, sight, transition, and finally entrance. The entry as body "...oriented to receive someone..." and ...call people in" can rely on other bodily metaphors.

4.5.3 Shared Form

Reaching social agreement encourages members of a society to construct shared entities to encompass individual frames. In the process of witnessing frames in action- either through activity, description or conflict- a designer attempts to 'invent' a new frame by stimulating restructuring, coordination, reconciliation, or integration of conflicting frames. By cultivating an archi-type, the architect 'invents' shared frames through designing form- achieving 'shared form' A shared image or cultural model containing cultural and architectural knowledge, ideally imbuing each 'good form.'[64]

The distinction between the frame and shared form is significant: A frame can be formulated individually regardless of external participants. Explicit details contained in personal frames are implicitly understood in the shared form. Shared form is operational, facilitating actions whereas the personal frame encourages description. Shared form is characterized by a gestalt-like nature, transcending singular definitions due to the dynamics between the individual and singular frames. The meaning and use of shared form is dependent on a situation, whereas personal frames are universal, able

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[60] Schön and Rein *Frame Reflection* ...p. 186.

[61] N. J. Habraken, *The Appearance of the Form* ...p. 15

[62] ibid., p. 274.

[63] A case of conflicting frames: one depicting urban housing in the U S as 'blight,' another as a 'natural community.' The prescription for the former is expert intervention to return the patient to health. The latter prescription is to reinforce, not redesign, by providing lower income families proper service and support. An integrated image is created, called 'sites-and-services.' enabling two previously different and conflicting ways of viewing the housing problem to coexist. Schön, "Generative ... p. 276.

[64] Alexander defines the 'goodness of fit' as "...based on the idea that every design problem begins with an effort to achieve fitness between two entities: the form in question and its context. The form is the solution to the problem; the context defines the problem. The form is a part of the world over which we have control...The context is that part of the world which puts demands on this form...Fitness is a relation of mutual acceptability between these two. We are searching for some kind of harmony between two intangibles: a form which we have not yet designed, and a context which we cannot properly describe." Christopher Alexander, *Notes on the Synthesis of Form*. (Cambridge, MA: Harvard University Press. 1966).

to be transferred to and from different contexts. Multiple interpretations of shared form can occur by placing it in different situations or with different people. The personal frame is consistent– retaining description regardless of context. Shared form is inclusive–supporting different interpretations. The personal frame is exclusive– accounting for only one definition. If properly constructed, the shared frame can ease communication efficiency whereas the personal frame requires negotiation and effort. Shared form ideally achieves agreement by creating win-win goals, whereas the personal frame requires changes to avoid or resolve disagreement.

Shared form seeking to achieve 'goodness of fit' requires synthesizing the two activities of 'inventing' shared frames and designing form. The unique aspect of the 'archi-type' is to use the design process itself to find origins. Cultivating shared form related to both culture and architecture also synthesizes form and program in an architectural intervention.[65] The initial role of the architect is to expose individual and tacit frames towards establishing communal agreement. By carefully analyzing potentials for initial overlap, he can begin to engage the community in a process of collaborative design which makes the gradual transition from cultural articulation to architectural definition. Simultaneously, by using architecture initially we come to support new organizational insights. The archi-type as intervention device and professional agenda provides a unique opportunity to assist building a community of partners and learners within the organization via facilitating the emergence of a new culture.

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[65] Alexander suggests tracing a design problem to its earliest functional origins and be able to find some sort of pattern in them. bid., p. 15.

ENGAGING CULTURE

Cultivating shared form through an archi-type in the organization leverages the uniqueness of design activity by exposing, articulating and coordinating the frames that underlie thought and action. By seeking shared understanding, architectural design stimulates organizational reflection, learning, and agreement. Implanting a culture imbued with these virtues is achieved by an architectural design process stimulating the emergence of culture though 'bricolage'– the synthesis of current and future concerns with an omnipresent and indelible past to guide daily interaction in the environment. However, unlike the myths which guide primitive societies, as culture emerges the architect encourages an organization to reassess the frames circumscribing cultural activity. Heightening the appreciation and enlightenment of culture imparts the practices to create a community of partners and learners. To achieve such acumen and impact we must 'reframe' our professional agenda to reestablish cultural significance and meaning to architecture and the design process.

5 ENGAGING CULTURE

5.1 REFRAMING DESIGN

5.1.1 The Organizational Mind

Tacit and culturally shared frames guide the actions and behavior of organizations- providing the external 'form' of culture. The design of physical form is a powerful way to unearth, modify and share frames. By stimulating three profound activities- reflecting, learning, and coordinating- the social aspects of design elevates each cognitive action to a collective level- offering an organization the practices necessary to build community- both physically and culturally.

Architectural design and theory exhibits a close kinship to cognition. Manipulating a physical object literally reflects the influence of subjective perception and decision. Physical evidence exposes the tacit and cultural syntactical structures providing coherence to frame descriptions, opening opportunities to understand frame construction. Exploring a design world- akin to frame construction- uses the interaction and reconciliation of prior knowledge with a constantly evolving physical object to spark the cognitive work of restructuring. In a social setting characterized by negotiation, conflict, and agreement, restructuring encourages collective learning. Coordinating disparate frames builds upon what is shared to align the naturally different agendas of organizational culture. The resultant shared form corresponds to type in architectural theory, offering a tool for cultural intervention by creating organizational space.

The strength of architectural design lies in characteristics inherent to its primary nature- an evolving object within a social network. Allocation of the physical world opens a window to personal and cultural priorities by demanding personal investment and choice. Evidence of frames and their implicit structure can be seen in the actions shaping an evolving design object. To reconcile physical evidence with intention and peers, the perceiver must modify purpose and action. External 'appearances' of form and the variety of interpretations engendered cause frame contents to surface. The resulting design dialogue - in mind and between design participants- stimulates intra and inter personal learning. Frame coordination identifies common concerns amongst designers, then creatively cultivates an abstract object to support different agendas.

The socially oriented cognitive roots of architectural design offers organizations the paradigmatic practices necessary to build community- both physically and culturally. Establishing shared meaning to concrete actions and situations understands the significance of adaptation through learning; readily embracing the difficulties of reconciliation to coordinate action. A community must coordinate social interaction to expedite social action- creating a shared vision for organizational effectiveness.[1]

5.1.2 Critical Disjunction

However, architecture's folk theory- space as architecture's secret door to culture- prevents the discipline from engaging the frames critical to understanding organizational culture. In the organization, both the physical and social attributes of design are implicitly distinct– organizational activity occurs regardless of the physical environment. The potency of architecture is an independent object within a dynamic social context. Architectural relevance within the organization requires maintaining a distinction between workpractice and workplace to leverage design's strengths:

Maintaining this distinction is precisely what enables the profession to provide meaningful practices for the organization and imbue architectural with cultural relevancy.[2]

The dichotomy begins with articulating the assumptions, attributes, and priorities of the individual. Describing a physical object in the World objectively reveals how we organize the world subjectively. The object provides an obdurate empirical experience; The community necessitates agreement. Design

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[1] See Peter Senge, The Fifth Dimension: The Art & Practice of the Learning Organization (New York: Doubleday, 1990)

[2] Turid Horgen, Michael Joroff, William Porter, and Donald Schön, *Excellence by Design: Transforming Workplace and Work Practice* (New York: John Wiley & Sons, 1999).

shifts and the learning they potentially achieve therefore depends on a distinction between the physical and social for intersubjective agreement to be reached. If they are too closely intertwined, shifts cannot occur as easily. In short, the virtuous act of frame restructuring is fueled by the disjunction between the object and its environment, between the physical and the social.

Deploying design to reveal, modify and coordinate the frames underlying organizational culture is a viable strategy to exploit the creative tensions between workpractice and the workplace. Allocation of the physical environment and artifacts concerns most cultural inhabitants. Architectural design deals with the a concrete reality whose information-richness encourages the cognitive work of restructuring: regrouping, reordering, and renaming. As a medium with inherent political tendencies, architectural design includes multiple actors with various expertise influence the shape of the object— thereby engendering conflict, negotiation, and compromise.

Design in the organization stimulates frame restructuring by cultivating a shared understanding delineated by the language of objects— building elements and relations— synthesized with a language of meaning— what occurs within the environment.[3] By seeking to excavate cultural knowledge through architectural knowledge, we may ideally imbue each with 'good form'- potentially improving organizational practices and increasing the accuracy of architectural intervention.

5.2 REVISITING CULTURE

5.2.1 Professional Relevancy
An architect's desire to identify and describe the frames central to culture is in fact a modest aim given the complexity of the contemporary organizational environment.[4] Corporate pursuit of product innovation and organizational change hinders facile spatial usage data gathering. The once rigid definition of work is now fluid and broad, obscuring the boundary between work activity and workplace. Decisions regarding organizational redesign are now made by consultants, not key stakholders, thus limiting architectural effectivity by predefining architectural agendas. Clients now demand consultant-like working methods- clear deliverables based on a strict agenda for implementation- not easily achieved in light of the unforeseen complexities of architectural design.

Architects must navigate this complex and competitive environment- and reaffirm the relevancy of architecture in the business environment- by justifying early participation in the organizational redesign process. A recent RIBA's strategic study of the profession affirms such a bold claim: "Architects need to be management consultants."[5] The desire to infiltrate this echelon of work is not wishful nor wistful thinking. However, it does require showing both consultants and clients that architects have relevant and insightful contributions to make, beyond renaming inventively what *they* already have set in place, or deemed to be desirable.

Making the case for the 'value added' of architectural design lies in identifying and describing the frames central to organizational culture. Not only can this approach navigate the complexity of the contemporary organization, it supports postulating that design activity is a change process itself. Given the new challenges of the contemporary organization, this position is essential for professional competency and relevancy. However, to see architectural design as a form of change management, we must reframe our interaction with culture and ultimately, our own professional self-image.

5.2.2 Cultural Bricolage
Both culture and form emerge from similar contingencies and processes. Like the frames circumscribing organizational activity and form-making, Levi-Strauss argues that the myths, taxonomies and other classification systems of so-called 'primitive' cultures make reality coherent and facilitate

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[3] William L. Porter, "Notes on the Inner Logic of Designing: Two Thought-Experiments" *Design Studies* 9/ 3 (July 1988): 179

[4] Tom Peters, *Thriving on Chaos: Handbook for a Managerial Revolution* (London: Macmillian, 1987)

[5] Royal Institute of British Architects , *Strategic Study of the Profession- Phases 3 & 4: The Way Forward* (London: RIBA Publications, 1995) p. 43

coordinated cultural activity.[6] Despite their imaginative and speculative nature, a culturally specific rationality legitimizes their application and acceptance.[7] The method these systems come into existence is through a kind of intellectual 'bricolage.'[8] Reminiscent of world-making and frame construction, mythical thought builds structure out of the remains and debris of events and experiences-just as the bricoleur makes use of 'whatever is at hand' and the collection of past activity. Reminiscent of frames in architectural design, bricolage reuses precedent. Each represent a set of actual and possible relations; they are 'operators' to be used for any similar operations.[9] Cultural form- the external manifestations evident to the eye- is thus contingent on all occasions to renew or enrich previous constructions or destructions.

Not only does form emerge from the past, mythical thought structures the 'debris' of experience by creatively representing parts to create new wholes. Myth as artistry invents, distorts and links representations highlighting aspects of the empirical world to provide a culture a coherent frame for understanding.[10] Reaching shared understanding depends on collectively imbuing meaning to representations. In architectural design, not only do representations emerges from the design dialogue, but they act as the primary vehicle for establishing intersubjective agreement.

5.2.3 Emergence of Form

By engaging a culture through active design activity, the architect can facilitate the emergence of cultural and architectural form through bricolage. As cultural expectations assemble, the architect, like the bricoleur, cultivates abstract and physical form out of the raw materials in the situation. Design activity reveals the material substantiating the variety of frames that implicitly influence behavior, speech and action; and explicitly shape the organization. Using and rebuilding the frames found in design, we come to understand and raise to consciousness the underlying cultural consistencies. Frame restructuring and coordination through the manipulation of physical form recasts culture with explicitness and insight.

Inherent to cultivating form is stimulating the formation of a common language- to discuss priorities, understand action, and postulate change.[11] Questions guiding an intervention eventually reach specificity by enlightening the common propositions held by a culture. Determining tacit structure provides validity to frames and opens the opportunity for discussion, change and learning. Detailing frames offers understanding what influences decisions and other behavior within the office culture. Seeking labels facilitates finding the 'key words' in an environment and creates new descriptive terms and images. Clarity emerges through constructing new representations to encode shared meaning-either linguistically or graphically- enabling participants to use it, discuss it, and learn through it.[12]

Fundamental to the emergence of form and the language to describe it is the design of an object with high vested interest in a group setting. Focusing on the physical environment by the movement of objects

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[6] For example, if a culture determines that a frog's toe is a remedy for warts, the issue is not whether it can cure warts, but whether there is a plausible point of view where from where they can be seen to 'go together.' Levi-Strauss argues "Classifying, as opposed to not classifying, has a value of its own, whatever form the classification may take." Claude Lévi-Strauss, *The Savage Mind* trans. George Weidenfeld (Chicago: The University of Chicago Press, 1966) Translated from the French: *La Pensée Sauvage*, (Paris: Librairie Plan, 1962). p. 9

[7] In another example, even witchcraft attempts to describe a cause and effect relationship E. E. Evans-Pritchard, Witchcraft, Oracles and Magic Among the Azande (Oxford: The Clarendon Press, 1965). pp. 418-419

[8] ibid.

[9] ibid., p. 17-18.

[10] Art proceeds from a set (object+event) to the *discovery* of structure. Myth starts from a structure to *construct* a set (object+event) ibid., 26:

[11] Please see the Appendix 3: FormLanguage for more details.

[12] This is similar to Habraken's argument that the type cannot be described, it must be implemented through drawing or action. See N. J. Habraken, *The Structure of the Ordinary: Form and Control in the Built Environment* ed. Jonathan Teicher (Cambridge, MA: MIT Press, 1998). p. 279.

provokes specific reactions from individuals and chain reactions from the group. The inherent design shifts elicited by the object and group dynamics exposes the infrastructure of the organization. Cultivating shared form– frames which translated easily between the cultural and architectural-implants objects to anchor change, create stability, and monitor cultural development.

5.2.4 Architectural Implications

Moving architectural design, not the architect, under a paradigm of bricolage is an essential to reestablishing meaning in architecture. Similar to the way culture emerges through bricolage, architectural design stimulates the emergence of form through inhabitants unpredictable and even mythological sense-making. Beyond the bricoleur, architectural design engages observation, mind, and community simultaneously to reveal, codify, and even change culture.

To this shift requires 'reframing' architecture's many folk theories. The design act, not the static physical environment nor its use, is the primary means architecture can access culture. The profession likes to see the architect as bricoleur– drawing from the design situation and intuition to construct new realities.[13] However, it is the design act, not the architect, that works and acts like a bricoleur.[14] Finally, the notion of design should be replaced cultivation– a term that avoids the implied exclusivity of design by placing the architect in culture, not against nor detached from it.

Reassessing these professional positions is essential given the tenuous relationship between architecture and culture. The separate and distinct of architecture and culture, and in particular the submergence of culture, creates complications for an architectural intervention within organizations. In the past, the language of design was implicit, actualized through implicit action. Today, the architectural act must excavate and assemble culture through 'bricolage' to infuse form with relevance.

5.3 MEANING IN ARCHITECTURE

5.3.1 Engaging Culture

"All building...shows man either as gathering or governing, and the secrets of his success are his knowing what to gather and how to rule."[15]

In a complex professional and organizational setting, knowing what to look for and how to deploy it is difficult. Engaging culture to facilitate its emergence is not an act of exasperation, rather enlightenment. To mine the depths of culture's complexities, the architect must engage in a design process to stimulate organizational reflection, learning, and agreement.

For design to be a lever for organizational change– rather than being a lever of it– the tools we deploy must not attempt to physically categorize existing or desired patterns of work.[16] Rather, we must engage a process that generates an enlightened physical environment by identifying the nuances of work and the culture which frames it. This modest agenda incidentally provokes key cultural insights early on in organizational change projects, placing the architect and the architectural process in a stable and strategic position in a turbulent and competitive environment.

Type is a device to guide our new agenda to architectural and cultural insights. Type is not rooted in industrial processes, ahistorical contexts, or invention. Rather, it is a product deeply rooted in culture.

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[13] See Alexander Tzonis and Liane Lefaivre "Syncretism and the Critical Outlook in Le Corbusier's Work," *Architectural Design Profile* 60 55/7-8 (1985): 7-8.

[14] It is a common mistake to confuse Strauss' bricoleur with an individual person and not the act of culture. Not only is this problematic given the variety of players and influences in design, it neutralizes the architects most potent form of intervention into culture. The seduction lies in the analogy focusing on an individual. It is important not to take this literally as the cognitivists have done. Strauss is describing how myths emerge in a society, not about individual cognition, although the leap is hard to resist. For example, see Sherry Turkle and Seymour Papert "Epistemological Pluralism: Styles and Voices within the computer culture" *Signs: Journal of Woman in Culture and Society*, 16/1 (Autumn, 1990): 128-157.

[15] John Ruskin, *The Seven Lamps of Architecture* (London: George Allen Publishers, 1906). p. 126

[16] Duffy argues that architecture should "...be used to achieve managerial objectives and to lever organizational change." F. Duffy and J. Tanis, "A Vision of the New Workplace" *Industrial Development Section* (April 1993).

Kahn's ability to draw out the 'collective memory' and the frames comprising it presents a architectural methodology. Neither abstract nor precise, the archi-type encourages the use of existing knowledge and situational demands as the means to establish new insights.

The archi-type guides an intervention to achieve cultural coherence via form- architectural and cultural. As midwife, the architect gives birth to the 'institution' by enlightening and articulating the indeterminate activities of a culture. Built up through the local materials of a culture, the process metaphorically creates shared myths to guide cultural activity. Literally, cultivating form ideally establishes the shared language and common reference points requisite for cultural fidelity.

5.3.2 Managing Complexity

Contrary to intuition, engaging culture is not cumbersome: Cultivation of an archi-type simplifies design amidst complexity. Excavation of underlying frames increases awareness of relevant knowledge to all participants. Collaborative design facilitates agreement through cooperation. Negotiation of a shared language can improve communication by minimizing misunderstanding.

As a methodological device, the archi-type can manage complexity and foresee difficulties.[17] Design teams focus on critical issues, identify barriers, and describe innovation in real terms. Its schematic nature enables modification and integration of conflicting agendas. Key ideas are encoded into form, acting as a management device for the architect. Interdisciplinary cooperation is facilitated by developing common terms and issues, in addition to assigning responsibility for coordination and clearly defining work scope.

Cultivating an archi-type increased intervention efficiency. The architect can anticipate what expertise will be needed for successful implementation of the necessary changes. Simulation demonstrates the potential problems incurred by modifying elements of an interconnected system and 'cultural tissue.' Implementation improves by anticipating problems, collecting the required resources, and providing a document robust enough to be easily transcribed to an actual situation.[18] Finally, securing agreement initially can lead to later design inventions.

Finally, the archi-type facilitates evaluation by measuring progress and evaluating solutions. Within the process, milestones identify key junctures and points of reflection. When issues are completed, the archi-type can be used to ask "Have we achieved everything we initially set out to achieve?" Actors are brought into cooperative inquiry by metrics to define positive and negative developments in a design problem, and to anchor subsequent decision making.

5.3.3 Increasing Competitiveness

Cultivating archi-types provides the architect a four-fold competitive advantage to join the contemporary professional business foray. The process exposes the frames of individuals and groups, increasing investigative rigor. Archi-types synthesize frame restructuring and coordination, establishing the groundwork for innovation. Frame formulation as an explicit goal establishes direction for project interaction. Interaction improves by providing an entity to refer to. Finally, the process is readily adaptable to match a consultant's approach.[19]

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[17] Within the business community, a similar development is gaining acceptance. Prototyping is a means to foresee problems, encourage concrete decisions-making, and facilitate successful implementation. Clear communication required by the process is available for subsequent client interaction. Role identification establishes post-project teams for new work. Realistic expectations versus unattainable goals minimize disappointment and frustration. Most importantly, recent research points to the such an approach as a self sustaining process for internal change. See John Porter and Jeffery Infusino, "Making relationship management pay: A rapid-fire approach to implementation." *Mercer Management Journal* 9 (1997): 81-96.

[18] Implementation of recommendations is currently the biggest problem facing consultants, and receiving the greatest investment to provide solutions. This is also the case for architectures, where programming commonly avoids any graphic representations, depending on linguistic and numerical description only. I contend this is a critical limitation to the relevance of programming since it does not facilitate the transition from word to form.

[19] Please see the Appendix E: WorkPlace for such a proposal.

To leverage the implicit competitive advantages of design, we must recast our traditional resources to supply new found insights. Design schematics can be a valuable deliverable to ease real design and facilitate agreement, not a design phase with little compensation. The information generated during design provides a base to facilitate future designs, not just to be archived on a disk. Rather than seen as problematic, unruly, and undesired, the social dynamics and complexities inherent to designing an object in a social setting brings to the surface the frames which give culture its form. Negotiations– a labor intensive activities– are not just a legal necessity, they offer valuable cultural insights.

Fulfilling Habraken's challenge to creatively participate in the society which brings forth a type is facile for architect- we participate in the culture by designing collaboratively.[20] Creative intervention is perhaps as simple as being attentive to the frames that emerge in design activity. By sustaining a dialogue between architecture and culture – between the physical world and the abstraction to make sense of it– we heighten our sensitivities to their interaction and raise both architecture and culture to new explicitness. In the end, the emergent form inscribes the organizational and its architecture with meaning characterized by clarity, coordination and common ground.

5.3.4 Building Community

By securing agreement, establishing a common language and coordinating action, design can initiate, sustain, and concretize organizational learning. Implantation of a learning culture is based on actual experiences with a concrete object and its social life. As a collective learning experience, recommendations shared by the participants make implementation consensual. Ideally, the intervention itself yields an environment for self-learning, enabling the culture to develop independently, without the involvement of external 'experts.'

Cultivating an archi-type can potentially bring people together. The initial flexibility of the archi-type sets forward an open atmosphere, more susceptible to novelty since an 'ideal' is being created. The gestalt character of the archi-type encourages design participants to engage in multiple readings and searches for origins– yet achieve convergence of meaning. As actors its witness evolution, the material at hand is augmented as a means to arrive at collective engagement. Fostering an appreciation of individual priorities , goals, constraints and agendas develops respect rather than mere tolerance. As dialogue converges, the emerging form reflects joint understanding. In this manner, architectural design stimulates and sustains organizational change, fulfilling its true latent potential.[21]

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[20] Habraken, *The Structure of the Ordinary...* p. 284.

[21] Duffy contends that architects must "...learn how to work in more integrated ways with clients and users. Only through close and intelligent cooperation...can the latent power of architecture be release...The potential for architecture to become an essential ingredient of broader change is ...through the powerful and unambiguous expression of collective ideas and values." [21]
F. Duffy "Working at Waterside" *Architectural Review* (August 1998). 204/1218: 44-45.

FRAME VARIETY

Frames and the prior knowledge they contain enable sense making and inform subsequent action and decision. Therefore, contrary to the contemporary concept of design based on the fictional idea of creation free from precedent, design includes the explicit consideration of precedent. In fact, choosing precedent and modifying it through frames is a common aspect of design: Design aptitude is coordinating seemingly disparate frames. Design creativity manages and synthesizes the unexpected synergies between preexisting frames.

Cognitive science articulates a variety of potential frames– clusters of prior knowledge influencing perception and action by describing and prescribing. A category is indicated by a word containing information to justify subsequent action. More directly imposing action is a 'perceptual' frame that organizes stimuli into meaningful figures to facilitates meaningful activity. Similarly, plans emerge from the circumstances encountered in design activity to guide action. A 'vision' is a desired state defining actions to resolve discrepancies with the current situation. Although seemingly a projection into a future state of affairs, a 'vision' is closely related to past experience. Cases, on the other hand, explicitly reach into precedent. Case-based reasoning focuses on how the mind deploys prior experience to assist making sense of new situations. Images in mind condense exemplars and previous visual experiences via shape details. Unlike images, artifacts influence human interaction by use, dimension, and specific features. Similarly, attributes of the physical environment encapsulate the experience of place. Related to place description is the more action oriented script- a stereotypical event sequences describing routine activities to predict appropriate action. Scripts depend on another descriptive frame, roles. Commonly we assign people to predefined stereotypes or patterns of expected behavior to facilitate our own understanding or prediction of other's behavior.

A. FRAME VARIETY

A.1 OVERVIEW

Frames and the prior knowledge they contain enables sense making, subsequently informing action and decision. The frame concept reflects a long standing tradition within cognitive science that has exerted a strong theoretical and experimental influence on cognitive research.[1] Bartlett analyzed stories and folktales for richer evidence of memory, and articulated what is commonly known as a schema: "...an active organization of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organic response."[2]

The general notion is that new, incoming information activates a higher-order body of relevant past knowledge and experience encoded in relation to information already organized in the mind. At the time of retrieval, when a similar occurrence is activated, recall of a prior experience consists of some combination of specific information already contained by the relevant body of knowledge. Such an approach accounts for the occurrence of distortions and biases in remembering.[3]

Support for schema-based views comes from the various types of omissions and distortions in remembering. However, the notion itself is imprecise, and experimental results have not proved easy to replicate.[4] Several studies suggest that schema-based inferences do not occur as frequently as automatically as schema theories would lead one to expect.[5] Moreover, findings from a variety of experiments indicate that whether one obtains evidence for the operations of schematic processes depend critically on retrieval condition...information about an event that is not relevant to the schema activated at the time of study and appears to be inaccessible at test can be made accessible by altering the retrievable information that is provided to the subject.

These results suggest that many different types of information-both schema relevant and schema

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[1] The first thoughts on the notion came from Kant, who tried to understand what permits the mind to apprehend experience in the way it does, and to yield necessary knowledge. In analyzing what he called the *synthetic a priori*, Kant had to show how knowledge begins with experience [thus not being purely analytic] and yet does not arise out of, or come directly from it [thus not being purely *a postori*]. Critical to this understanding was viewing the mind as an active organ of understanding which molds and coordinates sensations and ideas, transforming the chaotic multiplicity of experience into the ordered unity of thought. This organizing mental entity depends upon and is stimulated by the outside world. The closest we can get to truth are the assertions we can make about information that arises under optimal conditions through our sensible natures. Knowledge proceeds from and builds out of the 'raw' materials of sensory experience.

Initially, there is the concrete sensory world which exists external to the subject and from which one's knowledge must begin. But this sensory world cannot be perceived directly; there is no privileged access to the thing itself [das Ding an sich]. We must deal always with phenomena-appearances-and not with noumena-the unknowable external world. Any phenomena consists of sensations, which are caused by particular objects themselves: the form of the phenomena is due entirely to our subjective apparatus...the apparatus that forms our intuition are called "categories of thought" [following Aristotle]. That is, we have general concepts that organize and shape the phenomena and these alone allow the individual to make sense of his experience:

1. quantity (unity, plurality, totality)
2. quality (reality, negation, limitation)
3. relation (substance and accident, cause and effect, reciprocity)
4. modality (possibility, existence, necessity)

Since these categories are remote to actual physical objects and our perception/interactions/ experience with them, Kant developed an attempt to concretely apply the abstract categories,. thus providing another level of phenomenal analysis. Interposed between the raw sensory information and the abstract *a priori* categories, the schema serves as a mediating representation that is directly activated in terms of sensory experience, yet can be plausibly thought to provide an interpretation of that experience. Schemas are part rules [therefore linked to pure understanding or generalization] and part images [therefore linked to empirical perception]. The schema of each category determines the condition by which it is applicable to the objects of experience. Most importantly, schemas are found at the level of concrete experience. We can apply the concept dog to fido, we must be able to produce in our mind the schematic representation-that is the attributes and values that must have. Schematic theory thus demonstrates how the conceptual categories have empirical consequences.

paraphrased from : H. Gardner. *The mind's new* science (New York: BasicBooks,1985). pp. 57-59

[2] F. Bartlett, *Remembering,: A Study in Experimental and Social Psychology* (London: Cambridge University Press, 1932), p.201.

[3] as summarized by Daniel L. Schachter, Memory. In Michael I. Posner ed. *Foundations of cognitive science.* (Cambridge, MA: MIT Press, 1989). p. 692.

[4] J. Alba, and L. Hasher, Is memory schematic? *Psychological Bulletin* 93(1983):203-231.

[5] D. Schachter, Memory. In Michael I. Posner ed. *Foundations of Cognitive Science.* (Cambridge, MA: MIT Press, 1989). p. 694

irrelevant-are represented in memory, and that the accessibility of schema-relevant information depends critically on the nature of available retrieval clues. Such considerations call for revisions in schema theory, with greater emphasis placed on the operation of schematic processes at the time of retrieval.[6] Additionally, the critique focuses on explaining memory, not explaining everyday cognition.

Within the past 20 years, researchers provided greater depth to Bartlett's observation with a wide variety of terms and examples of everyday use.[7] A recent incarnation to redress the empirical limitations by focusing on both daily cognition and its cultural aspects is from the linguist George Lakoff. He contends we organize our knowledge by means of structures called idealized cognitive model (ICM). For Lakoff, ICM's have cognitive status: They are used for understanding the world and for creating theories about the world via facilitating the retrieval of old information, encoding new information, and generating inferences based on old and new information.

To acknowledge this cognitive activity without confusing the reader by creating a new term, I have chosen to modify Minsky's term 'frame.' The term is easily understood vis-à-vis its impact on perception. Additionally, 'frame' exists in everyday language, whereas the other definitions are lexical. Using the term 'frame' also enables drawing upon the insights of Schön to raise the concept and its activity to a cultural, imaginative, and experiential level. Finally, the term 'frames' the variety of knowledge structures in mind while outlining their potential to become full-fledged 'frames' - a tacit knowledge structure with action implications. To further understand the frame and its variety of manifestations, I will survey the cognitive literature on the subject. Glimpsing into the potential frames in design ideally will shed light on frames in mind.

A.2 CATEGORIES

Categories are perhaps the broadest and most basic knowledge structure used to explain featural regularities.[8] Categories help people organize and interpret information by determining whether situations, objects or people belong to preexisting groups. Lakoff writes "There is nothing more basic than categorization to our thought, perception, action and speech...."[9] Categorization then identifies objects or experience by highlighting certain properties, and downplaying or hiding others. Rosch claims that dividing up the world maximizes within- category similarity while minimizes between-category similarity.[10] In performing this activity, we focus on properties fit our purposes and therefore they shed light on purposes.[11] Roberta's use of the Richardson library as entry is one example-certainly the library has many other prominent features, but the entry suits her needs at that time.

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[6] J. Alba, and L. Hasher, Is memory schematic?...

[7] Frames- Marvin Minsky, "A Framework for Representing Knowledge," in *The Psychology of Computer Vision* ed. Patrick Winston (New York: McGraw-Hill, 1975), pp. 211-277.

'Molar' organizational units- W. Brewer and G. Nakamura, The nature and functions of schemas. In R. Wyer and T. Srull, eds. *Handbook of Social Cognition*, (Hillsdale, NJ: Erlbaum, 1984).
Frame semantics- C. Fillmore, Frames and the semantics of understanding. *Quaderni di Semantic* 6/2:(1985): 222-253.
Mental Spaces- G. Fauconnier, *Mental spaces*. (Cambridge, MA: MIT Press, 1985).
Schemas-"...[a schema] is a spatially and/or temporally organized structure in which the parts are connected on the basis of contiguities that have been experienced in space or time. A schema is formed on the basis of past experience with objects, scenes, or events and consists of a set of (usually conscious) expectations about what things look like and/or the order in which they occur. The parts, or units, of a schema consist of a set of variables, or slots, which can be filled, or instantiated, in any given instance by values that have greater or lesser degree of probability of occurrence attached to them. Schemata vary greatly in their degree of generality ..." J. Mandler, Categorical and schematic organization in memory. *In C. Puff, ed. Memory Organization and Structure*. (New York: Academic Press, 1979), p. 263.

[8] G. L. Murphy and D. L. Medin, "The role of theories in conceptual coherence. *Psychological Review* 92 (1985), 289-316.

[9] George Lakoff, *Women, Fire, and Dangerous Things: What Categories Reveal about the Mind* (Chicago: University of Chicago Press, 1987) p. 6.

[10] Rosch, "Principles of Categorization...

[11] If this is the case, then every true statement necessarily leaves out what is downplayed or hidden by the categories that frame the statement.

Categorization's simplest act is to group things on the basis of what they have in common. Similarity occurs by finding either a function, prototypical features or an object's shape and matching this to a representation of a category.[12] In the case of the library, function enables a connection to other libraries– a general suburban library or a more specific- Richardsonian. Similarly, category membership justifies inferring that two objects have the same hidden properties, although this might not always be the case. For example, Roberta assumes offices, civic offices, retail activity near the library, impacting the quality and function of the surrounding area.. A more extreme occurrence is when categorization infers invisible properties from visible ones. In both instances, the danger of inference from categories is when we categorize incorrectly, then the rational for decisions is compromised.

Categorization is primarily facilitated by words which code experience and facilitate perception through accessing convenient groups of knowledge.[13] Many words achieve 'cognitive economy' by designating categories; either in the physical world (library) or the abstract world (reading). These labels are at a 'basic' level, supporting inferences unlike general or specific terms. For example, the speed of Roberta's inferences regarding the library attributes shows that the basic level enables perceivers to rapidly identify category members. Rosch contends most individuals tend to represent objects at the basic level of abstraction- "...an optimal balance between the breath of the category [to] ease separating members and non-members."[14]

Naming ultimately induces typification.[15] When the designer labels an object with a common noun such as entry or library, she implicitly states that the shape will either represent a member of the category or incorporate features of the category. Mitchell writes "If we know some facts about the class, then this knowledge can enter into the critical discourse, direct design intentions, and guide design exploration."[16] As was demonstrated in the design protocol, such terms access information to facilitate sense-making of form and space. Within architecture, they achieve this by attaching form to the frame: "... atrium, porch, iwan and the like denote utterly familiar units of space and form, obviating further description."[17]

Building on the hierarchical nature of words, categories form taxonomies. Taxonomies consists of categories deployed in hierarchical fashion, in which successive levels refer to increasingly general kinds of objects. The levels of categories each reflect different levels of experience. The lowest level is typically raw experience of direct input from the environment. At an intermediate level, we are more likely to use labels that to code experience. Higher levels, on the other hand, refer to more abstract experiences and are commonly referred to as feats of imagination that enable higher level cognitive processing. Roberta identifies the library within a taxonomy of public buildings, and then describes the specific instance as a suburban library.

However, categorization does not only rest on similarity nor explicit relationships alone. Wittgenstein demonstrated how categories are more flexible than assumed. He used the example of the family, were family members resemble each other in various ways (hair or eye color, similar physical features) and there is no need for a single collection of properties shared by everyone in a family. In

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[12] J. Snodgrass "Concepts and Their Surface Representations," *Journal of Verbal Learning and Verbal Behavior* 23 (1984): 3-22.

[13] Edward E. Smith, Concepts and Categorization. *Thinking: An Invitation to Cognitive Science V. 3* eds. Edward E. Smith and Daniel N. Osherson (Cambridge, MA: MIT Press, 1995), pp. 3-33.

[14] Eleanor Rosch, "Principles of Categorization," in *Cognition and Categorization* eds. E. Rosch and B. Lloyd (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1978), pp. 27-48.

[15] Rafael Moneo, "On Typology" *Oppositions 13* (1978): 1- 45.

[16] William Mitchell, *The logic of architecture; design, computation and cognition.* (Cambridge: MIT Press, 1990), p. 85

[17] N. J. Habraken, *The Structure of the Ordinary: Form and Control in the Built Environment* ed. Jonathan Teicher (Cambridge, MA: MIT Press, 1998). p. 279. Oddly, contrary to the positive intersubjectivity categories provide, Mitchell claims to avoid the negative implications of category membership– preconceptions and clichéd discourse: architects should prefer the freedom of abstract geometric labels as not to hinder them from the complexity carried by common terms. Although we attain disciplinary freedom, we lose a valuable connection to the social sphere. See William Mitchell, *The logic of architecture....* pp. 85-86.

this scenario, the category is defined not by singly exclusive properties, but by family resemblances that state that members of a category may be related to one another without all members having any common properties to the category. Wittgenstein also pointed out that categories have degrees of membership, not necessarily clear boundaries. Membership gradience is related to extendable boundaries, increasing the breath of categories provided that they resemble the previous members in appropriate ways. Additionally, he pointed out that some members of a category may be better examples of the category than others- further underscoring the flexible nature of categories and their dependence on perception. These points should be seen as clarifications, not weaknesses of the category. Humans deploy them legitimately to facilitate cognition, yet an appreciation for their nuances would limit misapplication and misunderstanding.

A.3 PERCEPTION

Situations do not contain interconnections, weights nor hierarchies. However, gestalt psychologists demonstrate perception entails 'seeing' such relationships.[18] As Arnheim writes: "Seeing means grasping some outstanding features of objects...[to] determine the identity of a perceived object ..."[19] The result of 'perceptual organization'- the process of organizing stimuli in systematic and meaningful ways- is to demarcate information about the positions of objects in space and other visual properties. Rather than seeing marks on a page, a designer 'sees' a coherent or familiar figure that contains specific attributes.[20] Forming 'perceptual concepts' is "...a creative activity of the human mind."[21]

The natural tendency towards 'selective attention' filters a design problem to determines architectural priorities. Such perceptions create potent frames. Schön remarks that designers quickly lock into them, unconsciously working from them until the designer becomes aware of the frame's grip on decisions.[22] Within the design activity of entrance #1, Roberta perceives an axis implicit from the entrance which has a major implicit on the final form, as she plainly states: "I think having an axis in the middle would influence the form." The axis organizes the interior of the building, in a 'dogbone' shape. Next, it provides a formal and physical reason to establish the entry as a 'special event.' Additionally, the axis impacts the exterior form as well. Roberta decides to generate perpendicular directions off of the main axis.

The axis is a case of an 'image-schematic model' that specifies the internal structure of the building, certain spatial experiences in a building, or formal composition. Reminiscent of Arnheim's 'shape' perception, the schematic image does not describe the entire figure, rather a key element. Schematic images characterize key aspects of the object, imposing a hierarchy identifying key relationships. Particularly for architects, this skeletal structure is used to infer movement. Lakoff refers to an image-schematic model implying movement as a 'trajectory schema.'[23] Within architecture, these are essential to connecting physical form with movement. Roberta's first reaction her perception of an axis is a clear example of this:

> "If you're really coming in at that point, it seems like there's a very strong axis moving through the building [draws axis, then crosshatch it]. There's going to be a dominant kind of circulation that's coming through the center."

However, not all trajectories support movement in reality since other factors must be taken into consideration. Activities occuring in a space is a critical influence on movement. In spite of this, the

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[18] Rudolph Arnheim, *Visual Thinking.* (Berkeley, CA: University of California Press, 1969).

[19] Rudolf Arnheim, *Art and Visual Perception: A Psychology of the Creative Eye* revised ed. (Berkeley, CA: University of California Press, 1974). pp. 43-44.

[20] Donald A. Schön, Designing: Rules, Types and Worlds. *Design Studies* 9/3 (July 1988):181-190.

[21] Arnheim, *Art and Visual....*, pp. 45-47.

[22] ibid.

[23] Lakoff, *Women, Fire, and Dangerous Things...* pp. 105-107.

perceptual reflex to attach movement to trajectory schemes is a common phenomena in architectural design. Not only do they define movement for inhabitants, architects use 'trajectory schemas' to guide their design of places.[24] In this way trajectory schemas transform preliminary image-schemas. By utilizing the implicit movement in the trajectory schema, a new image schema can emerge. In other words, the designer uses the trajectory as a device to explore the initial image. Transformation is made possible by stable line or path of reference to 'explore' the image and guide generating change .

A.4 CASES

Commonly, the initial point for transformation is an existing experience or case. Case-based reasoning addresses how the mind deploys prior experience to assist making sense of new situations.[25] Triggered by a perception, a prior experience is provides the raw material for comparing the past to the new situation in the effort to understand.[26] If the differences between the case and the situation at hand are significant, we reevaluate the old case and update our expectations and learn. Roberta does this when she is reminded of Richardson due to a stair that projects, common with Richardsonian libraries, but in this specific cases, the match is not perfect because Richardson's libraries are frontal entrances, whereas the entrance she is exploring is too obscure.

Cases package unique pieces of knowledge about experiences in ways that make them accessible for future use. Therefore, some cases are more important than others. A case should be important either because it contains important facts (perhaps it changed history), it is unusual (there is little to which to compare it), or it is paradigmatic (it represents a class of things that occur repeatedly). Cases can be viewed as a group expectations, lessons, and information derived from prior experience that best approximates the situation at hand. Clearly for Roberta, having worked in New England, Richardson is an important figure for libraries. This is best evidenced by her response to MH not stating where the library is by responding that she has worked primarily in the New England area.

Labeling determines what case will be found when it might be relevant, typically in terms of the use of a case. If a case is not properly labeled it will become difficult to access. Therefore, relative importance is an implicit attribute to any label. A good example is how Kahn's Kimball Art Museum is labeled under the term light for Renee. "...It might be - I'm thinking of the Kimball Art Museum, which diffuses light in wonderfully...References are real important for me, trying to think about other building that might have similar light qualities." Although light is primary issue for Roberta in the Museum, her drawing of it carries with it the museums vaults which is deployed to address the problem at hand- emphasizing the special event at the entry.

Schank contends that the majority of human reasoning is case-based rather than rule-based. Although rules may assist decision-making and planning in a general way, they cannot help the many situations we encounter which violate or are outside the bounds of generalization. Further, the complexity of design to far too great to be adequately characterized by the theories or rules we develop. The term design as a 'wicked problem' or ill-defined' explicitly acknowledge this fact. However, given the unforeseen nature of situated experience, cases cannot always be adequate.

A.5 PLANS

Plans emerge to guide *ad hoc* perceptions, actions and decisions taken in the context of a concrete circumstance and embodied experience.[27] Concrete refers to the actual elements residing in a designer's situation; embodied refers to the inability to detach oneself from the situation to engage in objective or

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[24] Schön refers to the use of a 'trajectory schema'–to explore an imaginary place as a 'felt path.' See Donald A. Schön, Designing: Rules, Types...

[25] Janet Kolodner *Case-Based Reasoning* (San Mateo, CA: Morgan Kaufman Publishers,1993).

[26] R. Schank, *The Connoisseur's Guide to the Mind*. (New York: Summit Books, 1991).

[27] Lucy Suchman, *Plans and Situated Actions: the problem of human-machine communication*. (Cambridge England: Cambridge University Press,, 1987). pp. viii-ix.

detached thought. Suchman's argument encourages the position that frames emerge in midst of situational activity. Fundamental to Suchman's argument is the observation that the circumstances surrounding actions cannot be completely anticipated. Further, their continual state of flux complicates premeditation. As a consequence action, actions cannot be planned in the strong sense. The weaker sense, is viable only as a resource to guide our *ad hoc* activity. In fact, plans stated in advance are necessarily vague to "...accommodate the unforseeable contingencies of particular situations."[28] Plans in the stronger sense emerge only as a result of accountbilty– the need to provide rationality for actions. Retrospective construction omits the details characterizing the situation which enlighten actions.

Although Suchman correctly identifies the imprecision of a postori plans, she does not adequately address their a priori significance. Drawing on stored plans, and modifying them to fit the current situation, is a common method for plans to emerge. Ideally plans are loose and flexible to adapt to the unique aspects of the situation. Rather than limit the relevance of plans, and the frames they represent, it is more fruitful to see the dialogue between a priori plans and the situation at hand.[29] In the design protocol, this interaction was clear: Roberta initially made sense of the situation with a basic frame– the library– and a perceptual frame– axis. As her work continued, these merged with the situation to create a new frame– directionality. The interaction between concurrent plans in which the outcome of one plan violates another plan derived from the repeated units and patterns that allow a person to perceive or act effectively.

Activity gives rise to plans. Design repertoires emerge through a mix of adapting old frames and acquiring new ones. Resonating with Suchman's argument, characteristics of the situation invoke plans to guide the creation of new ones. If a problem is determined, and an exact procedure is not readily available, a plan is composed on the fly to guide the current situation towards resolution or comprehension. The rapid composing and decomposing of a design problem builds a plan from the situation upwards– the new plan guides subsequent activity with situationally specific knowledge. Such latitude and generality is necessary to move beyond the specificity of the problem frame and its procedures.

A.6 PROBLEM AND PROCEDURE

Production fluency, characteristic of experienced designers and experts, depends on a large repertoire of prefabricated units to collect the knowledge around a familiar problem. Within design activity, certain sets of problems recur– such as the problem of entry into a building, the transition between ground plane and building, the dilemma between public and private and the dialectic between a sense of community and sense of privacy. Colin Rowe refers to these as elemental types-prototypes for solving general classes of design problems[30]

Problem selection often begins when a particular frame triggered early in the perception of the situation reflects an attribute. Once an initial problem frame has been triggered, it guides the interpretation of the rest of the problem[31]. By framing subsequent intellectual activity, the frame provides its contents as material to initiate and guide problem solving procedures. In this sense instantiation of the problem frame means imposing the indexed frame onto the problem. In the following example, a common problem is orientation of a building in regard to the sun. In accessing this problem, Roberta determines the best orientation and its relationship to the internal plan– a clear

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[28]ibid., p. ix.

[29]Lucy Suchman writes: "...a plan as something located in the actor's head, which directs his or her behavior. In contrast, I argue that artifacts built on the planning model confuse plans with situated actions...plans as such neither determine the actual course of situated actions nor adequately reconstruct it. While for purposes of practical action this limitation on plans is irrelevant, for purposes of a science of practical action it is crucial." ibid., p. 3.

[30] Peter Rowe, *Design Thinking* (Cambridge, MA: MIT Press, 1987). p. 87.

[31] Researchers suggest that less directed exploration of the problems facilitated acquisitions of useful problem types. J. Sweller, R. Mawer, and M. Ward, Effects of goal specificity on means-ends analysis and learning. *Journal of Experimental Psychology: Learning, Memory and Cognition* 8/5(1983): 463–474.

impact of a problem frame on design activity– As Roberta states: "I have to make some assumption about sun eventually. It would make a difference - if the sun were coming this way [toward entrance #3] then I'd put the reading area in here...."

Encoded around problems are solution procedures: "...like perceptual chunks, abstract problem schemas function to vastly reduce the amount of search required to find appropriate solutions."[32] Expert problem solvers "...recognize the stimulus as a familiar problem, retrieve a solution procedure for that problem and follow it."[33] Schön describes an example from a design experiment: "When Henry is able to construe the design exercise as a familiar 'guideline task', a type of task which is familiar, we seems to know just how to deal with it."[34] Since this is a design problem, Roberta invokes a number of her standard operating procedures from her design repertoire: "I tend to do most of my design work, actually, in hardline, so this is unusual for me in that I almost always sit down with a parallel rule pretty quickly to work out my dimensions." or "...References are real important for me..." or "I try to at least look at two options for everything." In the case of disliked problems, such as the diagonal entrance, lack of a solution procedure leads to avoidance, as Roberta exclaims: "I've done a diagonal building. I hate to come in on a diagonal."

Although problems are identified and procedures invoked, the problem solving process is recursive, never linear; executing one part of the process can cause complete, recursive invocation of the problem-solving process. In general, most subjects do not follow the standard procedures steps, rather they use a permutations, and these permutations produce effects different from the standard one. In cases where multiple frames are applicable, decisions are tentative and changes are routine. As new states in the problem space types generate additional information, additional procedures are required that will converge, diverge, or conflict.[35] When no frame will cover the whole problem, but two of more will cover some part, combinations of types are constructed to cover the whole problem. however, even with this strategy does not work, and impasse will be reached where an impossible action or false claim will halt the procedure.[36] A common symptom of such an impasse is the attempt to repair or recast the original reason or cause for being stuck.[37]

A.7 VISION

Building into a frame the flexibility to guide the randomness of problem solving depends upon having a line of thought to follow, something to wonder about or a plan of attack. In many instances, goals initially provide this direction. For example, Roberta's goal is stated in the problem statement- explore the entry implications. What is commonly overstated about a goal is its straightforward determination, as Schank writes: "Goals are natural...they are self evident..."[38] Emerging out of obvious needs or explicit necessity, the critical aspect of the goal is how it influence the cognitive process- the information it demands and its guidance to overcome difficulties.

Minsky address the critical part of desired states by describing what a goal does to a situation. By projecting a desired situation onto the current state, a vision identifies differences with the current

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[32] M. Chi, P. Feltovich, and R. Glaser, "Categorization and Representation of Physics Problems by Experts and Novices," *Cognitive Science* 5/2 (1981): 121-152.

[33] Also referred to as 'problem' schemas. see Kurt VanLehn, Problem Solving and Cognitive Skill Acquisitions. In *Foundations of Cognitive Science*, ed. Michael I. Posner (Cambridge: MIT Press, 1989). p. 545.

[34] Donald A. Schön, Designing: Rules, Types ... p. 188.

[35] J. Larkin, "The Role of Problem Representation in Physics," in *Mental Models* eds. D. Genter and A. Collins (Hillsdale, NJ: Lawrence Erlbaum, 1983).

[36] J. Brown and K. VanLehn, "Repair Theory: A Generative Theory of Bugs in Procedural Skills," *Cognitive Science* 4 (1980): 379-426.

[37] Brown and VanLehn (ibid.) outline common options, including: asking for more information, rejection of the failed schema, selection of another, or backtracking by redoing a frame selection.

[38] R. Schank, *The Connoisseur's Guide to the Mind*. (New York: Summit Books, 1991). p. 146.

situation. In this way the vision acts as a 'difference engine' establishing procedures out of differences versus out of the goal or situation alone.[39] The interaction and resulting differences provide guidance to achieve the desired state, crafting procedures to create a plan emerge from the differences between the two states. Desired states shape the situation at hand by checking to see if new information relates in a meaningful way to the task at hand.

The term 'vision' attempts to avoid the misunderstanding of goals and embrace a term whose ambiguity emphasizes process over product and end-result. A vision is a projected state not necessarily encumbered with the details of the current situation; as perceived from the problem, or stated by the designer or a client. This can take into account elements of the current situation, or it can disregard them completely. In the first case, embracing the situation at hand means using the situation to create a plan to achieve visions. For example, Roberta sees in the design problem the need to establish a special event. On the other hand, a vision not grounded in the situation requires that plans emerge from within the desire state itself. Roberta applies the central axis to both ends of the footprint.

Ideally, a vision avoids the limitations goals place on the search and exploration of problem spaces. Roberta's insistence on creating a special event leads to certain formal developments- the vaulted roofs and entry tower. The differences that emerge lead to access cases- such as the Kimball Art Museum and the Richardsonian Library- to fulfill the goal she sets out. Due to the explicit formal implications of her goal, a broader investigation is limited. Herein lies an key difference between the vision and goal: The latter, in its specificity, is resistance to change, becoming a self-fulfilling prophecy. The former, in its implicit imprecision, enables change and modification, sustaining a fruitful dialogue between organization and exploration.

A.8 IMAGES

Related to vision is the image one has in mind when engaging a situation, object, or design problem. As was seen in perceptual frames, images also have a hierarchical organization that an actual picture or artifact does not have. The perceiver creates a segmented mental image of what is perceived.[40] Although this is reminiscent of gestalt activities such as completion and grouping, the difference here is that we store images in mind based on this information. Since we do not remember exact visual details or spatial relations in a picture, hierarchical relationships provide convenient ways for image storage.

Within a hierarchy, complex mental images encode segmented units, each having a specific level of meaning for the perceiver. An image contains enough information- such as attributes, color, size, shape, category- to make connections to another images in mind or on a page. The vault of the Kimball Museum is one such example, where Roberta's use of a vault is sufficient to invoke the reference. In this example, we also see how shape representation is a predominate attribute for encoding images.[41] The vaulted roof becomes a significant shape in Roberta's design. This corroborates research showing that in categorizing pictures of both natural kinds and artifacts, we rely heavily on detailed information about the shape of the objects rather than prototypical features. Such shapes enable images to become icons in the mind- images characterized by basic shapes imbued with specific meanings. Roberta's New England library, for example, relates to Cape Cod houses through a subjective iconography- the roof. Although shape representation is accessed first, if the shape is associated with more than one object, additional processing of the shape's details will be needed.[42]

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[39]Marvin Minsky *The Society of Mind* (New York : Simon and Schuster, 1985). p. 78

[40] John R. Anderson, *Cognitive Psychology and Its Implications* 3rd ed. (New York: W.H. Freeman and Co., 1990).

[41] E. Warrington and T. Shallice, Category-Specific Semantic Impairments, *Brain* 107 (1984): 829-854.

[42] Much evidence shows that in categorizing pictures of both natural kinds and artifacts, we rely heavily of detailed information about the shape of the objects. In picture categorization, people rely on detailed representations rather than prototypical. When people form a mental representation of the shape of the test object, and determine its similarity to the shape information in the target concept only if similarity in shape exceeds some criterion do people decide that the test item is a member

Lakoff cites another type of image– the scenographic image.[43] This is a sequence of movement, or multiple images of the same object, contained within a frame. Typically this depicts different states of use. For example, the image of moving around the library, and the library as static building. Composing these different image creates a 'montage'– opening the opportunity for exploration. In related research, operations on mental images require a process analogous to actually operating on a physical object.[44] This strengthens the connection between the image in mind and familiarity with the actual object. The image that Roberta has of the library– arising from the footprint– enables her to understand the movement around it. The designer's ability to select attributes to enabling such mental manipulation– the basis for much of design– requires a familiarity with the form's realities.

A.9 ARTIFACTS

Unlike images, objects are based primarily on function and features. Function can be described as the desired outcome the artifact can assist achieving. One critical factor in assessing function is relevance. However, understanding what properties an object exhibits reveals more about how artifacts are used.[45] The perceptual-functional hypothesis claims that categorizing objects depends on prototypical features. Some features refer to perceptual aspects (has windows) and some refer to functional aspects (can sleep in).[46] Tversky argues that the featural approach represents objects as a set of discrete features such as geometry, dimensions, and perforations.[47] As further evidence, object comparison emphasizes common features over different features. Whereas mainly perceptual features are included in the representation of natural kinds, functional features figure in the representation of artifacts. In general, we see a close kinship between function and features in artifact knowledge.

Features are delineated by dimension and location. Roberta uses both to determine what areas are spatially suitable for architectural space: "If I look at the form again...it seems that spatially, - I'm getting one, two; three spaces... They're about square, so there's a tendency to try and see them as spaces." In another case, a given dimension provides the rational for other architectural viable spaces: "Given the equal 25 foot steps everywhere, it seems that coming in on 6 generates a wider range of variety of spaces..." Objects stored according to spatial position seems to indicate a strong relationship between dimensions and the body. For example, a low bench implies the act of sitting by corresponding to height of the buttocks. Dimensions are even closer to bodily correspondence by mapping directly to certain parts. Sitting is 'encouraged' by the dimensions of the seat correspond to the dimensions of the buttocks. Handles similarly correspond dimensionally to the hand.

The relationship of dimensions to activity approach is quite strong in determining the quality and function of spaces, as Roberta understanding of circulation within the protocol: "I somehow see the circulation as being smaller, less formal and there's a lot more area to be used. Circulation really doesn't need much more than maybe 5 or 10 foot width associated with it. I'm beginning to see the rest of the 15 feet as really usable." Her activity reflects a common folk theory in the architectural professional called 'Proxemics.' This folk 'science' delinates spatial behavior in terms of dimensions. This is used as critical information for the design of places, reinforced by "... a decade of research ... generally supportive of Hall's hypotheses about spatial zones, culture, and the use of space."[48]

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of the target category. Finally, although details in the image are accessible to memory, shape is usually retained. Carolyn Mervis and Eleanor Rosch, Family Resemblances: Studies in the Internal Structure of Categories. *Cognitive Psychology* 7(1975) :573–605.

[43]George Lakoff, *Women, Fire,...*

[44]Anderson, *Cognitive Psychology....*

[45] M. Farah and J. McClelland, "A Computational Model of Semantic Memory Impairment," *Journal of Experimental Psychology: General* 120 (1991): 339-357.

[46] Warrington and Shallice , Category-Specific....

[47] Amos Tversky, Features of Similarity. *Psychological Review* 84 (1977): 327-352.

[48] See Altman, I. and Vinsel A. Personal Space: An Analysis of E. T. Hall's Proxemics Framework. In Irwin Altman and Joachim Wolhlwill, eds., *Human behavior and Environment*. v.2, (New York: Plenum Press, 1977). pp. 151., Hall argues four different

The negative aspect of having functional and featural definitions of artifacts is functional fixidity. Jannison witnessed 'design fixation' in engineering students, where prior examples had a fixating effect in the sense that they constrained the range of ideas that were produced by the subjects who had viewed them.[49] A significant source of such fixity the terms describing artifacts. 'Circulation' contains prototypical features as well, merging terms with details. In general, defining places explicitly encodes features to give practical meaning to the terms used to describe them.

A.10 PLACE

Kevin Lynch views knowledge and memory of place resting on elemental features- not critical dimensions- to create a mental map– an internalized image of a place to guide movement and orientation.[50] Paths are channels along which the observer customarily moves. Edges, linear elements not used or considered as paths, act as the boundaries between elements. He argues these lateral references are important organizing features, not axes. Edges give form to districts- areas an observer can 'enter into' or territorial definitions with a distinct character. Critical district points or strategic spots enabling access, transitions, or convergence are called nodes. Landmarks- an example of a physical node- are used as point references for understanding place. Typically, they can be a simply defined object, identified by singling out one element from a variety of possibilities. Landmarks are local phenomena, providing clues of identity and the structure of the surroundings.

For architects, these are all powerful tools for both orientation and, perhaps more significantly, exploration. Paths provide organizational elements to make sense of experience. Edges are always identifiable from the inside and can be used as external references. District points are intensive foci organizing events along paths. As a journey becomes more and more familiar, landmarks confirm the journey. In the design protocol, Roberta demonstrates her understanding of these makes features of place to guide movement. For example: "With a library, sense of arrival, and where you orient yourself, and where you go next, is important."

Attributes of place fulfill the mind's internal orientation system. Recent research confirms Arnheim's earlier contention that spatial orientation presupposes a frame of reference.[51] Typically our visual field provides such a framework– the retinal field (x/y axis). For example, a turn 90 degrees tends to interfere with the character of visual shapes drastically by causing the vertical and the horizontal to exchange places. Minsky refers to another type of orientation vis-à-vis the body. A directional system (N, S, E, W) and height are sufficient to understand location. In addition to coordinates and directional systems, orientation in place is informed kinesthetically by muscular sensations in the body. The orientation of our body, head or eyes implies a direction. In daily life, these kinesthetic sensations are usually in harmony with those derived from the visual framework of the environment.

In addition to features and directional systems to provide orientational reference points, place contain memories and emotions. Charles Moore contends a person stores architectural experience in memory by

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kinds of space: Intimate space is characterized by a close phase where all details are visible, and use of distance receptors is greatly reduced except for olfaction and sensation of radiant heat, The 'far phase' is characterized by is enlarged and distorted head - usually uncomfortable for Americans: up to 45 cm (18"), maximum enclosed area 90 x 90= 1m2 (10 ft2). Personal space in the close phase contains no visual distortion, and the three-dimensional quality of objects is particularly pronounced. The far phase of personal space is a normal distance to discuss: 45cm to 122cm(18" to 48"),maximum enclosed area 244 x 244= 5.9m2 (64 ft2). The close phase of 'social space' is conducive for impersonal business: 122cm to 213cm (4'-7'), maximum enclosed area 426 x 426= 18m2 (195ft2). The far phase marked conversation is difficult, and eye contact becomes an issue in maintaining conversation: 213cm to 365cm (7' to 12'), maximum enclosed area 730 x 730= 53m2 (574 ft2). Public space is large enough to act if threatened, but fine details are lost. Its 'far phase'– greater than 25 feet, is the standard public distance, nonverbal communication is reduced to gestures and body stance: 365cm to 762cm(12' to 25'), maximum enclosed area 1524 x 1524= 232m2 (2501 ft2)

[49] D. Jannison and S. Smith "Design Fixation," *Design Studies* 12 (1991): 3-11.

[50] Kevin Lynch, *The Image of the City* (Cambridge, MA: MIT Press, 1960).

[51] Rudolf Arnheim, *Art and Visual Perception...* For the recent research, see the September/October 1998 issue of *MIT Technology Review*.

creating an imaginary 'memory palace'.[52] To access such preexisting memory, the architect encourages inhabitants to enter into their 'palace' by describing their associations to a place. Schön refers to as experiential archetypes, containing images of objects experienced or desired settings in the built environment, like a cave or a meandering path.[53] The role of imaginary places is critical to imbuing place with memory. Emphasis is not on the ways in which the image in characteristic of something, but on its experiential significance, emotive strength, and ultimately the activity occurring within.

A.11 SCRIPTS

Place is ultimately associated with the activities and people it circumscribes. Routine activities provide a fixed set of activities to facilitate thought and action. Within cognitive science, patterns of behavior warranted by specific situations are referred to as 'scripts'– a stereotyped sequence of events. Scripts organized expectations of what we hear or see into a stereotyped sequences of events. Scripts enable the basic cognitive activities of causation and interaction- enabling perceivers to do less thinking. By packaging expectations into events, scripts tell us what will come next and help us make the necessary inferences. Roberta uses a script to define how people will access the building and the typical activities in a library, in her initial assessment of the problem:

> "Coming in at either end, the access to the rest of the building is more difficult, especially with a library function, where single-point control is important so the librarians can keep track of books in and out. Having the entry at either end is more difficult, because that means people have to move all the way through the entire building -In quick response, that means 5,6,2, and 3 are probably easier..."

The contents of a script is the knowledge about a situation we bring to an activity. By relying on how events are supposed to unfold or how people normally act in situations, deviations are common. Script failure primarily occurs in social situations, when actors don't play assigned roles. This is less common in individual activity, which can be problematic. For example, designers routinely anticipate activity by playing a script to foreshadow how people will use the space.[54] Based on the assumption of script relevance and robustness , a preconceived sequence of events dramatically impacts emerging form:

> "What I think it does is that now your library is going to have a whole series of activities. As you move through, you can see a whole range of size of places . There's a very small activity, arrival at some larger room. It seems easier to have thin overlap, or separate - you have that potential. If you had a children's reading area, it could be all the way back at the other end [d] and you could begin to really separate that off from the rest of the activities."

In such instances, scripts avoid a key component to their potency- deploying prior knowledge to be modified through situational nuances. Scripts are normally improved in the attempt to preclude the problems we envision occurring from a script. However, in design situation scripts are typically applied unaltered onto situations rather then being modified by the situation. Roberta chooses to place the circulation desk alongside the entry, rather than "...the first person you face when you come in, because I think people are more relaxed in spaces like that." Design decisions are commonly taken based on envisioned activity, not activity based on real people.

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[52] Charles Moore, Working together to make something. *Architectural Record* 172 (1984): 94-103.

[53] Donald A. Schön, Designing: Rules, Types ...

[54] Alexander calls these shape giving activities 'patterns.' As Habraken points out, "...patterns are not a product of enlightened pronouncement, but one of historical and continual use and renewal." Architects must continually explore the situationally and culturally specific behaviors that influence form rather than deploy pre-packaged activities. See Christopher Alexander, A Pattern Language: Towns, Buildings, Construction (New York: Oxford University Press, 1977). For Habraken's critique, see N. J. Habraken, *The Structure of the Ordinary: Form and Control in the Built Environment* ed. Jonathan Teicher (Cambridge, MA: MIT Press, 1998).

A.12 Actors

People are commonly assigned predefined roles to facilitate sense-making and to assist a designer's decision making. One common approach is through stereotypes. Although most people think stereotypes are bad habits, generalizations to be avoided, they are similar to scripts– intentionally allowing us not to think.[55] Stereotypes define cultural expectations, characterizing the meaning of certain words. Stereotypes, if properly chosen, provide a storehouse of valuable information. However, if poorly selected, stereotypes form paralyzing collections of irrational biases. Roberta reacts to the 'deranged client' – a classic myth within architectural lore describing the role a client can play in a design process- by the interviewer to coerce her to address the diagonal entrance: "For some reason - there's a demented head of the library committee; it must come in diagonally, it's a condition of your employment." Another designer for the library entrance discusses the difficulty of entrance #3 in terms his stereotype of architects which in turn influence his recommendations:

> "...One and Two and Four, may not be as poetic as coming at Three, but we're trying to get some guidelines, and poetry is for poets....unless you say, OK, we're going to pick a few architects who will understand this... But then they usually screw it up, so--"

A variation on stereotypes is the roles we see ourselves and others playing. A role is the pattern of behavior expected by others from a person occupying a certain position in an organization. The term 'set of roles' refer to the fact that an individual plays a number of roles in life and only some of them are associated with their place of work. There are different ways to define roles: prescriptive definitions are concerned with what a person should do when he plays a specific role. This is common to job descriptions. An evaluative definition asses how well of poorly a role is being performed. This requires certain standards of criteria. A descriptive role is defined by the actual duties performed by a person. While action role definitions addressed the unwritten activities required to perform certain prescriptive roles.[56] For example, a designer discusses the difficulty of entrance #3 in terms of the political processes and the roles that board members play that influence design decisions:

> "... my advice is, stay away from it [entry #3] because the same people that selected the architects will continue to select the architects.... If you are dealing with the political process, then I would say that's one of your design factors. I'm very pragmatic."

Both stereotypes and roles influence a person's self concept, thus defining a great deal of expectations and activities. This is not only true of individuals, but our interactions with others as well. The self-fulfilling prophesy is an expectation leading to certain patterns of behavior whose consequences confirm the expectation.[57] The frame of actors, in addition to the additional knowledge sets, provide ample evidence of how expectations lead to consistent patterns of thought, decision and action.

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[55] R. Schank, *The Connoisseur's Guide* ...p83

[56] David Buchanan and Andrzej Huczynski,*Organizational Behaviour: An Introductory Text*. 3rd ed.(Prentice Hall: London, 1997). pp. 374-384

[57] Phillip Zimbardo et al, "A Pirandellian Prison," *New York Times Magazine* , 8 April 1973.

SYNTACTIC FEATURES

The rationality of cultural and personal imaginative activity requires a device to order a frame logically. The existence of a syntax– an underlying, implicit interrelationship between propositions– enables the frame to be treated as a coherent whole. Despite the difficulty of defining frames, postulating a syntactical feature is critical to explain and exploit a frame's dynamics. Postulation and awareness of a syntactical structure– a featured element to identify a syntax– enables constructing an account of action and interaction from cognition and communication. Coherency comes in propositions, metaphor, metonomy, examples, linear chains, and even the body. Propositions exude the most basic syntax- sentence structure. Over time, these become 'facts'- epistemological commitments strengthening the resilience of a frame. Culturally shared commitments can be described in terms of metaphors which implicitly draw upon shared propositions. Conflating a metaphor with one dominant fact leads to metonomy– one proposition or attribute organizing an entire frame. Metonomy culls legitimacy through experienced or imagined examples. Far from being simply an illustrative device, examples are reference points to organize related propositions. Examples commonly preserve information by organizing propositions sequentially in a linear chain. Finally, Lakoff argues the most common and potent grounding of our conceptual system is in the bodily experience the world. The body's basic organizational scheme of the body is a container, described by and in/out relationship and characterized by a bounded surface separating interior and exterior.

B . S Y N T A C T I C   F E A T U R E S

B.1 "FACTS"

Cognitive activity rationality condenses experience into manageable parts applicable to other situations.[1] As a consequence, new experiences are connected to existing information via the logic found within propositions. This activity requires two bits of language syntactically organized.[2] For example, the statement "The table is wooden" organizes a proposition about an entity (in this case that its material is wood). Jackendoff refers to the bits of language that connect references and relationships as 'indexicals' and associative terms, basic terms such as is or be.[3] Even in languages where such terms do not exist, associations are made by putting two words together. Their proximity is sufficient to indicate which is the object and which is the descriptive term. To build a proposition, it is not the indexical terms, but the paired relationship between a value and its attribute required.

Schön's 'naming and framing,' sets situations in terms of what the perceiver sees as being the relevant 'facts.' As facts, perceived attributes and relationships enable reasoning, decision making and legitimize action. This makes frames resilience— resisting appeals to other facts. Once a frame as been constructed to account for a certain organizational situation or phenomena, it seeks evidence to confirm it existence and legitimacy, regardless of contradictory evidence. Propositions easily become self-fulfilling prophecies- expectations leading to confirming patterns of behavior.

Given the large investment in frames, divestment is difficult, if not impossible. The selective attention and construction of social realities implies an epistemological commitment to the frame by the frame holder. One reason for commitment is the work invested in a proposition's construction. Additionally, change implies the existence of an alternative epistemological position- undermining the legitimacy, accuracy, and acumen of the proposition and its creator.

Throughout the design protocol the designer states and works from "facts" that comprise a frame and influence decision. For example, the negative prejudices toward the diagonal entrance provides the rational for its avoidance. In one instance, Roberta changes the problem rather than violate her proposition that an entry must be in the same geometry as the building. Only after the interviewer's insistence does she finally agree to deal with the problem as stated. Facts underlie the worlds designers engage in, implicitly bounding and perhaps limiting exploration, discovery and change.[4]

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[1] The notion of a 'syntax' underlying frames is based primarily on Lakoff's argument for the experiential and cultural nature of the structure of cognitive entities. Lakoff addresses the implicit structure of the frame and schema concept by naming them *idealized cognitive models.* : "...we organize our knowledge by means of structures called idealized cognitive models. ICMs facilitate understanding the world and creating theories about it (see Chapter 8 in George Lakoff, *Women, Fire, and Dangerous Things...* p. 68.):
    1) They are characterized relative to experiential aspects of human psychology
    2) They do not necessarily fit the external world "correctly"
    3) They are used by speakers to suggest how to, or how not to, understand a given situation
    4) It is commonplace for ICMs to be inconsistent with each other.

[2] In English, patterns of sentences common to the mind will invoke certain conceptual organizations even through they may break grammatical rules. Minsky's reading of Chomsky's "colorless green ideas sleep furiously" vs. "furiously sleep ideas green colorless" exemplifies the mind and its use of frames. Although both sentences are 'equally nonsensical' the mind treats them differently: the first sentence generate an image and meaning (albeit odd ones) since it conforms to acceptable grammatical rule of English (adjective, adjective, noun, verb, adverb). The second phrase, however, does not evoke anything since it does not conform to any acceptable order in English. see Noam Chomsky, *Syntactic Structures* (The Hague: Mouton, 1957) and Marvin Minsky, "A Framework for Representing Knowledge...: p. 231.

[3] Jackendoff provides the following examples (se Ray Jackendoff, *Patterns in the mind:* (New York: Basic Books, 1994).:
    a) ascription of properties (the light is red)
    b) spatial location (the messenger is in Istanbul)
    c) motion (the messenger moved from Paris to Istanbul)
    d) possession (the money is Fred's)
    e) scheduling activities(the meeting is on Monday)

[4] "...facts are much more refractory and unmanageable and inconclusive, and can actually kill the very sort of inquiry imagination opens up." Phillip Roth *The Facts: A Novelist's Autobiography* (New York: Farrar Straus & Giroux, 1988)p. 166.

The resilience of frames is only partially due to the facts they contain. Propositions are reinforced by related propositions – built up over time and through experience. The synergies between related propositions strengthen the designer's world by providing syntactical strength. For example, although a designer sees entry #3 as being positively located in the 'geometric center' of the building, the geometry of the footprint makes nothing work at a 45 degree angle. Additionally, he has never seen a good solution to an entrance in a 're-entrant corner.' Not one of these stands out as a defining syntactical feature in his design world, however the synergy between them makes the exploration quite difficult. The result of his frame is the creation of an octagonal geometry in the interior of the building- emerging from the range of propositions formulated in setting the problem.

B.2 METAPHOR AS LABEL

Goodman succinctly articulates the impact of deploying one word to encapsulate relationships: "Classification involves preferment; and application of a label (pictorial, verbal, etc.) as often *effect* as it records a classification."[5] Objects or situations do not separate and organize attributes for perceivers. Grouping of attributes to define an object is active, selecting one of countless aspects. A label assists this cognitive work, as Goodman writes: "...composition or decomposition is normally effected or assisted or consolidated by the application of labels: names, predicates, gestures, pictures etc. ...temporally diverse events are brought together under a proper name..."[6]

Such activity is be akin to the application of metaphor– a word seemingly unrelated an to an entity is used to discover or develop a relationship to the entity. Metaphor aims to achieve understanding by experiencing one kind of thing in terms of another. Metaphorical description also achieves cognitive economy. Without metaphor must be more precise, and cumbersome. For example, if I see a housing situation as problematic for the community, thus requiring immediate attention and correction, I can use one word that expresses the same sentiment: 'disease.'

Lakoff argues "...most of our indirect understanding involves understanding one kind of entity or experience in terms of another kind-that is, understanding via metaphor."[7] Understanding through metaphor occurs through the set of propositions it contains. In addition to encouraging comprehension, the inclusion of external information can facilitate communication. Drawing on a metaphor to describe a set of propositions provides a way of partially communicating unshared experiences.[8]

Schön's 'generative metaphor' synthesizes the cognitive grouping, economy, and communication by providing a coherence and logic to the 'story' perceivers recant in describing a situation: "...the metaphor accounts for centrally important features of the story- which makes it understandable that certain elements of the situation are included while others are omitted..."[9] Schön's 'story' derives its clarity from collecting attributes and observations via an implicit relationship described with one word. Thus the word supplies information to facilitate comprehension and communication.

One unique characteristic of the generative metaphor is its ability to give new coherence, or a new set of relations between attributes, to interlocutors. A metaphor can convey the way a perceiver 'sees' a physical entity, and the attributes of the entity they contend are relevant. Metaphor is a tool to structure the view of the same situation in concordance with a perceiver's. Additionally, it can initiate a prescriptive solution without explicitly referring to a preferred plan of action.

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[5] Nelson Goodman, *Languages of Art* 2nd. ed (Indianapolis: Hackett Publishing Co., 1976). pp. 30-32.

[6] Nelson Goodman, *Ways of Worldmaking* (Indianapolis: Hackett Publishing Co., 1978). pp. 7-8. Also see Languages of Art, Chapter II for a more extensive discussion.

[7] George Lakoff and Mark Johnson. *Metaphors We Live By* (Chicago: The University of Chicago Press, 1980). p. 178.

[8] ibid., p. 177.

[9] Donald A. Schön, "Generative Metaphor: A Perspective on Problem Setting in Social Policy." in *Metaphor and Thought*, ed. Andrew Ortony, (Cambridge: Cambridge University Press, 1978). p. 267

Frames are implicitly metaphorical and explicitly social.[10] To convey a pattern of relationships assembled by the mind, one must refer to it through the system of shared words language provides. The term we designate as referent is metaphorical since it is not the real source of the word. The name we provide is implicitly metaphorical since its function is to provide coherence to the attributes or facts we choose to describe, not refer or describe the empirical phenomena that gave meaning to the word originally. For example, if we see an urban housing project as a 'slum,' and choose to describe it as a 'disease,' the origin for the word disease comes from a very different context. But to assist someone to understand my perspective of the situation, which I construe to be a 'slum,' I can refer to it by using a term familiar to the culture we share.

Critical to the potential of metaphor is its cultural roots. Culturally agreed terms transmit meaning efficiently, as through a conduit.[11] Metaphors derive force from emphasizing purposes, values, and normative images, present in the culture. Since such agreement occurs in the course of action, members of a culture are not conscious of the metaphors they inherit to facilitate communication and sense-making-thus complicating the task of frames awareness.

B.3 METONYMY

Metaphor's containment of frames occurs due to the polysemic nature of words. Although we are brought up to think that words have precise meanings, Jackendoff writes "... some degree of imprecision is unavoidable."[12] Polysemy – the multiple senses of a single term– explicitly recognizes that terms do not have one definitive sense or meaning. Word meaning, when not imported from other frames through metaphor, is built up through propositional convergence and context. For example, the label 'house' reflects the convergence of different definitions, priorities, and attribute weights.[13]

Metonomy takes advantage of polysemy to put forth one proposition or attribute to be the primary meaning of the label. Lakoff describes metonymy as when "...people take one well-understood or easy-to-perceive aspect of something and use it to stand either for the thing as a whole or for some other aspect or part of it."[14] In such cases, an attribute, value, or subcategory can stand for the whole category for the purpose of making inferences or judgments. Stereotypes are one common example of metonym, where one proposition or attribute stands as representative of the entire frame. In such cases, the attribute chosen to act metonymically is typically socially accepted.

As a result of a label's polysemic condition, metonymy also can be seen as a cluster of propositions or a convergence of different attributes.[15] Viewing a word as the convergence of possible meanings implies certain attributes within frames are not given equal weights, thus effecting the understanding of the frame as a whole. In the case of house, each characteristic exposes the priorities and understanding of the type as used by interlocutors. A client conceivably might say: "a house is about family"; while an architect might say: "a house is an expression of living". Such positions go beyond different perspectives since they contain different priorities. The client seeks warmth and intimacy; the architect, activities expressed aesthetically. Both propositions exist within a design discussion, but are weighted differently. The client weighs its relationship to how the family will feel in the house. The architect weighs its architectural significance in terms of plans, programs, and compositional qualities. Although he may care about intimacy and warmth, it is overshadowed by another agenda.

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[10] see Kripke on his discussion of Wittgenstein and the impossibility of private languages in: Saul A. Kripke, *Wittgenstein on Rules and Private Language : An Elementary Exposition* (Cambridge, MA: Harvard University Press, 1982.). pp. 107-113.

[11] M. Reddy. " The Conduit Metaphor"....

[12] Ray Jackendoff, *Patterns in the mind:...* p. 202.

[13] In the dictionary there are 12 different entries. Eugene Ehrlich, Stuart Flexner, Gorton Carruth, Joyce Hawkins, *Oxford American Dictionary* (New York: Avon Books, 1980). p. 425.

[14] Lakoff, *Women, Fire, and Dangerous Things...* p. 77.

[15] Lakoff refer to this as a 'cluster model.' See Lakoff, *Women, Fire, and Dangerous...*pp. 74-76.

To expedite communication, it is necessary to allow labels to remain as metonymic, or 'packed.'[16] It is not possible to ask for precise definition of every word in dialogue. However, for the convenience a label provides, it masks interpretations, meaning, and potential conflict. If a primary attribute informs a label by implicitly weighing the set of interrelated attributes, the label must be unpacked to determine what attribute informs the frame's structure and intention. If not, labels remain as *representative structure*, where polysemy is disabled and meaning is based solely on a prototype.[17]

B.4 Examples

The proposition acting metonymically commonly rests upon an example. Far from being simply an illustrative device, an example is a pivot to organize related propositions. Unlike cases, examples are second-hand knowledge. Examples enable the individual to tap into a wealth of cultural experience to provide expectations to make sense of new situations. Within discussion, a shared example can be used to concretize more abstract issues. In this way we provide a group of interlocutors a similar set of expectations about what will occur, or explain what has already occurred.

Within design, we see how examples play a significant role in thought and action. Porter argues that examples provide a "...world of qualities and attributes always possible to reconstruct and reformulate as one probes the mental construct that is the exemplar itself."[18] Through re-experiencing the artifact within design, previously inaccessible information becomes accessible due to the nature of a design world. Its purpose in design activity is to draw together new sets of propositions, invoked by the design situation at hand. It is significant that designer #2 has never seen a diagonal entrance in an orthogonal building. His inability to refer to an example hinders his ability to construct a solution.

A prominent example is a prototype, or culturally accepted central case.[19] Eleanor Rosch's research showed that categories- and the frames they represent- are informed by the existence of best examples.[20] These 'prototypes' are a singular example containing perceptually salient properties to supply the attributes for resemblance, categorization and ultimately reasoning.[21] For example, the type 'bird' has strict boundaries. Robins, owls and penguins fulfill those criteria. However, robins are taken to be a better example of a bird than an owl.[22] For the designer, Richardson libraries are prototypical; She refers to them selectively, yet consistently.

Subcategories of the central model are all understood to as deviations from the central case. Although the central case is a convergence of all subcases, the central case cannot generate or predict all subcategories. Since the sub-categories are culturally defined, the rules are culturally specific rather than universal. Additionally, subcategories change over time whereas the central case remains relatively constant. In the library, a web based electronic library would be compared to the 'reading' model of library and perhaps be criticized for not having traditional media. Subcategories change over time, unlike the central model which is relatively fixed within the culture.

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[16] This is similar to Reddy's understanding of language as a conduit. See Reddy " The Conduit Metaphor", in A. Ortony ed. *Metaphor and Thought...*

[17] Lakoff defines representative structures concern nothing but the prototypical case, thus hiding the richness of structure in a cognitive model. "Representative structures, though real, are mere shadows of cognitive models." Lakoff, *Women, Fire,...* p. 82.

[18] William L. Porter, "Notes on the Inner Logic of Designing: Two Thought-Experiments" *Design Studies* 9/ 3 (July 1988): 175.

[19] The central case establishes a 'radial structure' within frames, where subcategories are a function of the central case. See Lakoff, *Women, Fire, and Dangerous Things...* p. 83.

[20] Eleanor Rosch, "Principles of Categorization," in *Cognition and Categorization* eds. E. Rosch and B. Lloyd (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1978), pp. 27-48.

[21] Rosch refers to the role prototypes play in cognition as 'reference point reasoning.' See Carolyn Mervis and Eleanor Rosch, "Family Resemblances: Studies in the Internal Structure of Categories," *Cognitive Psychology* 7:573-605.

[22] Eleanor Rosch, Carolyn Mervis, Penny Boyes-Braem, Wayne Grey, and David Johnson, "Basic Objects in Natural Categories," *Cognitive Psychology* 8 (1976):382-439.

Culture provides a variety of other examples.[23] Typical examples contain less metaphysical characteristics than the prototype. Similarly organizing an enormous amount of knowledge, typical examples are assumed to be true based on experiences.[24] Paradigmatic examples go beyond the typical example by providing a powerful experiences to shape behavior. Classic examples influence worldmaking by carrying the weight of history and a touch of holiness. These are like familiar examples, typically invoked in a shared culture containing language specific to the culture as well.

Salient examples are deployed when situations resemble familiar events. One common result is the conjunction fallacy, where people use salient examples in making probability judgments about the category of disasters.[25] For example, after a DC-10 crash, most people refused to fly in the plane, showing how expectations for the future are commonly based on the construction of hypothetical scenarios rooted in the past Unique examples, on the other hand, are the cases that in the past did not meet our expectations. These commonly occurs when most expectations are fulfilled, except for one. Such events do not update our original expectations, but are encoded as separate, yet related events.

Imagined examples create scenarios to explain or investigate certain expectations. They draw upon exemplars, abstracted prototypes, and feature frequencies.[26] Ideal examples, on the other hand, are neither typical nor stereotypical.[27] The library standing alone on a site is informed by the designer's ideals of library as house of knowledge. There is an aloofness through the solitary nature of knowledge, accentuated by the distance an individual must go to acquiring knowledge. "A lot of cultural knowledge is organized in terms of ideals... We have cultural knowledge about ideal homes, ideal families, ideal mates."[28] The ideals about libraries is culturally specific. The library is informed by western traditions and specifically related to libraries of Massachusetts.

Additionally, people are understood in relation to paragons who represent either an ideal or its opposite. Particularly in professional cultures, paragons shape a great deal of our actions since we try to emulate them.[29] Roberta believes that architects should provide clarity to the movement within buildings: "as architects we can probably do something to provide more clarity in that there are also events along the way that help organize some of the activities..." More specifically, paragons influence actions and decisions since we commonly try to emulate them. Corbusier as a paragon of architecture enlightens the desired and valued attributes of architecture and its practitioners.

B.5 LINEAR CHAINS

Examples commonly preserve information about a sequence of events by organizing them sequentially like beads on a string.[30] Logic is a prime example of a linear chain. Based on the knowledge of the ordering, one continues linearly towards a logical conclusion. The linearity of sentences orders words, predicting what will come next in speech or writing. Linear order judgments are based on the knowledge of the ordering. Intentionally breaking an expect order results in humor, surprise or embarrassment.[31]

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[23] See Lakoff for a similar discussion: Lakoff, *Women, Fire, and Dangerous Things...* p. 84-90.

[24]"Knowledge about typical cases is generalized to non-typical cases, but not the converse." ibid., p. 87.

[25]Amos Tversky and Daniel Kahneman, "Probability, Representativness, and the Conjunction Fallacy," *Psychological Review* 90/4 (1983): 293-315.

[26]Ronald Finke, Thomas Ward, Steven Smith, *Creative Cognition: Theory, Research, and Applications* (Cambridge, MA: MIT Press, 1992). p. 130.

[27] George Lakoff, *Women, Fire, ...* p. 87.

[28] ibid., p. 87.

[29] Corbusier as a paragon of architecture enlightens the desired and valued attributes of architecture.

[30]John R. Anderson, *Cognitive Psychology and Its Implications* 3rd ed. (W.H. Freeman and Co.: New York, 1990) pp. 109-110. This discussion is also related to Lakoff's notion of image-schemas. See Lakoff's example of the Japanese Hon (pp. 104-109) and the case of 'over' (418-439) and subsequent discussion (440-461) in *Women, Fire, and Dangerous Things...*

[31] R. Schank, *The Connoisseur's Guide to the Mind.* (New York: Summit Books, 1991). p. 83.

Forming a linear chain are anchors and triggers. Anchors lie at the beginning and end of a linear chain, assisting frame consolidation. End anchors have significance as being the end of the chain, not being the last in the chain. Front anchors are closer to the front of a chain, and are recalled better. Triggers are typically the front anchors of a production systems, setting off a chain of actions when triggered by an emotion, event, or goal.

Similarity is a primary criteria for establishing connections between attributes. Unrelated assemblages can be linked through similar properties. Surprisingly, connections and relationships between two objects is increased when the distance or difference is large. However, both similarity and difference masks important relationships between instances by enabling quick decision-making. To avoid such weaknesses, finer methods of analysis must be applied to initiate more robust connections and comparisons. One such technique is triplets- where confirmation of a linear ordering sequence occurs when a pair is followed by a value that is consistent to the relationship initiated by the original pair.

Another potent form of establishing infrastructure through links is causation. Causation is the direct manipulation of an agent that achieves a new state. Production systems are a related linear chain, encoding condition-action rules: "If such-and-such conditions prevail, then perform such-and-such action."[32] By establishing vivid interaction between propositions, causation enables designers to foresee the impact of certain activities. Like the trajectory schema, resultant action projected linearly. From a design point of view, seeing and provoking causal chains is a mechanism to facilitate design moves-leveraging the cognitive efficiency and economy of the frame.

A 'source-path-goal' schema, for example, is a linear chain defined by a contiguous location [path] connecting starting [source] and end points [destination] and a direction [toward the destination][33] As Lakoff notes, this is a potent metaphor: complex events have initial states [source], a sequence of intermediate stages [path] and a final state [destination]. Further, the linear 'source-path-goal' schema embodies physical (source) movement towards destinations (target). In architecture, we commonly see paths as having destinations. This can now be understood as a cognitively necessary trait- a path cannot be a path unless the traveler has intention of arriving somewhere.

Scripts and stories encode sequences of events and encode logical expectations of behavior. Schank describes scripts as a "...a kind of play that we can engage in where our lines are prepared by a kind of general social agreement, where we anticipate the lines of our partner in their likely place in the play and react accordingly."[34] From a social perspective, scripts characterize situations familiar to all people because of frequent experience. To codify culturally specific behavioral rules, scripts provide names to indicate what our expectations should be. Thus, scripts are social phenomena: "... culturally shared knowledge organized into prototypical event sequences enacted in simplified words."[35]

B.6 BODY

Lakoff argues that the classic view of definitions, categorization and knowledge structures does not acknowledge the bodily and experiential influence on thought and action. Instead, it focuses on the inherent properties of objects, such as shape, weight, parts. Although legitimate, Lakoff contends these do not take into consideration how the ways in which we experience the world ground our conceptual system. He posits understanding takes place in terms of experience, not isolated concepts.

Bodily experience influences the coherent organization of frames initially by enabling the conceptualization of the "...nonphysical in terms of the physical...the less clearly delineated in terms of the more clearly delineated."[36] Based in part on Mark Johnson's work, Lakoff identifies the body's

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[32]Allen Newell and Herbert Simon, *Human Problem Solving* (Englewood Cliffs, NJ: Prentice-Hall, 1972).

[33] Lakoff describes these as 'scenarios.' See Lakoff, *Women, Fire, and Dangerous Things...* pp. 285-286.

[34] R. Schank, *The Connoisseur's Guide to the Mind.* (New York: Summit Books, 1991). p. 83.

[35] Dorothy Holland and Naomi Quinn *Cultural Models in Language and Thought* (Cambridge: Cambridge University Press, 1987)

[36] George Lakoff and Mark Johnson. *Metaphors We Live By* ...p. 59.

organizational schemas as a significant provider of cognitive infrastructure.[37] The body provides perceptual and motor apparatus, mental capacities, and emotions. The body guides interaction with physical environment include moving, manipulating, objects, and eating. Social interactions with other people, either politically, religiously, or economically, also influence the choices of labels, attributes, propositions. In short, the way we interact with the world influences how we construct the frames to manage experiential complexity.[38]

The basic organizational scheme of the body is a container; described by an in/out relationship, characterized by a bounded surface.[39] The surface demarcating interior and exterior can be quantified in terms of the amount of substance contained, its quality, or just to mark off territory. Within architectural design, this schema has a great deal of application due to the enclosing nature of architectural form. Roberta organizes her approach to the library problem with such a schema. The internal character of a container causes Roberta to push the roof upward to give a certain emotion to the interior space. Similarly, the external appearance and shape of the container is critical: Spaces must be "...oriented to receive someone..." and forms can actually "...call people back in."

In addition to the qualities of contents and exterior surface, the depth and resilience of defining surfaces is a third dimension of the container schema.[40] Particularly acute in an entrance, explicitly implying an opening on the boundary surface to enable passage from exterior to interior, or vice versa. The notion of the transition is from the need to diffuse the severity of our well-defined boundary. In fact, it becomes evident that the concept of entry transition can only by relevant when a container schema is projected onto a situation.

The body also acts as center, defining periphery and proximity. It minimally establishes relationships via connecting ourselves physically, visually, or emotionally to objects, people and situations. For example, the library must have a central area. The body also creates unique relationships between two wholes by creating connections between them. Connections also occur though identifying the parts composing a structure, offering additional opportunities for bodily links.

Bodily relationships rest on orientation, including such relations as up-down, front-back, and near-far.[41] Body orientation provides a fixed and familiar point to guide movement and make sense of encounters. Roberta maintains coherence in her design world through her body simultaneously as she explores it: "I come in this way, now I'm turning left, and going around or turning right, and then left, and then right again...." In this application the body is used as a trajectory through different frames, exploring the design world by providing an organizational and navigation device.

In general, the range of devices to organize thought and action offers ample evidence for the need for consistency in creating the frames to account for empirical situations. Fortunately, these devices are all explicitly culturally based, offering the possibility for intertranslatibility and intersubjective understanding. These windows into the mind also encourage proactive interventions to unearth, discuss, and even change the frames in mind and culture.

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[37] Mark Johnson *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (Chicago: The University of Chicago Press, 1987)

[38] Understanding the body as a basic cognitive structure may be related to what Anderson refers to as "perception based knowledge representations.' *see* J. Anderson, *Cognitive Psychology* ... pp. 86-95.

[39] Lakoff builds upon Reddy's model of the conduit metaphor where words are seen as containers of meaning.

[40] When we use the term 'thick-skinned' we reflect the nature of the bodily envelope.

[41] Lakoff also argues that bodily position and activity corresponds to and invokes emotions. Pictures of body positions or facial expressions can reminds of physical encounters. Upon seeing an image we can relate to the emotion it will invoke by referring to its metaphorical bodily position. Running makes the heart beat faster so seeing an image of a runner provokes a natural instinct. *see* Lakoff, *Women, Fire, and Dangerous Things...* p. 270.

FORMLANGUAGE

The ability of the architect to facilitate new organizational practices depends on his ability to spark and concretize a shared language. Once evidence of frames and their underlying structure exists, he can begin to build the semantics of a 'language' to make frames sensible and clear to the community. Attempting to cultivate a 'FormLanguage' enables stakeholders to infuse meaning to form as it emerges from the design process. Although several players with distinct languages operate simultaneously, the design process requires the various actors to converge on instructions for building– expressed in the language of objects. Articulating the frames underlying the logic of each player's decisions and behavior within design enables understanding aspirations by mapping them into a prototypical frame. Seeking a 'FormLanguage' begins with values and attributes, gradually probing for the interrelationships between propositions and eventually applying a descriptive label. The resulting shared language should enable communication between design and designer, and more importantly designers within a culture. Ideally, cultivating a 'FormLanguage' should provide inhabitants objects and tools to monitor and improve their own infrastructure, both literally and figuratively. By sparking and concretizing the frames shaping organizational culture in form, the effort may yield new organizational practices aimed at building partnerships within the culture through learning, respect and understanding.

C. FORMLANGUAGE

C.1. OVERVIEW

The ability of the architect to facilitate new organizational practices depends on his ability to spark and concretize a shared language. Although several languages may operate simultaneously in an organization– each associated with an actor's concerns and agenda–the design process requires the various actors to converge on instructions for building, expressed in the language of objects.[1] The resulting object synthesizes disparate languages, similar to Cuff's observation that successful architectural projects are "... a understood by the principal actors in their own terms."[2]

Rather than assume form carries certain meanings as semioticians do, cultivating a language of objects ensures that stakeholders infuse meaning to physical form as it emerges from the process itself. This language, emerging from design activity, forms the basis for shared form- enabling communication between design and designer, amongst designers within a culture, and more importantly, between physical and linguistic descriptions.[3]

Critical to language coordination are 'visual hinges'- a notation to enable key players to 'hang' ideas.[4] Detailing the frames that play significant roles in a design process initially enables a client to understand his aspirations. Articulating the frames underlying the logic of each player's decisions and behavior ideally facilitates achieving consensus. As Schön writes, the "...consensual design world is not a given by an achievement, a product of the work of communicative inquiry."[5] The result provides inhabitants a language to monitor and improve their own infrastructure, physically and figuratively.

C.2. FRAME NOTATION

Building a 'language' to describe architectural and organizational form should include reference to both physical and linguistic description.[6] A language that can be seen as speaking verbally as well as physically can be called a 'FormLanguage.' We can refer to the composition of frames in terms of a label, a syntactic structure, an attribute and a value:

Linguistic Notation: label [feature (attribute <value>)]

Graphic Notation: ■ [⊠ (⊠)]

Definition occurs concurrently along four dimensions, from the specific to the abstract:

1. ☐ Determining Values- identify specific and significant empirical instances

2. ⊠ Clarifying Propositions- excavate associations or significance of values

3. ⊠ Building Relationships- combine propositions according to a relative logical structure

4. ■ Assigning Labels- attach a linguistic or graphic reference to identify a propostional set

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[1] William L. Porter, "Notes on the Inner Logic of Designing: Two Thought-Experiments" *Design Studies* 9/ 3 (July 1988):180.

[2] Dana Cuff, *Architecture: the story of practice* (Cambridge, MA: MIT Press, 1991).p.234.

[3] William Porter first introduced the term *FormLanguage* in: William Porter, "What relation does knowledge of form and knowledge of the nexus of form, language, and computation have to do with professional practice?" *Pin-Up: MIT Department of Architecture Newsletter* (Cambridge, MA: MIT Dept. of Arch., 11 Novemer 1995).

[4] William L. Porter, "Notes on the Inner Logic of Designing...

[5] Donald A. Schön, "Designing: Rules, Types and Worlds" *Design Studies* 9/3 (July 1988):183.

[6] Propositional notation emphasizes the perceptual claim of the proposition; it is a declarative statement asserting a specific perception. Similarly, Mitchell claims "Plato is a philosopher" and notes this as: philosopher[Plato]. Since we expect an attribute of a philosopher is to be clever (philosopher [x]--> clever [x]), we can infer that Plato is a clever philosopher. The critical difference in my formulation is constructing a frames by articulating attributes. the first notion yields: Plato (profession <philosopher>). Inference adds a proposition to the frame: Plato(intelligence <clever>). See Mitchell *Logic of Architecture* ...p. 85.

C.3. Values

☐Determining values begins with questions or guidelines to sensitize the architect to the potential frames underlying organizational culture. The empty frame notation (☐) indicates the need to identify specific and significant empirical instances. The value is an actual or possible instance to fulfill the attribute a physical entity, particular aspect, sensual or behavioral trigger as identified in the environment.

The generic frames guides questions or guidelines to unearth values, including:

1. **Stories-** "Where do we come from?" "Where do I come from?"
   a) beliefs [stories]- "what past events influence who we are?"

2. **Actors-** "What am I capable of doing?" "What are you capable of doing?"
   a) beliefs [actors]- "Are people here career oriented, competitive, supportive?"
   b) beliefs [actors]- "How do we interact with each other, practically and descriptively?"
   c) beliefs [actors]- "How do we interaction with clients?"

3. **Place-** "Where are we?" "Where do we perform?"
   a) beliefs [place]- "What aspects of the environment maintain certain beliefs?"
   b) beliefs [place]- "How does the place influence daily practice?"

4. **Plans-** "How do we communicate?" "How do we understand what others do and say?"
   a) beliefs [plans]- "What is the accepted way to interact?"
   b) beliefs [plans]- "What are the accepted ways to raise difficult issues?"

5. **Time-** "When do we do what we do?"
   a) beliefs[time]- "How valuable is time?

6. **Plans-** "What are the concrete steps to implement abstract visions?"
   a) beliefs [plans]- "How is the company culture effect the planning process?

7. **Script-** "What do we do?" "What is routine?" "How do we respond to problems"
   a) beliefs [script]- "How does the daily routine reinforce who we are?"

8. **Artifacts -** "What is here?" "How do we use it?"
   a) beliefs [artifacts]- "What do the object reflect about ourselves?

9. **Vision -** "Where are we going?" "What is the leading idea for the organization?"
   a) beliefs [vision]- "Where should we be going?"

C.4. Attributes

Values indicate potential frames. ◹Clarifying propositions uses the frame indicated to be relevant to guide more specific questions to clarify the significance of values. Attributes articulate the actual criteria to fulfill the featured role. The joint within the frame notation (◹) indicates a proposition in the frame - a value linked to an attribute. As frames reveal values, the intersection of frames guide a second level of deeper questions to establish propositions:

beliefs	stories	actors	place	plans	time	script	artifact	vision
stories	beliefs [stor]	stories [act]	stories[plc]	stories [pln]	stories [time]	stories[scr]	stories[art]	stories[vis]
actors	actors[stor]	beliefs [act]	actors[plc]	actors[pln]	actors[time]	actors[scr]	actors[art]	actors[vis]
place	place[stor]	place[act]	beliefs[plc]	place[pln]	place[time]	place[scr]	place[art]	place[vis]
plans	plans[stor]	plans[act]	plans[plc]	beliefs [pln]	plans[time]	plans[scr]	plans[art]	plans[vis]
time	time[stor]	time[act]	time[plc]	time[pln]	beliefs [time]	time[scr]	time[art]	time[vis]
script	script[stor]	script [act]	script [plc]	script [pln]	script [time]	belief[scr]	script [art]	script [vis]
artifacts	artifact[stor]	artifact[act]	artifact[plc]	artifact[pln]	artifact[time]	artifct[scr]	beliefs[art]	artifact[vis]
vision	vision[stor]	vision[acto]	vision[plc]	vision[pln]	vision[time]	vision[scr]	vision[art]	beliefs [vis]

Sample questions include:

1. Place (attribute)

a) place [beliefs]- "How are our corporate beliefs reflected and reinforced in the physical environment?"

b) place [vision]- "Where do we generate vision? what attributes enable or prevent vision generation?"

c) place [stories]- "What places contain a story, both + and -?"

d) place [actors]- "How does location reinforce stereotypes? how is the public/private dilemma resolved?

e) place [interaction]- do specific places enable or prevent different ways of interacting

f) place [script]- "What places are associated with which activities?"

2. Actors (attribute)

a) actors [script]- "What do I do, what can I not do?"

b) actors [place]- "What do I like about the work space" "What objects are important for me" "What does location say about my personal identities?"

c) actors [stories]- "What experiences shape or inform how we define ourselves and others?"

d) actors [beliefs]- "what are the beliefs each individual holds about the organization?" "what does this shed light on regarding the individual?"

e) actors [visions]- "What are the difference in personal visions? "do any conflict?" "how can he help each other reach individual visions?"

3. Vision (attribute)

a) vision [script] - "How is the vision reinforced in daily activity?"

b) vision [time]- "What are the short, medium, long term visions?"

c) vision [actors]- "Who are the key players?

d) vision [plans]- "What do we want to achieve?" "When does a vision become a plan - why doesn't this happen?"

4. Artifacts (attribute)

a) artifacts [beliefs]- what do the artifacts in the office represent?

b) artifacts [vision]- "Do we use physical artifacts to clarify, define, or reinforce direction and vision?" "What abstract artifacts, or simple physical representations encourage vision?"

c) artifacts [stories]- "What past experiences are associated to artifacts?"

d) artifacts [interaction]- "How are artifacts shared or withheld?" How is responsibility assigned?"

e) artifacts [actors]- "What is the association between artifacts and personal identity? "How is the dilemma of ownership or privilege resolved or balanced?"

C.5. Feature

[X] Building relationships connects different propositions and their associations to fortify a frame. The X or joined v's within the frame notation ([X]) indicates a structure maintaining the coherence of a set of propositions. Proposing a syntactic feature assigns a 'relative logic' to the frame- ensuring the set does not contain contradictory propositions. Increasing the accuracy of the feature occurs by analyzing an actor's agenda and seeking attributes through the above questions. Features directly influence attributes, so the attributes and their propositions are the primary source of syntactical insight.

The feature is the purpose to be fulfilled: a featured role, what the actor most commonly associates the entity with, or simply a frame of reference. The feature is the potential domain of application or purpose it can serve as informed by the priorities one has. For example, a wall seen from by architect may be a paradigmatic example of penetration. A contractor may be metonymic- focusing on the cost and time attributes over aesthetics. The feature is the primary purpose to be fulfilled by the frame, the role it has been chosen to play. This is a decision chosen based on the actors predilections which

influences or inherits potential applications. The architect, by defining the wall with a paradigmatic example, will influence what attributes he seeks to fulfill his frame.

The attributes of the frame can be seen as the criteria fulfilling a featured role; detailing how to fulfill the priority or meet the conditions set out by the frame of reference. Thus, they are predefined by the feature. For example, a 'wall' with a construction feature implies certain attributes- materials, costs, placement in the construction plan, coordination with plumbing. If a client sees the primary feature as reducing privacy, he will by looking for attributes related to size, location in room, height in wall, exterior entities, and covering. The architect, focusing on natural light, will seek attributes of orientation, location in room, height in wall, and glass frame. For a wall to fulfill its spatial feature or role, it must allow for visibility, separation, enclosure.

Raising the frame to the surface is an essential step in making the frame and its internal relationships explicit. The underlying syntactic structure not only holds the frame together, it also contains the possibility for understanding the actual syntactic structure in use. Referring to one word enables frame holders to evaluate in their own terms if it is an accurate description of the implicit relationship defining the frame. By applying a label the inhabitant can raise awareness of how a frame influences behavior and thought.

C.6. LABELS

■ Assigning labels attaches a linguistic or graphic reference to identify a propostional set. The blackened frame notation (■) indicates a label implicitly referring to a propostional set. Its implicit nature enables the frame contents to remain hidden, until a situation warrants unpacking.

The label is the name given to the item from the empirical world, categorizing and placing it into a known or agreed upon group of propositions. Since an entity in the physical world requires naming, the architect seeks values which seem to correspond to a label. The existence of an entity in terms of the values it contains [a four cornered entity with height, constructed with drywall] in turn indicates the label ' wall.'

Labels as symbols are of particular interest in architectural interventions. Graphic labels provide an easy way to encode issues that lend themselves to architectural elements or spatial arrangements. Gradually, such symbols can encapsulate an architectural parti. Graphic labels can also be gradually replaced with, or supplemented by, linguistic labels. For example, a visual dictionary might develop both linguistic and graphic descriptions to ensure intersubjective understanding for both the organization and the architect. The resulting document can reference the new language introduced into the organizational culture, in addition to providing the organization with an outline of the intervention, enabling evaluation and post-intervention performance.

In both cases, the activity of assigning labels to define a 'FormLanguage' creates a new role for an architect. Similar to a lexicographer, the architect figuratively 'builds' community by constructing a shared language. Compiling an organization's lexicon requires determining values, clarifying propositions, building relationships- the fundamentals dimensions of frames. Such a special vocabulary is critical to imbuing the form emerging from design activity with the shared meaning necessary to establish an intersubjective language.

DESIGN SHIFTS

Exposing frames and cultivating a 'FormLanguage' requires sensitivity to 'design shifts.' By drawing upon the labels, attributes, and values of related frames, the ebb and flow of design activity reveals the attributes and values of frames in action. The design shift for Porter is subtle, yet significant: "Move a line or a corner just a bit, and the whole design no longer seems to reflect the more general set of ideas being pursued." This change in ideas indicates a shift; the direction of the change indicates an attribute guiding a frame.

Design shifts are varied: The inevitable inadequacy of frames incurs surprise, when what we expect does not occur. To facilitate comprehension, the mind indexes existing information-routinely invoking and applying attributes of related frames to situations. However, usually inconsistencies do not even emerge since preexisting expectations confirm meaningful information while disregarding others to legitimize a selected frame. All these shifts are in an effort to avoid frame failure- the most extreme design shift- which exposes frame contents through frame conflict. Ideally, this extreme provokes the potency of the design shift- a mechanism to stimulate the frame restructuring necessary to learn.

D. Design Shifts[1]

D.1. Inadequacy

D.1.1. Surprise

Frames in mind cannot be completely accurate or predict all the nuances of a situation, hence they inevitably fail. This can be seen as a surprise, when what we expect does not occur. When surprise occurs, we try to understand what was surprising in comparison to what was expected. Within the built environment, patterns of internal coherence established by the building set up expectations that "....act as the frame to make sense of aspects of the building that violate them."[2] The notion of surprise plays a role in Roberta's design agenda: "I think it's wonderful to find surprises in buildings; that as you move in, not everything is known. You find something as you move along."

D.1.2. Anomaly

When surprise cannot be accounted for, a discrepancy emerges between what is known or expected and the appreciation one has of a situation. This provides the ground for anomalies— observations counter to the predictions of the current paradigm or inconsistencies discovered within the paradigm.[3] The existence of anomalies is dependent on familiarity with the situation- determine what is wrong with a situation requires knowing what is the right situation. Knowing what is right comes from preexisting frames. Although some expectations will cause us to overlook anomalies or 'read in' explanations to maintain coherence of the frame, Scheffler argues that anomalies deny a frame blindness (a phenomena Kuhn describes pejoratively as 'normal science'). In fact, it is preexisting systems, their inherent anomalies, and search to understand an anomaly's source that underlies routine cognition.[4]

D.1.3. Questions

By admitting or acknowledging that certain aspect of existing information are insufficient to account for the nuances of a situation, the perceiver takes the first step to further exploring the situation at hand and their existing knowledge.[5] One productive way to address expectations that do not adequately address a new situation is through a question. Formulating a good question depends on identifying what is familiar- as a way of identifying what is unfamiliar. By acknowledging weaknesses in existing knowledge, desired information is defined, as well as how to acquire it.

The potency of questions lies in updating expectations. Ideally, the question raised eventually provides insights that modify expectations, or create new expectations. The question also enables the

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[1] William L. Porter describes this phenomena in: "Notes on the inner logic of designing: Two thought-experiments" *Design Studies* 9/3 (1988): 176. Also see J.R. Anderson and J. Pichert, Recall of previously unrecallable information following a shift in perspective. *Journal of Verbal Learning and Verbal Behavior* 17(1978):1-12.

[2] Porter "Notes on the inner..." p. 178.

[3] We may substitute Kuhn's term 'paradigm' with 'frame' to understand his notion of anomalies. Paradigm shifts occur when:
1) when the new paradigm can solve the problems that have led the old paradigm to a crisis
2) new paradigm displays a quantitative precision better than the old paradigm
3) predicts new phenomena that had been unsuspected while the old paradigm prevailed
4) appeals to the individual's sense of what is aesthetically appropriate– the new paradigm is neater, more suitable, or simpler
5) the decision is based less on past achievement that on future promise– it is a decision based on faith
    see Kuhn, Thomas S.. *The Structure of Scientific Revolutions*, 2nd ed., Chicago: University of Chicago Press, 1962, 1970)

[4] Scheffler raises a number of difficulties inherent to Kuhn's model of paradigms. Anomalies are common since schemata (or frames) obviously cannot account for everything. Therefore, built into filtered observations are observations that fall outside the boundaries. Kuhn addresses this event as the impetus to creating new paradigms, but it is a self-fulfilling system. Obviously anomalies will occur, and so a new paradigm will be formed to respond to them, in which more anomalies will happen, and a new paradigm will be formed to address them, and so on, and so on. In short, the notion of the shift is more commonplace than Kuhn would have us believe. *see* I. Scheffler, *Science and Subjectivity*. (Indianapolis: Bobbs-Merill, 1967). For a detailed critique of Kuhn's position, see Steven Weinberg, "The revolution that didn't happen." *The New York Review of Books* 8 October (1998): 48-52.

[5] Roger Schank writes: "one important way we learn is by realizing that we had the wrong frame in mind." R. Schank, *The Connoisseur's Guide to the Mind*. (New York: Summit Books, 1991). p. 52.

perceiver to unlearn an expectation, a much more difficult task than to learn it.[6] Finally, as new information is acquired, an active mind will always develop more profound questions as new anomalies are revealed. The question in the positive sense is to either realize a discrepancy exists or a necessary piece of information is missing. Questions in the negative sense are rhetorical, used as an excuse to supply a ready made answer. This latter sense is all too common in shifts to avoid contradiction.

D.2. INDEXING

D.2.1. Noticing

Inadequacy is initiated by 'noticing' inconsistent patterns of behavior. In the process of comparing a new situation to our expectations, we notice the differences between what is expected and what the perceiver confronts.[7] Noticing implies characteristics potentially overlooked by someone else due to what preexists in the mind. While recognition is explicitly looking for something, noticing is about unintentional finding. Noticing highlights the unique aspects of experience that do not conform to the expectations which would make them seem ordinary. In other cases, consistent patterns are noticed, but disregarded or 'taken for granted' if not deemed to violate our expectations. Discovery and insight, although seemingly unstructured, involves noticing by recognizing relationships between certain elements and tacit knowledge.[8]

D.2.2. Appreciation

Noticing is related to Porter's concept of appreciation- the dialogue between a priori knowledge and what is noticed. Appreciation is exemplified in architectural design, of the site and of the program. Appreciation of the site involves an interaction between the place and what the designer brings to it. Appreciation of the program links site to mind: "We look for the unique aspects of the place that require the introduction of ideas drawn from an architectural inventory in order to qualify how aspects of the place are read."[9] These aspects are inserted into a design, or at least act as critical points to the design. In Porter's design protocol, the designer notices that an entrance is not used in relation to an expectation of its use. In another example, the designer notices movement on the site, based on the implicit logic of paths to reveal where and why movment occurs.[10]

D.2.3. Reminding

Noticing and appreciating reflects the operation of reminding: attributes from the design situation recall similar attributes already in mind. The retrieval process, called indexing, reveals tacit knowledge by the knowledge contained within a frame- labels, attributes, or values- that causes and sustains a design shift. For example, Roberta is reminded of a Richardson library by the protrusion adjacent to entry 3: "It's a piece that comes out, so it reminds me more of Richardson libraries where you have...a stair...somehow marks the entry. In Richardson's case, it's a flat facade which curls out." The design shift reveals an entry attribute- the need for demarcation.

In seeking a relevant frame to assist in making sense of the situation, indexing can cause memory confusion by recalling unrelated information. Failure commonly occurs when indexed frames are based solely an attribute and are weak for all others. This typically occurs when quick judgments are made based on one attribute rather than taking the time to determine all the details of a situation. In the case of the Richardson library, Roberta quickly concludes that the information retrieved is not completely relevant to her design situation and she is able to move beyond it.

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[6] ibid.

[7] David Perkins, *The Mind's Best Work* (Cambridge, MA: Harvard University Press, 1981).

[8] Porter, "Notes on the Inner Logic ... " pp. 171.

[9] ibid., p. 173.

[10] Porter, "Notes on the Inner Logic ... " pp. 171-174.

D.3. INVOKING

D.3.1. Assumption

Related to indexing is invoking preexisting expectations– assumptions assumed to be appropriate to facilitate understanding. Although this natural reaction enables us to react speedily, assumptions limit question generation.[11] When expectation is conflated with explanation, no question emerges. In the beginning of her design activity, Roberta assumes the library stands alone on the site, that the entry should be formal, and that the location is in New England. Her lack of questions reveal professional as well as personal knowledge- emerging in light of her inability to account for all the relevant aspects of the problem that require her to invoke preexisting knowledge.

D.3.2. Inference

Assumptions emerge from noticing aspects of a situation that support inferences. Inferences infuse meaning to events by supplying expectations. Negative inference conversely defines what something is not, in comparison to what is known. Inference deploys experience even in situations when it is not relevant. Although both are highly risky processes, wrong as often as right "... it is the basic process upon which we all rely to make sense of the world."[12] Errors are unfortunately common when inferences are made from inappropriate sources. In social settings, false inferences are recognized by the reaction of others. In individual thought, they can corrupt a line of thinking and action if not identified early.

D.3.3. Inheritance

To facilitate comprehension, not only do we infer from preexisting knowledge, we inherit from the situation itself. For example, the formulation of goals are commonly a function of preexisting attributes in the situation or past interaction with the situation. Both act to limit and define what is relevant or feasible. In many cases, to understand a person's behavior, or why a person did something, we work backwards from the situation as it presents itself to us, inferring reason from action. In this way comprehension inherits a static situation- seeking comprehension by reconstructing rational by moving backwards. Reconstruction through inheritance commonly leads to misunderstanding behavior since perceivers are never privy to all the beliefs, events, or needs that underlie action. Further, since other's actions are commonly not what we would have done, personal assessment commonly incurs failure.

D.4. APPLYING

D.4.1. Association

Invoking knowledge accesses information within a frame system- a collections of related frames linked together through labels, attributes, and values.[13] Associations tap into these systems by indexing a key attribute residing in the situation. Such activity reveals the contents of frames by accessing knowledge through similarity or within levels of hierarchy, referred to as 'span' by Simon.[14] Associations enables access to expectations embedded within hierarchies of knowledge; looking upward towards generality and downward towards specificity. For example, professional systems of knowledge provide information about functional elements in terms of location, hierarchy, and material: Columns rest on concrete piers, connecting to foundation walls; they connect to lintels and support roofs.[15]

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[11] Adults, through their wealth of experience, commonly supply an answer to an anomaly without letting a question develop. If possible, assumptions should be held in escrow until a question is formulated. Another option is to use them to initiate exploration.

[12] R. Schank, *The Connoisseur's Guide ...*

[13] Marvin Minsky, "A Framework for Representing Knowledge," in *The Psychology of Computer Vision* ed. Patrick Winston (New York: McGraw-Hill, 1975), pp. 211-277.

[14] For a full description, see the section of the hierarchy of complexity and systems, pages 186- 216 in Herbert Simon, *The Sciences of the Artificial 3rd. edition* (Cambridge, MA: MIT Press, 1996).

[15] N. John Habraken's "Type as Social Agreement: A Paper presented at the Asian Congress of Architects, Seoul 1988.

D.4.2. Mapping

Entering into any network of connections between entities and attributes depends on mapping-the existence of similarity between the source frame and the target to conversely support similarity between concepts and objects.[16] Direct one-to-one mapping succeeds if every element in the source (object, attribute or relations) correspond to a unique element in the target. One pair of objects considered in isolation and are likened on the basis of a mapped similarity between the attributers relevant to each object. When one-to-one mapping and structural consistency are met, total mapping is achieved.[17] Such 'isomorphisms' provide complete understanding but limit the opportunity for creative leaps.[18]

D.4.3. Analogy

Analogies are powerful ways to understand how thinking connects current situations to previous knowledge.[19] The ability to "... see analogies has much in common with the capacity to form and use concepts that represent categories of objects, events, and situations."[20] The essential requirement for analogical thinking is the ability to look at specific situations and discern specific attributes or abstract patterns that may also be found in superficially different situations.[21] For example, Roberta draws upon the notion of 'caves' to supplement her design understanding with a certain light quality and a kind of materials which generates a sort of echoing recess. This analogy describes the character of the place in a way meaningful to both her own knowledge and the proctor as well.

D.5. CONFORMATION

D.5.1. Confirmation

The search for related frames, is a natural tendency of "... reasoning and understanding, whose main business... is maintaining coherent and consistent frames of reference ...."[22] Unlike applying prior information, confirmation explains by imposing existing knowledge isomorphically to new situations. As choices accumulate over time, knowledge clusters become epistemological commitments, making new acquisitions subservient to preexisting expectations.[23] Roberta's prejudice against the diagonal is

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[16] Semantic networks are characterized by are ideas, concepts, and objects referred to by labels. Connections represent interrelationships. Also called 'associative structures' in J. Anderson, *Cognitive Psychology...* pp. 129-133

Propositional networks map out possible associations between entities and attributes or values based on connections that are proposed to be valid, rather than mere semantic associations. *see* in John R. Anderson, *Cognitive Psychology and Its Implications* 3rd ed. (New York: W.H. Freeman and Co., 1990).

Connectionist networks, where processing devices (often called units, nodes, or artificial neurons) correspond to simplified neurons and the communication channels (often called connections or links) corresponding to simplified synapses. The nodes within the connectionist network have an activation level-a number (usually either between 0 and 1, or between -1 and +1 . This varies as the node becomes more or less active and paths between nodes represent either excitatory or inhibitory relations.

Parallel distributed processing [PDP's] claim a variety of cognitive engines run concurrently. This position is an attempt to integrate the different modes of representations and organization. *see* J. McClelland, D. Rumelhart and G. Hinton "The Appeal of Parallel Distributed Processing," in *Parallel Distributed Processing: Explorations in the Microstructure of Cognition* vol. 1 eds. J. McClelland and D. Rumelhart (Cambridge, MA: MIT Press, 1986).

[17] This is also called relational mapping: a mapping of two pairs of fillers based on similarity between a pair of relations.

[18] "...A mind [must be] able to use attribute, relational, and system mappings to form analogical inferences by substituting as well as copying..." K. J. Holyoak and P. Thagard, *Mental Leaps: Analogy in creative thought* (MIT Press: Cambridge, MA, 1995). p. 31.

[19] Analogy = source->target, where the source is prior knowledge and the target is the situation. *see* K Holyoak, *Mental..*

[20] ibid., p. 20.

[21] These are first-order relations, either semantic correlation (i.e. same word) or semantic simplicity (the concept of chase is straightforward, requiring 2 parties). Proportional mapping, on the other hand, is mapping of size (or, relational mapping based on size). Higher-order relations occur with more abstract concepts. The critical step in the mobilization of an analogy is the failure to solve a problem. Failure triggers the search for an analogous problem to which the solution is known- a procedure that depends on finding existing links from the concepts active in the unsolved problem to those in another domain. Holyoak, *Mental*

[22] David Perkins, *The Mind's Best Work ...* p. 99.

[23] Minsky, "A Framework....

enlightening since it cause her to articulate an attribute of her entrance frame: "I think entries need to be more transition...Even in formal buildings, the entrance should be transitional." Confirmation reinforces an existing frame's centrality: Roberta's entry *must* be orthogonal in light of the diagonal.

D.5.2. Denial

Epistemological commitments lead us to compress or ignore differences by elevating situational aspects for immediate legibility. Although we may be sensitive to unique events, the natural tendency is to deny them so they do not seem odd- repressing the subtlety and uniqueness of experience. When two experiences match on many points, yet fail on others, we typically eliminate the differences and concentrate on the similarities. In this way the details are either ignored or minimized to avoid frame revision. Since understanding means fitting the current situation into familiar expectations, this process inherently cuts potentially relevant details out of the process to fit existing knowledge. For example, Roberta ignores the design parameter of one-story when applying her knowledge of Richardson libraries. In the process she solves the frame she has created rather than revising the frame itself. The result in the design is a two-story library. Such action demonstrates how minimizing and conformation inhibit an explicit attempt to define what is unique about the event.

D.5.3. Excuse

Excuse is a design shift indicating avoidance of a cognitively complex situation. An excuse can be seen an apparent misfit- excused or explained due to a technical difficulty inhibiting conformity. The functional nature of objects leads to excuses regarding broken or missing attributes. Rather than fluid design activity, excuse commonly incurs a massive design shift. For example, Roberta stops her design activity due to a technical difficulty:

> R: "I can see something happening here.. so I have a special kind of view ....I tend to do most of my design work, , in hardline, I almost always sit down with a parallel rule pretty quickly to work out my dimensions."
> M: "Maybe that should be the cue for when to go on to the next problem, ..."
> R: "OK. I was actually going to suggest that, too."

Similar to excuses are embarrassment, apology, impromptu meetings, jokes, insults— all manifestations of the lurching for other frames to compensate for the failure of our expectations.[24]

D.6. Failure

D.6.1. Dilemma

Excuses are commonly invoked to avoid failures caused by dilemmas, conflict, and crisis. Dilemma refers to the existence of two equally legitimate and relevant frames. As Schön demonstrates, , the existence of competing frames do not necessarily lead to disagreement about the facts; they simply turn attention to *different* facts.[25] Without some notion objectivity, people naturally respond to dilemmas "...by a kind of surgery... leaving out of account values which in an earlier formulation entered into conflict."[26] Ideally, the ability to legitimize two distinct frames relies on a commitment not to either frame, but to seeking a robust understanding of the multitudinal nature of the situation at hand.

D.6.2. Conflict

Conflict emerges when two actors hold seemingly contradictory frames, and are commitment to their positions. Schön argues that parties involved in controversy and conflict see situations in different and conflicting ways since framing embodies "...different systems of belief and related prescriptions for action..."[27] Within individual design activity, conflicts emerge between the situation at hand and the

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[24]R. Schank, *The Connoisseur's Guide ...*

[25] Donald A. Schön, "Generative Metaphor: A Perspective on Problem Setting in Social Policy." in *Metaphor and Thought*, ed. Andrew Ortony, (Cambridge: Cambridge University Press, 1978): 255-283. *see page 269 for quote on different facts.*

[26] ibid., p. 275.

[27] ibid.,

designers appreciation of it. Within collaborative design, conflict routinely occurs between opposing frames held by design participants.

D.6.3. Crisis

The height of conflict is crisis-the massive failure of an existing frame. Only when something clashes with a frame, causing a knowledge rupture, will the mind to shift out of a frame.[28] Confrontation with a situation which runs counter to preexisting frames requires the complete rebuilding of a frame or the creation of a synthetic frame invention. This is the height of the design shift- seeking frame crisis to spark frame restructuring through learning. Schön contends the advantage of seeking frame awareness is to come into sharper and more explicit confrontation with frame conflict.[29] As adversaries become aware of the frames deployed for sense-making and the underlying cultural metaphors sustaining frames, ideally conflicts and crises will dissipate in light of the different features of reality. Although crisis is extreme, containing indeterminable consequences and repercussions, it acts to emphasize the significance and potential of the design shifts– articulation of frame contents– and the potential for frame restructuring– learning. As Schön writes: "...when controversies are situated in messy and politically contentious policy arenas, they may actually lend themselves...to pragmatic resolution."[30]

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[28] R. Schank, *The Connoisseur's Guide ...*

[29] ibid., p. 186.

[30] "The effect of constructing hybrid frames that more adequately reflect the full reality of a problematic situation may be to bring fundamental dilemmas-conflicts of abiding truths-to the surface Donald Schön and Martin Rein *Frame Reflection* (New York: BasicBooks, 1994). pxviii

WORK PLACE

Architectural design is a potent form of change management: It offers insights into organizational culture and develops levers for change. Through the collaborative design of an organization's physical environment, participants acquire the skills necessary to develop a community characterized by reflection, learning, and coordination. Aligning the spatial environment of workplaces around reorganization strategies is a significant business opportunity. To exploit this untapped market, I propose to deploy the organizational potentials of architectural design in a project called 'WorkPlace.' WorkPlace will interact with change management consultants with a methodology called 'spatial re-engineering'– the re-design of office environments to support and achieve organizational objectives established via an internal re-organization initiative. Documented cases of spatial re-engineering projects have generated impressive results and clearly increased the impact felt by the client vs. re-organization projects alone: A nearly closed division of a Boston bank underwent a managerial and physical restructuring that yielded a savings of $9 million per year. In another case, a new floor design reversed the trend of inefficiency and dissatisfaction in hospitals by lowering nurse turnover by 65% and absenteeism by 37%. By combining the practices and techniques of spatial re-engineering with a change management case, WorkPlace leverages the spatial dimensions of managerial change to improve the accuracy and implementation of a consultant's intervention. Simultaneously, WorkPlace provides an architecture firm robust design schematics and a fertile ground for architectural execution.

E . WORKPLACE

E.1. OVERVIEW

Architectural design is a potent form of change management. It offers insights into organizational culture and develops levers for change. Through the collaborative design of an organization's physical environment, participants acquire the skills necessary to develop a community characterized by reflecting, learning, and coordinating. Additionally, not addressing the spatial dimensions of companies hinders the successful implementation of organizational change:

♦Team development is difficult when employees remain in cubicals or are remote from each other

♦A decentralized organization is untenable if managers remain physically isolated from employees

♦Rapid response to market dynamics is hindered by inter-managerial spatial disputes

♦Institutional memory inhibits change management when the environment remains unchanged

Architects traditionally come upon the opportunity to provide spatial consulting services, however they lack the managerial expertise to effectively perform the organization-related portion of the work. Even architects concentrating on spatial programming, the generation of information to inform spatial decisions, do not have the mandate to utilize the information gathered as an opportunity to supplement managerial change with spatial insights. In both cases, responding to the spatial opportunity because architects lack the necessary skill and knowledge set.

A new area for architectural growth is the collaboration with change management firms. Currently, no consulting firm offers spatial consultancy services to enhance work practice, thus a new market for architects exists. By offering defined methodologies and tools necessary to successfully exploit the critical relationship between workpractice and workplace, an architecture firm can collaborate with change management consultants to leverage this new market.

"Spatial re-engineering" is the term I have coined to describe the methodology and tools required to infuse change management with a spatial agenda. It offers architects a methodology and tools to leverage spatial change by identifing and modifing work practice and organizational culture. For managerial consulting firms, spatial re-engineering is a natural "add-on" opportunity for additional services. It can be performed during or after client re-organization. It also supports the physical recommendations of strategic planning (such as new offices, boutiques, or hotels).

E.2. OBJECTIVES

To realize the potentials of spatial consultancy, I propose to establish a team named "WorkPlace" within an architecture or consulting firm. WorkPlace will exploit the relationship between:

Work– the activities of an organization
and
Place–the physical environment where these activities occur

WorkPlace provides an architecture or consulting firm with a commercial package to deploy spatial re-engineering into this new market. As a natural add-on to change management cases, WorkPlace can achieve high performance levels for clients. For the firm itself, it can unlock new streams of profit growth and establish competitive advantage.

➤*Increase client satisfaction by improving efficiency of change management projects:*

♦Provide insights into tacit organizational behavior via physical manifestations of work practice

♦Develop innovative interiors that capitalize on recommended organizational change

♦Implement and reinforce consulting recommendations via physical work environment qualities

♦Increase project 'return on investment' (ROI) for clients

♦Maintain business through a collaborative design process with key decision makers

≻*Create and dominate a new market segment:*
- ◆Increase earnings by adding on spatial services to traditional change management cases
- ◆Broaden the range of services offered acts to attract new clients
- ◆Open opportunities for additional consulting work through cases initiated by WorkPlace
- ◆Product-ize process for rapid global rollout
- ◆Dominate segment by leveraging rare skill set and close links to concept-inventing institution
- ◆Utilize office renovations to open opportunities for change management

≻*Establish competitive advantage for a firm via a compelling and unique offering:*
- ◆Develop the first intervention to address the impact of spatial arrangements on work practice
- ◆Enhance the firm's image of complete and effective services
- ◆Capitalize on scarceness of skill asset
- ◆Support other firm practices by casting 'innovation leader' shadow across business

E.3. METHODOLOGY

E.3.1. Phase I: Fact Base Formulation

≻*Leverage learning and processes of change management project to structure intervention:*
- ◆Integrate WorkPlace activities into change management methodology
- ◆Leverage existing client data to assist WorkPlace fact base formulation
- ◆Determine information deficiencies required by WorkPlace and include in project data gathering
- ◆Define key re-organization initiatives which may be optimized by spatial re-engineering support
- ◆Profile the existing physical situation of the client will consist of Infuse surveys utilized by the change management team with questions aligned to WorkPlace data needs
- ◆Assess current office layout by updating existing architectural drawings
- ◆Analyze spatial usage and current allocation through video tapes and work observation
- ◆Identify key environments for work and spatially driven problems areas to be addressed

≻*Engage the primary client managers in a collaborative analysis to determine the fundamental issues of their work environment using proprietary tools:*
- ◆Spatial Politics: Client interviews and meetings will determine the key issues regarding spatial allocation, current usage, and underlying tensions influencing both
- ◆Guided Tours: A tour of the workplace with key personnel
- ◆Anthropologist: Managers and employees document spaces by using disposable cameras
- ◆Sketchbooks: A collective analysis of existing workplace utilizing images taken during anthropologist session
- ◆Design Games: The custom design and play of games raises underlying issues of work practice to the surface for discussion and modification
- ◆Families: Map of the hierarchies, relationships, and tacit work cultures found in the workplace
- ◆Community Board: An intranet site will be developed to provide the opportunity for client input
- ◆Video: Create a video describing the work environment and use as point of departure for discussions

≻*Define key opportunities for improvement in working environment across multiple metrics:*
- ◆Internal corporate image to promote and encourage desired company culture

◆Employee work satisfaction

◆Worker fatigue

◆Level of team work

◆Efficiency of team work

◆Efficiency of spatial usage.

➢*Communicate findings of Phase I to client for defining the mandate for spatial modification:*
   ◆Analyze the impact of findings on the case direction
   ◆Present insights to clients using comprehensive, fact-based multi-media presentation
   ◆Update Intranet site to include latest findings of WorkPlace
   ◆Achieve consensus on primary opportunities

E.3.2. Phase II: Collaboration towards Consensus

➢*Engage the primary client managers in collaborative design utilizing advanced, proprietary tools:*
   ◆Utopia: Managers generate new thoughts by creating their ideal workspace in cyberspace
   ◆WorkBench: A 3D computer generated model to facilitate collaborative design of interiors
   ◆Perspectives: 3D computer and hand drawings to illustrate the physical implications of decisions
   ◆Virtual Design: The intranet site will enable input from participants to the emerging design
   ◆LiveBoard: Collective and simultaneous design of space by exploring critical issues via remote synchronic communication with a LiveBoard
   ◆Co-Design: WorkPlace consultants will simultaneously draw with groups as they explore new spatial ideas to refine propositions and display the implications of new ideas

➢*Gain support and approval for new office interiors deploying a variety of representation tools:*
   ◆Animation: 3D computer animation will be created to present the overall scheme
   ◆Perspectives: 3D computer drawings will display the physical implications of critical decisions
   ◆Walk-Through: 3D computer models will be explored on personal computers
   ◆Virtual Reality: 3D computer models will be explored dynamically with latest VR technology
   ◆Mock-Ups: Full scale models of key areas allowing for experience of proposals
   ◆Visualization: Display of interior furnishings and lighting studies via computer images
   ◆Axonemetrics: 3D drawings of new plans including new furniture layouts
   ◆Video: Create a video summarizing the experiences of the co-design process

E.3.3. Phase III: Recommendations

➢*Develop recommendations for spatial redesign of client office space which supports change management strategy*
   ◆Formulate specific spaces for specific work activities
   ◆Explain the organizational practices supported by the proposed physical changes
   ◆Outline these intersections in a document submitted to clients
   ◆Recommend methods for continued improvement of practice

➢*Formulate recommendations for interior furnishings*
   ◆Include furniture, lighting, color, material, and surface treatments

♦Outsource selected work where appropriate

♦Submit to clients examples of recommendations

♦Recommend ways to leverage new physical environment for improving client's corporate image

➤*Support client in converting plans into physical reality*

♦Select architect, interior designer, and contractor for client

♦Assume the role of client spokesperson in relationship with architects

♦Maintain close coordination between architects and consultants to ensure implementation accuracy

♦Improve WorkPlace management through intelligent outsourcing

♦Create alliances with architects and contractors for increasingly efficient implementation

E.4. DELIVERABLES

E.4.1. Phase I: Fact Base Formulation

➤*Present critical issues guiding the WorkPlace intervention, including*

♦Drawings of existing physical layout, highlighting location of furniture, equipment and key spatial areas Work practice

♦Assessment of key client managers, their inter-relationships, the impact on spatial allocation and potential problems for spatial re-engineering

♦Assessment of future spatial needs as recommended by change management team

➤*Profile current spatial usage and needs, including:*

♦Work Processes- map of the work activities and their interrelationships

♦Circulation- map of the internal movement of a client's employees as related to work tasks

♦Furniture Analysis- furniture se and position to understand work configuration and practice

♦Interior Analysis- location of staff, services, and zones (public, private and access)

♦Patterns- articulation of the primary events occurring within the workplace

➤*Introduce multi-media tools*

♦Present video of the work environment and its impact on work practice

♦Demonstrate Internet site to update clients and enable access for input to the project

E.4.2. Phase II: Collaboration towards Consensus

➤*Document summarizing the results of Phase I*

♦Present consensus of specific areas to undergo spatial re-engineering

♦Outline impact on departments

♦Recommend strategies to re-align spatial conflicts

➤*Increase intranet role as a vehicle for WorkPlace-Client interaction and consensus building by providing on-line access to:*

♦Images of critical areas of space

♦Video Clips from co-design sessions

♦Results of collaborative design interventions

♦"Community Board" for continual client discussion and feedback

♦Animation of proposed spaces

➤*Present issues regarding workpractice and workplace:*

◆Present synthesis of Phase I findings and Phase II results.

◆Demonstrate translation of critical spatial issues into physical changes

◆Profile managerial directions and the resultant spaces

◆Define new work practices and the spaces that support them

➤*Images to illustrate new spaces:*

◆Schematic computer generated plans

◆Computer generated animation of new interiors

◆Artistic quality computer rendered perspectives of key areas

◆Virtual Reality immersive environment of new interiors

◆3D computer models for dynamic viewing

E.4.3. Phase III: Recommendations

➤*Organizational Recommendations*

◆Document exposing practice and organizational implications of spatial recommendations

◆Places for innovative thinking

◆Rooms to encourage feedback and reflection

◆Meeting centers that promote open communication

◆Relaxation centers or areas

◆Uniquely designed rooms for unique purposes

➤*Interiors Recommendations*

◆Detailed interiors for pleasant working atmosphere

◆Recommended changes for interior partitions

◆Recommended new furniture layout

◆Lighting and spatial analysis

◆Floor, ceiling, and wall treatments

➤*Furnishing Recommendations:*

◆Furniture to represent and project company ideals

◆Chairs and desks to support work practices such as "hot-desking" or rapid change

◆Custom designed pieces such as sculptures, fountains, or plants

◆Lighting fixtures that complement and contribute to positive working atmosphere

➤*Technology Recommendations*

◆Recommendations for equipment such as LiveBoards, video projectors, or tele-conferencing systems

◆Detailed analysis of technology's relationship to new organizational practices

➤*Promotional Recommendations*

◆Recommendations for using new physical image of company for marketing

◆Insights into how changes give the company a competitive advantage

◆Access to all images created during the WorkPlace interventions for marketing purposes

◆Recommendations for using images as promotion

E.5. Implementation
The WorkPlace team will consist of three people, performing 2 simultaneous cases . The staff will be deployed primarily on a rotational basis according to the case Phase, thus enabling concurrent projects:

➢*Manager*
- ◆Sell WorkPlace services as add-ons to change management case
- ◆Participate in change management case team
- ◆Provide expertise on spatial dimensions of workpractice
- ◆Organize WorkPlace intervention
- ◆Manage WorkPlace case and formulate recommendations
- ◆Interact with client, performing key activities such as interviews and co-design

➢*Spatial Analyst: Phase I*
- ◆Analyze data from client fact base, survey, secondary research
- ◆Collect existing spatial information of client
- ◆Research current spatial situation of client
- ◆Arrange interviews with key client managers
- ◆Codify questions to be included on survey and analyze results
- ◆Assist in documenting the collaborative analysis of spatial issues with clients
- ◆Convert raw data to useful knowledge

➢*Interactive Designer Phase II*
- ◆Establish WWW site for the case
- ◆Update site with latest information
- ◆Produce CAD drawings
- ◆Analyze directions and key issues emerging from the "Community Board"
- ◆Oversee all computational based client interaction
- ◆Manage outsourced computational media

➢*Spatial Analyst: Phase III*
- ◆Formulate recommendations for interior furnishings
- ◆Provide expertise on surface treatments
- ◆Manage all outsourced interior recommendations
- ◆Assist manager in spatial dimensions of work practice
- ◆Research architect and contractor for client

E.5.2. Proposed Project Timeline.
The recommended duration of WorkPlace cases is as follows, but is dependent on:

> Phase I: Fact Base Formulation, 4 Weeks.
>
> Phase II: Collaboration towards Consensus 6 Weeks.
>
> Phase III: Recommendations 4 Weeks minimum [extended based on project scope]

E.6. Integration

E.6.1. Clients

Through collaborative design, the spatial consultant seeks to improve organizational culture. Interaction with clients is the primary method of operation. Not only is this essential to encourage clients to shape their own workplace, but gain insights into their relationships. In addition to frame development, the cultivation process must be guided by the following objectives:

➢*Direct natural individualism to:*

◆Develop multiple roles that establish general competencies

◆Encourage self-motivated education and personal growth

◆Establish clear goals for individual accountability

➢*Educate team leaders to*

◆Employ enlightened managerial practices within teams

◆Remove obstacles inhibiting teamwork

◆Maintain relationships with customers

◆Increase research and its integration into design

➢*Develop teams that:*

◆Co-construct common purpose

◆Develop an explicit working approach

◆Jointly define goals

➢*Establish a performance ethic that:*

◆Encourages innovation

◆Emphasizes quality

◆Maintains cost sensitivities

◆Provides discussion security

➢*Encourage teams to:*

◆Practice mutual support

◆Establish joint accountability

◆Maintain open communication

E.6.2. Change Management Consultants

Efficent interface with change managmeent consultants is critical. Work allocation should be jointly determined to define responsibilities for each activity. These areas should be defined at the beginning of collaboration to clearly define respective responsibilities. In general, when an activity or intervention is primarily architectural, such as in the beginning of a project or in the presentation of spatial issues/recommendations, WorkPlace would lead the activity. When the consultant feels an activity does not require a WorkPlace presence, or is not at all related to the work environment, clearly the consultant will lead.

Broadly, during the early phases, interaction can be "behind the scenes," infusing the consultant project with spatial insights and issues. During collaborative design, a joint effort would be beneficial. The latter stages can revert back to "behind the scenes," to generate events, conferences, programs etc. that acknowledge and leverage the work environment.

The first phase- an overview of the project to initiate collaboration and define responsibilities. This provides the opportunity for WorkPlace to become familiar with the case, define areas within the consultant project methodology that should incorporate work environment issues, and determine the scope for spatial re-engineering.

In the second phase, WorkPlace would embark on understanding the client's work environment through analytical techniques (such as patterns and defining spatial metrics). Using the methodology of *Kinsley Lord* consultants as an example, this data would contribute to their preliminary phases such as "Diagnose and Evaluate," and "Assess Performance." In addition, collaborative inquiry techniques such as 'sketchbooks' and ideal work environment drawings would encourage "Unfreezing and Visioning" and to "Mobilize" the client for change.

The third phase will consist of collaborative design with the clients. WorkPlace and the consultant would now work together in the formulation of techniques and their implementation- combining the past solo efforts by bringing together the workplace and workpractice. These activities would enhance the consultant phases of "Realize," and "Planning and Making Connections." The final phase will also define how to synthesize the changes in the workplace and the changes in workpractice. This will include providing schematic architectural drawings, explanations of what workpractices will be supported by the new work environment, and initiating the implementation of recommended changes. WorkPlace will coordinate this and other deliverables to complement the consultant's stages of "Sustaining Connections" and developing the "Design Change Programme."

E.6.3. Architectural Practice

A spatial re-engineering initiative also requires new ways of looking at architectural practice. By developing a work approach closer to consultants, selling cases is an integral part of the intervention. Fees are commensurate with increasing a client's business performance. Diverse skills are required to manage cases and interact with the variety of players

In a spatial re-engineering initiative, selling cases is significantly different than selling architectural services. The primary distinction is that potential clients are management consultants, not the end user. Although architects work with the end user, they are secured as clients by the management consultant. Since the consulting market is finite, efforts should concentrate on establishing strong relationships with them rather than following up newspaper leads or rumors, typical of selling architectural services.

This new activity requires working with consultants to develop a joint case proposal. During case implementation, we must be able to seamlessly integrate our services. As implementation comes closer, our contacts with the end user should weigh heavily in our favor to secure the implementation and completion of full architectural services. Selling spatial re-engineering cases requires capabilities to:

♦Initiate projects rapidly through strong contacts with international change management firms.

♦Develop new business and manage client relationships with strong interpersonal skills and familiarity with management consulting approaches

♦Speak coherently to both management and architecture communities

♦Appeal to both consultants and architects with proven methodology and tools

♦Pursue business opportunities vigorously due to a strong intellectual and experiential commitment to the process of spatial re-engineering

In a spatial re-engineering initiative, an architecture firm's financial rewards are unprecedented. Change management consultants charge very high fees for their services. Partly a deliberate attempt to increase the value of the services provided, this also reflects the financial resources companies have at their disposal to improve business performance. A $250,000 fee for a 3 month case is actually below the industry standards. However, for an architectural firm, this represents unprecedented revenue and profit growth.

To leverage the potential financial performance of spatial re-engineering and to penetrate this new market, a spatial consultant must be able to:

♦ Infuse change management methodologies with spatial metrics

♦ Encourage clients understanding of organizational through collaborative inquiry and design

♦ Deploy a methodology and tools to enable rapid global rollout through education and training

♦ Integrate spatial re-engineering with change management methodologies and tools

♦ Develop and protect the intellectual property of an architecture firm

In a spatial re-engineering initiative, the spatial consultant will perform a variety of activities other than traditional designing. Re-engineering the spatial dimensions of a company does draw upon design skills. However, engaging in spatial re-engineering demands a different set of skills. Observing and documenting spatial activities, deploying tools to let others express their design desires, and engaging the primary decision makers in collaborative design are just a few of the new activities the spatial consultant will require. Rather than compete with an architecture firm's existing team of talented designers, a spatial consultant must be able to

♦ Deploy design expertise in an appropriate and timely fashion

♦ Engage clients at any level with the tools and techniques of spatial re-engineering

♦ Generate schematic design plans for detailing by architects

♦ Increase efficiency of architectural work with spatially sensitive managerial guidelines

♦ Present intervention to management consultants and clients in ways meaningful to them

E.6.4. Summary- Common Consulting Comments

➢ *Very interesting, but it falls outside of our traditional scope of work...*

♦ If you are engaged in reorganization and not addressing the physical environment of organizations, a major contributor to successful implementation is being overlooked.

➢ *Our clients don't care about this issue.*

♦ The work environment's impact on organizational performance, like other aspects of reorganization , must be raised by the consultants rather than the clients. Once the significance is articulated, not only can performance be significantly increased, collaborative design is another powerful tool available to the reorganization consultant to trigger a new organizational culture

➢ *We can't charge our normal fees for moving furniture!*

♦ Spatial re-engineering requires a deep analysis to build a fact base to make hard decisions. It achieves this through proprietary techniques that engage the client in unique and insightful ways. Both of these dimensions warrant normal consulting fees for a re-engineering service.

➢ *Spatial Re-engineering would be more appropriate on a case by case basis.*

♦ Without a spatial consultant on each reorganization case team, the ability to see spatial problems, opportunities and solutions does not exist- continuing the disregard for the work place

➢ *WorkPlace would be a great independent company, but not within our firm!*

♦ If WorkPlace was independent, the margins for consulting firms would decrease significantly. More importantly however, no competitive advantage or "shadow" casting would be possible since the service would be available to all consulting firms.

➢ *So why our firm?*

♦ WorkPlace improves organizational performance by leveraging a critical of work practice.

♦ WorkPlace sustains new organizational culture by providing new environments and discourse.

♦ WorkPlace ensures implantation of new culture by collaborating with client leadership team.

E.7   CASE STUDIES

Bank of Boston
Case #1

Context
The securities-process business of the Bank of Boston was in a state of disarray and losing money. Top management had a choice: close down and sell the services, or reaffirm their commitment to customers by developing something new and profitable. To realize the latter, two tasks where identified: consolidate the different business activities into one central location and develop competitive management strategies. By addressing both the physical and managerial needs for revitalizing the business, an opportunity opened for their integration:

Methods
1. Architectural team worked in conjunction with Coopers & Lybrand management consultants to transform organizational change into physical layout.
2. Workshops to encourage managerial participation and enthusiasm for change centered around collaborative design of office amenities.
3. Games were employed to demonstrate to employees the dynamics of teamwork and efficiency.
4. Drawings and full-scale models illustrating the future space were used to visualize and clarify discussions.

Intervention
1. Change from a product to functional organization provided the activities that dictated a functional work plan.
2. Efficiency from minimal equipment, material, space and employee time kept furniture to a minimum, and lightweight for flexibility.
3. Transparency of operations required clear lines of sight, minimally enclosed offices, and open work surfaces.
4. Easy communication among team members was enhanced by proximity of teams, employees, and supervisors.
5. Rapid response to changing customer needs demanded equally rapid reconfigurable floor layouts, and computer connections.
6. Use of the workplace as a showcase for service necessitated an openly visible workplace.

Results
1. Construction costs were under $45 per square foot.
2. Reduction in workforce due to consolidation and improvements in efficiency produced savings of $9 million per year.
3. Employee turnover, previously 25%-30%, dropped to %10.
4. Using the new facility as an image of efficient, flexible securities processing helped secure large accounts, increasing volume by 80%.
5. The new facility was presented as a high-productivity workplace in Fortune's October 1992 issue, and one of the top 5 securities-process business in the US.

Hackensack Hospital
Case #2

Context

The stresses of hospital care are infamous: nurses have one of the highest turnover and absentee rate of all fields. Patients typically do not speak of the comforts of the hospitals. Both lead in part to hospital inefficiency and cost escalation. To make nursing work more efficient, two primary goals were defined: bring caretakers and their tools closer to patients; make patients feel more secure by establishing visual connections to nurses. Over a two month period, the architects worked closely with the CEO, doctors, and nurses to create a new concept of hospital care.

Methods

1. Architectural team worked in conjunction with CEO to translate an ideal organizational scheme into a physical reality.
2. The team interviewed many staff members and employed techniques to have them communicate with each other about their attitudes toward their current workplace.
3. Collaborative designing occurred with doctors, nurses, administrators and staff by having the architect listen to the issues and problems, then sketch out ideas emerging from the conversation.
4. New ideas were only raised in the context of meetings, not brought a priorily.
5. Tours of other hospital facilities were arranged to solicit the ideas of a representative group from the hospital.
6. Full-scale mock-ups were built in the open space of the hospital to insure ideas would accommodate anticipated activities.

Intervention

1. The goal to bring caretakers and their tools closer to patients yielded a "cluster unit" comprised of one nurse overseeing 5 patients.
2. Charts, linen, medical supplies are kept in nurses workstation, cutting down on amount of movement necessary to procure material..
3. Nurses located close to unit's entrance, enabling quick exchange of information with doctors.
4. Private bathrooms equipped with showers make it easier for patient to care for themselves.
5. Refreshment center makes it possible for patients to reheat leftover food after mealtime.
6. Patient rooms were designed to make their occupants comfortable and reduce anxiety.

Results

1. A Post-Occupancy Evaluation indicated that nurses were "unequivocally and overwhelmingly positive in their evaluation of virtually all measures employed."
2. Nurse turnover reduced by 65%, absenteeism reduced by 37%.
3. Patient falls from beds dropped 50%.
4. Patients ordered fewer sleeping pills due to reduced anxiety.
5. Doctors felt the layout had a positive impact on their patients who felt more secure knowing care was immediately outside their room.
6. Increased accessibility to patients decreased nurse fatigue, improving job performance, and positively altered work attitudes.
7. Theft was reduced due to nurse controlling supplies in a cluster.
8. Patient's records assigned to nurses rather than centrally located increases nurses sense of responsibility and authority.
9. Collective designing led to innovative work saving ideas, as physical space and organizational systems were reworked simultaneously.

Xerox LX Laboratory
Case #3

Context
Xerox is constantly seeking to speed the process of technology and product development. The LX Laboratory was originally designed to develop innovative technologies under the new management imperative to reduce the time to market. Consultants recommended cross-functional teams to facilitate parallel rather than sequential processes of design and engineering. This restructuring of work practices was expected to yield major benefits to the corporation by improving performance, quality, efficiency and productivity. Architectural team worked in conjunction with lab members to determine actual work practices and their corresponding spatial requirements.

Methods
1. The architectural team was first taken on a walk-through of the lab and other buildings to meet with occupant's representatives.
2. Photographs taken during the "walk-through" were used by small groups from the Lab to construct a "workbook" to determine what physical aspects were successful and which were not.
3. Based on the crucial issues articulated in the "workbooks," each member of the Lab drew an ideal workplace.
4. To explore the organizational principles being developed, existing and ideal communication lines were drawn.
5. Games were set up to model the implications of the emerging spatial options on work processes.
6. Collaborative designing, informed by the previous interventions, resulted in the creation of a strategically located common space that incorporated the necessary technology for communication.

Intervention
1. The continual variability of work processes necessitated different types of meeting places.
2. Rather than allocating space by entitlement, space was defined by functions and accessibility.
3. A common space was established that was suitable for group meetings, yet informal to support uninvited guests or lab members desire to continue their own work.
4. To share the work occurring in the labs, they were located adjacent to the common space.
5. Accessibility to information was fulfilled by centrally locating files and intellectual property.
6. To facilitate remote synchronous communication , two large "LiveBoards" were installed in the common space.
7. Experimenters need for rapid prototyping dictated their close proximity to modelers.

Results
1. Defining work practices assisted in determining the appropriate role for technology, as was evidenced in the inclusion of "LiveBoards" in the common room.
2. New technology enabled new work practices: the "LiveBoards" enabled group problem solving, not merely communication.
3. The intervention itself stimulated more democratic and open meetings within the group.
4. The character of team work in the laboratory changed significantly, as George Napier, Lead Scientist states: *"...what's really changed in the laboratory is a change in the work culture...there was something different happening to the group, as opposed to just changes in the facilities."*
5. Work enthusiasm increases, as one senior scientist claims: *"The LX workplace experiment has to be lived."*

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FIGURES

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DISSERTATION SUMMARY

CHAPTER ONE
THE PROFESSIONAL QUANDARY

In the search for meaning, the architectural profession legitimately seeks culture to sanction its products. Unlike in the past, contemporary culture is complex and tacit– richer and deeper than any of its external manifestations, including architecture. By assuming facile access to culture through its spatial use, I contend the profession actually limits its ability to make real cultural contributions and provide relevance to physical form– particularly in business organizations. If the 'form' of the organization– its external cultural manifestations– is distinct from its physical form, how can this disjointed relationship provide insights into organizational culture while improving the design and implementation of its architecture? An avenue of exploration is put forth by Schön, who contends organizational culture is defined by tacit frames. Further, he argues the design process itself reveals these frames. To leverage this opportunity, this dissertation aims to provide insights into architectural form and process in relation to organizational culture.

CHAPTER TWO
APPEARANCE OF FORM

Understanding the frame is essential to reestablishing architectural relevancy to the organization. The concept has a long tradition in the field of cognitive science. However, this discipline does not address Schön's observation that frames are difficult to define. Due to their tacit and cultural nature, he recommends seeking evidence of frames in the actions and stories of people. In architecture, physical evidence of frames exists by what Habraken calls 'appearances of form.' This residue, in addition to a designer's 'story' accompanying design activity, facilitates understanding how the frame operates and is constructed in mind. A case study using both form and description will exemplify frames in action. By partially revealing frames, design activity enables us to propose or infer the nature of their tacit structures. The notion of syntactic features reconciles the tacit and cultural nature of frames with the desire to make frame descriptions more explicit. Additionally, this approach potentially provides the architect with a guide to achieve robust architectural and organizational form.

CHAPTER THREE
DESIGN WORLDS

Evidence of frames through the 'appearance of form' is only the beginning to reestablish organizational relevancy to architecture. In this chapter I will analyze how fluid design activity is akin to frame construction, thus revealing the contents of frames. Similar to the construction of frames, the design of a constantly evolving physical object requires the inclusion of prior knowledge to facilitate comprehension. Although we may not be able to access frames directly, we can improve our understanding of them by examining the actions and decisions taken in the design of an object. I will present a case study showing how the dialogue between image in mind and design object enables a 'reconstruction' of frames. For the individual designer, this methodology demonstrates design's inherent strength to enlighten tacit frames. However, design in a social setting– characterized by negotiation, conflict, and agreement– sparks the cognitive work of frame restructuring necessary for learning. Seeking a shared frame through collaboration leverages the potency of design to stimulate collective reflection. The resultant patterns of activity can provide the organization new practices characterized by cultural awareness, learning and agreement.

CHAPTER FOUR
ARCHI-TYPE

Residual representations and the subsequent negotiations of frames enables designers— and ideally an organization— to achieve shared intersubjectivity of a cultural model. Coordinating disparate frames to achieve this end does not imply modification towards complete congruence. Rather, identifying dimensions of the 'collective memory'-what individuals already have in common- sets an agenda to coordinate the naturally different activities, interpretations and agendas of organizational culture. Once again, the design process can be used to reveal these initial overlaps. When supplemented by the architectural theory of type, design becomes a means to establish a shared frame. The design activity of Louis Kahn draws upon these insights to demonstrate how architectural design stimulates the emergence of form- architectural and organizational. This process I describe as cultivating an 'archi-type'- a collaborative process to raise, accommodate, or change frames towards achieving agreement in a schematic architectural solution. The result is a guide to direct architectural intervention and redirect organizational action. Through the creation of organizational space, the 'archi-type' exploits the dynamic relationship between workpractice and workplace to imbue each with 'good' form.

CHAPTER FIVE
ENGAGING CULTURE

Cultivating shared form through an archi-type in the organization leverages the uniqueness of design activity by exposing, articulating and coordinating the frames that underlie thought and action. By seeking shared understanding, architectural design stimulates organizational reflection, learning, and agreement. Implanting a culture imbued with these virtues is achieved by an architectural design process stimulating the emergence of culture though 'bricolage'- the synthesis of current and future concerns with an omnipresent and indelible past to guide daily interaction in the environment. However, unlike the myths which guide primitive societies, as culture emerges the architect encourages an organization to reassess the frames circumscribing cultural activity. Heightening the appreciation and enlightenment of culture imparts the practices to create a community of partners and learners. To achieve such acumen and impact we must 'reframe' our professional agenda to reestablish cultural significance and meaning to architecture.

APPENDIX A
F R A M E   V A R I E T Y

Frames and the prior knowledge they contain enable sense making and inform subsequent action and decision. Therefore, contrary to the contemporary concept of design based on the fictional idea of creation free from precedent, design includes the explicit consideration of precedent. In fact, choosing precedent and modifying it through frames is a common aspect of design: Design aptitude is coordinating seemingly disparate frames. Design creativity manages and synthesizes the unexpected synergies between preexisting frames.

Cognitive science articulates a variety of potential frames– clusters of prior knowledge influencing perception and action by describing and prescribing. A category is indicated by a word containing information to justify subsequent action. More directly imposing action is a 'perceptual' frame that organizes stimuli into meaningful figures to facilitates meaningful activity. Similarly, plans emerge from the circumstances encountered in design activity to guide action. A 'vision' is a desired state defining actions to resolve discrepancies with the current situation. Although seemingly a projection into a future state of affairs, a 'vision' is closely related to past experience. Cases, on the other hand, explicitly reach into precedent. Case-based reasoning focuses on how the mind deploys prior experience to assist making sense of new situations. Images in mind condense exemplars and previous visual experiences via shape details. Unlike images, artifacts influence human interaction by use, dimension, and specific features. Similarly, attributes of the physical environment encapsulate the experience of place. Related to place description is the more action oriented script- a stereotypical event sequences describing routine activities to predict appropriate action. Scripts depend on another descriptive frame, roles. Commonly we assign people to predefined stereotypes or patterns of expected behavior to facilitate our own understanding or prediction of other's behavior.

APPENDIX B
S Y N T A C T I C   F E A T U R E S

The rationality of cultural and personal imaginative activity requires a device to order a frame logically. The existence of a syntax– an underlying, implicit interrelationship between propositions– enables the frame to be treated as a coherent whole. Despite the difficulty of defining frames, postulating a syntactical feature is critical to explain and exploit a frame's dynamics. Postulation and awareness of a syntactical structure– a featured element to identify a syntax– enables constructing an account of action and interaction from cognition and communication. Coherency comes in propositions, metaphor, metonomy, examples, linear chains, and even the body. Propositions exude the most basic syntax- sentence structure. Over time, these become 'facts'- epistemological commitments strengthening the resilience of a frame. Culturally shared commitments can be described in terms of metaphors which implicitly draw upon shared propositions. Conflating a metaphor with one dominant fact leads to metonomy– one proposition or attribute organizing an entire frame. Metonomy culls legitimacy through experienced or imagined examples. Far from being simply an illustrative device, examples are reference points to organize related propositions. Examples commonly preserve information by organizing propositions sequentially in a linear chain. Finally, Lakoff argues the most common and potent grounding of our conceptual system is in the bodily experience the world. The body's basic organizational scheme of the body is a container, described by and in/out relationship and characterized by a bounded surface separating interior and exterior.

FormLanguage

The ability of the architect to facilitate new organizational practices depends on his ability to spark and concretize a shared language. Once evidence of frames and their underlying structure exists, one can begin to build the semantics of a 'language' to make frames sensible and clear to the community. Attempting to cultivate a 'FormLanguage' enables stakeholders to infuse meaning to form as it emerges from the design process. Although several players with distinct languages operate simultaneously, the design process requires the various actors to converge on instructions for building— expressed in the language of objects. Articulating the frames underlying the logic of each player's decisions and behavior within design enables understanding aspirations by mapping them into a prototypical frame. Seeking a 'FormLanguage' begins with values and attributes, gradually probing for the interrelationships between propositions and eventually applying a descriptive label. The resulting shared language should enable communication between design and designer, and more importantly designers within a culture. Ideally, cultivating a 'FormLanguage' should provide inhabitants objects and tools to monitor and improve their own infrastructure, both literally and figuratively. By sparking and concretizing the frames shaping organizational culture in form, the effort may yield new organizational practices aimed at building partnerships within the culture through learning, respect and understanding.

Design Shifts

Exposing frames and cultivating a 'FormLanguage' requires sensitivity to 'design shifts.' By drawing upon the labels, attributes, and values of related frames, the ebb and flow of design activity reveals the attributes and values of frames in action. Design shifts are varied: The inevitable inadequacy of frames incurs surprise, when what we expect does not occur. To facilitate comprehension, the mind indexes existing information- routinely invoking and applying attributes of related frames to situations. However, usually inconsistencies do not even emerge since preexisting expectations confirm meaningful information while disregarding others to legitimize a selected frame. All these shifts avoid frame failure- the most extreme design shift— which exposes frame contents through frame conflict. Ideally, this extreme provokes the potency of the design shift- a mechanism to stimulate the frame restructuring necessary to learn.

WorkPlace

Architectural design is a potent form of change management: It offers insights into organizational culture and develops levers for change. Through the collaborative design of an organization's physical environment, participants acquire the skills necessary to develop a community characterized by reflection, learning, and coordination. Aligning the spatial environment of workplaces around reorganization strategies is a significant business opportunity. To exploit this untapped market, I propose to deploy the organizational potentials of architectural design in a project called 'WorkPlace.' WorkPlace will interact with change management consultants with a methodology called 'spatial re-engineering'– the re-design of office environments to support and achieve organizational objectives established via an internal re-organization initiative. Documented cases of spatial re-engineering projects have generated impressive results and clearly increased the impact felt by the client vs. re-organization projects alone. By combining the practices and techniques of spatial re-engineering with a change management case, WorkPlace leverages the spatial dimensions of managerial change to improve the accuracy and implementation of a consultant's intervention. Simultaneously, WorkPlace provides an architecture firm robust design schematics and a fertile ground for architectural execution.