# Design in the Digital Age:

## In Search of a Collaborative Paradigm

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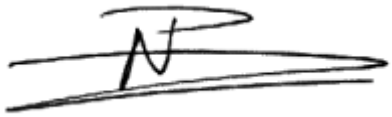
I declare that:

1. I am the author of this thesis.

2. The work reported in this thesis is entirely my own, unless otherwise specified.



Nicholas Rossis

# Acknowledgements

"The fact is, when you are producing your dissertation, the most important thing that you are producing is yourself".

*Phil Agre, The Red Rock Eater, 21-12-1999*

The essential message of postmodernism can be argued to be that, all points of view are equally valid, and equally arbitrary. Since I first started this thesis, in 1995, I have found myself time and time again being forced to reassess and re-evaluate my beliefs, changing a number of them in the process. The realisation that "εν οίδα, ότι ουδέν οίδα" ("I only know this, that I know nothing"), first uttered by Socrates, may be the greatest lesson that I have learned during these years.

Throughout this journey, I had the immense luck of being accompanied by my supervisor John Lee. He helped me the innumerable times I got stuck, and was always there, whether it was to hear me despairing over the direction of the thesis, or to listen to yet another exciting idea that would throw me on a new tangent. He managed to let me explore all directions I wanted, while keeping me on schedule and in track. Without leading, or following, he managed to be next to me every step of the way – and that is no mean feat. He is the best supervisor I could have, and I am genuinely grateful to him.

I was also lucky enough to have Electra offer her own support, whatever happened to my personal and professional life. It was through her that I managed to overcome my doubts and find a lot of joy, while knowing I could share with her both difficult times and happy ones. For that security she offered me, as well as for so much more, I will always be grateful to her.

Mike was a friend, editor and unofficial supervisor combined. He tirelessly checked all those almost identical drafts, always suggesting improvements, assisting and encouraging me. He offered more help and support than I could ask for, and I am both thankful and proud he is my friend.

I am also grateful to my parents, without the support and help of whom I would never have embarked on this fascinating journey – or be on this planet, for that matter.

Finally, to all those who have helped, and to those who have hindered me; they have all contributed to my being who I am.

# Previous Publications

Earlier parts of this thesis have appeared as follows:

- "Developing New IT/CMC Paradigms in the Architectural Practice Context", Edinburgh Architecture Research, vol. 26, Edinburgh, 1999
- "Design Methodologies"; Edinburgh Architecture Research, vol. 24-25, Edinburgh, 1997
- EuropIA 1997, Edinburgh, "The Architect's Role in the Information Age", April 1997
- "IT/CMC: Effect on Design"; Edinburgh Architecture Research, vol. 23, p. 176, Edinburgh, 1995

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# Abstract

This thesis examines the theory and practice of architecture in an attempt to suggest a new design paradigm, more appropriate to today's unique era. The central argument is threefold: first, it is argued that architects should strive to find a balance between being creative and meeting their clients' practical needs. Second, that in today's democratic and learned society, good communication between the two parties is essential. And third, that technology can help them overcome many of the practical difficulties presented in such a new collaboration.

To test these arguments, both architectural theory and practice are examined. Architectural theory is examined with a focus on the architect-client interaction, and the psychoanalytic aspects of design activities, from a Jungian perspective. Furthermore, the creative process is examined from an analytic psychology perspective. A theory of creativity is proposed, that builds on both Jungian archetypes and associationism. This theory argues that creativity is the result of the metamorphosis of external material by unconscious archetypes, through the unconscious activation of archetypal images.

The design process itself is also discussed, and design theories are critically examined in detail. A new design theory is proposed, that emphasises architect-client collaboration, and attempts to redefine the relation between the two parties. This results in a design paradigm that aims to enable practitioners and clients to better collaborate – and is therefore referred to as a collaborative design paradigm – with the aim of developing architecture that meets both aesthetic and practical client needs in a balanced way – called balanced architecture.

This emphasis on collaboration is the result of the observation that most existing design paradigms seem to deal with design as an isolated event. In reality, however, there is a constant interchange of design ideas between all parties involved. Therefore, the new paradigm proposed here emphasises communication and collaboration skills as key aspects of successful design.

Architects are then classified according to three key-attitudes: towards design; their clients; and technology. Three theoretical opposing pairs are proposed that help distinguish between these attitudes; they are Art-oriented vs. Pragmatic in the first attitude; Authorities vs. Enablers in the second; and Innovators vs. Commodity-users in the third.

Again, analytic psychology is used extensively to test this proposed typology and examine the transpersonal activities that take place in any design collaboration. Practitioners took the Myers-Briggs Type Indicator (MBTI) test, and the proposed typology was correlated with the MBTI one.

Architectural practice is then discussed extensively, particularly in relation to new technologies that have been introduced into the profession during the past few decades. A second set of interviews indicated that architectural practice has indeed changed due to the introduction of information technology (IT) into the workplace. The impact and extent of these changes is examined in detail, while a new IT system is proposed, that should improve the collaboration between architects and clients. This builds on recent technological advances to create a tool utilised in the design activities that should encourage more active collaboration, thus helping generate more balanced architecture.

# Chapter One

## *Introduction*

"The best way to predict the future is to create it"

*Alan Kay*[1]

It is often argued that today's world is a unique one. Technological advances, the presence of democracy throughout the Western world and the process of economic and social globalisation are key factors in this uniqueness. Architecture and design are often used as a way of understanding something about the societies which created them. Our ways of designing, then, should reflect this uniqueness of our world. However, more often than not, the design paradigms architects are taught and follow have been largely the same since classical antiquity. This thesis examines the theory and practice of architecture today, in an attempt to suggest a new design paradigm, more appropriate to this unique era.

It does this by making an assumption and an argument. The assumption is that development of a collaborative design paradigm can help examine architectural practice and bring to light several of its aspects that may be hidden from a casual observer. The word *paradigm* is taken in this context to signify a *way* of designing; a *methodology* and a *practice*. It is not assumed that understanding of this – or any – paradigm is necessary for practitioners to be able to design, although it may assist researchers from a methodological point of view. Furthermore, it is not assumed that this is the only applicable paradigm; it is taken from a very particular point of view that uses extensively analytic psychology, but of course this is but one of the many points of view that can be adopted. It does offer a distinct benefit, however, in that it utilises a single theoretical framework – analytic psychology – to examine and describe a wide range of phenomena; from client-architect collaboration to the creative process.

The argument is threefold: first, it is argued that architects should strive to find a balance between being creative and meeting their clients' practical needs. Second, that in today's democratic and learned society, this can be more easily achieved by architects and clients working more closely together. And third, that technology can help them overcome many of the practical difficulties presented in such a collaboration. In the course of exploring this proposed collaborative design paradigm, architectural practice is discussed particularly in relation to new technologies, namely information technology (IT) and Computer Mediated Communications (CMC), that have been introduced into the profession during the past few decades. Architectural theory is examined with a focus on what is probably two of its least examined aspects: the architect-client interaction, and the psychoanalytic aspects of design activities, from an analytic (Jungian) perspective.

One may summarise the suggested paradigm as one describing a collaborative way of designing between practitioners and clients– and is therefore referred to here as a **collaborative design paradigm** – with the specific aim of developing architecture that meets both aesthetic and practical client needs – called here **balanced architecture**.

## In Theory…

A number of design theories have been put forward throughout history, attempting to examine and interpret design. Some describe it as an esoteric, mystical and mysterious process that can never be fully understood; let alone interpreted and codified. Others take the opposite view, breaking it up into steps, even offering mental exercises that promise to help design students "learn" how to design – the fact that architectural schools survive, probably indicates that enough people share the view that architectural design can, indeed, be taught.

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[1] in Schulz, 1997

Despite their great differences, both ‘mystical’ and ‘logical’ design paradigms seem to focus on the examination of specific aspects of design activities, dealing with design as an isolated event. This appears to cover it only partly, since in reality there is a constant interchange of design ideas between architects and clients; clients and their friends and families; architects and their peers, in a non-stop inter-flow of inspirational – or not – design concepts. And yet, this aspect of design that is arguably one of its most distinctive qualities, is more often than not neglected by researchers. Design in the practitioner’s office is not an isolated, self-centred activity, but a combination of synchronous and asynchronous communication, at a number of different levels. Due to a number of social and economic factors, this emphasis on communication seems destined to increase. The current lack of appreciation for this fact, mirrored in the architectural school’s curriculum with its lack of subjects on communication skills, will probably have to change, and new teaching practices may have to be developed, emphasising communication and collaboration skills as aspects of successful design.

If design is examined in this light, it becomes obvious that it is, to a great extent, a transpersonal activity. As such, many of its aspects depend greatly on the personalities of the parties involved. Any emerging paradigms would benefit from including this factor; and in this light, the study of design in general is much less informative than the study of a particular practitioner’s design, including those moments spent with clients, exchanging ideas. This is why the Myers-Briggs Type Indicator (MBTI) – a tool born out of analytic psychology to classify personalities into 16 distinct types – has been used extensively here to examine the transpersonal activities that take place in any design collaboration.

Based on analytic (Jungian) psychology, with its emphasis on the individual’s psyche, the MBTI is an excellent medium for the exploration of the transpersonal aspects of design activities. If practitioners are thought of as individuals who also design, rather than designers who are also individuals outside office hours, a drastic shift in focus occurs. The emphasis is put onto the subject instead of the object; and

it can be argued that a science particularly well equipped to handle this subjective outlook is analytic psychology. This, then, was be the preferred tool for attempting a typology of practitioners that may help develop this new collaborative design paradigm that will aid the development of balanced architecture. To examine the transpersonal activities that take place in any design collaboration and test the applicability of the proposed typology, thirty practitioners were interviewed and asked to take the Myers-Briggs Type Indicator test. This first set of interviews, that took over six months to complete and included thirty practitioners from two countries, raised interesting points pertaining to the personalities and communication skills of practitioners, and helps define the new collaborative paradigm. A correlation has been found between MBTI scores and the proposed typology and, although the sample was too small to offer any concrete results, it does not contradict the original typology hypotheses.

Of course, this examination of the transpersonal design aspects does not mean that *all* aspects of design are transpersonal. The "divine spark of inspiration" of our design mythology does constitute a phenomenon worthy of attention. At this more esoteric level, the cognitive mechanisms, such as spatial awareness and Gestalt theories of design, have been studied extensively by cognitive psychology. Few, however, have studied it using the principles of analytic psychology, which may be better equipped to deal with the non-rational[2] aspects of inspiration. Instead of asking whether an actual mental image is formed during design activities or not, as cognitive psychology might do, analytic psychology wonders where such an image, if indeed one exists, might be originating from. Therefore, the image's actual hypostasis is, in this sense, irrelevant, and inspiration is subjectified. Analytic psychology, then, is the tool chosen to examine these esoteric aspects of design – creativity and inspiration.

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[2] "Non-rational" should not be mistaken for "irrational". The 'inspirational' design aspects can be independent from rational thought, but still prove to be logical, even if choice-making precedes rationalisation.

One important aspect of design that cannot be examined through this theoretical stance is that of corporate design; i.e. design by groups of architects interacting with committees instead of individuals. There are three main factors that need to be examined in this context. First, the percentage of actual firms with too many employees to have a person-to-person collaboration with the client. Although it has been argued that the architect-sole trader is being substituted by the architectural office[3], it was found that, at least in Scotland, most collaboration between architects and clients occurs on a person-to-person basis. Indeed, a recent Royal Incorporation of Architects in Scotland (RIAS) survey revealed that 93% of its members is working in offices with less than 5 persons, where it is likely that an architect will always deal with the same client on a personal basis.[4] According to the exact figures, 52% of RIAS members are still sole-traders, 24% work in two-persons offices, and 17% in offices with 3-5 persons. This means that the proposed theoretical framework is valid in the vast majority of cases. Second, the applicability of the proposed theoretical framework. Analytic psychology is limited by its nature – unlike psychology fields like transactional analysis, it is best applied to one-to-one interactions. And third, the existence of a theoretical and empirical framework within which the design activities can be examined. Design methodologies commonly deal with design as an isolated event in the lives of a single architect and a single client. Although it can be argued that there is a central figure in each of the architectural and client committees, and it is these two persons that shape the interaction, there is a lack of empirical data which makes it very hard to examine the design activity in a satisfactory manner. For these reasons, it has been decided that group design activities will not be examined in this context.

## … In Practice

Descriptions of architectural practice have not changed significantly for centuries. Vitruvius' books are probably among the longest lasting examinations of a profession. And yet, a plethora of paradigms describing the contemporary

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3 Cuff, 1982; Duffy, 1992

4 Source: The Royal Incorporation of Architects in Scotland, May 1998

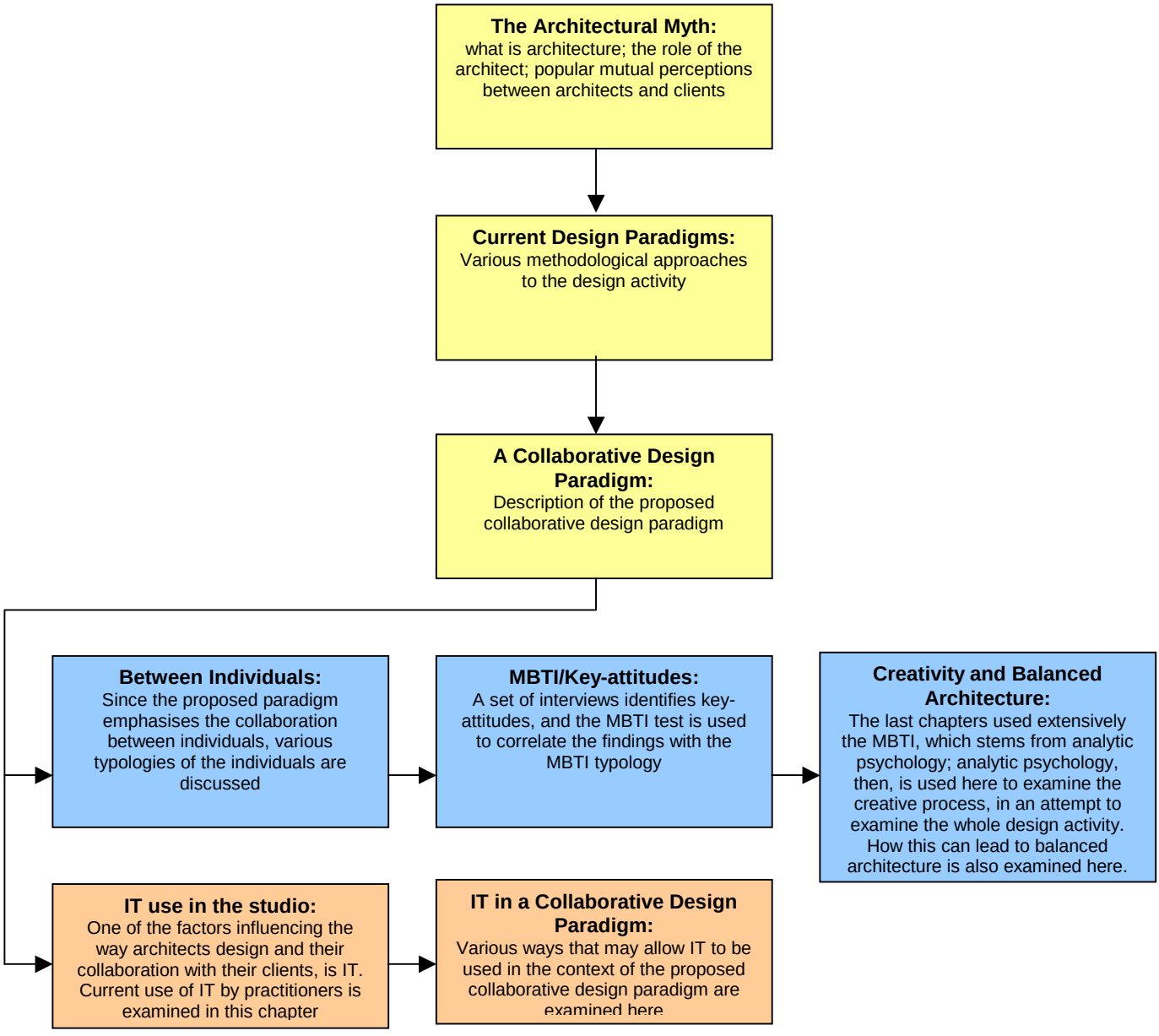
architectural practice have been developed, most during this century. The very speed which seems to characterise our era suggests that many more will probably be needed in the future. As new technologies emerge, the workplace is forced to mirror this. Some people grew up using computers; others are still determined never to touch one. These changes have all occurred with a characteristic rapidity. Nowadays, computers are used in many architectural practices, maybe most. And yet, it was only in 1943, no more than a few decades ago, that Thomas Watson, Chairman of IBM, famously predicted: "I think there is a world market for maybe five computers".

Contrary to this uncanny prediction, we now live in a heavily digitised era. In the course of further exploring the design practice in this new information age, architectural practice is discussed particularly in relation to new technologies that have been introduced into the profession during the past few decades, possibly forcing substantial changes to the workplace. A second set of interviews, also lasting over six months and including the same practitioner group, attempts to examine these changes. Despite the small sample, they clearly seem to indicate that architectural practice has indeed changed due to the introduction of information technology (IT) into the workplace. Although this may appear to be an obvious statement, it is the width and depth of these changes that are debatable. This is what the interviews attempt to clarify, and indeed they offer some insight in a number of key questions about these changes in the workplace: Can design methodology observe a change in the way practitioners design as well – something that methodologists commonly refer to as a *paradigm shift* – or could it be that only the tools of this remarkably stable profession have changed, but all else remains the same? Furthermore, has the role of the architect changed as well? The computer stylus has replaced the drawing-board pencil in many practices; but does this mean that the hand behind it is moving any differently? These are all questions about the present of architecture, but what can be surmised about the future?

All these questions bear heavily on the development of the new collaborative paradigm, for, before one attempts to examine what the future may look like, one should first examine thoroughly the present. Both design practice's present and future are examined here, and it is the study of these changes and the direction things may move in, that constitutes the subject of the last part of this thesis, in an attempt to see how the proposed collaborative paradigm may apply in the future as well as the present.

## Thesis Structure

Because of the nature of the topic, there are many aspects that need to be examined. This presents a number of challenges relating to the structure of this thesis. In particular, it was decided that design should be examined as thoroughly as possible from both an analytic psychology point of view, as well as a technological one. This resulted in the structure following two distinct strands, that find a common ground in the discussion of technology use by various personality types. However, this has also resulted in a more complex structure than may have been possible, if less aspects of the design activity had been examined. Therefore, it was felt that the reader may benefit from a graphical representation of the thesis' structure:



# Chapter Two

## *The Architectural Myth*

"We make our buildings, and afterwards our buildings make us".

*W. Churchill, 1924, from an address to the Architectural Association*

# Introduction

The first side of the central argument in this thesis is that architects need to strike a balance between being creative and original, and satisfying their clients' practical needs; i.e. a balance between the aesthetics and the practical function of a building. This is a combination often conceived as bipolar, as shown by the common phrase "form vs. function" that clearly distinguishes between the two, presenting them as opposite poles in a bipolar system. This concept is part of a larger set of preconceptions about the role of architects and clients, that often presents the two as opposite factions with opposite needs and priorities; these preconceptions are referred to here as the '**architectural myth**'.

The task of achieving this balance is complicated greatly by the fact that the role of the architect is a very unusual one. That is partly because architecture is a possibly unique combination of science and art, business and aesthetics, money and culture; and partly because of the architectural tradition this combination has created throughout history, starting from the Roman times, when, in the 1st century AD, Vitruvius made a statement that has reverberated throughout architectural history:

> "...But for my part, Caesar, I have never been eager to make money by my art, but have gone by the principle that slender means and good reputation are preferable to wealth and disrepute."[5]

[5] Vitruvius, 1960

Promoting the ideal of the architect-artist, Vitruvius was the first of a long series of architects to do so. Today, however, things are not so simple. A number of changes have taken place, resulting in recent architectural advertisements reading like the following one:

> "As architects, we're expected to be good designers. We're not always expected to be good businessmen. The fact is, we have to be both. ... We believe the key to the business of good architecture is communication. Communication between the architect and the client; between the architect and the builder; and between the architect and the engineer. Because we listen, we're better able to make the kind of design statement our clients want. And because we understand our clients, we recognise that the design not only has to work, but be within budget and on time. Creativity and business. They can't be separated in architecture."[6]

It is interesting to compare this emphasis on communication with Michelangelo's strong words, conveying strong feelings, when answering to certain cardinals who thought the lighting was inadequate at St. Peter's Cathedral:

> "I neither am nor will I be obliged to tell your lordship or any other person what I intend or ought to do for this work; your office is to produce money, and to take care that thieves do not get the same; the designs for the building you are to leave to my care."[7]

This clear-cut distinction between the roles of architects and clients may sound arrogant today, but have these sentiments disappeared? And, if so, is this disappearance a recent thing? For the best part of almost two thousand years, architecture had not changed significantly. In the last few decades, however, movements like participatory design, echoing relevant social movements, have resulted in a change in the role of the architect, with an increasing emphasis on the communication between architect and client. In 1982, Cuff explicitly suggested the use of the term *negotiation* as one best suited to the design activity, since it implies both the "give-and-take" nature of the interaction and the attempt to reconcile many different ideas[8]. However, the term *collaboration* is proposed here instead, since negotiation also implies a certain antagonism between the two parties, while collaboration implies two equal parties working together towards a common goal. During the past 20 years, it is believed that client and designer have grown to play

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6 US practice advertisement, under the heading 'Creativity isn't enough'; in Cuff, 1982, p. 252

7 Cuff, 1982, p. 115

8 Cuff, 1982

more equal parts, since the client is perceived as possessing a unique understanding of his particular needs and idiosyncrasies, and at least some design appreciation. And the designer can offer his trained eye, and his experience and knowledge of design solutions. In such a type of collaborative relationship, it is hoped that both can win.

These changes in the relationship between architect and client, however, along with social factors like the increase of the literate percentage, the democratic tradition and a shift of focus from the society to the individual, have resulted in a confusion over the role of the architect in today's society. It is, then, the role of the architect that is the main topic explored in this chapter. In the following sections, the definition of architecture will be discussed, while the architectural myth – the way architects are traditionally perceived by the society – will be examined, and compared to the way architects view themselves, and to the objective data that can be collected about their actual role.

# Defining Architecture

The Oxford Dictionary defines architecture as "the art or science of designing and constructing buildings"; the architect is reasonably enough defined as "a designer who prepares plans for buildings... and supervises their construction"[9]. Both definitions use the same word, *design*, to explain the work of the architect. Since design itself is not easy to define, however, it is obvious that one needs understand its meaning first, before understanding what an architect actually does. The same dictionary offers the following definition of design: "**a.** a preliminary plan or sketch for the making or production of a building... **b.** the art of producing these."; the designer is then defined as "a person who makes artistic designs or plans for construction".[10]

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9 Pearsall, 2000, p. 56

10 *ibid.*, pp. 315-6

So, an architect is a designer; architecture is the *art* or *science* of designing. And a designer makes *artistic* designs. *Art* and *science* are intertwined in any attempt to define what it is that architects do. A simple definition, then, would be that architecture is a combination of art and science, that involves a process of planning and sketching with the aim of constructing a building; and an architect is the expert who has been trained specifically to practice architecture.

This definition is far from satisfactory, though, since it leaves a lot of questions unanswered. It does not deal with the question of, who is visualising the building that is to be constructed, and who is assuming responsibility for decisions. Does the word *design* include these? Nowhere in the definition of design can that be seen. Actually, the American Institute of Architects (AIA) itself does not seem to be able to deal with that question; according to their handbook, architecture is defined as "the blending of aesthetics, function, space and materials"[11]; a remarkably vague definition. But who is responsible for taking decisions?

In normal practice, it is the client who has the funds, and the architect is little more than an employee; the AIA describes the supposed ideal relationship as one where the architect provides "certain services for his[12] employer, the client; in return, the client reviews, comments on and periodically approves the work of the Architect"[13]. It can be seen through this rather ambiguous description that, although the client has power of veto - after all, he *is* the one with the money - it is the architect who is responsible for coming up with alternative solutions. He has to choose between a number of design possibilities, decide which will be the best for his client's interests, and then submit it to the client for approval. Design, therefore, involves decision making; in fact, it can be argued that, in architecture, design *is* decision making, albeit a particular kind of decision making. Since architects are trained as designers and decision makers, they fully expect to practice this training.

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11 The AIA Handbook, 1980, Ch. 4, p. 3

12 The Handbook adopts the convention of referring to the architect and client in the masculine gender. For reasons of simplicity, this convention has been followed throughout this thesis.

13 The AIA Handbook, 1980, Ch. 5, p. 7

Furthermore, the design decisions which trained architects expect are important, large scale decisions; part of the definition is "constructing buildings", and anything on that scale has a significant cost. There is no room for mistakes; even a slight one can result in serious consequences, both financially and in the potential cost in human lives. Therefore, decision making with significant stakes is part of design, and part of the architect's work.

Still, decision making is not just the privilege of the architect and the client. A number of people share responsibility; in fact, probably more than in most other professions. Contractors, subcontractors, engineers, various experts, lawyers, geologists, developers; they all share in the responsibilities. Informal 'consultants', usually ignored, but sometimes able to exert a significant influence, can include the client's friends, his family members, architects from other firms, financial backers etc. Responsibilities, authority and role expectations form a fluid mixture, that makes it almost impossible to identify a single actor as responsible for a particular decision. There is an unavoidable confusion and ambiguity, and this ambiguity can be said to be an integral part of architectural practice.

To illustrate this problem of shared responsibility, an architect says: "At one time you'd just get the client's instructions and come up with a solution. Now the important thing is to be able to satisfy the planners. You have to be able to provide answers about density, servicing, traffic, illumination and external materials as well as the appearance of the building."[14]

Along with the shared responsibilities, there is also shared interest in the building. Interested parties include, naturally, the client and the architect, but extend further to various community groups, financial backers, the city architect and council, the neighbours etc. These stakeholders have a number of potentially conflicting interests; and this can be said to be another part of architectural practice that can not be avoided.

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[14] Golzen, 1984, p. 76

Cuff offers an interesting insight into common preconceptions regarding architecture[15]. At first, she writes, she had this simple idea: that the client would walk into the architect's office with a clear idea of the building he wanted to build, and that he would communicate this to the architect, who would then go ahead and build it[16]. In fact, she found out that the actual procedure was far from that, and that neither the client nor the architect had a clear image of the building; in fact, there was plenty of room for surprises even *after* the building had been built. Although each party obviously had some preliminary ideas, these were not well defined nor rigid, and changed constantly throughout the design procedure. Therefore, design can be defined as a constantly changing procedure.

Furthermore, there can be no simple 'right' solution. Architects knowing this stress the need for a timetable, and the importance to stick to it. Architecture requires a constant balancing of all the above factors, along with artistic and engineering ones - energy, fire safety, structural, soil and corrosion problems are just a few of the potential factors that need to be considered before any decision can be made. Each decision will have a positive effect on some of these, and a negative one for some others; this makes it impossible for a single 'right' design to exist. Design, then, is an open-ended procedure, every issue is potentially negotiable, and the design process could go on endlessly.

Relative to that, is the fact that the actual size of the work undertaken can also change through time: "A small remodelling project in which the client wanted a bookshelf that doubled as a room partition blossomed into the architect's plan to eliminate one wall, construct another, rearrange the room's usage, with no mention of a bookshelf"[17]. In fact, were it not for fiscal and temporal constraints, the design process would probably be extended indefinitely (much to the architect's delight, according to the architectural myth).

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15 Cuff, 1982

16 *ibid.*, p. 11

17 *ibid.*, p. 165

The temporal factor can be very important, in a number of ways. Except for the obvious need to adhere to time constraints, time has a particularly intricate relationship with architecture. Buildings are designed to meet their inhabitants' needs; as these change with time, so must buildings. In our rapidly evolving technological society, this is even more obvious. A number of buildings that were built a few decades ago are being demolished today for being unable to meet information technology (IT) requirements. Buildings less than fifty years old, may actually be cheaper to demolish and rebuild, than to adapt in a way that will allow their users to use IT. Responsiveness to change, defined by Duffy as the ability to accommodate, over time, changes in individual requirements and organisational demands[18], is a factor of ever-increasing importance.

Since all these factors are inherent in architecture, they should probably be included in its definition. Therefore, the following definition can be suggested:

Architecture is a combination of art and science resulting in the design and construction of buildings that will accommodate present and future human activities. Its practice by experts, specifically trained to exercise it, has the following characteristics: Decision making with significant stakes and little room for mistakes; shared and ambiguous responsibilities, authorities and roles by a number of actors; shared and potentially conflicting interests by a number of stakeholders; constantly changing mental images; and being an open ended procedure, of indefinite size and duration. Although it involves aesthetic expression, its practitioners need also take into account and balance a number of other factors, scientific and financial.

## Negotiation vs. Collaboration

As mentioned in the introduction, Cuff used the term *negotiation* in 1982 to define the interaction between architect and client. She explains her selection of that term, as one that best expresses the "give-and-take" nature of the interaction, and that best

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[18] Duffy, 1992, pp. 174-5

describes the attempt to reconcile many different ideas – not only about design, but more generic ones as well. However, nowadays the term *collaboration* may be more appropriate. *Negotiation* successfully describes the interaction in the recent past, and, to an extent, the present, but interaction between architects and clients is gradually becoming more equal and less confrontational. *Negotiation* is commonly perceived as a term implying a certain antagonism between the two parties, that need to overcome their differences in order to reach a compromise; while *collaboration* implies two parties working together towards a common goal.

Another important difference between the two models, explored in detail in the following chapter, is their different temporal nature. In Cuff's negotiation paradigm, architect and client still design in an *asynchronous* manner; they have short bursts of interaction, then have limited or no interaction for a long time during which the designer prepares material for the client, and then repeat this process until the end of the project. The suggested *collaboration* paradigm is a *synchronous* one; the interaction between architect and client is envisioned as a continuous process that permeates design activities and is a constant, background activity in itself (the temporal nature of various paradigms is examined in detail in the next chapter – "Interaction Paradigm Problems").

## The Architectural Myth

Having arrived to a more satisfactory definition of architecture, another question arises: how close is this definition to the architectural myth – the popular perceptions of architecture and its practitioners' role? People, including architects, seem to have different and often conflicting answers to this question, and, indeed, are categorised according to this in Chapter 5. But first, these common ideas concerning architecture need to be examined.

Cuff has produced an Open Letter to prospective clients, compiled from a number of client feedback she collected during her research, describing what one should expect through his collaboration with the architect[19]. Having found it to be a most graphic summation of the misunderstandings and the complaints clients have from their collaboration with architects, it is therefore included here in whole:

> "So, you're going to hire an architect? There's a few things you should know - brace yourself. At the first few meetings you'll talk to the architect whose name is on the door, then - remember that young one who sat at the end of the table and never said a word? Suddenly, that's your architect, and you never see the other one again.
>
> "Start by naming a price that's far below your budget for the building. When the final estimate comes in, it will be more than you can afford regardless. Architects know virtually nothing about cost - such mundane concerns thwart their creativity. As does practicality. Your building may look attractive (especially to other architects), but it may NOT keep the rain out or the heat in. Yet, there's no such thing as a 'make-do' attitude: every detail must be just right in their opinion but at your expense.
>
> "Next they'll invade your privacy, asking all kinds of questions that have little to do with the project at hand, and when you next visit, here are drawings that could have been made for someone else! Don't let yourself be used as a guinea pig for the sake of architecture movement. It's YOUR building, even if architects act otherwise. Each architect has pet peeves and a few 'favourite things' that will be smeared over your building. You must stand up for yourself, without letting them intimidate or confuse you about your priorities. You <u>might</u> know something about your functional needs, but every architect will want to keep a tight rein on the looks of the place.
>
> "Stick to your guns. Study the drawings so things can't be slipped past you. Don't be pressured into approval. And finally, if things aren't going your way, you can always hold back on their fees for a while. If you want a building you can live with, you must fight for your rights."

Incidentally, the client described in the last paragraph would probably be described as a 'client from hell' by architects; their feelings being the other side of the coin, as described in the following "Warning to Architects"[20], also compiled by Cuff:

> "Beware the client. He will try to rob you of your integrity, your creative intent, and with that robs himself of good architecture. No matter how many buildings you've seen to completion or how happy your former clients may be, the next client will not trust you to do a good job in his behalf.
>
> "With clients, the pocket book reigns. Amen. And since they're sure we have no monetary restraint, they pinch and pull at the building until only a fragment of your intention remains. Woe

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19 Cuff, 1982, p. 5

20 Cuff, 1982, p. 6

be it to the architect who suggests spending more money to achieve greater quality without a measurable gain in quantity - more square feet, another window, a bigger entrance. At billing time, this penurious streak persists. Expect only that doing a good job means losing money. We can wait months for our fees, yet somehow clients expect we are "moving right along" on their projects. They think our fees extravagant, yet they sally into the office with a new idea each week, ready for you to throw out the old and bring in the new. And when you show a scheme - be prepared - clients know very well what they don't want and very little about what they do want. The tiniest detail, the most insignificant element, that runs counter to their taste can subject the whole scheme to criticism. Every client fancies himself a designer, and expects you to recognise it.

"With one client, you might be able to explain, reassure, persuade, but nowadays, we most often entertain medusa-like clients of committee proportions: each representative has a personal bias, each wants to parade his impeccable taste, with no clear way of making a decision about anything. We listen to them talk about everything, like a counsellor, in meeting after meeting, until (and this may be their intent) we have no energy left for architecture."

So, is there any truth in these feelings of mutual distrust? Although they certainly are extreme, they do illustrate the preconceptions with which both clients and architects enter the design process, and form the architectural myth. And yet, architects and clients work together daily; surely, then, there is some room for reconciliation.

## The Disappearing Architect

The first accusation of the clients, concerns a very real problem. In every office there is the 'star' architect, who will tackle the more prestigious designs, and the 'junior' one who will deal with the more mundane aspects of architecture. This can easily be explained logically - the more prestigious the design, the more difficult problems it will pose. A seasoned, experienced architect stands far better chances to come up with a successful solution than a less experienced one. And it is hardly worth spending an expert's time (which can be quite expensive) on design problems that can be easily dealt with by junior personnel.

Still, all that can be hard to explain to clients, who, reasonably enough, demand the best service they can get for their money. That the experienced architect "whose name is on the door" will realise that a particular design is relatively routine work,

and will decide to pass it on, can be seen as a form of treachery by the client, who feels he is being tricked; after all, he did choose the "name on the door".

Yet, it is interesting to note how some firms try to make a point of the senior architects being involved with every project, in an effort to avoid these negative feelings. A firm's brochure reads "we are a team of Designers and Architects led by the two partners ... who are actively involved in *all* projects".[21]

Another interesting aspect of the same problem was mentioned during a series of interviews conducted for the purposes of this Thesis. An architect marvelled over a particular architectural feat by a 'star' architect, which led to the question, "but doesn't he build any simple houses?" To which he answered, "sure, but no-one wants to know about them! Every architect has his skeletons in the closet - boring, mundane architecture, that interests no-one. But that's what pays the bills, you know!"

## Reign of the Pocket Book

The price issue is a much harder one, and has led to many communication breakdowns. Anecdotal evidence gathered during my interviews with architects suggests that it is the primary factor in clients leaving a particular architect for a new one, and indeed the most common cause of strife with clients. In fact, this problem was so persistently mentioned, that an attempt to explain the idiosyncrasies of the personality types of most architects is made in later chapters, where it is argued that most architects belong to creative personality types that lack an aptitude for observing details such as timetables and budgets. This can be even more obvious when the client belongs to an opposite personality type, leading to a complete breakdown in communication. In any case, a gap in communication is generally present, originating from the fact that architects feel clients do not trust them, while clients feel architects are irresponsible and show no consideration for their budget.

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[21] Lee Boyd Partnership brochure, Edinburgh, 1998

The truth has to lie somewhere in between. Although a particular personality type to which many architects belong can be prone to exhibiting an unnerving lack of interest concerning their clients needs, all architects know they depend financially on the client, and therefore it is to their own interest to respect his budget; obviously, a bankrupt client is a poor investment.

Still, architects are under a dual pressure: on one hand, they have to earn a living; and that depends on the client's willingness to part with his money. On the other hand, they have to take into account their peers' view of their work. This is a factor usually neglected in literature; yet, architects do seem to care a lot about what their peers think. This feeling is further reinforced through architectural awards, magazines and exhibitions. It is as if they feel they *have* to pretend they are on the cutting edge of contemporary architecture, and they constantly *have* to prove their worth to their peers. And, as clients would say, it is as if they live in a world of their own. Some architects acknowledge this; as one who was complaining that "architectural photographers tend to produce pictures that will impress other architects or the editors of architectural magazines. I'm not sure that they say enough to non-architectural clients who are not so interested in form, texture and massing. They want something more human and which indicates human scale. How often do you see people in an architectural photograph?"[22] In this highly antagonistic environment, it is no wonder that they may neglect their client's financial needs, albeit inadvertently.

At the same time, architects have to be competitive; therefore, in the bidding practice, they may tend to quote a smaller budget than they suspect the real one will end up being. This is one of the unavoidable problems of the bidding practice, of course. As an architect complains, "in my work the actual design emerges quite late in the course of meetings and discussions when you try to get to what the right

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[22] Golzen, 1984, p. 131

solution is from the client's point of view. With a competition you start from the wrong end."[23]

Golzen offers an interview with a member of "that rare species, the genuine private client" [24]. He has built three houses, in one of which costs have run over the original estimates, and about which he comments: "Some of the over-runs occurred because of unexpected problems with the fabric. But the architect also led me on a bit. In the course of the job he put forward much more expensive solutions than the ones he'd originally suggested, and of course that has a domino effect on other parts of the process."[25] Not surprisingly, he is feeling that, consciously or unconsciously, architects have the idea that clients have much more money to spend than they say. "I was able to meet the additional costs because of an unexpected legacy, but if that hadn't been the case I would have been forced to sell, or go to the bank for a loan I might not necessarily have got."[26]

So, what can be done about this financial problem? It can be argued that its roots lie in the basically antagonistic relation between architects and clients. As a developer points out, "the contractual case law reasons an adversarial relationship has built up, in which all parties try to protect themselves amid the small print, instead of working together."[27] In the occasions where all parties do manage to overcome their antagonism and fears, the result can be highly successful for all involved, even if it means more expenses than originally anticipated. While the Lloyd's new building was being built, the architects realised that rapid changes in information technology (IT) meant that the proposed capacity for electronic equipment already needed upgrading. "A commercial judgement had to be made about how much additional expenditure and threat to the programme could be justified to meet an unknown demand. After studying the options it was decided to upgrade capacity to the equivalent of 25 $W/m^2$ in offices and some 50-60 in the Room. The additional cost,

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23 *ibid.*, p. 150
24 *ibid.*, p. 177
25 *ibid.*, pp. 177-8
26 *ibid.*, p. 178

although great, was acceptable, and Bovis the contractors were confident that the changes would not prejudice the programme." [28]

As this example demonstrates, one way to smooth relations is, simply, through bargaining and good communication. Both parties should keep in mind that their goal is to produce a building that would satisfy them, and that they will need sufficient funds to accomplish it. Architects should not be sceptical about talking over their financial worries with the clients – as one developer pointed out, "developers respect hard and fair dealings – and they don't thank you if things go wrong as a result of taking shortcuts. Cut-price buildings nearly always produce trouble for the architect, the client or the contractor – often for all three. It is a short-term capital gain for a long-term revenue loss."[29] In fact, some architects argue that good business procedures should be an integral part of the total process, and good design is more easily achievable because of them.[30]

Besides, this financial bias can also work in the interest of the architect. According to an architect, "there's much more interest in design quality among developers because the recession showed that excellent buildings continued to be saleable or lettable even when times are difficult."[31] This is a very interesting observation, but unfortunately he does not explain what he means by "excellent buildings". It can be surmised, though, that an excellent building is one that maintains its artistic value, being successful from an aesthetic point of view, while at the same time meeting its users' practical needs.

Ironically, it would seem that one of the positive aspects of the architectural myth is that, since clients expect architects to be impractical anyway, they are ready to forgive them for that. As one woman nostalgically says of their building a new house, "it was just like I thought. We knew what we wanted, but Bill (the architect)

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27 *ibid.*, p. 201
28 Blackmore, 1990, p. 55
29 Golzen, 1984, p. 103
30 *ibid.*

decided what it should look like on his own. He also forgot the heater completely! And it cost $20,000 more than we budgeted. But we got along pretty well; I think I'd hire him again if we needed an architect."[32]

## Architect - the Artist

The third complaint towards architects, mentioned in the 'open letter' is that architects will show no respect for their clients' functional needs and artistic desires, and they will impose their views instead. On the other hand, architects revolt at the notion that every client considers himself a designer. In their mind, they have spent years learning about design, and indeed that is the central axis of their professional (and often individual) identity; how can a *layman* dictate them how to do it?

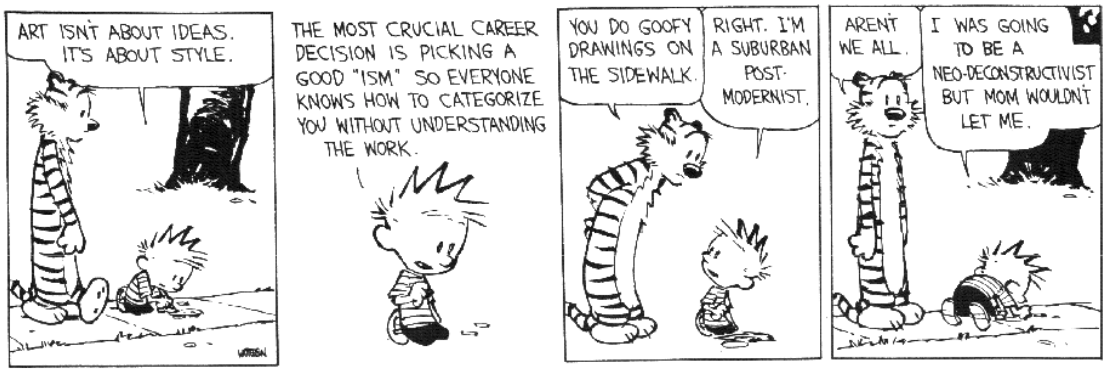


*Fig. 2-1*: The architect-artist is often perceived as caring more about style than content[33]

This is another factor mentioned persistently that depends heavily on personality types, and architects are categorised in later chapters according to this – how much they respect their clients' needs, and how much they heed their own artistic views. It can be a hard reconciliation, and all architects seem to have struggled with it, at one time or another. Clients feel they have a right to get what they want, and architects feel they have a right to broaden their clients' artistic views and ideas, and they justly

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31 *ibid.*, p. 31

32 Cuff, 1982, pp. 3-4

wonder how clients can really choose what they like best, if they are only aware of two or three styles. Often, they can even ignore completely their clients' real needs for the sake of pursuing Art, like the architect designing a park around an exhibition: he wanted to use hard stones for the gardens, while the park users wanted grass, so their children could play without fearing a possible injury. The architect managed to win, on the grounds of his idea's superior artistic value, that would set the park apart from all the other '*banal*' parks that have grass.

This can seem arrogant and imposing, but in truth it is common practice. From the architect's point of view, he has a *duty* to educate society, to propose changes, to open people's eyes to new ideas and to change culture. Architects bring on that change, and are responsible to a great extent for the society's artistic values. From that point of view, clients' needs *must* come second; as Eisenmann says, "none of my houses is shaped for clients' needs. They are designed to shake them out of those needs." [34] After all, they argue, that is what they are there for; if someone wishes, they may as well use an engineer (often perceived by the myth as their artistic enemy, lacking any aesthetics) instead. Architects are needed exactly for their ability to accommodate the new and exciting in their designs. In this era of individuality, architects struggle to produce for their clients designs that will be as individual as their owners; a convincing argument. Buildings are far more that shells, accommodating their owners' activities. They are statements of who these people are, what they do, what their standing in the society is, and how much they appreciate art. This is not the architects' doing; the society has chosen to project its values in such a way. It is the clients, therefore, that demand this, and architects have to accept their wishes.

However, there are three additional factors that form the clients' point of view: Clients are also human beings, and the buildings have to provide for their more 'mundane' and practical daily activities. Also, in the long run, they do not want to

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[33] Calvin and Hobbes (c) 2000 Watterson. Reprinted with permission of Universal Press Syndicate. All rights reserved

live in a house that will look great – at least for a number of years – but be impossible to live in. And, thirdly, no-one admits freely they have no good taste and appreciation for art, and then surrender without terms to someone else's taste. It is these three factors that are responsible for the ensuing 'tug of war'.

Architects, therefore, have to accommodate these factors, along with the fact that clients lack their architectural training. What is commonplace for architects may well be fascinating for clients; what is redundant for one, can be exciting for the other. Perhaps the problem actually has to do with the aims of architecture. If architecture is meant to shape society, then architects have a right to impose their views and taste. If it is meant to provide clients with a built shell that will make them feel 'at home', it is obviously wrong. The potential for architecture changing the world is summed up in Churchill's words, "we make our buildings, and afterwards our buildings make us"[35]. However, it is inappropriate to ignore the fact that each individual has different needs, and that clients choose an architect because they want their idiosyncrasies to be taken account of. In that light, the client, not social change, should be the primary focus of an architect's efforts.

It is generally recognised that, "architecture, whatever the skills or ambitions of individual architects, is like automatic writing which spells out the truth about the condition of society"[36]. Architecture changes with the society, and it is generally accepted that there can be no 'perfect' architecture if examined outside its context. Perfection in architecture cannot be taken as a constant, but rather implies the perfect blending of a building within the society of its time. This explains the vast variety of styles, schools and designs that have influenced architecture at one time or another. Therefore, it can be argued that any attempt to create perfection in architecture is doomed to be temporary; but the client will still be the one that will have to live with the result.

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34 Newsweek, Oct. 4, 1976; pp. 66-69; in Cuff, 1982, p. 65

35 W. Churchill, 1924, from an address to the Architectural Association; in Duffy, 1992

36 Duffy, 1992, p. 233

Consequently, the primary goal of the architect should be to balance the satisfaction of the client's needs and the artistic needs of his time - since it is impossible for one to live outside it. Of course, not all client wishes and whims should be followed unquestionably. Indeed, architects, with their significantly greater experience, may understand some client needs better than the client himself. However, their job should be to interpret the client's wishes in tenable, buildable ways, to tell them what is possible and what not, and to be able to suggest alternative solutions that will please both. An architect's job should not be to change the client and impose his own deterministic view on how the client ought to live. Architects can warn the client, but do not have the right to decide for them. The primary focus should be on communication, and therefore there can be no room for arrogance, since that always destroys communication. Architects must possess good communication skills, and a personal empathy that will allow them to understand the clients' needs even when they cannot express them satisfactorily.

The persistence on this "arrogant" aspect of the designer *psyche* is due to its ability to play a very important part in the interaction with the client. This attitude is considered by the architectural myth to have prevailed throughout architectural history. However, in reality, participatory and collaborative design made a conscious attempt to change things during the 1960s. The client was given supremacy in the interaction, and the designer's role was reduced to that of a consultant. These movements have largely disappeared nowadays, albeit not without making their mark. Their failure was that, although patronising and often annoying to the client, the "star" attitude acknowledges that clients normally have but a limited knowledge of design, and lack any sophisticated criteria for the judgement of good design. Giving them all decision-making power, as some extreme movements called for, led to equally unsatisfactory design solutions, as giving them no say at all. Obviously, a new balance needs to be reached in the interaction between architect and client; collaboration is suggested here as that balance.

Still, the often antagonistic relation between artists and their clients has been going on for centuries, and it seems unlikely that it will end soon. On a larger scale, it can be seen in modern-day debates as to whether advertisements can be Art or not, and as to what Art is; the obvious answer being, that it depends on who you ask. However, by accepting the definition of design mentioned earlier, one can see that, if architects make an effort to balance their artistic views with their clients' needs and with the scientific problems factors, there is no reason why the whole experience cannot be, in the words of a client, "marvellous fun, like an elaborate game for grown-ups."[37]

## The Medusa

Another very real problem for architects is mentioned in the final paragraph of the 'open letter to clients': that of the increasing need to "entertain medusa-like clients of committee proportions". In this post-boom era, it is usually large corporations and organisations that can afford to build; the wealthy client increasingly becoming a thing of the past. Just as the architect working alone has often been replaced by the architect-employee of a firm, the client has been replaced by the corporation. Clients now are representatives who attend meetings and then report internally to some higher authority. As a result, instead of direct knowledge of a project inhabitants, the architect deals instead with their agents - those corporate or institutional entities who commission the projects. Statistical data has replaced first-hand observation of real people and their needs and aspirations.[38] Some times, the situation can be even worse, as when working with developers, developing a site to be sold to an unknown customer. A generic, flexible design must be discovered, that will appeal to a number of possible buyers, with a variety of needs and tastes.

Architects must, therefore, often deal with committees and virtual clients, and every decision has to be pushed through a number of different individuals, each with his own agenda and idiosyncrasies. This is indeed a daunting task, and has led to the

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37 Golzen, 1984, pp. 177-8

38 Fitch, 1965, p. 236

evolution of interesting tactics. For example, an architectural firm explains they first devote a lot of attention to establishing what the corporate structure of their clients is and trying to find out who makes the decisions. After that, "it's more a question of instinct and experience and picking up the atmosphere in meetings." [39]

This strategy is based on a common fact; committees are groups of people, and, as such, interpersonal dynamics tend to follow certain rules. There are centres of power, with relations of antagonism or agreement. As with every group, impromptu coalitions and mini-wars can take place, but everything tends to be fluid; today's 'ally' can be tomorrow's 'foe' and vice-versa. Seldom does something dramatic happen, but one must be careful to maintain the right balance. This can indeed lead to feelings of despair, as plans can be scrapped for no apparent reason other than that a particular centre of power rejects it, even though everybody else may be perfectly happy about it (or, in some cases, exactly *because* everybody else likes it). At the same time, it can also open new avenues; architects knowing whom to approach before meetings, who to talk to and what to say, can push through their views much easier. And, of course, cultured, well-educated committee members can be more open to new architectural ideas than single clients.

Therefore, the increasing presence of committees changes the communication process between architects and clients. These changes, however, have in fact little to do with the actual design, and the way architects exist as designers. Their main area of impact lies in the architects' communication skills, and their ability to be flexible, to interact and to communicate effectively. Diplomacy can be far more important than good design in this context, and, as with the single client, possession of good communication skills is crucial.

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[39] Golzen, 1984, p. 68

# The Client's Tale

Practitioners do not exist on their own, in a vacuum. They have to interact with real clients, in a real environment. In this context, it seems that the situation is perceived as changing. Generally, all clients - individuals or not - are thought to be more demanding, better educated and with specific demands, often to the point of choosing the building elements themselves. At one time a client used to approach a firm, and it could be safely assumed that he wanted them for that job. Nowadays, they will be only one of four or five firms he will speak to, and he will want to look round their office, examine the structure of the partnership, their finances and even the extent of the insurance they carry[40]. A possible factor for this may well be the better marketing of companies that offer building materials. Specialised advertisements have left their normal magazines that are written specifically for the needs of the architectural, construction, design and engineering industries (referred to as the ACDE sector), and have found their way to TV and mainstream publications, in the companies' effort to become more competitive. This has resulted in expanding knowledge of building material products outside the normal ACDE industry boundaries.

Or, as an architect puts it, "clients these days are much better informed and there's less spec building by developers in the hope of an occupant. Generally an occupant exists or has been signed up and he has a clear set of objectives about time, cost and how he wants the building to perform."[41]

This seems to be partly the result of the increasing power of the planners, and the increasing amount of considerations. "At one time you'd just get the client's instructions and come up with a solution. Now the important thing is to be able to satisfy the planners. You have to be able to provide answers about density, servicing, traffic, illumination and external materials as well as the appearance of the

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40 *ibid.*, p. 73

41 Golzen, 1984, p. 151

building."[42] There is a feeling of decentralisation, and of sharing of control between too many actors.

Still, and apart from the general changes, the fact remains that different client attitudes reflect different architect attitudes. They complement each other; in an example mentioned above, the architect is easily forgiven for overlooking some important, but mundane, details such as heating! Likewise, "star" architects need clients like an eminent captain of industry who, as chairman of a major city chamber of commerce, headed the committee responsible for a new headquarters building. An appropriate procedure to appoint an architect was followed, and after the successful candidate had been told of his appointment the chairman turned to his colleagues and said: "I am confident that in the selection of Mr. X we have made an excellent choice. Now we can leave it all to the expert and look forward to receiving his detailed proposals for our new headquarters."[43] In a similar example, a client says during an interview, "when [the architect] takes one of my suggestions, it makes me really nervous. Why should he listen to me?"[44]

One attitude towards architects is reflected on a survey of over 600 "mega-clients", conducted in 1980 by the "Building Design and Construction" magazine. These clients were the ones who do at least $1 million of commercial - institutional - industrial construction annually, and the average expected outlay for the upcoming year was $23.5 million. What was examined, was the way through which these clients hired a particular firm. According to their answers, their choice was based (in rank order) on: ability to complete on budget (47 %) and ability to make building function (47 %); ability to complete work on time (36 %); and ability to work with owner staff (33 %). Aesthetic quality ranked tenth on their list along with fee amount (both at 21 %).[45]

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42 *ibid.*, p. 76
43 Blackmore, 1990, p. 27
44 *ibid.*, p. 74
45 Cuff, 1982, p. 57

These clients do not care so much for aesthetic quality, as for practical value. What they are interested in is a well-built building, that will function properly, economically, and will be completed within the available time and budget. Effectively, they want a good project manager, who also happens to be an architect. Architectural qualities like the ability to produce a well researched brief are appreciated and creativity is a desired quality, but not essential. There is a growing feeling that good buildings can be designed on very tight budgets, as exemplified by the Kasabov Associates' Amnesty International offices in Easton Street, London, Arup Associates' Colwyn House, or the Lloyd's of London Press offices in Colchester[46], and this ability is often considered to be more important than the aesthetic qualities of design.

When these clients choose an architect, they know what to look for: "the Client's Advisory Service came up with the names of three firms. We chose Moxley Jenner & Partners because we felt there were three vital areas where our interests needed to be protected - the performance specification of the building, construction time and cost."[47] Often, these clients are developers, with very specific needs: "What we have to look for mainly, now that funds are short, is the ability to work within the limits laid down for housing associations in the tables of total indicative costs."[48]

On the antipode of this attitude are the clients that choose not so much an architect, as an "-ism"; a school of design. This attitude is exemplified by the newly emerged tradition of architectural magazines that offer blueprints for houses built in different styles. The customer only has to cut the blueprints, and use them to build his own house, without considering any of the practical issues like lighting, site orientation etc.

Finally, there are the clients that care for both design quality, and the fulfilment of their practical needs. "Chiefly we look for design excellence - easier to recognise

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46 Blackmore, 1990, p. 27

47 Golzen, 1984, p. 160

than to define. But we also look for sheer technical skill. It's absolutely vital with high-tech materials and construction methods that are used on our buildings for a practice to have a thorough understanding of engineering and servicing problems, as well as of the economic implications of various construction solutions."[49] Presumably they will be demanding on architects, and will frown upon any attempts for potentially costly design improvements, but aesthetic qualities are important as well.

# Conclusion

This chapter attempted to define architecture and the role of the architect. Architecture was described as a unique combination of elements traditionally conceived as opposing; namely, as a combination of art and science resulting in the design and construction of buildings that will accommodate present and future human activities. This, however, describes only one side of the architectural practice. Once it is accepted that any design paradigm has to include a description of the creative process, which in turn has to take into account the unconscious factor, as demonstrated above, the light in which one sees architectural practice must change to reflect this. In the description of the creative process as the expression of unconscious, archetypal images and symmetries, the artist surrenders part of his conscious control over his work, and it is in this element that the importance of this theory in the architectural context can be fully comprehended.

The validity of the architectural myth – common preconceptions that surround the architectural practice and practitioners – was also examined. According to this, architects are expected to be artistic, impractical, sole creators and protectors of Art in the form of their buildings, and shapers of society. Architects are artists first, and Art is their main focus. The interests of both architects and clients, however, can better be served in a context very different to that presented by the architectural myth.

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48 *ibid.*, p. 162
49 *ibid.*, p. 165

This is already happening, and today the very nature and organisation of architectural firms is changing towards a more business-like approach. The ethics of the individual architect-artist are being replaced by the business-like ethics of the architectural office. The role of the architect has similarly changed, and the ideal of the architect-artist is fading away, as new requirements and pressures are being applied. It seems that the 'mythical' element is losing its importance, while practical needs are getting more attention than they used to. The architect therefore is becoming more of a manager and less of an artist.

The main reasons for change are financial and social. Social factors like democracy, literacy and a sharp focus on the individual all play a significant part. Architects find it harder to impose their views, and a disrespect towards 'experts' of any kind means they find their designs criticised and questioned more than ever. Clients have become more demanding, and the new challenge to practitioners is to make people aware of what they can do for them. Many architects have realised that they cannot afford to be indifferent towards their clients' need. They now face the challenge to review their role in the best way, learning to heed their clients' needs. If this challenge is not met, the very role of the architect - designer could be replaced in most cases by that of the architect - project manager.

This realisation has led to a new focus in communication and collaboration. Committee meetings and demanding clients mean that architects have to develop their communication skills, and learn how to manoeuvre and gently manipulate whole committees to accomplish their goals. Architects have largely got used to the notion that the ability to perform the business part of architecture effectively need not distract from the creative act of design. Today, it can be argued that good collaboration with clients is the key to achieve good design, and good communication skills are a *sine qua non* of this new collaboration.

# Chapter Three

## *In Search of new Design Paradigms*

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The six phases of a design project:

1. Enthusiasm
2. Disillusionment
3. Panic
4. Search for the guilty
5. Punishment of the innocent
6. Praise for the non-participants

*(Notice on the wall of the Greater London Council Architects Department)*

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# Introduction

In the previous chapter, the architectural myth and the role of the architect were examined. It was argued that both practitioners and clients will benefit from a collaborative approach to design, leading to the emergence of a new collaborative design paradigm. In this chapter, the development of this new paradigm that will promote balanced architecture is continued. To understand the differences from existing paradigms, some of the existing classifications will be described, and the argument will be made, that they usually neglect to encompass both parties of the design process; namely, they largely ignore the role of the client. An alternative collaborative approach will be suggested, described and explored. Some ways in which architects and clients currently collaborate are also described, as are ways in which technology can aid the collaboration.

# Descriptions of the Design Process

The first step towards a successful collaboration, is to envision the interaction between architect and client as a partnership, with both partners holding equal shares. Each brings something unique to the whole; the client his understanding of his needs,

and the architect his training and experience of successful and - perhaps even more importantly - unsuccessful design solutions. It is this client factor that has been largely neglected in existing design paradigms. Indeed, one of the most common existing paradigms' shortcomings is the fact that they deal with the designer as if he were a stand-alone creature. In practice, obviously, this is not the case, and the actual interaction between an architect and a client will be analysed. Their relation can be thought of as a combination of asynchronous and synchronous communication. This communication is focused on the exchange of design ideas, in an attempt to form a conceptual idea of the built form. These conceptual ideas are created through verbal communication and image presentations. Therefore, the aim is the ultimate creation of built form; the medium is the communication and exploration of design ideas.

The first obvious place for one to look for a description of the design process, is the Royal Incorporation of British Architects (RIBA) Handbook. The RIBA has produced a practice and management handbook for use by architects. The handbook divides the design process into four phases[50]:

### Phase 1 assimilation

This phase involves the accumulation and ordering of general information and information specifically related to the problem in hand.

### Phase 2 general study

This one concerns the investigation of the nature of the problem, possible solutions and/or means of solution.

### Phase 3 development

The third phase concerns the development and refinement of one or more of the tentative solutions isolated during phase 2.

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[50] RIBA, 1990

### Phase 4 communication

Finally, one or more solutions is communicated to people inside or outside the design team.

Since the handbook is declaring that there are likely to be unpredictable jumps between the four phases, a schematic diagram of the design process would be as in Fig. 3-1.

The RIBA Handbook also has a more detailed plan of work, that consists of twelve stages described as a logical course of action. Labelled from A to M, they are the following:

A Inception
B Feasibility
C Outline proposals
D Scheme design
E Detail design
F Production information
G Bills of quantities
H Tender action
J Project planning
K Operation on site
L Completion
M Feed-back

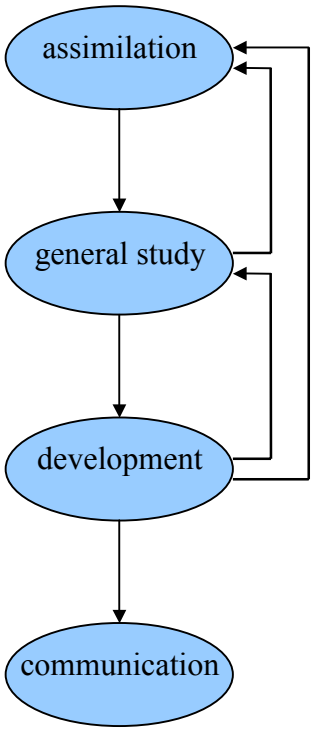


*Fig. 3-1*: The RIBA plan of work map of the design process

This *Plan of Work* as it is called is later condensed to a simplified version in what is described as "usual terminology".

| | |
|---|---|
| A-B | Briefing |
| C-D | Sketch plans |
| E-H | Working Drawings |
| J-M | Site operations |

From this, one can understand that this Plan of Work is not really a description of the process, but rather a description of its products. This assumes that every product marks effectively the ending of a particular Phase, or stage; for example, sketch plans are indeed the end product of stages C (outline proposals) and D (scheme design). This, however, does little to explain what is really happening in the design studio during the process itself.

Furthermore, it is obvious that the two descriptions fail to converge into a single method of design. While stages A-B can be thought to correspond to Phase 1, stages C-D to Phase 2, and stages E-H to Phase 3, stage M (feedback) comes only after stages K (operation on site) and L (completion). If one was to take this description literally, it appears the client will only get to offer some input into the design process after the building is completed. This makes no sense, and in fact Phase 4 (communication) seems to be included almost as an afterthought.

To understand this – or indeed any – design paradigm, one has to clearly distinguish between 'drawing-board' design, or something a designer does on his drawing-board, and the 'building' design process, or the process that leads to the creation of built form. The first one essentially ends when the drawing plans have been produced, whereas the second one only ends when the building itself has been completed. The problem with this RIBA paradigm is that it is trying to combine the two in an unclear way. It is only valid in the first case, where partial design problems are concerned, but is an inadequate model for the description of the whole process. Indeed, it applies to the case of the simple design problem, where a client would mention a single problem (assimilation), the architect would study it (general study), develop a solution (development) and then communicate it to the client, who would then offer feedback (communication). It cannot, however, apply to the whole process, as if the client were only to be advised after the building had been completed. This methodological error is further emphasised by the fact that a description based on the end products can only be referring to the whole process; for example, stages J-M are described as "site operations". It appears that this paradigm has been taken out of scale, and applied wrongly from 'drawing-board' design to the whole process; there is no clear distinction between the two 'designs'.

The model could be clarified by an approach referring to the whole process. This would include communication stages and a number of loops *between* the various Phases and stages. In Fig. 3-1, communication comes after the development has been completed; in fact, it is a continuous process, that permeates the

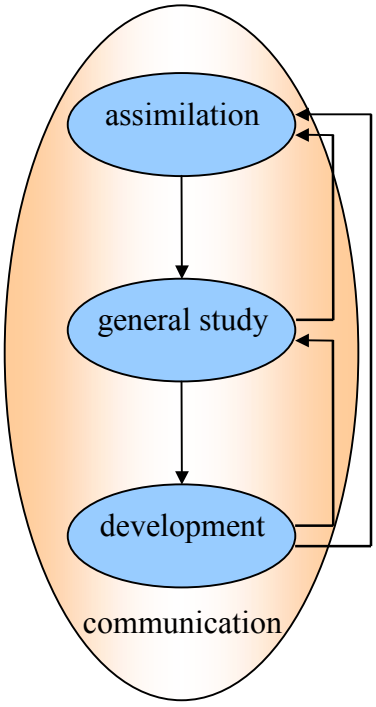


*Fig. 3-2*: The proposed plan of work map of the design process: communication is an omni-present background activity, instead of a separate Phase.

various Phases and stages. As such, it would have been better to present it as a background activity (Fig. 3-2). Still, the RIBA model is the only one that indirectly acknowledges even the existence of the second meaning of 'design', and attempts to describe the whole process, and not the 'drawing-board', partial design that is clearly the focus of other paradigms.

For example, McKim (1980) takes a more theoretical approach, that focuses almost exclusively on the 'drawing-board' design, instead of the design products; and, as such, refers to the solution of partial design problems and the development of partial products. He suggests a process called ETC (Express/Test Cycle). According to this method, a feedback loop is created in design, involving seeing, imagining and drawing; the name ETC was chosen "to dramatise the importance of repetitive cycling to the graphic development of visual ideas"[51]. Figure 3-3[52] illustrates how ETC works. The "arrow in" represents an input of information; "arrow out" an output. An input is typically the statement of a problem, corresponding to Phase 1 of the RIBA handbook, while an output is the communication of the solution ideas, thus corresponding to Phase 4. Phases 2 and 3, however, have been substituted by Express and Test. The expression of ideas is considered to be the first step in graphic ideation. The second step is a careful evaluation - Test. The designer then returns for another round, utilising the information he has gained through the previous cycles - Cycle. The loop ends when the desired idea is fully conceived, and the optimum solution has been reached.

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51 McKim, 1980, p. 135

52 Adopted from McKim, 1980, p. 137

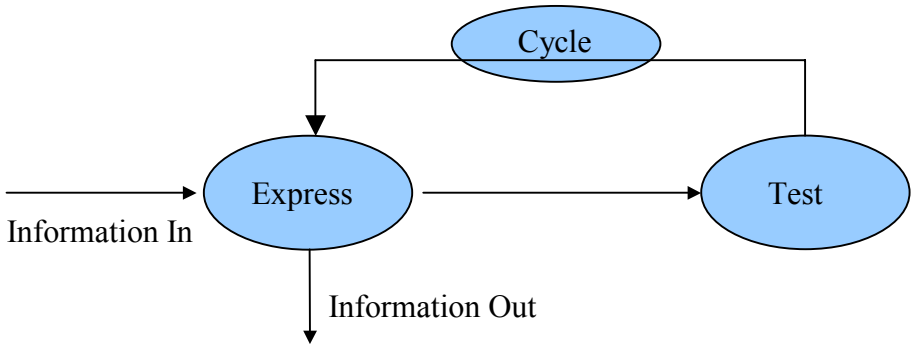


*Fig. 3-3*: The Express-Test Cycle

This method has the advantage of emphasising the importance testing has for the designer; something almost overlooked by the RIBA handbook. However, it fails to demonstrate that testing should involve the client as well as the designer; design ideas are finally put to the test when the designer presents them to the client. A possible rejection means the cycle has to be repeated. In effect, two different levels of testing take place: one by the designer, and one by the client. This second testing stage has been omitted by McKim; something that is limiting the method. Furthermore, the ETC model, unlike the RIBA one, can only be applied in small design problems. This is because it is a 'small scale' paradigm; a description of the whole process would have to be significantly more detailed, and closer to the RIBA stages.

Markus (1969) and Maver (1970) have tried to develop and relate these two design aspects, aiming for a more complete description of the whole process, that would also include the detailed stages. They suggest that design is a recursive process, with stages similar to those suggested by McKim being repeated through the various phases of building. They propose a three-phase design, with four stages in each. This is described in the Markus/Maver map of the design process[53] (fig. 3-4). The four stages are repeated through all three phases, and consist of "analysis", "synthesis", "appraisal" and "decision". These concepts occur frequently in design

[53] Adopted from Lawson, 1990, p. 26

paradigms, and are fairly well known; as such, they will not be described in details here. In summary, analysis involves the exploration, ordering and structuring of the problem and the objectives. Synthesis is an attempt to find possible solutions and ideas. Appraisal then involves the critical evaluations of these ideas against the objectives, as these were defined during analysis. A decision is then made as to the success of the design. In the Markus/Maver map, these stages are repeated through three phases of increasing detail. These phases, "outline proposals", "scheme design" and "detail design" have more to do with the level of detail in the design results than with the process itself; as such, they refer to the progress of the 'building' design process.

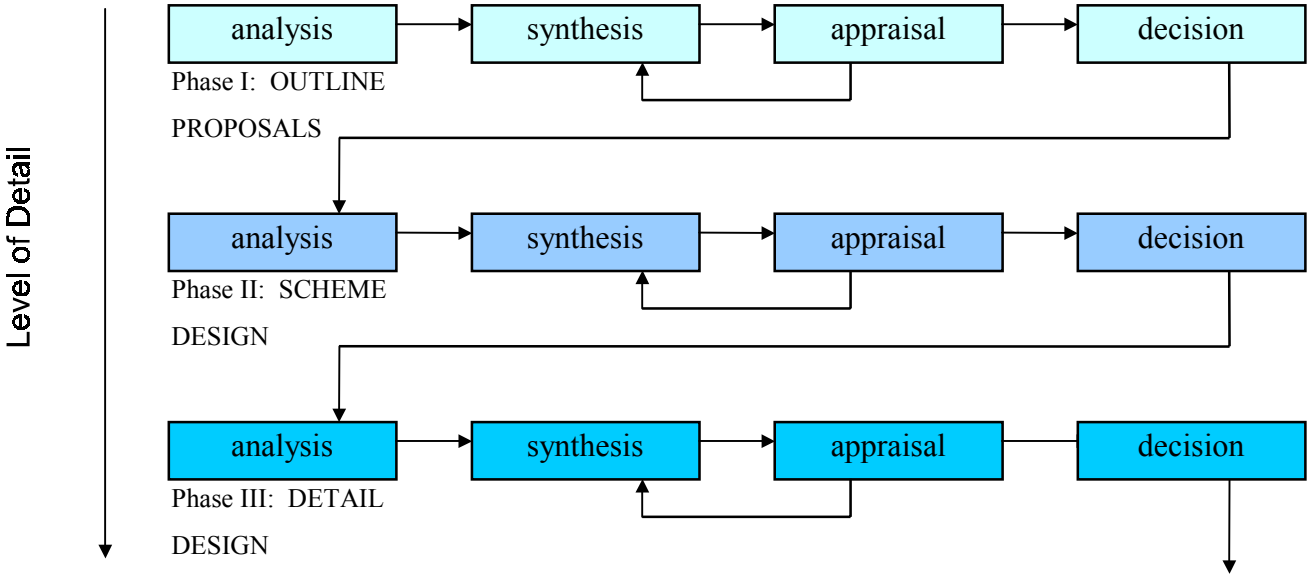


*Fig.3-4*: The Markus/Maver map of the design process

Still, there are different problems with this map, and Lawson is keen to observe its main shortcoming[54]: In a process as complex as design, one return loop is unavoidably inadequate. Even the simplest map of the design process must allow for a return loop to all preceding functions. External elements and unforeseen needs invade the process, creating a much less clear image. But even with return loops

[54] Lawson, 1990

added everywhere, there is no evidence that architects in practice use these paradigms; or, indeed, that they all use any specific method. Attempts to define design techniques like the Alexander technique have failed, and been criticised by many researchers, including Alexander himself[55].

Furthermore, this is effectively a map of the middle part of design, excluding the actual building process, and ending as soon as the plans have been completed. The actual building process, however, can be very important, as many of the factors influencing and influenced by design will be revealed only then. Although it can be argued that a map of the design process needs not deal with anything except 'drawing-board' design – i.e. what the designer will do on his drawing-board -, it can be surmised from the RIBA map of the design process that design should indeed include this stage; something that the Markus/Maver map neglects to do. And any practitioner knows that his work is not finished as soon as the plans are produced. Furthermore, the Markus/Maver map neglects to mention the initial stage; Phase 1 (assimilation) of the RIBA map. Therefore, a successful paradigm should describe all stages of the design process, including the actual building.

Other researchers have attempted a different approach. Trying to propose a method closer to practice, Darke (1978) has substituted analysis-synthesis with generator-conjecture-analysis (fig. 3-5)[56]. In effect, Darke's argument – supported by later research by Rowe (1987) – is that a central idea, which he calls *primary generator*, tends to appear at the very early stages of the design process, and is used throughout the entire process. The primary generator is used to narrow down the range of possible solutions, and as an indication of the success of a particular idea. One of the characteristics of the generator – that can be very simple idea, e.g. to leave as much open space as possible, or to have large bedrooms – is that it is often not even mentioned in the brief, but is an unstated objective instead. As such, it can exert significantly more influence than it would if it were explicitly stated. Rowe

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55 Alexander, 1964

56 Darke, 1978, pp. 325-337

records the "tenacity with which designers will cling to major design ideas and themes in the face of what, at times, might seem insurmountable odds"[57].

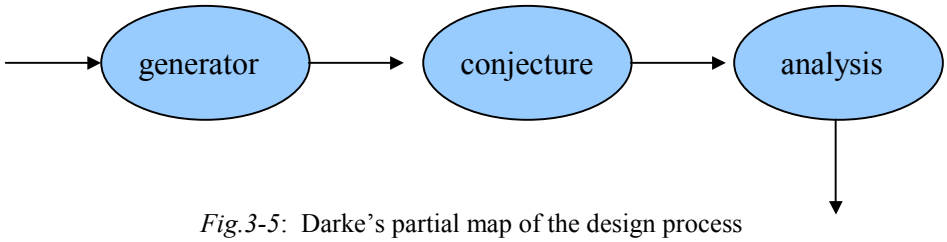


*Fig.3-5*: Darke's partial map of the design process

The same criticism that applies to the previous maps, applies here as well. The Rowe map is probably closer to the actual design process – if design is limited to what the practitioner does on his drawing-board. It is a focused map, describing that aspect of design, but not the whole process. Like the Markus/Maver map, it applies to the middle part of design, and neglects the client's importance in the design procedure. Still, Darke-Rowe's map offers an interesting alternative to the analysis/synthesis stages, exploring exactly how they work. As such, it could be combined with the Markus/Maver map, to produce the map shown in Fig. 3-6.

[57] Rowe, 1987

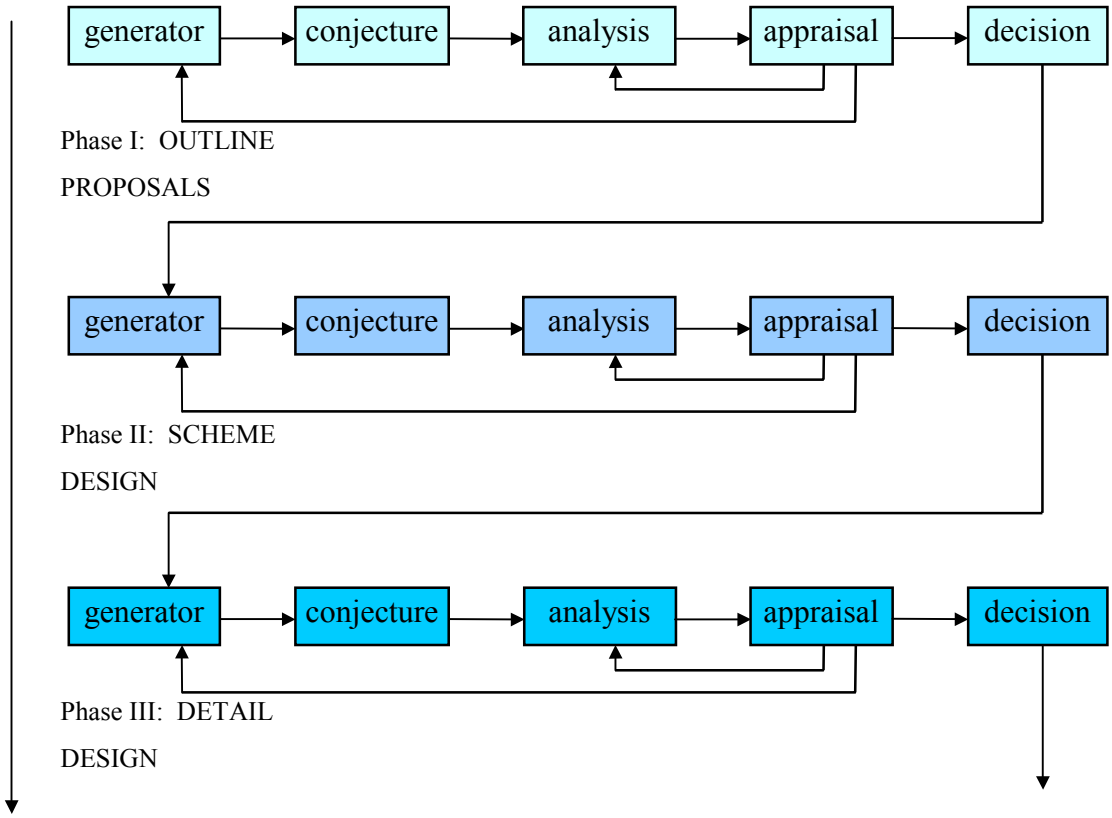


*Fig.3-6*: The Markus/Maver map of the design process combined with Darke's partial map

Still, it appears that these design paradigms are of more value to the researchers, and that designers in practice do not distinguish between different stages. This has actually been observed by a number of researchers in experiments that examined the way designers attempt to create solutions[58]. What was found, is that designers explore problems through a series of attempts to create solutions, but "there is no meaningful division to be found between analysis and synthesis... but rather a simultaneous learning about the nature of the problem and the range of possible solutions"[59]. Even when Akin specifically set out to "disaggregate" the design process, he failed to distinguish analysis and synthesis as meaningful discrete components of design. Instead, he found that they were constantly generating new goals and redefining the constraints. His conclusion was that "analysis is part of all

[58] Akin, 1986; Eastman, 1970; Moore, 1970

[59] Lawson, 1980, p. 33

phases of design and synthesis is found very early in the process"[60]; it appears that design is not a linear process formed by a succession of clear stages, but rather a non-linear procedure, with inter-changeable phases and continuous loops.

## A Collaborative Design Paradigm

As mentioned before, most existing design paradigms focus on the designer. The client's role is largely neglected, and his contribution usually limited to an 'input of information' arrow in these maps. Alexander himself commented on that, remarking that "the artist's self-conscious recognition of his individuality has a deep effect on the process of form-making. Each form is now seen as the work of a single man, and its success is his achievement only"[61]. In the previous chapter, the need for a more equal partnership that would lead to balanced architecture was stated. The corresponding paradigm is described here in detail.

During the first stage, drawing-board design, the designer goes through the various phases examined above, and reaches the communication stage; i.e. he is ready to communicate his idea to the client. The next stage, evaluation, is from the client's point of view. This is important, as designers and clients use different criteria to evaluate design ideas. And finally, communication, or cycle, is the stage at which the client offers feedback and either accepts or rejects the design, thus generating another cycle (see also fig. 3-7).

This paradigm applies to the whole design activity, in a four-phase repetitive manner. As such, it could be combined with the RIBA map of design Phases:

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60 Akin, 1986

61 Lawson, 1990, p. 15

**Phase 1**: Stages A-B / Briefing

**Phase 2**: Stages C-D / Sketch plans

**Phase 3**: Stages E-H / Working Drawings

**Phase 4**: Stages J-M / Site operations

According to this map, four main stages are being repeated, with a different emphasis on each one, according to the Phase it refers to; indeed, the map itself is being altered depending on the stage. These stages are:

**Stage I**: *Communication - a*: The client communicates a design problem to the designer

**Stage II**: *Design*: The designer alone works through an analysis/synthesis/evaluation loop to reach a design solution

**Stage III**: *Communication - b*: The designer communicates the proposed design solution to the client

**Stage IV**: *Evaluation*: The client evaluates the proposed design solution and either returns to Stage I (if not satisfied by it), or moves to the next design problem.

The four stages are forming a loop that moves into different levels as new design problems emerge and the design advances. All stages are present during all design phases, although there is a shift in the emphasis placed on the various elements. Therefore, during the stages A-B, analysis/synthesis/evaluation on the designer part is only rudimentary, and serves to identify potential areas of problem, and ask for clarifications. The main emphasis is on Stage I; Stages II, III and IV are almost non-existent, although it is possible that the designer will start thinking about possible solutions in a very rough way, discussing them with the client in an attempt to discover more about the client's ideas, and using the feedback to generate more design ideas.

During Phase 2, Stages II, III and IV are the focus of attention, with each Stage playing roughly an equal part, although an emphasis may be put on Stage II. Stage I

will largely merge with Stage IV, as the Briefing is now complete. Since changes are relatively easy to make, Stage IV will also play a prominent role; clients may be more eager to suggest changes while it is financially cheap.

Phase 3 is largely similar to Phase 2, although Stage II may enjoy more attention. Also, Stage IV may play a less major part, as it is gradually becoming harder to suggest major alterations; especially ones that may require important changes in basic design solutions and ideas.

Phase 4 sees a shift in the role of the architect, from that of a designer to that of a site manager. This is an important shift, that is largely neglected by researchers, with the possible exception of the RIBA map. Emphasis is no longer on design quality, but on quality of workmanship, punctuality and adherence to the time and financial schedule. If architecture is described as the combination of art and science, it is now science that is the focus of attention, with art having largely fulfilled its role. The four Stages still apply, although they have now changed as follows:

**Stage I**: *Communication - a*: The client communicates a problem in the design/built form to the designer

**Stage II**: *Design*: The designer alone works through an analysis/synthesis/evaluation loop to reach a solution

**Stage III**: *Communication - b*: The designer communicates the proposed solution to the client

**Stage IV**: *Evaluation*: The client evaluates the proposed design/built form solution and either returns to Stage I (if not satisfied by it), or moves to the next built form problem.

Design problems now specifically refer to built form problems, and communication no longer needs to be mainly verbal, as the client can actually see the problems, and does not need to visualise and imagine them. Problems identified during this Phase are hard to correct, and require an important amount of time and

money. Therefore, it is more than possible that the client will be discouraged from suggesting new problems, and will prefer to stay on schedule. Stages I and IV will therefore play a lesser role in this Phase than in Phases 2 and 3. The complete map of the process is shown in Fig. 3-7; with different emphases, it applies throughout Phases 1 to 4.

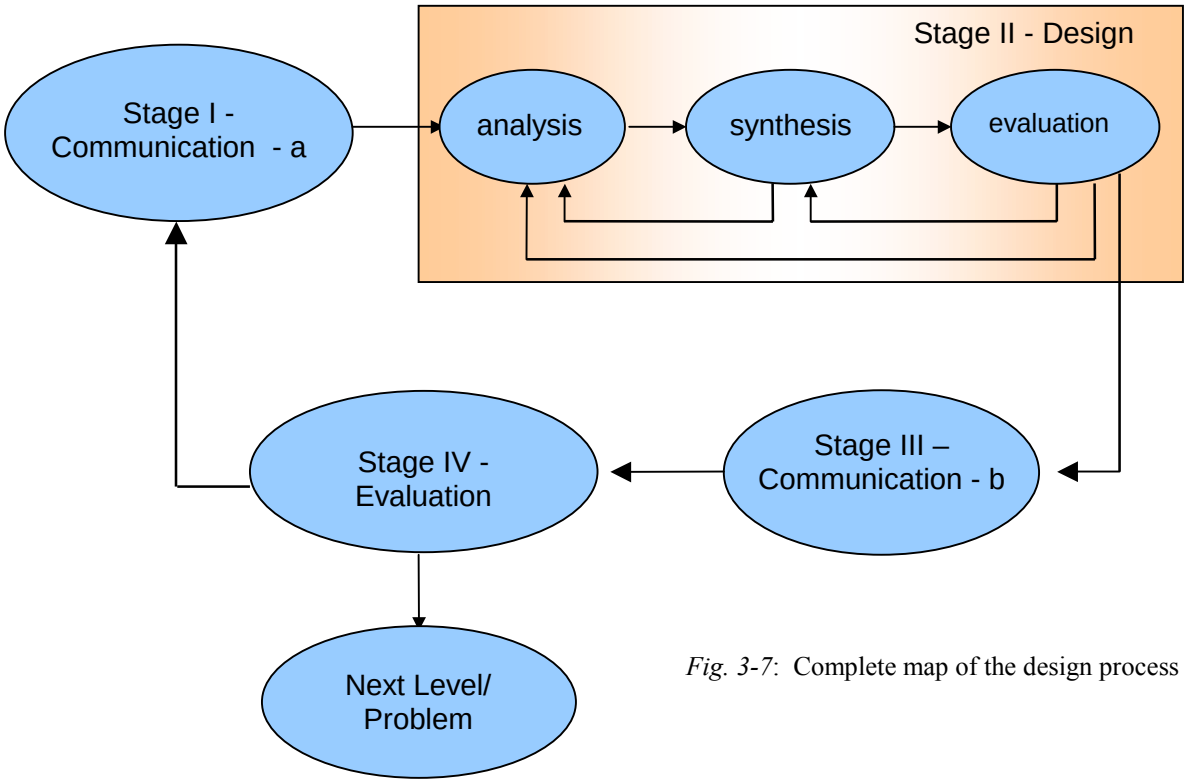


*Fig. 3-7*: Complete map of the design process

## Interaction Paradigm Problems

Every interaction implies the existence of two parties, with their beliefs and experience, exchanging information and ideas. In the case of the architect-client interaction, these ideas are design ideas in particular. Following the definition of architecture offered in the previous chapter, design ideas can be defined as any ideas pertaining to the design and construction of buildings. They can be communicated in either of at least two ways: verbally or through image presentation. Verbal communication can take at least two forms: one, as a verbal description, and two, as a comparison with something recognisable by the client. These forms of

communication will be examined later in detail, but they generally aim to create a conceptual idea of the built form in the minds of the participants. This conceptual idea is constantly changing, since architecture is an open-ended procedure, and the exchange of successive ideas is the medium through which architects and clients are trying to create a design solution, satisfactory to both. Like architecture, design ideas involve, as well as aesthetic expression, a number of other factors, e.g. scientific, functional, social and financial.

The interaction itself is usually perceived by researchers as a combination of synchronous and asynchronous negotiation, that can be compared to waves (Fig. 3-8): periods of low or no interaction, followed by brief periods of high interaction. These periods are defined by the amount of exchange of design ideas that takes place. The architect and the client meet at certain intervals to discuss design progress and evaluate the possible design solutions and ideas. The architect then works alone, implementing the client's feedback, until the next meeting, when he will present any progress made, and so on.

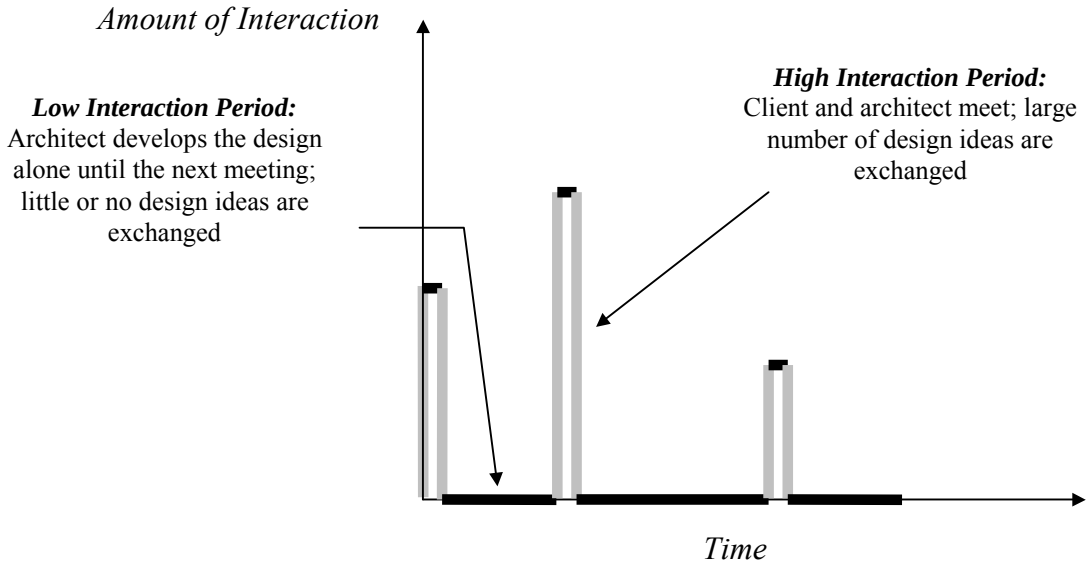


*Fig. 3-8*: "Wave" Negotiation Process: The flow of interaction consists of brief periods of design ideas exchange (grey), followed by long periods of little or no interaction (black).

This interaction model has some important disadvantages, from a methodological point of view. The most important of these is, perhaps, that it isolates client input, transforming it into a static "in" arrow. In fact, some meetings may be more successful than others, while client input may take many forms, and design ideas may be influenced in a number of ways, by a number of participants. For example, one architect interviewed during a series of interviews described in later chapters, had a client who wanted to take all the plans after every meeting and show them to his wife; her input was then transferred back to the architect via the client. And of course clients often discuss on the phone a particular design problem or idea between meetings. These interactions permeate the collaboration process, but cannot be easily depicted using the "wave" map of the process. To solve this problem, one may use the map in Fig. 3-9. The client input is depicted as a background, constant activity, instead of a wave-like activity confined to certain peaks. Obviously, there will be times when there will be no exchange of design ideas; this is shown as the fluctuation in the communication. The same applies to the client evaluation process; communication may fluctuate, but is seen as a constant, background activity instead of a separate stage.

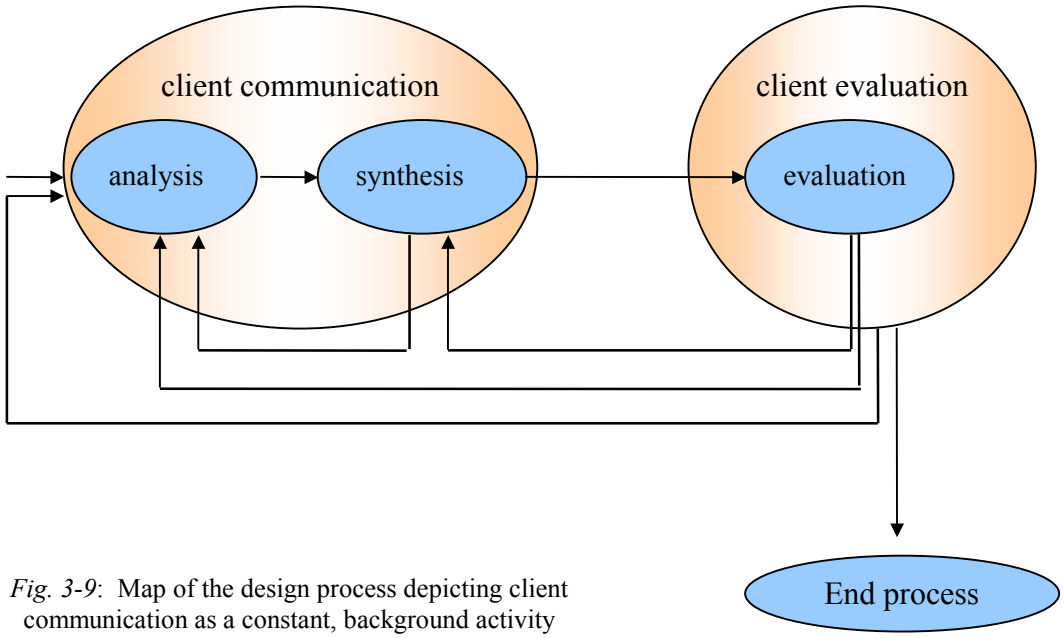


*Fig. 3-9*: Map of the design process depicting client communication as a constant, background activity

## Communication Problems

A great disadvantage of the existing collaboration between architect and client, is that, any mistakes identified during meetings can easily result in a drastic redesign of everything the architect has been doing since the last meeting. The cost, not only in financial, but also in temporal terms is obvious. There are other problems as well; brief or infrequent meetings may impede communication, since clients, realising the high cost their suggestions may lead to, may be reluctant to express their negative feelings towards a particular design. This can easily lead to a silent renegotiation of the role and standing of the two partners in this procedure, with the architect leading, and the client following. On the other hand, clients feeling they are being pushed to accept design solutions they are not happy about, may feel threatened and overreact, being overly negative as a result. They may make impossible demands of the architect or criticise the smallest details, just to ensure their equal standing in the interaction. These are all factors obviously hindering the development of balanced architecture.

There are, however, some equally important advantages to the existing collaboration. Each partner is left to do what he can best; the architect is designing, and the client is then offering his insight as to what would be acceptable and what should be redesigned. The client can spend his time carrying on with his work, and only needs to dedicate a certain, relatively small, amount of time periodically. The architect spends his time designing without having to explain and rationalise every idea he has, and can therefore explore several design solutions in a fraction of the time he would need if he the client were present at the time. This is because of what is often a major lack on the part of the client: a lack of the ability to think visually. One developer was commenting on the importance of this ability of the trained architect: "The ability of an architect to think graphically on his feet in front of an audience is still probably the most valuable gift he can bring to bear in a presentation." [62] Indeed, as this developer implies, almost no-one can do this better

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[62] Golzen, 1984, p. 172

than a trained architect. This is why the interaction with the client can be a tiresome procedure: clients usually have no such training, and are unable to think in a similar way. Most untrained clients will fail to make the spatial connection between the two dimensional sketch or plan they are being shown by the architect, and the three dimensional, full sized, real building it represents; an ability architectural students spend years trying to acquire.

It is obvious that, in order for balanced architecture to be encouraged, a collaboration paradigm should be developed that would exploit the advantages offered by the existing collaboration, while at the same time removing the disadvantages. The main disadvantage is probably due to the inability of the majority of clients to think visually. Architects have identified this problem, and architectural practice has a number of ways of dealing with them. Model making, modelscopes, 3D drawings, perspective, axonometric and plans, are all ways devised to curb this problem and aid the client in his visualisation of the built form. Even simple sheets of brown paper have been used by imaginative designers in their effort to aid their clients' visualisation of the built form, as in the example of the Arup Associates, who used them in their offices to help Lloyd's visualise ceiling heights and the effect of the higher area[63]. The problem of spatial representation is shared between all designers. Full-scale mock-ups were used extensively to develop and evaluate ways to transport the Lunar Rover vehicle on the Apollo 15 flight to the moon. The soft mock-up shown in Fig. 3-10[64] revealed the feasibility of an early piggy-back version. Not only the exterior, but also the interior of this mock-up was detailed, to permit designers to study the human-factor feasibility of the module's instrumentation and controls.

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63 Blackmore, 1990, p. 59

64 McKim, 1980, p. 182

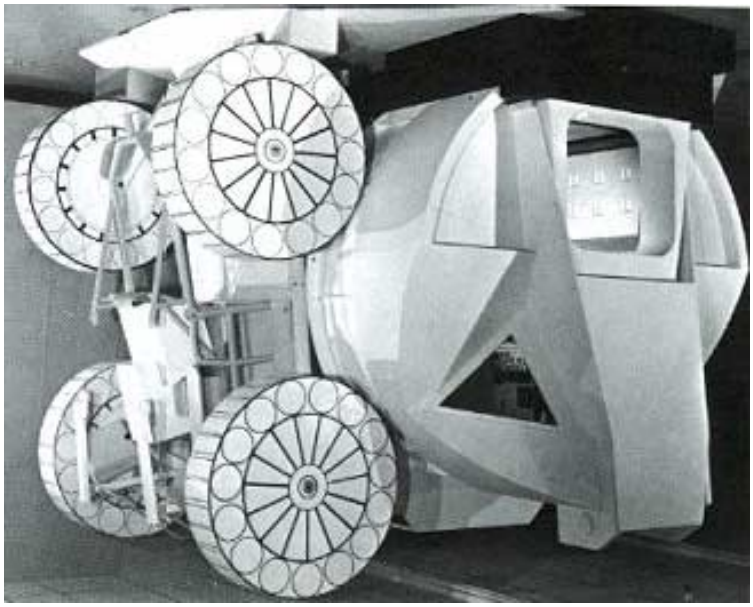
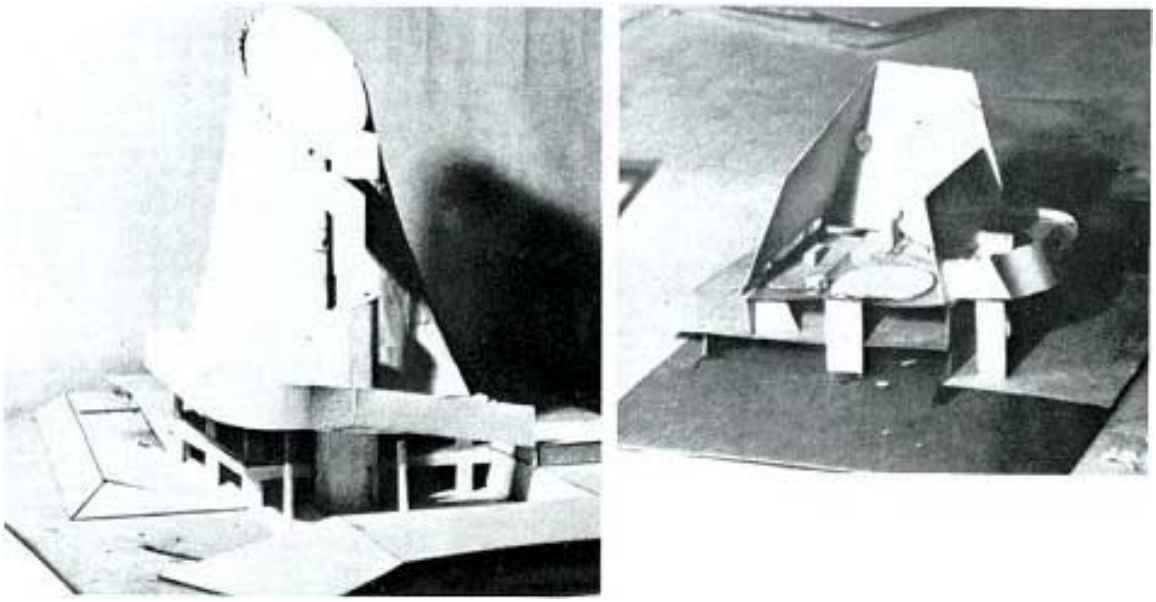


*Fig. 3-10*: Full-scale mock-up of the Lunar Rover on the back of the Lunar Shuttle.

These visualisation techniques need not always be so detailed. When Le Corbusier was designing *l'Eglise de Firminy*, he used a rough sketch, that would encourage modification, manipulation, and consequent evolution of the spatial concept (Figs. 3-11, 3-12[65]). And in Fig. 3-13[66], the model contains considerable abstraction: the outer shell is symbolised by white lines, the seat is a bent plane and the engine a solid block.



*Figs. 3-11, 3-12*: Both Le Corbusier's models for *l'Eglise de Firminy* and Mike Golden's model are particularly interesting for their lack of detail, serving as a rough sketch

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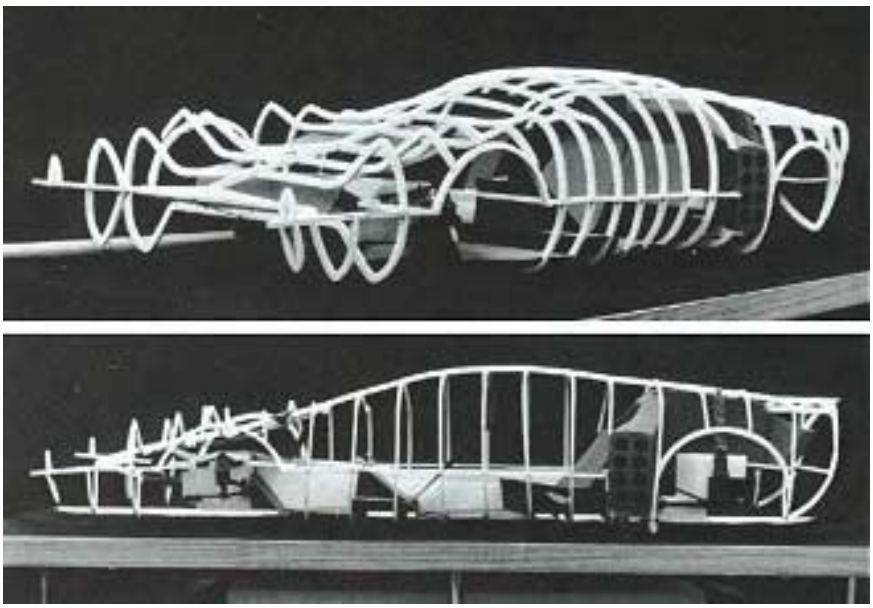
65 McKim, 1980, p. 183

66 *ibid.*, p. 181



*Figs. 3-13*: This model is notable for its abstract style and lack of detail, while still managing to convey the car's general shape

However, these visualisation aids are not always successful; their success or failure depends greatly upon their correct use by the architect, and upon the client's ability to comprehend them. Cuff mentions a clear example of this[67]: "an architect presented two alternatives to a client for a new research laboratory. The client did not pick the architect's preferred alternative, she's convinced, because the axonometric emphasised the roof, almost invisible to any normal viewer, but quite overwhelming from above." The architect, already knowing what the building will look like, failed to realise that she should not have used an axonometric in this case, as the client would not understand the particularities of this representation. This, then, can be thought of as a communication problem, with the architect failing to see through the client's eyes and vice versa.

Furthermore, architects themselves can have problems with existing representation techniques. Specifically trained though they may be, it is very rare for an architect to visualise precisely the expected outcome. Architects will name other kinds of

surprise than clients, of course; which is expected, since clients focus on their personal future use of space. Therefore, architects will name the boldness of a colour, the contrast between some of the materials and the skilful use of space, while clients will wonder about fitting their existing furniture, or how easy it will be to warm up a particularly cold room with large openings. Things, therefore, are complicated by the fact that clients evaluate as users of buildings, while architects think as creators of built form. This again is strongly linked to the architects' ability to think graphically; but can lead to important – from the client's point of view – elements being neglected. When, for example, Frank Lloyd Wright's cousin Richard Lloyd Jones complained to him that the roof of his new house, designed by Wright, was leaking on his desk, Wright calmly replied, "Richard, why don't you move your desk?"[68]; a comment that, presumably, was not appreciated by Jones.

This different point of view is vividly portrayed in architectural magazines and critiques. Architects will discuss at length factors incomprehensible to the layman, such as 'spatial effect', 'visual drama', 'scale' etc., and examine a building according to different styles, movements and influences; clients will want to know whether it has central heating, it is cheap to maintain, it has leaking windows, lack of storage space and noises penetrating party walls.

Another area where this communication problem can be readily demonstrated, is in styles and movements that require the use of concrete. Influenced by Le Corbusier's use of concrete and by movements like New Brutalism, many recent architects have left concrete exposed, both on the exterior and on the interior. Exposed concrete is supposed to express the structural function of load-bearing walls and floors, and it is considered 'honest' to leave it exposed. But the client does not think in terms of 'honesty' or strength of materials; instead, he reacts directly to the colour and the structure of the exposed concrete. Van Wegen's[69] experiment with the words 'wood, concrete, brick and glass' shows that laymen primarily associate

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67 Cuff, 1982, p. 154

68 Kaufmann, 1990

these materials with the constructions in which they usually occur. 'Concrete' is especially disliked, probably because it is associated with roads, dams and bridges, or because of its unyielding, dull grey structure. Architects should think twice about the use of a material that carries such connotations; yet, it is part of their professional system of norms and beliefs which they obviously cannot share with the layman. They evidently ignore the fact that some of the negative connotations of the word 'concrete' will unavoidably carry over to buildings executed in that material, no matter how well designed.

That attitude has also been evident in the case of the more general built environment. Research[70] has demonstrated that architects who like a building or a neighbourhood because of its aesthetic qualities will be inclined to excuse its practical shortcomings; something that Prak calls the "halo-effect"[71]. Yet, the same sensitivities did not apply to laymen. This is further supported by several studies which have given an experimental demonstration of the discrepancies between the attitudes of architects and users towards the built environment[72].

Therefore, in order to improve on the interaction, information technology and computer-mediated communication (IT/CMC) developers have to provide clients and architects with means that will allow clients to increase their spatial awareness, and architects to increase their awareness of how the space is going to be used. Until fairly recently, there were relatively few and expensive ways to accomplish that. But the increased use of information technology (IT) may be able to change that, leading to improved collaboration and communication between architects and clients, and therefore to a more balanced architecture.

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69 Van Wegen, HBR., 1970

70 Kaplan, Kaplan and Deardorff, 1974

71 Prak, 1977

72 Gadellaa et al 1973; also, Lansing and Marans 1969, Yancey 1972

## Improving the Collaboration: Possible Uses of IT/CMC

In order to move towards balanced architecture, one needs to improve the client-architect collaboration. In order to accomplish that, one has to provide both parties with what they need: a way for clients to increase their spatial awareness, and a way for architects to increase their awareness of how the space is going to be used. Furthermore, architects will have to be encouraged to view the building from the client's point of view. It can be argued that clients should also be encouraged to understand the architect's aesthetic arguments, but that is not so much a visualisation problem, as an educational one. Although obviously impractical to suggest that clients should follow a course in architecture when they decide to build a house, this would probably solve many communication problems! Still, IT/CMC may be able to aid collaboration and communication between architects and clients, offering improved visualisation techniques; perhaps to the point where architects will design with their clients during certain stages, on a more collaborative basis. The flow of information can be made to be more synchronous, as in fig. 3-9, with the negotiation being aided by the better understanding through visualisation of the designer's ideas by the client. The architect could also benefit, as the client might be able to bring up problems such as draughty windows or dark rooms.

This approach need not be restricting to the designer; instead, it can free him, allowing his arguments to be more convincing. Architects have long argued that clients can be negative because of their inability to think visually; this would offer a way to overcome this difficulty. If clients can visualise and therefore conceptualise space better, it should be far easier for architects to discuss their ideas. And if architects can be made to pay more attention to practical questions, the situation would be further improved.

Still, this approach could not be applied throughout the entire process, or it would be distracting to the designer. The goal is to keep the benefits of the existing interaction (each party doing what he does best, no need for the designer to constantly explain his line of thought), without the problems (communication and

visualisation). Therefore, it is impractical for architects and clients to work on a fully collaborative basis, as a designer would do with another designer. To achieve this, one would have to apply it to certain stages of the design process. Designers need to work alone or with trained personnel at times, especially while exploring alternative approaches. This is because the criteria that a designer will apply will differ from those of the layman; for example where building regulations and other aspects of building design the client will most probably be unfamiliar with are concerned. The designer needs freedom of thought; something that will be impeded if he had to work with a client from the beginning. However, it is possible that the product of that initial 'brainstorming' activity could then be examined by both architect and client, and then a more collaborative collaboration would be feasible with the help of IT/CMC.

Another important area where use IT/CMC could contribute immensely, is that of the "natural" depiction of thermal and structural data that can be included in the visualisation process. Once the initial design has been completed by the architect working alone, he could meet with the client to discuss it. Visualisation of information such as the temperature inside a room could be accomplished by means of colours; for example, blue usually signifies colder spots, and red warmer; a convention that can be understood by most laymen. The architect would then be able to move around the windows and the heating elements to minimise energy costs, while the client would add his comments from his point of view - e.g. whether his furniture would fit in the new layout or not. Structural data could also be visualised in a similar fashion. Red spots could mean structurally weak areas; clients would then easily realise why, for example, it may be impossible to remove a particular column, without jeopardising the building's safety. Ease of manipulation would be of great help, as it would enable architects and clients to discuss and implement changes in a single meeting. Thus, client input would be accomplished without the architect being hindered by client interference. However, more will be accomplished faster, as the changes will be realised in one meeting instead of requiring a succession of meetings, as their implementation progresses.

If successful, this approach could help minimise financial and time costs. Developing the design together with the client, will minimise backtracking; the client will be able to understand the design as it evolves, and will not face unwanted surprises later, during the construction stage. Furthermore, the 'natural' visualisation of data like lighting and structural integrity, as described above, would force the architect to ignore the 'halo-effect' described above, that results in the tendency to ignore practical problems if aesthetic standards are met.

# Conclusion

A number of classification methods were examined in this chapter, in an attempt to develop a collaborative design paradigm leading to balanced architecture. Although none of these can be thought of as perfect, they all examine different aspects of the design process, and offer insight from a number of perspectives. In that way, they are invaluable, as they allow one to understand the mechanisms behind design. However, one should not mistake these theoretical models for an accurate representation of the chaotic, dynamic and murky process called design; especially since they tend to focus on one of its aspects, and not on the entire design process.

Still, and regardless of theoretical models, there is a fundamental need for communication in design activities, and both architects and clients can benefit from improved communication. With the help of visual representation techniques offered by IT, architects may be able to discuss design ideas with clients that will be able to better understand the space involved. This is currently possible, and can be achieved in a number of ways. Although computer modelling is only one of these, it can be argued it has several advantages over other representation techniques, such as being fast, economic and powerful enough to convey a feeling of 'being there', while at the same time allowing changes to be developed within a single meeting. However, there are still limitations. Clients are normally shown an already designed

walkthrough on a screen. If they want to make a suggestion, it will mean that it is back to the drawing board, then to a computer, then back to a new walkthrough and so on. This repetitive process can be avoided by architects designing directly into the computer, and discussing their design together with their clients, on the computer, realising changes as they discuss them. Visualisation of structural etc. data will help both to understand and remember the practical constraints of their design.

Again, it should be noted that computers do not necessarily have to be used for visualisation purposes. They do, however, represent in most cases the easiest way of doing so. Other possible ways include drawings, models, mock-ups etc. However, apart from enabling changes to be made faster, computers are most probably going to be increasingly utilised anyway, as their capabilities increase, their cost decreases and Virtual Reality (VR) becomes more common.

# Chapter Four

## *An Analysis of Types*

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"Today, we are convinced that in all fields of knowledge, psychological premises exist which exert a decisive influence upon the choice of material, the method of investigation, the nature of the conclusions, and the formulation of hypotheses and theories. We have even come to believe that Kant's personality was a decisive conditioning factor of his *Critique of Pure Reason*. Not only our philosophers, but our own predilections in philosophy, and even what we are fond of calling our "best" truths are affected, if not dangerously undermined, by this recognition of a personal premise… Can it be possible that a man only thinks or says or does what he himself *is*?"[73]

*C.G.Jung*

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# Introduction

In the previous chapter, several design paradigms were examined, that allow researchers to describe various aspects of the design process. There is a fundamental similarity between all theoretical models; they have to rely on standard forms in order for their findings to be as universal as possible. The same applies for the suggested collaborative design paradigm. As all other paradigms, this one describes the visible interactions between what is perceived as standard types of architects and clients. In reality, of course, there are many different types of both. When one attempts to develop a paradigm that is based on collaboration between individuals, the study and typology of these individuals comes into sharp focus. This chapter attempts to identify these types, encompassing a number of personality traits and idiosyncratic attitudes. Their nature and universality is the basic question explored in this and the next chapter.

Can this new paradigm apply to all types, or are there any differences in the way it applies to different types? To answer this question, one has to start by finding a suitable typology. It will be argued that different types have markedly different

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[73] Jung, 1971f, p. 150

behavioural patterns that influence the collaborative design paradigm in practice. Furthermore, a small number of basic distinctions in attitudes can be traced back to primary distinctions in philosophy and, indeed, religion – the philosophy of many civilisations – that have been explored by Jung and developed by Myers and Briggs to form a typology of the personality types. This typology will form the basis for exploring the architectural attitudes, and the relationship between the Jungian personality types and the architectural biases will be demonstrated. Architectural types will be related to the personality types using three key categories: types that influence communication, types that influence attitudes towards technology, and ones that influence attitudes towards design. It is hoped that this classification will help explore deeper the subtleties of the proposed collaborative design paradigm, exposing the various transactions, interactions and dynamics that are present in any collaborative environment. Having argued that this new paradigm is based on communication, it is discovered that certain types of architects will have far greater problems communicating with certain types of clients, and vice versa.

# Architectural Types

A number of attempts have been made to classify architects into distinct types. These attempts traditionally examine architects according to their attitude towards their clients and towards design. Focusing on the first, Larson lists four basic categories of orientation towards clients: manipulation, indifference, hostility and advocacy.[74] Dana Cuff adds the "negotiation" orientation, and points out that there is no "deference" orientation. According to architects, those who are deferent are the builders or contractors willing to draw up exactly what the client specifies.[75]

As part of his effort to examine architectural intention to influence social behaviour, Boughey[76] interviewed a number of architects. He identified a number of

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74 Larson, 1977, p. 188
75 Cuff, 1982, p. 66
76 Boughey, 1969

different categories; some after asking their peers to categorise them, and others based on his own interpretation of their behaviour. He then tried to combine their attitude towards design with that towards clients. He concludes that architects place their colleagues in one of three categories of dominance or submission toward clients, but also of orientation towards design: Hacks, Stars and Ideal Architects. These are characterised in the following manner:

- Hacks: Completely client-dominated; in business to make money.
- Stars: Complete contempt for clients; artist-heroes, showmen.
- Ideal Architects: Dominate clients in the best interest of clients, users or both.

It is interesting to note that, contrary to what clients might define as an "ideal architect", to architects themselves the ideal practitioner is a kind of benevolent dictator, dominating clients, but to their own benefit. This may, of course, be the case with 'expert' practitioners in other fields of work as well; for example doctors, lawyers etc. Still, it is very interesting in this particular case to note that these categories which capture architects' evaluation of one another do not hold up when Hacks, Stars and Ideal architects describe their work[77]. As groups, they do not maintain the client orientation associated with their categories, signifying that the relationships are more complicated than even their protagonists realise. But it is the shortcomings of this categorisation that are most interesting: it makes no attempt to distinguish between the design qualities and those of the communication with the clients. This is because Boughey effectively assumes that Stars are also art-oriented, Hacks pragmatic designers, and Ideal architects are a combination, or rather balance, of these two, designing in a inclusive manner, that engulfs both artistic and practical considerations.

That Boughey fails to distinguish between these two rather different aspects (attitude towards design – e.g. if they place aesthetic considerations over practical ones – and toward clients – e.g. arrogant or subservient behaviour), is due to a

common prejudice, also seen in the architectural myth part of the second chapter; namely, that 'artistic' designers are poor communicators, while good communicators are probably 'hacks' acting rather like "engineers" (another common prejudice), caring more about the practicalities of the design than about its aesthetic qualities.

It can be argued that, in order to better understand architecture, one needs to examine the practising architect. Boughey and Larson seem to distinguish between two key architectural attitudes; towards design and clients. Although these form the basic distinctions, a third one may also be worth exploring: the practitioners' attitude towards technology. The decision to add technology to this list was made not only because it appears to have an ever-increasing influence on the design practice, but also because it may be that different practitioner types could benefit from using different technologies; something that would shed light into the success or failure of various types of IT. Furthermore, use of IT can hinder or aid the collaboration between architect and client. Therefore, as IT becomes an increasingly important part of the design practice, its role is an aspect that seems worth examining in detail.

In the examination of practitioners offered here, the argument is made that these attitudes are due to different outlooks towards not only design, clients or technology, but the world in general. Furthermore, these attitudes can be traced back to a basic dichotomy in religion and philosophy; a dichotomy that has divided human thought in two main camps throughout history; that of idealism and empiricism. This is because Stars – mainly Art-oriented designers, artists-heroes – will be inclined towards an idealistic, subjective view of the world. It should be pointed out here that the term *idealistic* should not be confused with *ideal*. Wherever it is used in the context of this chapter, it refers to the notion that mental realities are the only existing reality in the world; that objects have no significance or even existence *per se*, and that what is of importance is the effect they produce in the observer's psyche; i.e. their existence inside a psychic reality. It is a purely subjective view, that corresponds, as will be shown, to the *Introverted* type of the Jungian typology.

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[77] Cuff, 1982, pp. 69-70

The opposite outlook is that of *empiricism*, where the object *per se* is of primary importance, leading to the objectivation of reality. Experience is the basis of our knowledge of the *cosmos*. Psychic content is mainly perceived through projections[78] onto objects. The objective world is the focus of attention; an attitude that is reflected by the pragmatism exhibited by Hacks, or Pragmatic designers, that fail to comprehend the value of the aesthetics and their importance for the psyche. This is an attitude that is reflected by the *Extraverted* type of the Jungian typology, as will be shown below.

Although Boughey's types seem limited to the architectural context, then, it can be argued that his types are indeed universal, and have been with us for a long time, as can be seen by tracing the history of religion and philosophy. While trying to obey Occam's razor, stipulating that "explanatory principles should not be multiplied beyond the necessary", it seems necessary to examine the occurrences of this dichotomy in history, in order to illustrate its universality. This is the subject of the following part.

# A Basic Dichotomy in Religion and Philosophy

In the history of philosophy and religion, one common identifiable trait is an underlying duality, often taking the form of 'good' vs. 'bad'. One of the least acknowledged contributions of Jung's personality types, is that they help resolve this fundamental dichotomy, in a move that brings the argument into the psychic realm. His main contribution is that, instead of arguing for the 'truth' of any given philosophical position, he interprets these through the light of different personality types, and accepts them as equally valid. In this manner, he is the first to bridge a gap that has separated humanity since its early attempts to rationalise the world and

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[78] Projection is another common psychological defence mechanism. Specific – usually unwanted – qualities, attitudes, feelings etc. are projected to another person or object, commonly in order to distance one's self from these.

its existence, in a move that anticipated the emphasis placed on the individual by post-modern thought.

The initial dualistic distinction was made very early indeed in the history of mankind, and is common in all civilisations. It deals with the difference between what can be called thoughts and material objects, although these have a different name in different cultures. Often, these stem from one single origin, and they may eventually return to that; this is the uniting principle, the middle path or third way, personified by the *Hermaphrodite*.

To the Gnostics, a similar distinction was made between the *Mind* and the *Speech*. Interestingly, this stresses the relation between the two, as the Speech is the "realisation" of the thought; its communication to this world, and its objectivation. The Platonic concept of Ideas as *a priori* entities and prototypes of things is probably the first time this notion was established philosophically. It was followed by the Aristotelian philosophy, that was an effort to rationalise this idealistic outlook. Plato and Aristotle helped to a great extent shape the history of philosophy, being the first to clearly define the boundaries and arguments of each arguing side. Indeed, it has been said that all men are either Platonists or Aristotelian in their thought. This aphorism is of special interest in this context, as it will be argued in the following pages that these outlooks towards life stem from a basic difference in the personality of people: the empiricist argues about the undeniable certainty of his reality, while the idealist insists on his.

During that same period, the distinction between idealistic and empirical philosophies gradually became prevailing; a distinction that has characterised the whole of philosophy to a great degree, often under different headings, but with similar content.

## Idealistic Theories

Idealistic philosophical theories are generally rationalistic ones; i.e. theories that focus on the Mind, and its perception of the world through rational functions. Rationalism, or orthologism (from Greek, *ορθός* and *λόγος*, or "correct Logos") believes that *Logos*[79] is the source of knowledge. This view is very old; Pythagoras, Heracleitos, Democritos and Parmenides can be perceived as idealists, in that they place the emphasis not on the object, but on the subject, and its perception of the objective world. For a brief time, this line of thought was interrupted by a type of subjective empiricism and sensualism presented by the Sophists; Socrates, however, returned to idealism, and Plato followed his teacher's belief. Aristotle argued about the importance of *experience*, but also maintained that the mind is the basic source of knowledge. The rest of Greek philosophy sees a constant struggle between idealism and empiricism. Epicouros is an empiricist, but the Stoics, despite giving importance to experience, speak of common pre-existing concepts, shared by mankind. Plotinus continues in the Platonic manner, while in Christianity, the personified God takes the place of the cosmic mind, enlightening man and making him logical. This is the *theological idealism*, that led scientists like Galileo to talk about pre-existing knowledge.

Taken *in extremis*, the idealistic viewpoint leads to the philosophy of *idealism*, or the view that mental realities are the only existing reality in the world. Anything we see, listen, touch and think are concepts; mental phenomena; in one word, ideas. Every object can be referred to the spirit, and the mind is the primary reality. Kant defines the Idea as the "archetype of all practical employment of reason", which in effect exceeds the bounds of the experience; "an ideal concept whose object is not to be found in experience"[80]. Hegel hypostatises the Idea completely, and argues that it,

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[79] *Logos* is often taken to mean logic; however, its Greek meaning transcends this simple definition. It signifies the mind that exists and guides; also the Word, Speech and the Spoken Word. For example, John's Gospel begins with "εν αρχή ην ο Λόγος, και ο Λόγος ην προς τον Θεόν, και Θεός ην ο Λόγος" – or "in the beginning there was the Word, and the Word was to God, and God was the Word"; here Logos is translated simply as Word. Theologians argue that it refers to the Son aspect of the Holy Trinity; this is another facet of Christ, as the *a priori* existing Ideal Mind.

[80] Kant, 1949, p. 319

alone, has any real being. It is the "concept, the reality of the concept, and the union of both… eternal generation"[81]. Schopenhauer says:

"By Idea, then, I understand every definite and well-established stage in the objectivation of the Will, so far as the Will is a thing-in-itself and therefore without multiplicity, which stages are related to individual things as their external forms or prototypes."[82]

Kant refers to the *Ding an sich*[83] (the object itself) to distinguish it from the contrasting phenomenon, and Fichte rejects the object altogether, maintaining that only the consciousness, the spirit, exists, in a subjective idealism.

These aspects of idealism involve psychological and logical problems, something that is in the nature of knowledge phenomena. Generally, idealistic theories have the following characteristics:

1. Knowledge is thought to originate in the mind as the reflection of objects and *a priori* ideas;
2. The mind organises knowledge, giving it value and objectivity; and
3. Conceptual knowledge is more important than empirical.

## Empirical Theories

*"Εμπειρία" (empeiria)* means experience, and indeed empiricism argues that the source of knowledge is experience, rejecting any notion of *a priori* knowledge or pre-existing ideas. Empiricism is idealism's opposing pole, and was born out of reaction towards it. Like idealism, it also has a dogmatic and metaphysical beginning; however, in time it became less so. The Sophists demonstrated the importance of experience, after which Plato and Aristotle were also forced to acknowledge experience to some degree. Empirical ideas generally accept the importance of experience, and acknowledge the real existence of objects. *Materialism* takes this notion to the extreme, claiming that nothing exists, but that which can be perceived

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81 Hegel, 1892, p. 356
82 Schopenhauer, 1883, p. 168
83 Kant, 1949

through the senses. *Critical realism* stands between empiricism and idealism, arguing that, although an independent reality does exist, it is not exactly the same as the one we feel. This is largely the viewpoint adopted by Analytical psychology as well.

## Universality and the Middle Path

The theories described above can be thought of as stemming from the philosophical thought of ancient Greece. What is interesting, however, is that similar distinctions have been made by very diverse cultures, under different guises. The Western Africans tribes believe that man was born from the union of *Obatala* and *Odudua* (heaven and earth), who lay together in a *calabash* until the son, man, arose between them. Heaven is thought of as the realm of ideas and deities, while earth is the everyday world, the world of man; a world of objects.

Similarly, in Japanese philosophy as described by Nakae Toju, a Japanese philosopher of the seventeenth century, the concept of *Riki* is introduced. *Ri* is the world soul, and *Ki* the world "stuff". Again, as above, a mediator, uniter of the opposites, appears, in the form of *Ryochi*, or the "true-self"; the self-regulating function.

Hindu religion calls these two aspects of the world *Form* and *Name*; they both unite (stem from and return to) in Brahma:

"When Brahma had entered into that other world, he bethought himself: how can I extend myself through these worlds? And he extended himself through these worlds by Form and Name"[84].

In Taoism, the male and female principles, the *yin* and *yang*, are united in the *Tao*, or "path", "way", "method". This is similar to the Stoics' *ειμαρμένη (eimarmeni)*, meaning again the "way". In Heracletian philosophy, the concept of *εναντιοδρομία (enantiodromia)*, lit. "running counter to", is utilised to explain the role the opposites play in the course of events; everything turns into its opposite. This dynamic

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[84] Shatapatha Brahmana 11.2.3.Cf.SBE,XXVI,pp. 27f; in Jung, 1971b, p. 205

relation, so reminiscent of the interplay between *yin* and *yang*, leads to balance through life. In Heracleitus' words,

"It is the opposite which is good for us. Men do not know how what is at variance agrees with itself. It is an attunement of opposite tensions, like that of the bow and the lyre. The way up and the way down are the same."[85]

Jung describes this middle path as follows[86]:

"The tragic counterplay between inside and outside (depicted in Job and *Faust* as the wager with God) represents, at bottom, the energetics of the life process, the polar tension that is necessary for self-regulation. However different, to all intents and purposes, these opposing forces may be, their fundamental meaning and desire is the life of the individual: they always fluctuate round this centre of balance. Just because they are inseparably related through opposition, they also unite in a mediatory meaning, which, willingly or unwillingly, is born out of the individual and is therefore divined by him. He has a strong feeling of what should be and what could be. To depart from this divination means error, aberration, illness."

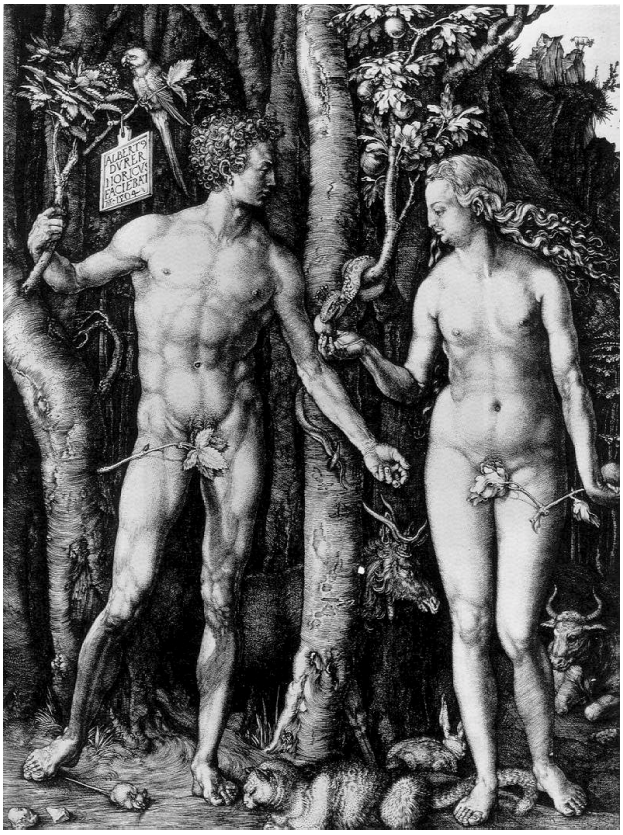


*Fig. 4-1*: Dürer, Albrecht, "Adam and Eve", 1504; Engraving

Man commonly appears as the impersonation of the third entity, the third middle way, combining elements from both poles. In Christian symbolism, the Saviour unites Man and God. What is interesting, however, is the extent to which the dichotomy has effected Christian thought; in the history of the Church, one can see this struggle between the two lines of thought. Indeed, what is the devil in many

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85 Zeller, 1881, p. 17

86 Jung, 1971b, p. 302

people's minds but the advocate of the senses? Even the original sin, is a sin of the senses; the tasting of the forbidden fruit (Fig. 4-1). In its original Greek meaning, sin, or "αμαρτία", means simply "missing the mark". The aim here is God; anything that takes our mind away from Him, is sinful; as opposed to the "departure from the individual divination" described above by Jung. In this manner, the whole 'sin' of empirical thought is purged from the psyche, to be cleansed through a Purgatorium of conspicuously sensational punishments, including flames, piercing etc., or to be punished for eternity. But is God in this context anything more than pure idea? And isn't demon's crime, the empiricist's cry for belief in the senses? So, it is the same idealism vs. empiricism (or, in Jungian terminology, sensation vs. intuition) debate that one may observe in much of Christian thought, and the ascetic excesses are nothing but the efforts of the soul to cleanse itself from the flesh, in order to lead to pure idealism. Through the metaphorical (or, in some cases, quite factual) ascetic castration, an attempt is made to cast away a whole segment of his psyche, perpetuating the dichotomy, and leading to the desensitising inhumanisation of a large part of the Church.

As the Church has been the preferred vehicle for architectural and, more generally, artistic expression through a large part of history, it should follow that this dichotomy would be reflected on art. Indeed, very clear differences exist in the art of various epochs and churches. The seventeenth century Caravaggio painting of *St. John the Baptist* (Fig. 4-2a) depicts a boyish saint, with a strong emphasis on his sensual, empirical side, exemplified by the presence of the goat. The choice of the animal is important, as the goat is an ancient symbol of fertility, and hence sensual delight[87]. This may be compared to the 1272 miniature of St. John the Baptist flanking Jesus[88]. The sombre, almost dematerialised, elongated forms, reminiscent of El Greco's elongated, ascetic St. John (Fig. 4-2b)[89] point to a completely different focus; one on

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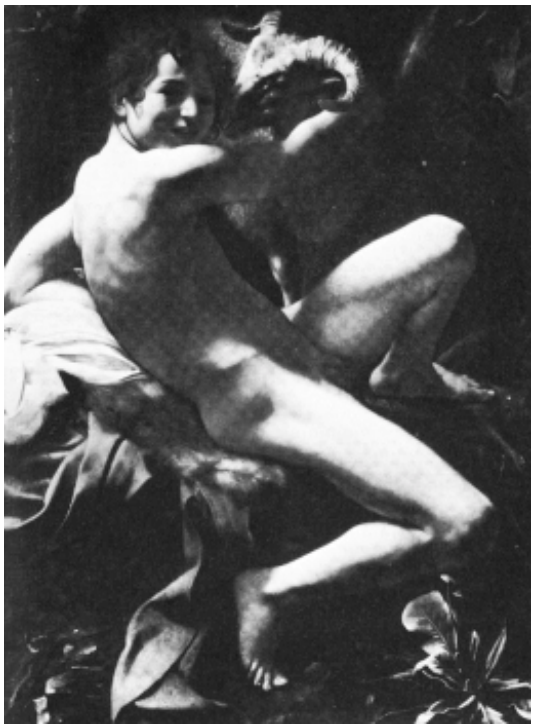
87 It is also interesting to note that the goat usually represents the horned devil; another aspect of the demonisation of the senses

88 detail; in the Armenian Patriarchate, Jerusalem

89 Dominicos Theotocopoulos (El Greco), "The Death of Count Orgaz", 1586; detail; in St. Thomas, Tolède, Spain

the spiritual qualities of the depicted holy figures, and one that bears no resemblance to Caravaggio's shepherd boy.



*Figs. 4-2a; 4-2b*: The contrast between Caravaggio's sensuous St. John and this 1272 ascetic miniature is probably indicative of the different personalities of the two artists.

Within the Church, a number of attempts to bridge the two sides have been made. Abelard tried to achieve a union of idealism and empiricism through his conceptualisation, but mostly failed. He was an eclectic, trying to connect different aspects of every outlook, but his almost contradictory writings prompted De Rémusat to exclaim: "Must we suppose that one man's head contained so vast and incoherent a collection of teachings? Is Abelard's philosophy a chaos?"[90]

[90] Jung, 1971b, p. 47

# The Role of Introversion - Extraversion

The problem with Abelard's mediatory formula was that it was ahead of its time. A few centuries later, psychology was born, and it was better equipped to deal with this problem. De Rémusat sees this, when he goes on to say:

"In pure logic, universals are only the terms of a conventional language. In physics, which for [Abelard] is transcendent rather than experimental, and is his real ontology, genera and species are based on the way in which beings are really produced and formed. Finally, between his pure logic and his physics there is a kind of mediatory or half-way science – we may call it psychology – in which Abelard examines how our concepts come into being, and retraces the whole intellectual genealogy of beings, a picture or symbol of their hierarchy and their real existence."[91]

The very nature of psychology ensures that it can combine the idea and the object without violating either. Jung points this out, when stating that:

"the radical difference between nominalism and realism is not purely logical and intellectual, but a psychological one… The man who is oriented to the idea apprehends and reacts from the standpoint of the idea. But the man who is oriented to the object apprehends and reacts from the standpoint of sensation… Idea and thing come together, however, in the human psyche, which holds the balance between them."[92]

Ostwald Wilhelm makes a distinction between the *"classic"* and the *"romantic"* type of man[93], but it was William James who tried to categorise the empirical (*"tough-minded"*) and idealistic (*"tender-minded"*) qualities. By doing so, he also produced a map of the idiosyncrasies of idealists and empiricists. He offers the following list of characteristics of their respective minds[94]:

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91 Jung, 1971b, p. 48

92 Jung, 1971b, pp. 50-51

93 Wilhelm, 1919

94 James, 1911

| ***Tender-minded*** | ***Tough-minded*** |
|---|---|
| | |
| Idealistic (going by "principles") | Empiricist (going by "facts") |
| Intellectual | Sensational |
| Idealistic | Materialistic |
| Optimistic | Pessimistic |
| Religious | Irreligious |
| Free-willist | Fatalistic |
| Monistic | Pluralistic |
| Dogmatic | Sceptical |

*Table 4-3*: James' Characteristics of Types

It was Jung that observed that this is, in effect, a description of two different personalities; different and universal enough to allow a general psychological classification. He attempted such a classification through his categorisation of *introversion* and *extraversion*. Although these terms have entered every-day language, they are often confused with some of their aspects that may, or may not, be present in any introvert or extravert. For example, introversion is often confused with the lack of social skills, while extraverts are often confused with socially prolific types. Jung's actual definitions use extensively the philosophical terminology, in an indirect acknowledgement of philosophy's influence in the shaping of his thought:

"Introversion means an inward-turning of *libido*[95], in the sense of a negative relation of subject to object. Interest does not move towards the object, but withdraws from it into the subject. Everyone whose attitude is introverted thinks, feels and acts in a way that clearly demonstrates that the subject is the prime motivating factor and that the object is of secondary importance… When introversion is habitual, we speak of an *introverted type*

Extraversion is an outward-turning of *libido*. I use this concept to denote a manifest relation of subject to object, a positive movement of subjective interest towards the object. Everyone in the extraverted state thinks, feels, and acts in relation to the object, and moreover in a direct and clearly observable fashion, so that no doubt can remain about his positive dependence on the object… When extraversion is habitual, we speak of the *extraverted type*."[96]

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[95] One is accustomed to seeing the term *libido* used in its Freudian context, as the sexual energy. Jung, however, uses it differently from Freud; to him, it represents all psychic energy, and not only its sexual aspects. In accordance to this, in this context *libido* is defined as all psychic energy.

Since introversion is an inward-turning of libido and turns away from the object, this corresponds to an idealistic outlook, where the subject's interest turns towards the internal world of ideas. Extraversion, being an outward-turning of the subject's energy, obviously corresponds to realism, with its interest in the objective, external world.

This psychological explanation effectively resolves the dichotomy, by establishing that there is no objective, absolute truth, but different ways of looking at the *cosmos*, depending on one's personality. This is Jung's middle path, and he used the following words to emphasise this importance of the individual attitude:

"We see colours, but not wave-lengths. This well-known fact must nowhere be taken to heart more seriously than in psychology. The effect of the personal equation begins already in the act of observation… The personal equation asserts itself even more in the presentation and communication of one's own observations, to say nothing of the interpretation and abstract exposition of the empirical material"[97]…

In other words, it is pointless to argue about superiority of empiricism over idealism and vice versa; they are both equally arbitrary, and merely reflect one's preferred stance towards the world. This is the middle path proposed by Jung; the union of opposites; "at once the most individual fact and the most universal"[98].

# Other Functions

Jung realised, however, that the plethora of human personality types can not be explained by the simple dualistic distinction between introversion and extraversion. Indeed, he later described a second couple of opposites, Intuition and Sensation, that attempt to correspond in an even finer way to idealism and realism, respectively. He felt that different factors influenced the personality, and concluded that these factors consist of sets of opposites that interact to create the individual's personality.

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96 Jung, 1971b, pp. 452-3

97 C.G.Jung, 1971b, p.9

98 C.G.Jung, 1971a, p. 302

Whenever a function is prevailing in the consciousness, its opposite becomes the *inferior function* of the individual. He defined functions themselves as follows:

"By a psychological function I mean a particular form of psychic activity that remains the same in principle under varying conditions… I distinguish four basic functions in all…: *thinking* and *feeling*, *sensation* and *intuition*."[99]

A Jungian map of the psyche is depicted in Fig. 4-4a[100]. The status shown, however, is not a stable one, and it may be that later in life, it can change, for example, to that in Fig. 4-4b. Introversion and Extraversion are not shown in this map, as they are not functions *per se*. In these maps, the bottom half of the circle is the Unconscious level, while the upper one, the Conscious. The Self, core of our consciousness, is located in the centre, while the functions that lie in the realm of the Unconscious are inferior ones. Therefore, in Fig. 4-4a, Sensation is an inferior function, while Feeling and Thinking are balanced. This situation has been inverted in Fig. 4-4b, where Intuition is now the inferior function.

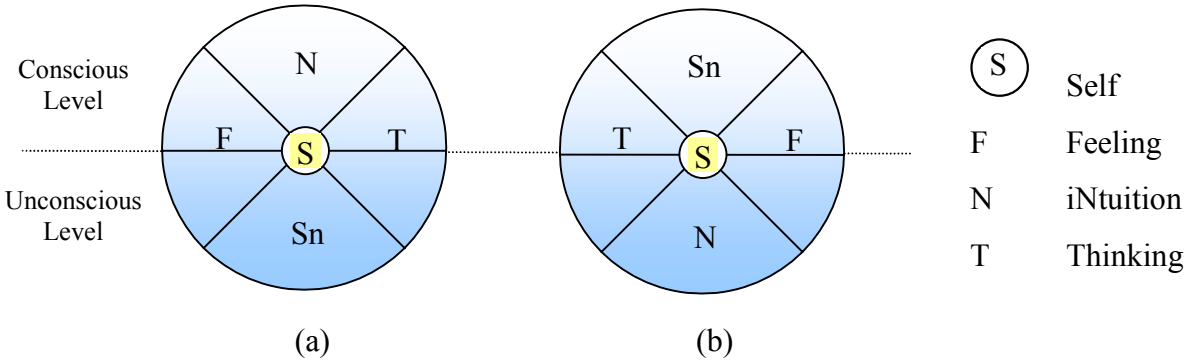


*Fig. 4-4*: Map of the Psyche

The problem with Jung's description of the types was that it focused almost exclusively in pathological situations, as it was his patients who provided him with the material for his work. As a result, no detailed description of a balanced individual existed, and a number of researchers attempted to provide one, ignoring

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[99] Jung, 1971b, p. 437

[100] adapted from Jacobi, 1973

Jung's efforts. Vernon[101] cited three systems of classification using combinations of perception and judgement; Thurstone[102] found four main factors corresponding to interest in business, people, language and science; Gundlach and Gerum[103] deduced five main "types of ability" – technical, social, creative, intellectual and physical skill. Spranger[104] derived six "types of men", namely economic, social, religious, theoretical, aesthetic and political.[105]

## The Myers-Briggs Type Indicator

In the midst of these attempts, Isabel Briggs Myers and Peter Myers took Jung's typology and extended it, trying to create a tool that could be used in everyday context. As a result, the *Myers-Briggs Type Indicator* (referred to here as the "*Indicator*", or "*MBTI*"), was born in 1943. In their work, the basic differences between different personality types concern the way people prefer to use their minds, and specifically, the way they perceive and the way they make judgements. They define these terms as follows:

"*Perceiving* is here understood to include the processes of becoming aware of things, people, occurrences, and ideas. *Judging* includes the processes of coming to conclusions about what has been perceived."[106]

In this light, functions are divided in two groups. There are two ways of perceiving the world, described by the Sensing – by which we become aware of the things directly through our five senses - and Intuition – which is an indirect perception by way of the unconscious, incorporating ideas and associations that the unconscious tacks on to perceptions coming from outside. There are also two ways of judging the world, described by the Thinking – i.e. by a logical process, aimed at an impersonal finding - and the Feeling – i.e. by appreciation, bestowing on things a personal, subjective value - functions[107].

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101 Vernon, 1938
102 Thurstone, 1931
103 Gundlach, RH & Gerum, E, 1931
104 Spranger, 1928
105 Myers-Briggs, 1995, p. 6
106 *ibid.*, p. 1
107 McCaulley, 1981; Briggs & McCaulley, 1985; Bayne, 1995, Thompson, 1996

When combined, they offer a basic understanding of the person's attitudes, as follows[108]:

- Sensing plus Thinking (ST) people rely primarily on sensing for purposes of perception and on thinking for purposes of judgement. Their main interest focuses upon facts (which can be collected by the senses), and they approach their decisions in an impersonal, analytical and logical fashion. Because of this, they will tend to be practical, and prefer fields that demand an impersonal analysis of concrete fact; e.g. in law, economics, business, accounting etc.

- Sensing plus Feeling (SF) people will also rely on sensing, but will prefer to exercise their judgement through personal warmth, because of their belief that feelings matter more. As a result, they will be more likely to prefer in areas like nursing, teaching (esp. elementary), social work etc.

- Intuition plus Feeling (NF) people have the same personal warmth, but do not centre their attention upon the concrete situation, preferring possibilities, such as new projects and new truths. These are imagined by the unconscious processes and then intuitively perceived as an idea that feels like an inspiration. This results in NF being probably active in areas like teaching (esp. college and high school), counselling, clinical psychology, writings and research.

- Intuition plus Thinking (NT) people also use Intuition, focusing on a possibility, but prefer to approach it with impersonal analysis, tending to be logical and ingenious. Because of this, they tend to be prefer computing, mathematics etc.

These functions are independent of the Extraversion and Introversion attitudes, and can therefore be combined with them in any way. This leads to categories like EST, INF etc. Myers and Briggs, however, noted that this alone is not enough to

describe one further crucial aspect: which one between their perceptive and judging functions is the preferred one for a person; i.e. the dominant process. Their specific contribution was the distinction between the *dominant* and the *auxiliary* functions. Myers and Briggs developed the idea that one function and one attitude are dominant, but these are then complimented by their opposites; and in all but the most severe cases, people have learned how to use both to relate to both the outside world, and to their private one. They introduced another set of opposites; *Judgement* and *Perception*, to help distinguish between the dominant and auxiliary functions.

People realise early on that one process is easier for them than another one; this becomes their preferred one, and is utilised more often and better. The other one, the auxiliary one, helps people maintain their balance; if the dominant process is a judging one, the auxiliary one will be perceptive. For example, an ENT who finds Intuition more interesting than Thinking, will focus on it, subordinating Thinking to it. Because Thinking is a judging function and Intuition a perceptive one, this person will have Perception as the dominant process. This is codified by a P at the end of the type; therefore, this person will be an ENTP. Such persons will consult their judgement, through Thinking, only when it does not conflict with their Intuition. P and J are used, then, to demonstrate which of the two pairs (S/N and T/F) is the dominant one, and which the auxiliary.

In the case of the Extravert, it is easy to identify the processes. The dominant process, being extraverted, is visible. Their most developed way of using their minds is devoted to the outside world; this is the side people see, even in casual contacts. With Introverts, however, the opposite is true. What appears in their relations with the outside world, is in fact the least developed part of them; except in the cases of those who are very close to them, Introverts will deal with people using their auxiliary process. So, Introverts with a perceptive dominant process will outwardly behave in a judging way, living their outer lives in the judging attitude, and vice versa. Because of this, J/P only reflects the preferred process in dealing with the

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[108] *ibid.*

*outside world*. Hence, if an Extravert's type ends in J, the dominant process is indeed a judging one, either T or F. For Introverts, however, the opposite is true. If an Introvert's type ends in J, his dominant process is a perceptive one, either N or S. The table below codifies this[109]:

| | **ST** | **SF** | **NF** | **NT** |
|---|---|---|---|---|
| **I—J** | I<u>S</u>TJ | I<u>S</u>FJ | I<u>N</u>FJ | I<u>N</u>TJ |
| **I—P** | IS<u>T</u>P | IS<u>F</u>P | IN<u>F</u>P | IN<u>T</u>P |
| **E—P** | E<u>S</u>TP | E<u>S</u>FP | E<u>N</u>FP | E<u>N</u>TP |
| **E—J** | ES<u>T</u>J | ES<u>F</u>J | EN<u>F</u>J | EN<u>T</u>J |

| **Extravert** | **Introvert** |
|---|---|
| The JP preference shows how a person prefers to deal with the *outer* world | The JP preference shows how a person prefers to deal with the *outer* world |
| The *dominant* process shows up on the JP preference | The *auxiliary* process shows up on the JP preference |
| The dominant process is used in the *outer* world | The dominant process is used in the *inner* world |
| The auxiliary process is used in the *inner* world | The auxiliary process is used in the *outer* world |

*Table 4-5*: The dominant process of each type

### The Need for Balance

The second major contribution of Myers and Briggs, was their passion for hard data. Because of this passion, no hypothesis remained untested; even today, those who have been trained in the use of the MBTI are asked to submit their data to appropriate MBTI bodies around the world for analysis, and alterations happen frequently, as a result of these analyses. This has helped create an image of the MBTI as a faithful tool for personality and aptitude testing, starting in its use by the US Army during the 2nd World War, and continuing in the business sector, where it is primarily used

[109] Myers-Briggs, 1995, p. 15

today. Because their descriptions of each type is based on continuous research, they are unusually precise, and can be used to gain valuable insight into individual behaviour.

This, however, does not mean that the MBTI is infallible. The descriptions generally apply to each type in its normal, well-balanced and well-adjusted form. This assumes a good development of both dominant and auxiliary processes. However, in reality people find themselves in different states of development. If the auxiliary process is underdeveloped, the person will lack balance between perception and judgement, extraversion and introversion. If the dominant process is underdeveloped, the weaknesses of the type will be all that can be seen. These unbalanced characteristics are also mentioned in the descriptions below.

One thing that has to be kept in mind, is the importance of the auxiliary functions. These form everyone's, well-balanced or not, *shadow side*. This side is the product of the least developed processes; that part which a person often rejects and disowns. It tends to exhibit relatively primitive and unevolved attitudes, and to stand contrary to conscious standards. A Feeling person, for example, may often make decisions that appear to be irrational and contrary to logic; this is because logic (a typically Thinking quality, which is in that person's shadow side) may not be the most important consideration in that person's decision-making process. The shadow side will also be mentioned in some of the descriptions.

### The MBTI in the Architectural Context

In the architectural context, a hypothesis can be made as to the influence these functions will exert onto both existing design and the suggested new design paradigm. According to this hypothesis, this influence will be three-fold: first, the function preference will influence predominantly the way *design quality* is judged, and therefore the first type of influence will relate to design itself and the attitude towards it. Second, it will influence the practitioner's *communication* with the client in a number of ways; for example, research indicates that people tend to

communicate better with people of similar types[110], something with obvious repercussions here, where the suggested new collaborative design paradigm is based on good communication. Furthermore, research indicates that some types are better communicators than others[111]. Third, it can be hypothesised that function preference may influence various types' judging of IT, and therefore the *medium* architects will use to design, something with particular implications for the architectural praxis within and without the suggested new paradigm.

These three hypotheses are discussed in detail in the following chapters, since this typology makes it possible for architects to be examined through their personalities. The next part of this chapter is a description of the functions and their combinations, and a summary of the characteristics of each type, as these are described by Jung and Myers and Briggs[112].

## The Thinking-Feeling Preference

Thinking and feeling compete with each other during any decision making. Both are reasonable and internally consistent; their main difference is that one is impersonal, and the other personal. Thinking seeks the objective truth, independent of personal qualities, wishes or personalities. As long as the problem is impersonal, as in engineering, thinking is the function to deal with it. When, however, a decision has to be made that involves people, thinking is inadequate; people usually resent being treated as impersonal, unfeeling objects, and human motives are notably personal. This makes it necessary for Feeling to deal with the situation.

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110 McCaulley, 1981; Briggs & McCaulley, 1985; Bayne, 1995, Thompson, 1996; Myers-Briggs, 1995; also Jung, 1971b

111 *ibid.*

112 *ibid.*

## Thinking

Thinking is defined by Jung as "the psychological function which, following its own laws, brings the contents of ideation into conceptual connection with one another"[113]. It is a function that focuses primarily on the objective data. If it is extraverted thinking, then it will be fed largely from the data transmitted by the senses through perception. However, it may also be completely esoteric; purely ideal. In this form, it will be based on axioms provided by education or tradition, so that the criterion by which judgement is performed will be external only in origin.

In this case, introverted thinking can be described as thinking that starts from the subject and returns to it, being directed towards subjective ideas and facts. When one's thoughts are preoccupied by a general idea in such a way that the thoughts finally return to the starting point, this intellectual process is in a constant relation to the subject. It is this person's subjective process, that is a *sine qua non* in any thinking. The bias on this aspect or the more objective one is that helps distinguish between subjective (introverted) and objective (extraverted) thinking.

## Feeling

Feeling is an independent function *sui generis*, defined as:

"a process that takes place between the *ego*[114] and a given content; a process, moreover, that imparts to the content a definite *value* in the sense of acceptance or rejection ("like" or "dislike")… It is an entirely *subjective* process, which may be in every respect independent of external stimuli, though it allies itself with every sensation… Hence feeling is a kind of *judgement*, differing from intellectual judgement in that its aim is not to establish conceptual relations, but to set up a subjective criterion of acceptance or rejection…"[115]

Although it, too, is a judging process, it serves as the opposite pole of the thinking-feeling pair, despite them sharing many common properties. Like thinking,

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113 Jung, 1971b, p. 481

114 The term *ego* was first devised by Freud, to describe the element of the human mind that represents the conscious processes concerned with reality, in contrast to the *id* (the instinctual element) and the *superego* (the ethically aware element). However, the term is used here in its Jungian use, as a general term for the processes concerned with the self and one's conception of one's self, encompassing values and attitudes.

115 Jung, 1971b, pp. 434-5

extraverted feeling is based on objective reality. Its key-quality is that it is always in harmony with 'objective' values. Although feeling can be hard to grasp as anything but a subjective experience, objective feeling has detached itself from the subject, and is constantly under some generally accepted values. This is demonstrated in the case when someone feels he likes a painting or a building or indeed another person because of the peer pressure on him to do so. In this case, the feeling does not originate from within him, but from outside, and may not necessarily be reflected on a more esoteric level. This kind of feeling is responsible for the successes of marketing, with so many people flocking to see the latest production – be it theatrical, musical or cinematographic – and actually enjoying it because "everyone else seems to". It is, also, to a great extent, the basis of our society, with our unquestionable support to beneficial and philanthropic cultural institutions. In this manner, it has a positive effect. It promotes learning, since it allows us to absorb and accept other ideas, and in the architectural context, allows for different schools and fashions to emerge, leading to a creative environment; without it, social life and learning would be impossible.

## The Sensation-Intuition Preference

The next pair of functions, Sensation and Intuition, are perceptive functions. They deal with the channels the individual perceives the world through. The difference between them lies in that Sensation deals primarily with actualities; Intuition with possibilities. Sensation types depend on their senses to interact with the world; therefore, ideas, metaphors, words and abstract meanings are deemed to be less trustworthy. This can often lead to poor academic results.

Intuition, on the other hand, deals with exactly that which is abstract, for it is the abstract which allows the most possibilities. Intuitive persons will solve a problem seemingly at a stroke of genius, ending at an advanced point with the intervening steps apparently left out. What happens, of course, is that the intervening steps have been performed in an unconscious level, and the result has appeared intuitively. This

speedy success in dealing with abstract ideas is much valued in academia, and Intuitives tend to do well in this area. Indeed, a sample of US National Merit Finalists showed that 83% of the finalists were Intuitive[116].

## Sensation

As Sensation deals with sensory information, one would expect it to be objective. This, however, is not necessarily the case. If introverted, a Sensation type will focus in his subjective factor. Although sensation is an absolute from a physiological point of view – sensory information will enter through the senses – this information may well be below the "threshold" of consciousness, and fail to register. For example, if a number of painters were to paint a given landscape, they would all perceive it (and replicate it) differently. This is due to their different ways of "seeing" it, for the mood they are in can not fail to be reflected on their work. This subjective factor can be very strong, as is particularly obvious in various forms of art – for example, surrealism.

The extraverted sensation type, however, can be overtly realistic. In the sensation type, the objects will be valued by their sensory information, and by the sensations they excite in the individual. If a relatively unbalanced extravert, the individual may well be a risk-taker, always on the look-out for exciting (and often dangerous) activities that will fill up their senses – e.g. bungee-jumping, parachuting, safari going etc.

An introverted sensation type is markedly different from the extraverted one, as what is perceived is either not found at all in the object, or only slightly suggested by it. Still, it makes a definite psychic impression on the individual, which is then duplicated in their art or design, if they possess such skills. In this case, they may be successful in creative design or in an artistic career. However, if combined with the typical introverted aspect of difficulty in expression, this will have a negative effect

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[116] Myers-Briggs, 1995, p. 58

on the artist's communication with others. Seen from the outside, it is as if the object has failed to make any impression on the subject. This is not because it is of secondary importance (as in the case of the introverted intuitive type), but due to the metamorphosis is has sustained upon entering the realm of the psyche. The object there is transformed into subjective content; it is as if the object *itself* no longer exists to the individual, although its *image* is still very real.

If the object's influence is too pronounced, the individual may tend to compensate by a well-intentioned attempt to neutralise its content, dampen its enthusiasm and generally to keep everything on a middle path. In that case, it is easy for the individual to become the victim of the aggressiveness of domineering others. Such architects, for example, may find it very hard to collaborate with strong-minded clients who know (or think they know) exactly what they desire.

## Intuition

Intuition is the function of unconscious perception, and therefore a perceptive function. In the extraverted type, it is directed towards external objects. It is an active, creative process, that tends to see *possibilities* in every object, and puts into objects just as much as it takes from them. Its primary function is to transmit perceptions that can not be transmitted by the other functions, in the form of insights and hunches. As such, it forces sensation into the unconscious, as sensation's intrusive stimuli direct attention to the physical surface. In the extraverted type, in particular, it actually comes very close to sensation; hence, the latter needs to be suppressed, for intuition to function properly. An intuitive person uses the sensory stimuli as starting-points from which he may commence the creative process.

Since only through envisioning possibilities and relations between objects is intuition fulfilled, every ordinary situation looks to the intuitive type as a closed door, behind which innumerable treasures may lie. If sensation is overtly repressed, the intuitive mind will perceive the world as its prison; a chain that has to be broken. Values are applied to those objects that seem to bring the promise of deliverance, but,

as soon as they have served their purpose, they lose all their value, and are discarded as burdens not to be carried around. Stability suffocates this intuitive type, who is constantly restless and seeking to explore, create and open new possibilities.

Introverted intuition perceives all the background processes of consciousness with almost the same distinctness as extraverted sensation perceives the outer-world objects. In doing so, it displays a fascinating view of the world, as it picks up "visions" of objects, as they are translated by the person's psyche. However, if it lacks the co-operation of sensation (i.e. sensation is overtly repressed), it will show a marked disregard for the real-life physical effects; something that is further exaggerated by the introverted function. This introverted intuitive type will show the same indifference towards the internal objects themselves (other than springboards from which it can leap to new possibilities), as the unbalanced extraverted intuitive type shows for the external objects. But also, it will be able to create significant creative works, through the transformation of ideas and their incorporation in new explorations and possibilities.

Still, the artist is actually considered by Jung to be the normal representative of this type, revealing "strange, far-off things in his art, shimmering in all colours, at once portentous and banal, beautiful and grotesque, sublime and whimsical"[117]. He can have great difficulties communicating his visions to others, however, and can become "the voice crying in the wilderness" – at least in his own mind.

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[117] Jung, 1971b, p. 401

# Summary of Types

To summarise the descriptions above, and help the reader better understand them in practical terms, Tables 4-6a and 4-6b are included in the next two pages[118]. Table 4-6a describes the effect preference has on various aspects of an individual's personality. Table 4-6b describes the characteristics expected to be found in this individual. These tables are merely aids; as everything in the MBTI, they should not be taken as absolute truths. As explained above, they express a trend and a tendency, but not necessarily the actual behaviour of a person.

[118] based on Briggs, 1994; McCaulley, 1981; Briggs & McCaulley, 1985; Bayne, 1995; Thompson, 1996

| Where do people focus their attention? The EI Scale | |
|---|---|
| Extraversion (E) | People who prefer Extraversion tend to focus on the outer world of people and external events. They direct their energy outwards and receive energy from external events |
| Introversion (I) | People who prefer Introversion tend to focus on the inner world of ideas. They direct their energy and attention inwards and receive energy from their own thoughts, feelings, ideas and reflections |
| **How do people take in information? The SN Scale** | |
| Sensing (S) | People who prefer Sensing like to take in information through their five senses. They are observant of what is going on around them and can easily recognise the practical realities of a situation. |
| Intuition (N) | People who prefer Intuition like to focus on the relations and connections between facts. They seek patterns and can easily recognise new possibilities. |
| **How do people make decisions? The TF Scale** | |
| Thinking (T) | People who prefer to use Thinking in decision making tend to look at the logical consequences. They mentally remove themselves from the situation to examine it objectively and analyse cause and effect. Their goal is an objective standard of absolute truth and the application of principles. Their strength lies in identifying a problem and applying their problem-solving abilities. |
| Feeling (F) | People who prefer to use Feeling in decision making tend to consider what is important to them and to other people. They mentally immerse themselves in a situation and empathetically identify with the people involved, so that they can make decisions based on person-centred values. Their goal is harmonious relations and recognition of individuals. Their strength lies in understanding, appreciating and supporting others. |
| **How do people orient themselves toward the outer world? The JP Scale** | |
| Judging (J) | People who prefer to use their Judging process in the outer world tend to live in a planned, orderly way, wanting to regulate and control life. They make decisions, implement them and move on. Sticking to a plan and schedule is very important to them, and they enjoy their ability to get things done. |
| Perceiving (P) | People who prefer to use their Perceiving process in the outer world tend to live in a flexible, spontaneous way, seeking to understand and experience life, rather than control it. Plans and decisions feel confining to them; they prefer to stay open to experience and last-minute options. They enjoy and trust their resourcefulness and ability to adapt to the demands of a situation. |

*Table 4-6a*: Effect of MBTI Preferences

| **Where do people focus their attention? Extraversion (E)** | **Where do people focus their attention? Introversion (I)** |
|---|---|
| • Attuned to external environment<br>• Prefer to communicate by talking<br>• Learn best through doing or discussing<br>• Breadth of interests<br>• Tend to speak first, reflect later<br>• Sociable and expressive<br>• Take initiative in work and relationships | • Drawn to their inner world<br>• Prefer to communicate by writing<br>• Learn best by reflection &mental practice<br>• Depth of interests<br>• Tend to reflect before acting or speaking<br>• Private and contained<br>• Focus readily |
| **How do people take in information? Sensing (S)** | **How do people take in information? Intuition (N)** |
| • Focus on what is real and actual<br>• Value practical applications<br>• Factual and concrete, notice details<br>• Observe and remember sequentially<br>• Live in the present<br>• Want information step-by-step<br>• Trust experience | • Focus on "big picture" and possibilities<br>• Value imaginative insight<br>• Abstract and theoretical<br>• See patterns and meaning in facts<br>• Look to the future<br>• Jump around, leap in everywhere<br>• Trust inspiration |
| **How do people make decisions? Thinking (T)** | **How do people make decisions? Feeling (F)** |
| • Analytical<br>• Logical problem-solvers<br>• Use cause-and-effect reasoning<br>• "Tough-minded"<br>• Strive for impersonal, objective truth<br>• Reasonable<br>• Fair | • Sympathetic<br>• Assess impact on people<br>• Guided by personal values<br>• "Tender-hearted"<br>• Strive for harmony<br>• Compassionate<br>• Accepting |
| **How do people orient themselves toward the outer world? Judging (J)** | **How do people orient themselves toward the outer world? Perceiving (P)** |
| • Scheduled<br>• Organised<br>• Systematic<br>• Methodical<br>• Like to plan<br>• Like completion<br>• Avoid last-minute stresses | • Spontaneous<br>• Open-ended<br>• Casual<br>• Flexible<br>• Adaptable<br>• Like things unconstrained<br>• Feel energised by last-minute pressures |

*Table 4-6b*: Characteristics of people and MBTI Preferences

# Conclusion

Both terms “designer” and “client” are merely labels, that express nothing in themselves. Both designers and clients are first and foremost individuals, shaped to a great extent by the society in which they live, influenced by the prevailing ideas of their times, and reacting to those in ways that are in accordance with their individual personalities. In this chapter, an attempt was made to describe two things: first, how universal these personalities are, and second, how they have been classified by the analytical typology. The aim of this examination was to offer some insight about the ways different types are currently interacting, and may interact within the suggested new collaborative design paradigm in order to promote the development of balanced architecture.

In the next chapter, the various functions and the respective personality types will be examined within the context of collaboration within design, and an attempt will be made to demonstrate how certain preconceptions and fears can be traced down to the elementary distinctions between individuals described above. As it was argued above, these distinctions are universal, appearing throughout history in every society and time period, in one form or another. The names may change, but the actual concepts do not.

# Chapter Five

## *Architectural Types and Attitudes*

"For two personalities to meet is like mixing two chemical substances: if there is any combination at all, both are transformed."[119]

*C.G.Jung*

# Introduction

Cognitive style has been defined as "consistent individual differences in preferred ways of organising and processing information and experience"[120]. This style tends to be stable over time and situations; and this consistency in information processing leads to consistency in behaviour[121]. Therefore, it would seem appropriate to explain seemingly random variations in human behaviour through an examination of the cognitive style of individuals.

The previous chapter examined the various personality types in general, as described by Myers-Briggs and Jung. In an attempt to further discuss the initial hypothesis, that architects and clients can benefit from working closer together, and to examine the ways in which this can be facilitated, as well as the ways in which this occurs presently, this chapter will examine the various architectural types, and will elaborate on the relation between these and the MBTI ones. Three main categories of classification are introduced, depending on practitioners' attitudes towards design, their clients and technology. It was mentioned that, within the design context, the functions influence the collaboration between architect and client in three ways: first, by influencing predominantly the way *design quality* is judged, and therefore relating to design itself, second by influencing the practitioner's attitude towards technology, and therefore the *medium* he will use to design, and third by influencing the

119 Jung, 1971f

120 Messick, 1976, p. 5

*communication* with the client. For balanced architecture, the aim of the proposed new design paradigm, to be possible, architects need to balance these pairs of opposites. For this reason, it was deemed important that these attitudes are examined in as much detail as possible, hopefully correlating any theoretical findings with an existing theoretical model, such as the MBTI, which is based on a very large amount of practical data.

One problem encountered, however, is that, although the MBTI is based on a large body of research, only a small part of it has actually dealt specifically with architecture and creativity[122]. For this reason, it was deemed necessary to conduct a set of interviews as an experiment, through which these hypotheses would be tested.

## Outline to Interviews

The initial theoretical position was that it should be possible to correlate practitioners' attitudes with Myers-Briggs personality types. According to this hypothesis, there should be a correlation as follows: Extraverted practitioners would have positive feelings towards technology; Intuitive-Perceptive ones would be more creative and artistic in the way they design; and Feeling-Perceptive ones would tend to listen more closely to their clients.

To test this, it was decided that a series of interviews with practitioners would be conducted, and the MBTI would be administered to them. The interviews aimed in understanding their attitude towards the three areas that are examined here. A total of thirty practitioners were interviewed, and classified according to their MBTI type and their three key-attitudes; towards design, their clients and technology.

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121 Goldstein & Blackman, 1981

122 MacKinnon and Hall, 1961; Myers, 1962; Jacobson, 1993

## Previous Research

The MBTI was chosen because of its wide acceptance, and its combination of being very relevant to the architectural profession, while at the same time dealing with a wide number of behaviours. The reason for the MBTI's relevance to the architectural practitioner, is that is deals with creativity, as demonstrated by Myers[123], who pointed out that, when two of its four dimensions (N/S and P/J) are considered in combination, it can indicate creativity.

### Jacobson's Research

Myers' claim has been further supported by experimental data that successfully correlate the Kirton Adaption-Innovation Inventory (KAI), another widely accepted measure of cognitive style, designed to measure "style of decision making, problem-solving and, by implication, creativity"[124], with the Intuition-Perception combination of the MBTI[125]. Jacobson's conclusion was that, "intuition and perception as measured by the Myers-Briggs were each found to correlate significantly with innovation as measured by the Kirton Inventory total score"[126]. Her findings are summarised in Table 5-1[127], where both the original Kirton Inventory and a subsequent study by Carne and Kirton are included and correlated with MBTI scores.

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123 Myers, 1962
124 Kirton, 1988, p. 65
125 Jacobson, 1993
126 ibid, p. 1136
127 Adapted from Jacobson, 1993, p. 1136

| **Original Kirton Inventory** | **MBTI** | | |
|---|---|---|---|
| | Intuition | Perception | Combined Intuition/ Perception |
| | | | |
| Originality[128] | .56* | .35* | .52* |
| Total | .66* | .49* | .65* |
| | | | |
| **Carne and Kirton Study (1982)[129]** | | | |
| | | | |
| Originality | .49* | .32* | .51* |
| Total | .44* | .53* | .62* |

* *p<.05*

*Table 5-1*: Pearson correlation for scores on Kirton Adaption-Innovation Inventory and Myers-Briggs Type Indicator (N=54)

## MacKinnon and Hall's Research

Another research that examines the correlation between Jungian typology and architectural creativity has been conducted by MacKinnon and Hall[130]. As part of a greater research supported by the Carnegie Corporation, they interviewed a total of 124 architects. These were classified in three groups, according to their creativity, as assessed by a panel consisting of architectural magazine editors, professors of Architecture, architects and other experts in Architecture. In addition, the number of articles by or about each architect and his work and the number of pages devoted to each architect and his work were also taken into account. What emerged from this complex selection process, is three groups. The group of the 40 most creative architects were called Architects I; the next 43 Architects II and the least creative ones, Architects III.

[128] All dimensions are referred to by that pole which is most likely to have a positive correlation with the KAI scores

[129] Values here are corresponding results reported by Carne and Kirton (1982)

[130] MacKinnon, 1961

These three groups were then administered a number of tests, one of which was the MBTI. The findings of this test seem to support the hypothesis that practitioners' attitudes and personality types can be correlated, since it was found that there were clear distinctions in the preferred functions and attitudes of the three groups (a graphic depiction of MacKinnon-Hall's findings and a table created using their data can be seen in Tables 5-2 and 5-3). An advantage of having these results available is that they provided good comparison for the findings of the interviews.

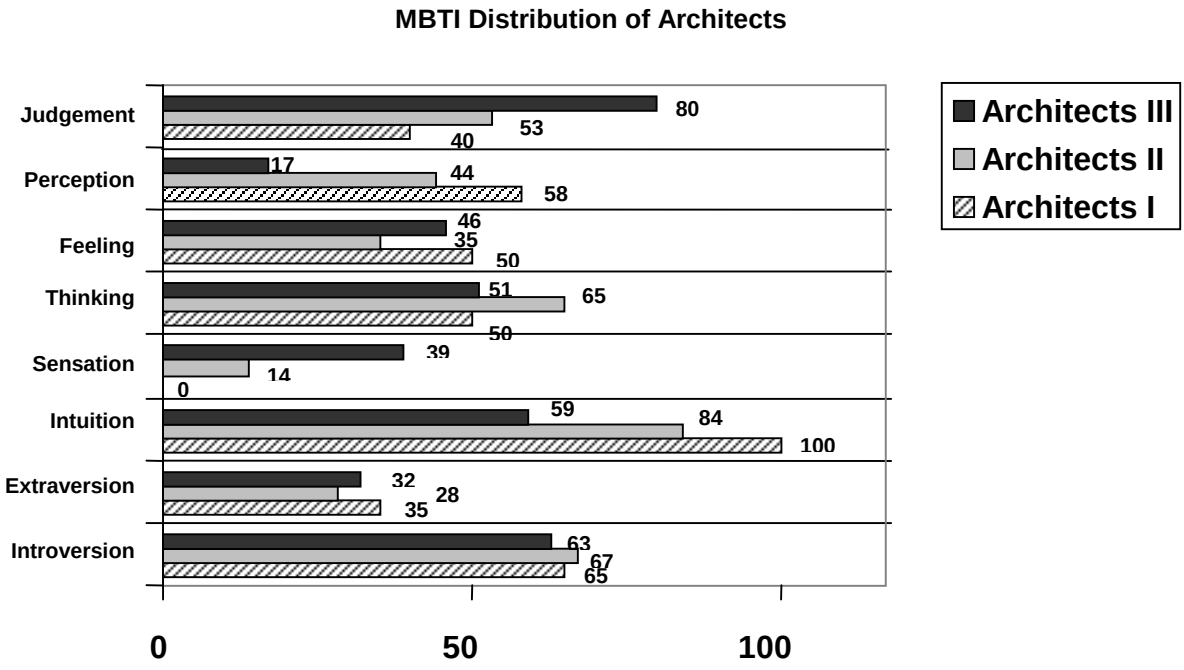


*Table 5-2*: MBTI distribution of architects belonging to three creativity groups (III to I, from least to most creative) in 1961 (*n*=124)

| TYPE | Mean % | | Architects I (most creative) % | Architects II (less creative) % | Architects III (least creative) % |
|---|---|---|---|---|---|
| | | | | | |
| **Introversion** | 65 | | 65 | 67 | 63 |
| **Extraversion** | 31.6 | | 35 | 28 | 32 |
| **Intuition** | 81 | | 100 | 84 | 59 |
| **Sensation** | 17.6 | | 0 | 14 | 39 |
| **Feeling** | 43.6 | | 50 | 35 | 46 |
| **Thinking** | 55.3 | | 50 | 65 | 51 |
| **Perception** | 39.6 | | 58 | 44 | 17 |
| **Judgement** | 57.6 | | 40 | 53 | 80 |

*Table 5-3*: Practitioners classification according to MBTI scores and creativity, *n*=124

# Methodology Description

While designing the interviews, a number of problems became apparent. To conduct these as objectively as possible, it was necessary to ensure that the MBTI scores would remain unknown until after the architects had been classified according to the three key-attitudes. To deal with this problem, the MBTI was scored by an independent counsellor trained in it[131], and its results were unknown to the interviewer until the practitioners had already been categorised. In Greece, the tests were scored by a psychologist and career guidance counsellor[132]. Again, the results were unknown to the interviewer until the practitioners had been categorised.

Another problem is the need for an objective means of classification according to the attitudes in question. Most researchers who have conducted similar experiments, asked the practitioners' peers to perform the classification[133]. This, however, seemed too arbitrary, so it was decided that a questionnaire should be developed. This was designed with a professional psychologist's help[134]. After a number of changes and a pilot trial, the final format was agreed upon, and the questionnaire submitted to practitioners was divided in three roughly equal parts; one for each key-attitude[135].

The questions were written in a repeating manner, so that it would be possible to identify the consistency of the answers. This was deemed important, as behaviours and attitudes may not be stable, but dependent on the circumstances. That way, it was possible to identify contradictions, and the conversation could then examine these further. For example, a practitioner in the pilot study claimed to have a negative attitude towards technology in the general question (question 1), but exhibited a positive attitude in the specific ones (questions 2, 4). When her attention was brought to this, she explained that she did not think of several of the items

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131 Therese Pratt, Stillpoint director

132 Stephanos Tzepoglou, Senior lecturer, Dept. of Psychology, University of Athens

133 Cuff, 1982; Boughey, 1969

134 Mark Pratt, Stillpoint director

135 Appendix 'A'

mentioned in the specific list as 'technology'; this demonstrated the need for a question that would examine what the word meant for each practitioner (question 9 was introduced to answer that need).

To identify practitioners' key-attitudes, the answers to each set of questions were taken into account. If all answers were consistent with one type, it was accepted that he belonged in this type. However, this did not always happen; some practitioners were harder to classify, choosing contradictory answers. In this case, the practitioner's type was chosen as the one indicated by most answers. As explained later, this was usually a problem when it came to the issue of attitude towards technology; some practitioners were ambiguous about their preference, as indicated by their answers.

## Procedure Description

Since the presence of a psychologist especially trained in the MBTI was not possible, a special MBTI administration seminar was attended by the interviewer to improve the accuracy of the test administration. Practitioners were chosen at random, in an effort to include as diverse a sample as possible. Both self-employed architects and members of staff were interviewed, with practices ranging in size from one person to thirty.

The interviews were divided in two parts. During the first part, practitioners were briefed on the MBTI, and a test was then completed. Upon completion, they were handed the key-attitude questionnaire. This second part had the form of a structured interview. As soon as the interviews were over, completed MBTI tests were sent to be scored, while the key-attitude questionnaire was analysed, categorising the architect's attitude as belonging to one of six groups. When the MBTI results were returned, they were correlated to the key-attitudes.

# Architect Types and Key-attitudes

Practitioners were classified through an examination of three key attitudes: towards design, clients and technology. Three pairs of opposite attitudes are identified in this manner, and architects are described as belonging to one or the other opposite pole. For balanced architecture to be achieved, architects need to balance these as well as possible. Naturally, actual practitioners have various ways of balancing these attitudes, and almost no-one belongs exclusively to one or the other. Still, for classification reasons, it is useful to think of these as real attitudes.

## Attitude Towards Technology: Innovators and Commodity Users

Architects designing balanced architecture need to know when it is best to use technology and when its use is counter-productive. A balance between the two extremes of technological preference – unquestionable adoption of technology and immediate rejection – is desired. Myers and Briggs state that technological preference is an Extraverted-Introverted one[136]. The interview findings, however, do not seem to support this, and, in fact, support no obvious preference at all. To test the practitioners' attitude towards technology, nine questions (questions 1 to 9, Appendix 'A') were included. The questions were designed in such a way, that any contradictions would be easy to spot; for example, if a practitioner claimed to have negative feelings towards technology while owning every item on the list on question 2, this would have to be further examined. A clear result was expected; Intuitive practitioners would enjoy using technology and Sensing ones would not. Surprisingly, it was found that some Intuitive practitioners often did not even have a computer, while some Sensing ones were already on the Internet. Furthermore, one Intuitive would describe his feelings towards technology as "positive", while another as "negative". At the same time, a Sensing type would describe his feelings as

[136] Briggs-McCaulley, 1985

"positive" as well, adding to the impression that this Sensation/Intuition preference did not seem to be an important factor in technology preference.

The explanation for this apparent discrepancy appears to lie in an unexpected problem; namely, how people define technology. When the interviews were initially set up, there was a vague understanding of the term 'technology'. This author's initial concept of technology was of one bearing a vague relation to IT/CMC and CAD systems in the architectural context. It seemed easy, then, to examine whether practitioners enjoyed using them. However, IT/CMC and CAD are not an homogenous area, but a whole collection of different programs, with more being produced every day. It turned out that the reasons why some practitioners would not use CAD systems were among the most interesting aspects of the interviews.

As the interviews progressed, the realisation was gradually made that IT and CAD vary enormously. Just like people are Sensing or Intuitive, software can also be categorised as one of the two. This helps provide a clearer view of the difference between what can perhaps be called 'intuitive-oriented technology' and 'sensing-oriented technology'. After realising this was an important distinction, it was realised that, prior to asking practitioners whether they enjoyed using IT/CMC or not, one had to enquire about details such as their past experiences with computers; including information such as what computers they were using, how recent that experience was, and, most importantly, what it was that they did not like with computers.

What was expected, was that Intuitive people would enjoy using innovative, Intuitive-oriented technology. They would not be using IT when it would be thought to be inadequately intuitive; these users could then be termed "**Innovators**". At the same time, it was expected that Sensing types would prefer Sensing-oriented technology, using computers like a commodity; these were called "**Commodity users**". It was necessary, then, to add a question asking them to describe the technology they would prefer to be using. Since the sample consisted solely of

architectural practitioners, the majority of whom are Intuitive, it was further expected that IT users would enjoy intuitive IT/CMC, non-users would complain about lack of intuition in current IT/CMC and CAD. This was indeed the case; architects using IT seemed to prefer imaginative, expressive software, while those who do not use IT complained about its incapability to capture their ideas.

This was thought to be a very important finding, because it shows that IT/CMC is not rejected because of a Neo-Luddite attitude, but, on the contrary, because it was perceived as not developed enough, and has not yet reached the stage where it will be a truly intuitive and transparent tool to use in the architectural and design context. At least among the limited sample of these interviews, this was the case: Intuitive types were generally Innovators, and Sensing ones were Commodity-users. Again, it should be stressed that a Commodity user may have a computer and an internet connection; just as an Innovator may have none. The difference is much subtler, as explained before, and depends on all the factors mentioned above.

A second factor influencing the actual use of IT involves the rapid growth of IT/CMC. Practitioners have no time to follow it, and are often unaware of the fact that a technology exists that could aid them in their practice. Even when they are aware, they realise that the learning cycle will mean large expenses - in both financial and time terms. And even when they do decide to acquire the technology in question, they need time to learn how to use it properly; and spare time is something most firms lack. It comes as no surprise, then, that it was often mentioned that technology is not used properly in practice. This leads to it being described as unsatisfactory, since people are actually incapable of taking full advantage of it, and feel reality fails to meet their expectations. This is a problem mentioned elsewhere in this thesis, and seems to be a general one. In this light, it is probable that, once practitioners start learning how to effectively use IT/CMC, they will become more content with it, and even Sensing types will be happy to use it.

## Design-Attitude Types: Art-Oriented and Pragmatic

To distinguish between different types of architects as characterised by their attitude towards design, the terms "**Art-oriented**" and "**Pragmatic**" were devised. This classification is based on whether they are more interested in the aesthetic point of view, or in fulfilling their clients' more practical needs. As mentioned before, this is one of the key elements of balanced architecture, and architects need to belong neither to one, nor the other type for balanced architecture to be possible.

Attempting to classify the architects as belonging to one of the two types, three questions (questions 10 to 12 of Appendix 'A') were included in the questionnaire. These were essentially the same question in various forms; the key distinction being whether the practitioner was chiefly focusing on the aesthetics or the practicalities of design.

Personality types as described by the MBTI can be seen to correlate with these two types. Intuitive types were expected to be more creative, leading to Art-oriented practitioners, but Sensing ones to be less so, leading to Pragmatic design. This was indeed shown to be the case, at least with the limited sample available. It should be noted here, that there is an apparent bias in architects being Intuitive, as has been demonstrated in a number of studies[137]. It would seem that the architectural profession attracts Intuitive types, perhaps because of its creative and artistic nature.

### The Art-Oriented Architect

> "Stern: the aesthetic is the only important thing about building... The only buildings that we are finally interested in are the ones that speak to us from an aesthetic point of view.
>
> Gehry: I'm interested in architecture as a work of art, and whether it will hold up as art." [138]

The above extract from the Progressive Architecture Award reveals a lot about the art-oriented architect. In accordance with our culture, these architects' view of architecture is that of a creative artist. In our society, the popular, mythical architect

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[137] MacKinnon, 1961; Myers, 1962; Bayne, 1995; Myers-Briggs, 1995

is a lonely, somewhat eccentric artist; sculptor, sole creator and protector of the built form, absolute in his believes of right and wrong.

Eisenmann, Stern and Gehry are good examples of Art-oriented architects. In their own words, they only care for the aesthetic point of view. They are indifferent towards their clients' practical needs, and are interested in architecture as Art; as an artistic struggle to give birth to a new form. During Boughey's 1969 interviews[139], he frequently came across what he calls "the art defence"; a justification for design decision on the basis of subjectivity, mystery and autonomy, rather than negotiation, explanation or compromise[140], or, in Boughey's words, "an architect's sudden claim to be an artist whose work is not rationally evaluable, due to fear of incursion into their professional autonomy"[141]. This romantic attitude best fulfils several aspects of the architectural myth, and these architects, usually classified by Boughey as Stars, believe strongly in the value of their attitude. They strive to change the culture, and for them the issue is how to win the right to charge the client for services rendered according to the standards established by one's colleagues; even if the client feels he has received no satisfaction or benefit.

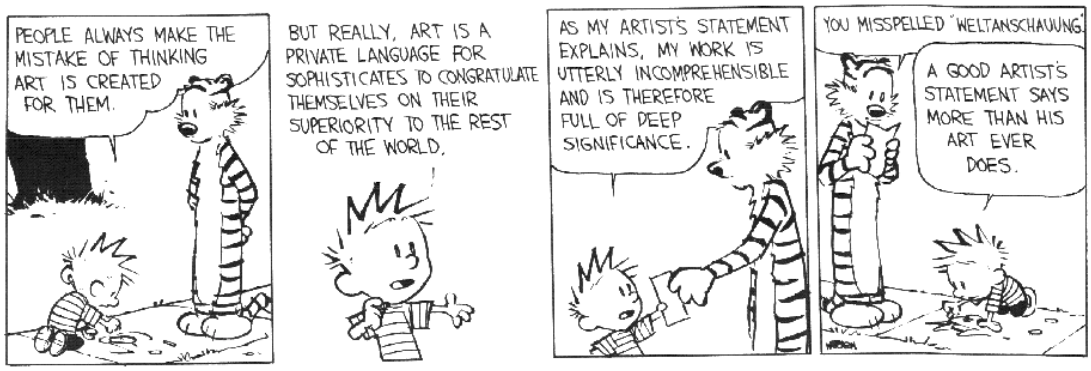


*Fig. 5-4*: Art-oriented architects can often be perceived as arrogant and irrelevant[142]

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138 Cuff, 1982, p. 98
139 Boughey, 1969
140 *ibid.*
141 *ibid.*, p. 166

This attitude, however, does little to help the architect deal with practical problems, while it promotes an image that is not altogether flattering. Contractors are worrisome, and sceptical of the architect's grasp of commercial realities. Clients feel that architects do not really exhibit an adequate interest in what their main concerns are likely to be - like the importance of getting finished within a certain time.

Furthermore, art-oriented architects that relate to their subjective idea of the building instead of the actual *object*, will probably tend to neglect its practical aspects, and focus into its aesthetic qualities instead. Such an architect will be predominantly concerned about the realisation of the idea in his mind; his thought will be focused inwards, and the relation with the client would take a secondary place. Being unable to understand his concerns and needs, and equally unable to communicate his vision, he would be the archetypal absent-minded architect, lost in his art. It is important for this type, if balanced architecture is to be achieved, to not allow the building's aesthetic qualities to be more prominent than pragmatic needs, and there is a growing feeling that architecture has done just that, distancing itself from the client. Even architects themselves sometimes question the wisdom of allowing one's work to be judged only by one's peers; as an architect mentioned by Golzen was commenting, "architectural photographers tend to produce pictures that will impress other architects or the editors of architectural magazines. I'm not sure that they say enough to non-architectural clients who are not so interested in form, texture and massing."[143].

Architects of this type can actually be proud of their indifference towards their client's needs. They may consider it as a sign of freedom, and be eager to impose their view, as Eisenmann's did when acknowledging with pride, "none of my houses is shaped for clients' needs." [144] Indeed, the esteem in which Eisenmann is held by

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142 Calvin and Hobbes (c) 2000 Watterson. Reprinted with permission of Universal Press Syndicate. All rights reserved

143 Golzen, 1984, p. 131

144 Cuff, 1982, p. 65

his peers is consistent with Boughey's observation, that esteem and prestige among architects follows the rule,

> "How dominant over or subservient to his clients the professional is reputed to be in his general practice. The higher the dominance, short of total egoistic contempt, the higher the esteem in which he is held by his colleagues"[145]

## The Pragmatic Architect

The pragmatic architect will focus on the practical side of a building. Artistic value and the aesthetic needs of the clients may appear as secondary in importance, and a practical bias will be imposed. Architecture of this type will be described by art-oriented architects as uninspired and uninspiring, lacking creativity. Often, a practitioner of this type will mimic other, more creative architects. If this is done in a sensible way, the result may be quite pleasing. If, however, a design is duplicated out of context, with disregard for the surroundings and the idiosyncrasy of the particular environment, it will almost certainly fail to function. A danger for the extreme example of this type lies in the fact that, lacking the creativity that would allow them to produce an aesthetically remarkable building, they may focus too much on the practical aspects of the building, neglecting its aesthetic qualities. This can lead to equally disappointing architecture as the aesthetically satisfying building that suffers from inadequate heating.

The hypothesis was that, architects of this type would have a preference for the Sensing function. This would make them able to successfully deal with the practical aspects of design, but production of ground-breaking design would be beyond their ambitions. It was very hard to actually find a Sensing architect; most were Intuitive, as was expected based on the available research on the subject[146]. However, it is important that all Sensing architects were classified as Pragmatic ones. Characteristically, one Sensing practitioner interviewed answered the question, "What do you think is more important; the aesthetic qualities of a building, or

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145 Boughey, 1969, p. 167

146 Myers-Briggs 1995

whether it meets the practical needs of its inhabitants or not", by saying, "The practical needs come first, allowing for good aesthetics. Form follows function; not the other way around". The same question was answered by an Intuitive (and remarkably honest) architect as follows: "I would focus on its aesthetic qualities, paying lip service to practical needs, but in my mind I'd be doing 'nice things'!"

Of course, it should be noted that, due to practical considerations, practitioners learn how to compromise between the two positions; as pointed out earlier, a number of factors increasingly ensure that design activities are the result of a collaboration, and not a one-sided endeavour. An Intuitive architect answered the above question saying, "Personally, I think that aesthetics are more important. But we must design practical buildings". His awareness of this need was further highlighted when he answered the next question, "Designing a new building, do you focus chiefly on its aesthetic qualities, or its practical side", by saying, "I focus on the practical first, and, out of that, come the aesthetics".

## Client-Attitude Types: Servants and Authorities

In relation to their clients, practitioners designing balanced architecture need to be neither authoritarian, nor subservient towards them. This balanced attitude is beautifully captured in a comment made by an interviewed architect:

> "I see myself as an 'enabler'. I have design skills, knowledge about regulations etc. What the client has is ideas, some of which the can't articulate. They also have practical considerations. They may give me a possible solution, and I may give them an alternative; I see this as my job".

This is reminiscent of Bruce Goff comment, "I'd like to design the sort of house the client would design if he were a great architect"[147]. In this case, the design procedure can be very satisfactory for both the designer and the client; a client describes such an experience saying, "we designed the house together - it was marvellous fun, like an elaborate game for grown-ups."[148]

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147 Golzen, *ibid*. p. 150

It is interesting that most attempts to categorise practitioners make no distinction between attitude towards design and that towards clients. In Boughey's terminology[149], introduced in chapter 2, architects are either Hacks (completely client-dominated; in business to make money), Stars (complete contempt for clients; artist-heroes, showmen), or Ideal Architects (who dominate clients in the best interest of clients, users or both). This categorisation shows architectural perception of their peers, but does not reveal whether these perceptions are actually true; indeed, as mentioned above, there is plenty of evidence that they fail to correspond to any actual attitudes towards design or clients.

Although popular belief holds that there is a strong relation between the two, a hypothesis was made that this is not necessarily the case, and indeed, more important factors exist, that influence the relationship with the clients. Furthermore, these factors can be better understood through use of the MBTI typology. To test this hypothesis, a total of eight questions (questions 13 to 20 of Appendix 'A') were devised, aiming at examining the practitioner's attitude towards clients.

In describing practitioner types, the terms "**Servants**" and "**Authorities**" were chosen. The first roughly corresponds to Boughey's Hacks. They are eager to please the client, and are readier to compromise their personal aesthetics and beliefs when this is demanded by the client. Of course, no-one was found during the interviews that corresponded entirely to Boughey's Hacks, compromising their personal views unquestionably, being interested in their financial profit and being held in contempt by their peers. The classification of Servants, then, serves only as one of two opposite poles and as a theoretical concept, as do Authorities and, indeed, all opposites in this classification.

On the other hand, "authorities" are perhaps closer to Boughey's "Stars". They will intimidate the client – usually without realising it – in their attempt to serve their

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148 Golzen, *ibid.*, pp. 177

149 Boughey, 1969

clients' interests. Wright's comment, "Richard, why don't you move your desk?" [150], mentioned above, is an extreme example of this attitude. Of course, examples of this type need not be as dramatic as that, but there is still a characteristic failure to take the clients' feelings and values into account.

In the MBTI context, there seems to be an interesting difference in the way Thinking and Feeling personalities deal with people. During the interviews, it became apparent that, although both agreed that the architect-client relation was among their most important concerns, and both dedicated a significant amount of time building it, they took a fundamentally different route in achieving this. One of the questions on the questionnaire was designed to explore this particular issue. It asked, "If a client's suggestion was fine technically, but in poor taste, how would you react?" Feeling practitioners' reaction was a typically non-confrontational one; they would not tell the client, but would try to suggest a better solution, making it appear as if the client themselves had suggested it. This is consistent with the need of Feeling types for harmonious relations. Thinking practitioners, however, would promptly inform the client. As one such architect said, "I would tell them, but if they still wanted their solution, I would probably accept it, putting on record that it was *their* decision, not mine". This, again, is consistent with the need of Thinking types to search for absolute truths; diplomacy is usually not their strongest point.

From the above, it is obvious that the difference between Servants and Authorities is inherent in the difference between the Thinking/Feeling functions. According to the initial hypothesis, Feeling practitioners were expected to tend to take their clients' values into account; and be very careful not to hurt their feelings. This is because of this type's need for harmonious relations and their respect for personal values. They were expected, therefore, to be Servants. Truth is more arbitrary to this type; and preferences subjective. Thinking types, however, believe that truth and logic should be the deciding factors, and the initial hypothesis was that they would lean towards being Authorities. As in the example above, they may not

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[150] Kaufmann, 1990

hesitate to hurt their clients' feelings; one design is *truly* better to another, and what is important is that this truth prevails. Interestingly, this same practitioner answered the question, "What do you think the relationship between architect and client would be" by saying, "Very close. It becomes very personal, honest and intimate", indicating that, for a Thinker, this need for a close relationship does not conflict with the need for absolute honesty. It is this faith in the absolute that can make them Authorities, using their power to ensure that a design not perceived by them as the *right* one does not go ahead, despite the client's feelings on the matter.

A general attitude was described above with regard to the MBTI types; Thinkers were expected to be Authorities, and Feelers to be Servants. During the interviews, however, it became apparent that there is a second way in which the MBTI can be used to describe attitude towards clients: this depends on the individual client, and it needs the client type in order to be useful. It predicts that certain types will communicate better with some, and poorer with others. This thesis' findings in that area are consistent with extensive research[151], and verify that certain preferences do create genuine problems during interactions between different types, especially with imbalanced individuals – i.e. people who have not sufficiently developed their inferior functions. A strongly intuitive practitioner, for example, can have difficulties communicating with a overtly sensing client. To test this, a question was included, asking practitioners to describe the most memorable case where things went wrong with their client (question 15 of Appendix 'A'). This verified the prediction; it is difference in types that seems to create most problems.

One characteristic example is that of a strongly Intuitive practitioner working for an equally strongly Sensing client[152]. The difference was further amplified by the fact that the client was a strong Judging type, whereas the practitioner a Perceptive one. As is consistent with SJ types, the client felt the need to write everything down,

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[151] Gray&Wheelwright, 1944; Plattner, 1950; Jung, 1971a, Jung, 1971b; Myers-Briggs 1995

[152] The client type was not examined during the interviews. The Sensing/Judging preference was surmised from this client's attitudes, which are characteristic of a person of this type. Even if the client belonged to

and then do everything exactly as agreed. The architect wanted to make changes according to the way things usually progress in the actual building site, but the client was always vetoing these, however minuscule. The result was an extremely tiring experience for both – enough so, to be recalled as the worst client case by the practitioner.

In this case, both client and architect were true to their type; and this is what created friction in their relationship. There is no obvious way to circumvent this except to suggest that practitioners are aware that clients belonging to their shadow types will have opposite preferences than them, and to either suggest they use a practitioner closer to their own type (a Sensing-Judging practitioner would be ideal for the type of client mentioned above), or to set specific boundaries, explaining that their preferred way of working should be accepted. It is in such situations that an understanding of different attitudes can be of great benefit to both practitioner and client, since they will be more inclined to respect the different attitude if they are aware that it is only normal for that type, and not meant as a personal disrespect or peculiarity.

In another case that is the essentially opposite of the former, demonstrating how it can play no role whether the architect is NP and the client SJ or vice versa, one SJ practitioner recalled a strongly Intuitive and Perceptive client as an example of a particularly bad experience with a client. The practitioner needed to check, verify and write everything down, while the client was enthusiastically coming up with new ideas at every meeting. This created an almost impossible situation for the practitioner, who felt he was unable to cope with what he characterised as a "constant stream of half-digested ideas" coming from the client.

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a different type, what is important in this context is that it was the particular behaviours, which were consistent with a Sensing/Judging person, that made the collaboration so hard.

# MBTI Results

The MBTI results from the practitioners' tests can be seen in Table 5-2 and Diagram 5-3. The first column lists the various types according to the MBTI, while the second one lists the absolute numbers in which they were encountered during the interviews. The third column lists the percentage represented by these numbers. The first three columns of Table 5-4 show the numbers and percentages of "Ideal Architects", "Hacks" and "Stars" that Boughey interviewed[153]. These were the characterisations given to architects by their peers. Boughey correlated these with his own findings of "architect-dominated" and "client oriented" relations, and the next two columns show the numbers and percentages of these two types. An interesting insight in the design attitude is offered by two of his tables. The first one answers the question, "On what basis do you make design decisions?", and has three possible answers; "Intuition", "Client demands" and "Not answering". The second, has the caption, "Desire for, or resistance to, research on designs", and questions whether practitioners will invoke the "art defence". These are also listed in the same table, as it can be argued that art-oriented practitioners will invoke the "art defence", and base their design decisions on intuition, while pragmatic ones will want practical research, and base design decisions on their clients' practical demands. This is done for comparison reasons, with the findings from the interviews listed in the next table, Table 5-5.

[153] Boughey, pp. 163-166

| TYPE | # | % |
|---|---|---|
| | | |
| ISFJ | 1 | 3.5 |
| ESFP | 1 | 3.5 |
| INTJ | 2 | 7 |
| INFJ | 2 | 7 |
| ENTP | 1 | 3.5 |
| ENFP | 8 | 27 |
| INTP | 4 | 14 |
| ENTJ | 1 | 3.5 |
| INFP | 7 | 24 |
| ESFJ | 1 | 3.5 |
| ENFJ | 2 | 3.5 |
| | | |
| Total | 30 | 100 |

*Table 5-5*: Practitioners classification according to MBTI scores and country, *n*=30

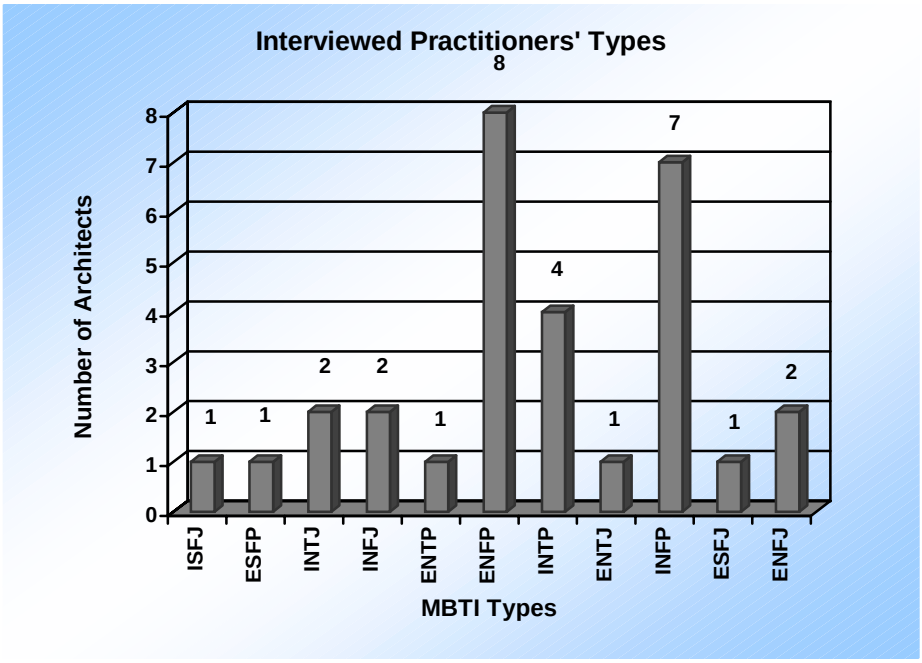


*Fig. 5-6*: Practitioners classification according to MBTI scores, *n*=30

| Types | Ideal Architects | | Stars | | Hacks | | Total | |
|---|---|---|---|---|---|---|---|---|
| | # | % | # | % | # | % | # | % |
| **Architect-Dominated** | 26 | 45% | 8 | 31% | 5 | 50% | 39 | 41% |
| **Client-Oriented** | 32 | 55% | 18 | 69% | 5 | 50% | 55 | 59% |
| | | | | | | | | |
| **Total** | 58 | 100 | 26 | 100 | 10 | 100 | 94 | 100 |
| | | | | | | | | |
| **On what basis do you make design decisions?** | | | | | | | | |
| **Intuition** | 7 | 14% | 3 | 6% | 4 | 8% | 14 | 28% |
| **Client Demands** | 2 | 4% | 2 | 4% | 0 | 0 | 4 | 8% |
| **Not answering** | 24 | 48% | 8 | 16% | 0 | 0 | 32 | 64% |
| **Total** | 33 | 66% | 13 | 26% | 4 | 8% | 50 | 100 |
| | | | | | | | | |
| **Desire for, or resistance to, research on designs** | | | | | | | | |
| **Want research** | 25 | 50% | 10 | 20% | 2 | 4% | 37 | 74% |
| **"Art defence"** | 8 | 16% | 3 | 6% | 2 | 4% | 13 | 26% |
| **Total** | 33 | 66% | 13 | 26% | 4 | 8% | 50 | 100 |

*Table 5-7*: Boughey's classification of architects, *n*=94 (rows 1-6) and 50 (rows 8-17)

Although it is impossible to estimate the percentage of Art-oriented practitioners from the above Table 5-7, since the majority chose not to answer on what basis they make design decisions, one can estimate the percentage of the Servant type at 59% (those who were described as Client-oriented). This is important, when compared to the percentage reached by the interviews performed for the purposes of this thesis; the relevant percentage was 63%. The exact figures are listed below, in Table 5-8.

| | Technological Attitude | | Design Attitude | | Client Attitude | |
|---|---|---|---|---|---|---|
| | Commodity-user | Innovator | Art-oriented | Pragmatic | Servant | Authority |
| **Number of Practitioners** | 13 | 17 | 21 | 9 | 19 | 11 |
| **Percentage of Practitioners** | 43% | 57% | 70% | 30% | 63% | 37% |

*Table 5-8*: Practitioners classification according to key-attitudes, *n*=30

The next table, Table 5-9, correlates all the above findings. Both the practitioners' MBTI type and their key-attitude type are listed. Next to each key-attitude type is the percentage of practitioners of each MBTI type exhibiting that key-attitude; the rest exhibit its opposite, although for reasons of simplicity, an extra column for each key-attitude was not deemed necessary to be added. Where only a single or no architect of a particular type was interviewed, this type has been omitted.

| Types | n | Technological Attitude | % | Design Attitude | % | Client Attitude | % |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Extraverted Intuition –ENFP | 8 | Innovator | 62.5 | Art-Oriented | 75 | Servant | 75 |
| Introverted Intuition – INTJ | 2 | Innovator | 100 | Art-Oriented | 50 | Authority | 100 |
| Introverted Intuition – INFJ | 2 | Innovator | 50 | Art-Oriented | 100 | Servant | 100 |
| | | | | | | | |
| Introverted Feeling – INFP | 7 | Innovator | 71.5 | Art-Oriented | 85.7 | Servant | 85.7 |
| Introverted Thinking – INTP | 4 | Innovator | 50 | Art-Oriented | 75 | Authority | 75 |

*Table 5-9*: Practitioners classification according to key-attitudes and MBTI scores, *n*=30

# Discussion

## Attitude Towards Technology: Defining Technology

As seen above, one particular issue became evident during the interviews: *technology* is a particularly hard term to define. It can only be usefully - for the purposes of this thesis - understood subjectively; one man's "technology" is totally transparent to another. By one definition, anything constructed in any other way than manually, is "technology"; even a needle used to sew a cloth can be described as "technology". It is obvious that, in our era, man is surrounded by "technology"; our dwellings are constructed through a "technological" process, our vehicles are part of our "technology", our clothes, even when hand-made, are made using some sort of "technology".

This broad definition, naturally, makes it impossible to gain a useful insight in the meaning of the term. Besides, there seems to be a 'threshold' level, past which something becomes too transparent to be thought of as 'technology'. This 'threshold' appears to be a highly subjective matter. For example, even the Hamish are using oil lamps and candles; which are arguably pieces of technology. To deal with this subjective threshold problem, a decision was made, that the word 'technology' would be left consciously vague in the interviews, in order to allow each practitioner to perceive it as they choose. At the end of the 'technological' questions, one further question was then included, that asked them to clarify what they perceived as 'technology'.

Four stages of a technological product's market presence and behaviour can be identified as follows[154]:

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[154] Based on Norman, 1998; Spool, 1998

**Stage 1**: *Tolerant User*. This is the stage where a company is the first to introduce a new product into the market. Since it is a novelty, a number of users will want to pay even for basic capabilities. When the pocket calculator was first introduced, for example, it only had four functions, but sold for more than £100. Users at this stage are tolerant – or even oblivious – to usability problems. This stage lasts until the first competitor attempts to take a share of the market introducing something with more features. This leads to the next stage,

**Stage 2**: *Critical User*. During this stage, various competitors enter the area, offering ever increasing features. Functionality becomes the main differentiator, and users gravitate to the product with the feature set that best meets their needs – or, if in doubt, the product with most features. This stage ends when vendors run out of functions that make a difference to the market, and customers cause the transition to the next stage,

**Stage 3**: *Intolerant User*. As an item enters this stage, users have become unwilling to accept a product that takes time to learn, and consider their productivity when deciding what to buy. Development emphasis is on areas that have to do with usability and ease of use. Finally, users become so comfortable with the product, that it enters the final phase,

**Stage 4**: *Transparency*. The product has now become a commodity, and has lost its "technological" status. It has largely become invisible to most users, and price is the key differentiator. Producers have no real interest in developing the product further, and try to minimise costs, in order to be competitive. According to Norman, this stage is reached when the product becomes a tool that fits so well, that the tool itself becomes a part of the task[155].

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[155] Norman, 1998

In this context, this model has the advantage of being descriptive and broad enough to allow an interesting distinction between the two types of users identified above, Innovators and Commodity-users. The former prefer to use things above their individual threshold, while the latter feel more comfortable with products beneath it – i.e. after a product has become a commodity, and has lost its technological "status". It should also be mentioned, however, that preferences appear to converge in the threshold level; i.e., both will prefer technology that is closer to their threshold than further.

In the previous model of 4 stages, it seems reasonable that users eager to acquire a product that it still in Stages 1 and 2 are Innovators. Commodity-users will only start using a product that has matured enough to focus on usability and ease of use, or that is completely transparent – i.e. a product in Stages 3 and 4. This helps distinguish between the two on the basis of when they think a product is developed enough for them to obtain.

Therefore, to describe attitude towards technology, the following definitions are also used: Innovators are people who enjoy using technology above their threshold and acquire a product in Stages 1 or 2; and Commodity-users are people who prefer using technology under their threshold and obtain a product in Stages 3 and 4.

# MBTI Types

## Biases Introduced

According to Briggs and McCaulley[156], most architects belong to the INTP type. Examining MacKinnon-Hall's findings, INTJ emerges as the predominant type. From these interviews, however, the top two types were INFP and ENFP. Since Briggs and McCaulley were based on extensive research performed with thousands

[156] Briggs & McCaulley, 1985

of people, it would seem to indicate there was a bias introduced along the interviews. Such a bias can, indeed, be identified, as stemming mainly from two factors.

The first factor is the limited number of architects interviewed. This alone does not explain the bias, although it does mean that a statistical error is much more probable. It does explain the bias, however, when coupled with the second factor; the fact that the Briggs and McCaulley data was collected from a variety of persons, some of whom completed the MBTI voluntarily and some as part of ongoing assessments. The MacKinnon-Hall data were the result of research conducted under the auspices of the Carnegie Corporation, which covered all expenses for the practitioners to fly to Berkeley, California, for a weekend. In contrast to these, this series of interviews was conducted in two stages: Scottish architects were commonly people unknown to the interviewer, who kindly agreed to give at least one hour of their time in order to help with this research. They were selected at random, and were under no obligation to participate; their acceptance relied solely on their willingness to help another asking for their help. Not only was there nothing of practical value in it for them, but they usually were interviewed in the middle of the day, when they commonly were very busy. It made no logical sense, then, to accept to participate, and, indeed, a large number of practitioners declined, saying they were too busy. The ones that accepted, then, must have done so because of their values and principles; not because of their logic. This, then, is a particularly effective way of eliminating Thinking types from the sample, and ensuring that the types interviewed would be predominantly Feeling ones. Indeed, almost all of the Scottish architects are of Feeling types (12 out of 13, or 92%).

A second set of interviews was performed in Greece. This time, practitioners were social acquaintances of the interviewer, and therefore under some social pressure to participate. Not surprisingly, the sample here was much less skewed; Feeling practitioners were now 10 out of 17, or only 58%. A similar bias was probably the reason behind the fact that the majority of practitioners were Extraverted; according to its definition, Extraverted Feeling focuses on the external

object (in this case the researcher), which means that this type would be more likely to accept to participate in the interviews. Indeed, 8 out of 13 Scottish architects, or 61%, were Extraverted; this falls to 7 out of 17, or 41% for Greek architects.

While it is acknowledged that the limited number of practitioners makes these statistics relatively unreliable, the differences in the results between Greek and Scottish architects seem to indicate that the hypothesis is probably correct, and the selection method does indeed influence the results. It is believed, therefore, that these findings do not necessarily contradict either the Briggs-McCaulley or the MacKinnon-Hall findings, and that a selection method that would make it obligatory for everyone to participate (e.g. if the RIBA were to ask all architects to participate), would probably result in similar findings to those described by them.

## Major Types

The small number of practitioners interviewed and the bias described above, mean that it is impossible to draw any definite conclusions about the key-attitudes types of the majority of architects. However, there is enough evidence to justify describing the three most predominant types that emerged during the interviews – INFP, INTP and ENFP – since it became clear during the interviews that they did indeed share certain common characteristics. This part of the chapter examines in further detail these three types from an architectural point of view, allowing one to better understand some of the subtler differences between the various types.

To help compare the findings of the interviews with existing research, the table below offers a practical guide to the ways in which the various combinations of perception (how people receive information; N or S) and judgement (how people make decisions; T or F) influence people's focus, according to Briggs[157].

[157] Briggs, 1994

| People who prefer | **ST** Sensing and Thinking | **SF** Sensing and Feeling | **NF** Intuition and Feeling | **NT** Intuition and Thinking |
|---|---|---|---|---|
| | | | | |
| Focus their attention on | Facts | Facts | Possibilities | Possibilities |
| Tend to become adept at | Applying facts and experiences | Meeting the daily concerns of people | Understanding the aspirations of people | Theoretical and technical developments with models |
| Solve problems by | A detached analysis of facts in a step-by-step process moving from cause to effect | A personal view of facts in a step-by-step process considering the value of the outcome | A personal view of possibilities in an insightful process considering the value of the outcome | An objective analysis of possibilities in an insightful process moving from cause to effect |

*Table 5-10*: Effects of Combinations of Perception and Judgement

## The Extraverted-Intuitive Type (ENFP)

The Extraverted-Intuitive type was predominant among the practitioners interviewed. It is described as enthusiastic and imaginative, quick with a solution for any difficulty, and ready to help anyone with a problem[158]; it is this eagerness to help others which may, at least partly, account for their predominance in the sample.

During the interviews, almost all exhibited the qualities described by Myers-Briggs. As the presence of Intuition would imply, they appeared to be eager to learn more about new ideas, and were interested in other people's views and theories. In

design, the intuitive type should be the most creative of types, constantly pushing forward the boundaries of what is accepted and known in his area. They like their design to be thought of as unconventional, ground-breaking and original. Their approach to design was imaginative and expressive; the majority of them (75%) were clearly Art-oriented in their attitude.

According to the MBTI, Intuition offers an understanding of others, and Feeling empathy, insight and warmth. During the interviews, they were very tolerant of their customers' ideas, and had good communication skills. It was apparent that this type would go to great lengths to accommodate others' points of view, and has an urge to harmonise all relationships; 75% were Servants. This combination allowed them to combine their developed aesthetic qualities with the practical needs of the clients, trying to keep a balance between the two.

What is of particular interest in the context of the suggested new collaborative design paradigm, is their poor relation to clients with characteristics consistent with an ISTJ/ESTJ type; nearly all mentioned such clients as among their worst. The typical reason given for this, was that the client wanted everything "done by the book", something that the architects felt was stifling their creativity. Perceptive types generally are enthusiastic, but not so strong in completing projects on time and keeping deadlines; they may be so much on the lookout for new ideas and possibilities, that they may never be satisfied with their work. As a result, they may tend to drag the design process on and on, until the client has no more funds, or finally prefers a less original, but more reliable designer. This was another area of tension with clients, especially those quoted as needing precise attention to details, order and structure, and liking everything done by the architect written down – again, all characteristics consistent with STJ types. As a result, ENFPs seemed to function better in offices where another architect, possibly of a TJ type, was responsible for completing projects. This is consistent with the MBTI's description of this type, as one that tends to start projects that attract their interest, but never finish them; as soon

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158 *ibid.*

as the subject becomes familiar, it also becomes boring, with the result that this type finds routine very difficult to cope with[159].

Since Boughey quotes architects considered as 'hacks' by their peers, as the ones "slavishly doing what their clients want to do in design"[160], it seems that one possible danger is that ENFP's respect for the client can mean they can be thought of as 'hacks' by their peers, for catering to all their clients' needs. If anything, the Intuition would seem to further exaggerate this trait, since they would be prone to overlooking practical problems in order to accommodate an idea a client had. Indeed, one of the architects interviewed has now retired, saying she could not cope with the competitive attitude of other architects in the firm.

Architects of this type were expected to be almost entirely Innovators, due to the presence of Intuition making them interested in anything new. However, they proved to be extremely hard to classify. In the end, 62.5% were classified as Innovators. Technology did not seem to be of interest to many of them, and one even said she had a 'negative' attitude towards technology. It appears that the ones that were Commodity-users failed to get excited by technology such as IT because they considered it "pedantic" and "non-intuitive". Everything has to be done in a precise manner, with the result that it fails to keep up with their spontaneous, enthusiastic approach. This attitude was even more evident with CAD, which was thought of as useless in the initial design stages, and boring in the later ones. Still, once they had encountered some technology that looked innovative, they were enthusiastic about it, and were keen to explore all possibilities it offered them. This dual attitude is consistent with the discussion above about the issues raised by use of the word 'technology'.

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159 *ibid.*, p. 15

160 Boughey, 1969, p. 100

## The Introverted-Feeling Type (INFP)

This is very similar to the above type, with the only difference of Introversion being preferred over Extraversion. Almost as many architects of this type as of the above agreed to be interviewed, and their attitudes closely resemble those of ENFPs, especially in the attitude towards technology, where their attitudes are virtually identical, with only a slightly larger percentage being Innovators.

During the interviews, they came across as Art-oriented, wanting their design to be original rather than practical; something consistent with the preference for Intuition, supplying them with imagination and insight. As with the their Extraverted counterpart, they were curious to explore new possibilities and implement new ideas. They appeared to be less enthusiastic, however, and more quiet, whether they were relating to people or ideas.

This feeling of quietness made them appear flexible and accepting, but they can also become very animated when they feel that a value important to them is being questioned. According to Myers-Briggs[161], Feeling supplies the urge to communicate and share, and this type is characterised by a good command of language. However, due to the lack of a strong Sensation function, both introverted and extraverted Intuitive architects can show an indifference towards their clients' pragmatic needs, something that can prevent the development of balanced architecture. According to Jung[162], this is because the objects themselves have no "real" value to this type, and they will therefore tend to ignore them. This can be frustrating to clients, and they, too, mentioned having problems with clients who failed to recognise the artistic value of their work. Still, Myers-Briggs stress this type's need to maintain harmonious relations[163], and, indeed, the majority were Servants. They appeared normally to be very respectful of their clients and their wishes, although they sometimes gave the impression of being secretly intolerant, and slightly patronising.

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161 Myers-Briggs, 1995
162 Jung, 1971b
163 Myers-Briggs, 1995

## The Thinking-Intuitive Type (INTP)

This type has several qualities in common with the above. During the interviews, they demonstrated intellectual curiosity, quickness of understanding and a successful intuitive perception of ideas that logic still has not had time to grasp; something consistent with the idea that the combination of Intuition and Perception is remarkably perceptive and creative. Also, they were expected to be Art-oriented architects; as indeed three quarters of the architects interviewed that belonged to this type clearly were. One example of the idiosyncrasies of this group, was the debate one of these had when building a public housing project. The developers – in this case, the City Council – wanted to ensure that the needs of everyone would be met, including people with mobility problems. So, when the architect designed an external door with a porthole on its upper half, they asked that a similar porthole was included on the lower half, so that wheelchairs users were able to see into the building as well. The architect felt that this idea was too pragmatic, and had no artistic merit, so in the end he preferred to use a plain door instead, rather than "betray [his] art".

A typically Thinking mentality is displayed by Rowland[164] in his description of Le Corbusier's *Notre Dame du Haut*. His comments display his logical bias, repeating words like "functional", "logical", "logically planned" etc:

> "…It was designed by Le Corbusier, one of the great architects of our time. At a first glance, you may think it looks rather unusual but when you have studied it for a little while you will find that there is really nothing strange about it. It is in fact a logical shape…
>
> A building such as this may be considered from many different points of view. We can see the masterly way in which the materials have been used… We may admire the structure, so well suited to the materials and to the purpose of the building… So skilfully has the space been utilised that one does not become aware of any lack of it… Lastly, it is quite obvious that the chapel serves its purpose well.
>
> Much more could be said about the Ronchamp chapel, but you will already begin to understand that, although it is unlike all other churches you have seen, it is a logically planned shape. As well as being a logical shape, it is also functional…"

This example underlies another characteristic of this type, which distinguishes him from the above two. In the interviews, INTPs came across as Authorities, rather than Servants. It is thought that this is due to the repression of Feeling; if this is over-repressed, communication can become problematic, especially since this is an introverted type. They seemed to place abstract truth – beauty and artistic merit – slightly higher than the clients' needs. At the same time, it seemed that they did not care to convince others of their ideas' validity. This type had a strong but mixed reaction to question 19 – "Do you feel the need to 'educate' your clients?"[165]. At one level, they seemed to feel the need for educated clients, but at another, this was an obviously distasteful job for them. The overall impression they gave, was that an educated client would be simply one that would immediately see the virtue of their design; it seemed that the issues involved were both artistic and control ones.

The general impression was that they can be seen as quite stubborn in their ideas, for it seemed that to them, the relation to people and things were of secondary importance, compared to their ideas of how things should be. This is consistent with the behaviour of Thinking types, who generally tend to place absolute truth higher than interpersonal relations. Although it became clear during the interviews that their thoughts were perfectly clear in their minds, they were hard to convince that their truth is not clear to everyone else; something hindering communication with the client, and therefore collaboration with them and balanced architecture. This quality is reminiscent of *avant-garde* artists, whose talents only too often are recognised in retrospect. Upon closer examination, however, most seldom seem to have tried to curry the public's favour; indeed, it would seem that too often, they went out of their way to distance themselves from their public, as if they were trying to prove they could be successful despite their contempt for their society and peers.

This communication problem is reported by many clients of "star architects", and they, in turn, acknowledge that their clients fail to understand their work. In a sense,

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164 Rowland, 1964, pp. 83-86

165 Appendix 'A'

this type is complemented by 'hands off' or 'leave it to the expert' clients, as expressed in the words of one of the New York stars: "ideal clients", he told an audience, "commission the building, leave on vacation, and return only when the last coat of (white) paint has been applied."[166]

This type's attitude towards technology was mixed; half were innovators, and half commodity users. This ambiguity seemed to stem from past personal experience with IT, rather than anything else; an unexpected finding, since it was expected their intellectual curiosity would ensure they were well informed about technological issues. Although the sample was small, they were divided among those who thought IT is not intuitive enough, and those who were using it on an everyday basis. This strong distinction is consistent with the MBTI characterisation of INTPs as people who "tend to have sharply defined interests".[167]

# Conclusion

There are many different types of architects and clients; something that affects their collaboration. To better examine the new collaborative design paradigm, this chapter attempted to identify the various cognitive styles of architects. The Myers Briggs Type Indicator was chosen as the instrument of preference for this task, because of its perceived relevance to the architectural profession, as it has been indicated that it can successfully examine the creative factor. This was complemented by a new categorisation, that identified three attitudes as key ones, and categorised practitioners according to these.

In relation to attitude towards design, the two types identified were art-oriented and pragmatic. These were correlated with Boughey's types and with their MBTI scores, and it was found that Intuitive types tended to be art-oriented, while Sensing types were pragmatic architects.

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166 Cuff, 1982, p. 14

167 Myers Briggs, 1994, p. 7

In relation to attitude towards clients, the two types were Authorities and Servants. Again, these were compared to Boughey's Stars and Hacks and to their MBTI scores, in an attempt to gain some insight into practitioners' personality and its relevance to these key-attitudes. Thinking types tended to be Authorities, while Feeling ones tended to be Servants.

In relation towards technology, the two types identified were Innovators and Commodity-users. These were compared to the practitioners' MBTI scores, and it was found that Intuitive types tended to be Innovators, while Sensing ones tended to be Commodity-users. The result was less clear than originally anticipated, however, and this was found to be a more complex attitude than expected.

In general, it was found that of the practitioners interviewed, most were Art-oriented, Servants and Innovators. Interestingly, the large presence of the Servant type seems to support the hypothesis that architects operate increasingly within a more collaborative design paradigm, where clients are treated as equals. Furthermore, they were found to belong to three main MBTI groups that are closely related; ENFP; INFP and INTP. Both ENFP and INFP types were found to be Art-oriented, Innovators and Servants; something that is consistent with the theoretical description of these types by Myers-Briggs. The INTP practitioners were Art-oriented, Innovators and Authorities; something also consistent with the Myers-Briggs typology.

It should be stressed here that, although the sample was too small to be statistically important, it is thought that it still allows a number of interesting trends to be observed. It does not, however, constitute an attempt to provide significant statistic information.

# Chapter Six

## *Creativity and Balance*

"A great work of art is like a dream; for all its apparent obviousness is does not explain itself and is always ambiguous… To grasp its meaning, we must allow it to shape us as it shaped [the artist]. Then we also understand the nature of his primordial experience. He has plunged into the healing and redeeming depths of the collective psyche, where man is not lost in the isolation of consciousness and its errors and sufferings, but where all men are caught in a common rhythm which allows the individual to communicate his feelings and strivings to mankind as a whole."

*C.G.Jung*[168]

"The difficulty lies in striking the dead centre. For this an awareness of the two sides of man's personality is essential, of their respective aims and origins."

*C.G.Jung*[169]

# Introduction

The previous chapter examined the transpersonal activities in the collaboration between architect and client. It was argued that the individual personalities play a significant part in these, and that these have to be understood first before a paradigm leading to balanced architecture can be developed. Both architects and clients have to maintain a balanced collaboration for their relationship to succeed, ideally by being able to balance their opposite function and process preferences within themselves first. A second level of balance, however, is required of the architect; one that is more often examined than the previous one. Even in the best type of relationship with the client, he alone has to maintain a balance between art and science; aesthetics and practicalities; creativity and rationality; subjectivity and objectivity.

As argued in the previous chapter, this balance within oneself depends greatly on one's personality type. Architects, however, are unlike most other professionals, in

168 Jung, 1971f, p. 161

169 Jung, 1971f, p. 148

that their work depends predominantly on their creativity. And although other artists have the freedom to express themselves in any way they choose, architects are constrained by practical considerations, rules and regulations. To achieve balanced architecture, architects need to master both types of balance. This chapter examines the origins of creativity and suggests an analytic explanation of its roots. Furthermore, it uses these two types of balance to examine balanced architecture, the development of which is the object of the proposed collaborative paradigm.

# The Origins of Creativity

When computer aided architectural design (CAAD) applications first appeared, some of their advocates argued that some day they might even replace practitioners altogether. This notion was largely based on a common problem with design methodologies: they describe various forms of design processes, but at the same time they exclude the creative factor itself, i.e. the origin of creative ideas. And yet, any attempt to offer a description or methodology that ignores this part seems incomplete. Without it, one has no option but to follow one of two routes: one may offer a dry, 'mechanical' methodology that can be thoroughly unsatisfactory, reducing inspiration and creativity to a simple mechanism that eliminates individuality. Alternatively, one may choose to fall under creativity's spell, proclaiming it a 'mystical' factor, and therefore outside our grasp.

It is the latter that Plato, the first known person to attempt an explanation of creativity, believed. Plato thought a rational understanding of creativity to be impossible: "A poet is holy, and never able to compose until he has become inspired, and is beside himself and reason is no longer in him… for not by art does he utter these, but by power divine"[170]. In a similar vein, Karl Popper's philosophy of science makes a rigid distinction between *discovery* and *justification*, the former being largely irrelevant to the latter. According to Popper, creative *inspiration* is

[170] Boden, 1996

fundamentally irrational, and therefore a psychology of creativity is effectively impossible.

And yet, a number of alternative theories of creativity exist today, examining creativity from a number of different perspectives. Notions such as "conceptual space"[171] and "Klondike space"[172] have been introduced to describe cognitive dimensions within individual minds. Others emphasise the importance of the social and historical context, stressing that the label "creative" is a socially sanctioned one, and as such may not be ascribed to an idea until long after its initial occurrence[173]. But the most significant influence on the theories of creativity was probably offered by Freud's theory of the unconscious. This proved to be the starting point for a plethora of theories that attempt to demystify and explain rationally the creative process, and the new science of psychology promised to achieve this. So far, no single definitive theory of creativity has been agreed upon. Instead, a number of complementary and antagonistic theories have emerged. A brief summary of the most influential of these follows.

## Divergers and Convergers

Divergent and convergent thinking styles were introduced by Guilford in the 1950s[174]. In an attempt to identify personality traits common to creative activity, he suggested that people need *fluency*, which he categorised as associational, expressional and ideational. Associational fluency is the ability to produce a large number of synonyms in a restricted time. Expressional fluency is the ability to move words around in a sentence, and ideational fluency is fluency in the production of ideas.

Guilford identified a number of factors he perceived as important, including flexibility of thinking, the ability to redefine a problem, aesthetic appreciation and a

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171 *ibid.*
172 Perkins, 1996
173 Boden, 1996
174 Evans&Deehan, 1990

tolerance of ambiguity. He then proceeded to build up the concept of divergent and convergent thinking, which he defined as follows[175]:

> "Convergent thinking proceeds towards a restricted answer or solution. If asked 'What is the opposite of high?' you would probably respond with 'Low'. This is an example of convergent thinking. If asked: 'What is two times five plus four?' you would have no other alternative than to say 'Fourteen'. But of you were asked to give a number of words that mean about the same as 'low', you could produce several different responses, all satisfying the requirement, such as 'depressed', 'cheap', 'degraded', and the like, and you would be correct. In this example we have an instance of divergent thinking."

Like every other theory of creativity, this has its critics. Liam Hudson analyses the following two investigations into the prevalence of particular thinking styles in particular pursuits[176]: First, Anne Roe produced a study of a group of eminent physicists, which found that they had the attributes characteristic of convergent thinking. However, MacKinnon carried out a similar study that included architects, finding that they tended to think divergently[177]. Hudson attempted to reconcile the two findings by proposing the possibility that there exists an intellectual spectrum in which each occupation attracts individuals of a particular personality type; the convergers are attracted towards one end of the spectrum, and the divergers to the other.

## Lateral Thinking

A variation on the convergent and divergent thinking was proposed by Edward de Bono, who suggested *lateral thinking* as an aid to creativity[178]. This is based on the idea that people can free their supposedly latent divergent thinking abilities by side-stepping the problems posed by the spontaneous generation of ideas. His argument is that, since there is no logical way to explain how ideas are generated, there must be another way, which he calls *provocation*.

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175 *ibid.*, p. 54
176 Hudson, 1966
177 MacKinnon, 1961
178 De Bono, 1987

De Bono identifies two stages in the thinking process; on the first, we perceive the world around us, while in the second we process the impressions and concepts we have observed and defined. Since logic has nothing to operate upon during the first stage, de Bono suggests lateral thinking as a system that aids the thinking process during that stage. By discarding the usual, judgement-based methods of thinking, he recommends the use of some provocative stimulus that will push the mind into new patterns, combinations and juxtapositions.

## Associations and the unconscious

In introducing the notion of lateral thinking, de Bono was making the implicit assumption that creativity is linked to the ability to create new associations. This is based on Mednick's and Hadamard's work, who promoted associations as a basic part of the creative process.

Sarnoff Mednick defined creativity as "the forming of associative elements into new combinations which either meet specified requirements or are in some way useful"[179]. This theory implies that there can be no novel ideas, except those arrived at by chance, while every problem must have similarities to other problems, already solved. A variation of this theory was offered in 1945 by Jacques Hadamard, who conducted a study of creativity in mathematics[180]. For him, creativity proceeds through four stages; *preparation*, a conscious process during which the problem to be solved is addressed in a logical way; *incubation*, an unconscious process in which the outcome of the preparatory stage is allowed to incubate in the unconscious; *illumination*, an intermediary stage during which the unconscious mind, having generated a novel idea and recognised it as useful, allows it to rise into consciousness; and finally *verification*, *exposition* and *utilisation*, during which the new idea is stated and analysed systematically, and tested against the original problem.

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179 Evans&Deehan, 1990, p. 49

180 Hadamard, 1945

Just as de Bono built on associationism to suggest lateral thinking, associationism built on theories of the unconscious. Poincaré was probably the first to describe the creative process in terms of the unconscious[181]. As to Freud, to Poincaré the unconscious is a melting-pot in which all experiences, memories and ideas are combined and recombined to create something worthwhile. Freud himself proposed a more complex view, and separated thought into two distinct kinds; *primary-process*, which is unconscious, and *secondary-process*, which is conscious. According to Freud, it is during the primary-process that novel ideas are generated; dreams are mediated by primary-process thought, hence the anecdotal creative power of dreams. The sudden cross-over of an idea from the unconscious into consciousness is the flash of inspiration in which ideas sometimes seem to arrive.

Koestler elaborated Freud's ideas and suggested that the roots of creativity lie in *bisociation*, the combining of concepts that were previously unrelated, or indeed opposites[182]. His definition is as follows:

> "I have coined the term 'bisociation' in order to make a distinction between the routine skills of thinking on a single 'plane', as it were, and the creative act, which, as I shall try to show, always operates on more than one plane. The former may be called single-minded, the latter a double-minded, transitory state of unstable equilibrium where the balance of both emotion and thought is disturbed."[183]

The theories of the unconscious themselves have been heavily criticised by Weisberg[184] among others, who points out that much of the claimed anecdotal evidence brought forward by advocates of the unconscious theory is of unclear validity, such as Coleridge's opium-induced poem *Kubla Khan* – an earlier version of the poem exists. Weisberg's main criticism is that intuitive leaps of thought are very difficult to demonstrate under controlled conditions, while some reports, like Coleridge's, are of questionable accuracy.

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181 *ibid.*
182 Koestler, 1990
183 *ibid.*, p. 13
184 Weisberg, 1986

Still, it has been far from demonstrated that these theories – or indeed any theories of creativity – are mistaken. Indeed, there is evidence, such as Oscar Janigar's experiments with LSD in the early 1960s, that the unconscious plays a great role in creative expression[185]. In earlier experiments in Germany, similar differences in the drawing style can be observed as drugs were used to suppress the conscious control centres (Fig. 6.1)[186]. Janigar suggested that this allowed the artists to gain access to unconscious forms of expression, enabling them to escape their usual repertoire to produce unusual paintings. Jaffee, a Jungian analyst, compared the drawings with a series of Roman coins, used in various parts of the empire: the further from Rome, the more abstract the face[187].

*Fig. 6-1*: Roman coins compared to the results of experiments with hallucinogenic drugs

It is believed, then, that analytic psychology is as valid in exploring creativity as any other theory. Indeed, in this context, it is probably the best suited to examine creativity, since it can be thought of as expanding on the analytic study of personalities of the previous chapters. An analytic examination of the creative factor will therefore be attempted here, examining some of the possible mechanisms behind

185 Evans&Deehan, 1990
186 Jung, 1989a, p. 259

the generation of creative ideas. It is proposed here that the creative idea is located in the unconscious, and is particularly influenced by the archetypes, although the actual process that will realise it is heavily influenced by the predominant style of each era. In this way, it can be argued to expand on both Hadamard's work – since it can be positioned within the second and third stages; incubation and illumination – but also that of Freud and Koestler – since it largely builds on the unconscious theory – and Jung – since it is ultimately in analytic psychology that it finds its theoretical support.

Therefore, this theory is positioned on the side of the theories of the unconscious. In one sense, it can be perceived as further expanding the development of the new collaborative design paradigm. If indeed it is in the unconscious sphere that the roots of creativity lie, the ways to describe practitioners and the design activities should mirror this. At the same time, it is important that theories of creativity are not necessarily mutually exclusive; it is probably much more beneficial to think of them as largely complementary. There are common strands of thought that run through most of the theories of creativity, from Plato to Popper and de Bono; until a definitive theory explaining fully the problems posed by creativity has been agreed upon, all theories can claim to hold at least part of the answer.

## An Analytic Approach

As mentioned above, the roots of many theories of creativity can be traced to psychoanalysis. Although traces of associationism can be found in Leonardo da Vinci's comment that, if one throws a sponge filled with paint onto a wall, the result will bring to mind heads, animals, landscapes and more[188], it was the Surrealist movement that was explicitly based on the premise that the creative process was expressing the unconscious contents, bringing into the light of consciousness what is usually hidden in the Freudian *Id*[189]. Indeed, the way most modern men think of the creative process has been heavily influenced by Freud's theory of the unconscious.

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187 *ibid*.

188 Jung, 1989a, p. 258

189 *Id* or *Es*: *That* - Freudian term for the unconscious

The Surrealist movement led by André Breton held Freud as its "spiritual father", and was particularly inspired by the thoughts and visions of the unconscious mind. In his words, "Couldn't we use dreams to solve life's basic problems? I believe that the apparent antagonism between dream and reality will be solved by an absolute reality, surreality"[190]. And artists like Giorgio De Chirico and Carlo Carrà, founders of the school of *Pittura Metafisica*, aimed explicitly to bring into consciousness the unconscious contents. De Chirico says characteristically,

> "Every object has two sides. The common side, which we normally view, and the spectral, metaphysical one, which only rarely is seen by individuals, in times of meditation and metaphysical thought. Art should express that which can not be seen in its obvious form".[191]

In this manner, modern art represents a turn inwards, in an attempt to focus not on the object being represented, but on the impact it has on the on-looker's psyche. For Franz Mark, the point of art is, "to uncover the life beyond earth that lies behind every thing, and to break life's mirror, in order to be able to face the being's face"[192]. And Paul Klee writes,

> "the artist does not pay so much attention to the physical form of the visible universe. He does not feel tied in with this reality, because perfect physical forms do not let the essence of the creative function show through clearly enough. In truth, he is more interested in the shaping forces, than in the forms these create"[193].

In these ideas, art has become a mystical doctrine; a viewing glass that enables humanity to capture the essence of the universe. This is ultimately a revolution against the materialistic notion that there is no more to the universe, than can be perceived by the senses. As such, it represents its opposite pole; one that withdraws completely from the outside world of the senses, to focus in the invisible; the imperceptible. Kandinsky was a passionate believer in this introversion. He states[194]:

> "The eye of the artist must always be turned towards his internal life. His ear must listen to the voice of his internal needs. This is the only way to give expression to what is commanded by the secret vision…

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190 Breton, 1946
191 De Chirico, 1919
192 Marc, 1964
193 Klee, 1953
194 Kandinsky, 1912

"[The importance of art of all times] lies not in the surface, in the external view, but in that Holy of Holies; art's apocryphal content."

And Klee states[195],

"The artist's mission is to penetrate as deeply as possible into the mysterious depth of the objects, where a primeval law is dictating their growth. What artist wouldn't strive to remain next to the spring of every movement within the space and time – whether this is called creation's mind, or heart…

"[And once this has been accomplished, the object is then to rebuild] what we secretly observed and dragged onto the surface."

André Masson's interest in the unconscious even led him to experiment with automatic drawing - simple pen and ink work, which in turn influenced Gorky and the Expressionists. Dali had even met Freud, and spent hours painting him, while surrealist artists used psychological techniques like free-association[196] to bypass the conscious mind.

However, although these artists may have been the ones to consciously do so, theirs was not the only form of art that was based on this expression; indeed, according to theories of creativity that lean towards the unconscious interpretation, any creative expression in any field is based on this principle. Jung is particularly keen on this aspect of the creative process, tying it into his theory of the collective unconscious and the archetypes. This is the preferred vehicle of examination in this thesis, since Jungian (analytic) psychology has been used quite substantially so far, since it offers a both a mature personality theory and a theory of creativity. Jung felt that the artist is capable of reaching into his psyche, finding a primordial, archetypal image, and sharing it with the rest of the world, which reacts to it because it reverberates in its own psyche. In his words,

"The creative process… consists in the unconscious activation of an archetypal image, and in elaborating and shaping this image into the finished work. By giving it shape, the artist translates it into the language of the present, and so makes it possible for us to find our way back to the deepest springs of life… The artist seizes on this image, and in raising it from deepest unconsciousness he

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195 Klee, 1953

196 Free-association: psychological technique developed by Freud, to explore the unconscious contents. The process through which the patient moves from one subject to another, is believed by analysts to offer insight on the unconscious contents.

brings it into relation with conscious values, thereby transforming it until it can be accepted by the minds of his contemporaries according to their powers [197]…

"The essence of art is not to be found in the personal idiosyncrasies that creep into it – indeed, the more they are of them, the less it is a work of art – but in its rising above the personal and speaking from the mind and heart of the artist to the mind and heart of mankind."[198]

In other words, artistic endeavour of this type is based on the expression of an unconscious archetypal image. This theory has the disadvantage of being impossible to prove: by its definition, anything unconscious is also immeasurable. However, as in the natural sciences one can measure an energy level by its influence on objects, similarly one can examine the evidence for signs of a 'psychic' energy – called by Jung '*libido*'[199] – in the creative process.

## Art and Archetypes

The *archetype*, from the Greek *αρχετυπίαι*, corresponds to St. Augustine's *ideae principales*. Jung, somewhat confusingly, uses the same term for two different concepts: first, there is the '*archetype per se*', the imperceptible archetype which exists as a potential in every psychic structure, resembling the Platonic *Idea*. Second, there is the *actualised archetype*, which has entered consciousness, and can be an image, a representation or a process. Jung explains the archetype *per se* as follows:

"Of course, this term is not meant to denote an inherited idea, but rather an inherited mode of psychic functioning, corresponding to that inborn *way* according to which the chick emerges from the egg; the bird builds its nest; a certain kind of wasp stings the motor ganglion of the caterpillar; and eels find their way to the Bermudas. In other words, it is a "pattern of behaviour". This aspect of the archetype is the biological one – it is the concern of scientific psychology. But the picture changes at once when looked at from the inside, that is, from within the realm of the subjective psyche. Here, the archetype presents itself as numinous, that is, it appears as an experience of fundamental importance. Whenever it clothes itself with adequate symbols, which is not always the case, it takes hold of the individual in a startling way, creating a condition of "being deeply moved", the consequences of which may be immeasurable."[200]

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197 Jung, 1971f, p. 130

198 *ibid.*, p. 156

199 Again, and in contrast with the Freudian view, the Jungian terminology is followed here, according to which 'libido' refers to the whole of the primeval psychic energy, and not only to sexual energy.

200 Jung, 1971g, p. xi

To further explain them, he likens them to the organs of the physical body, calling them "the organs of the prerational psyche"[201]. And yet, like their bodily counterparts, they have no specific content or shape at first; this only appears in the course of the individual life, when they are shaped and filled-in by personal experience. As such, an archetype acts like the invisible pattern inside a crystal, that dictates the positioning of the molecules once external material has become available. It is a psychic blueprint that accepts material from the outside, and positions it inside the psyche in a certain way. In this example, the *archetype per se* can be seen as this crystal pattern, that has no substance of its own, but can still be perceived by its consequences; i.e. by the resulting crystal. The crystal itself, is the *actualised archetype*, the end result of this process. Jung himself says that the form of the archetypes,

> "might perhaps be compared to the axial system of a crystal, which, as it were, performs the crystalline structure in the mother liquid, although it has no material existence of its own. This first appears according to the specific way in which the ions and molecules aggregate… The axial system determines only the stereometric structure, but not the concrete form of the individual crystal"[202].

In this manner, it becomes obvious that, just as the crystal form depends upon the material found in nature around it, so does the form of the actualised archetype depend on the social surroundings. In Kandinsky's words, "every time has its own share of artistic freedom. Even the most creative genius can not step over the borders of this freedom".[203]

This is the reason why, although the central idea in numerous myths seems to be repeated by many different peoples, the details can be very different. Typical examples include the ideas of the protective shape of the Cross; the benevolent Mother of gods; the devourer snake and its slaying (Figs. 6-2, 6-3, 6-4 and 6-5); of a god's death by hanging from a tree (the cross is often portrayed as the 'Rood Tree', in Christian religion; see Fig. 6-6) and the Resurrection: ideas which, although central

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201 Jung, 1971f, p. 845
202 Jung, 1971f, pp. 79
203 Kandinsky, 1912

in Christianity, also appear in the religions of peoples as diverse as the ancient Greeks and Romans, the Germanic tribes and the ancient Egyptians. In Jung's words,

> "an archetypal content expresses itself, first and foremost, in metaphors. If [it] should speak of the sun and identify with the lion, the king, the hoard of gold guarded by the dragon, or the power that makes for the life and health of man, it is neither the one thing nor the other, but the unknown third thing that finds more or less adequate expression in all these similes, yet – to the perpetual vexation of the intellect – remains unknown and not to be fitted into a formula… Not for a moment dare we succumb to the illusion that an archetype can be finally explained and disposed of. Even the best attempts at explanation are only more or less successful translations into another metaphorical language"[204].

It is thus that the resemblance between not only artistic elements but also the Crucifixion and Resurrection and Odin's myth can be explained. In *Havamal* (literally, 'Words of the High One'), Odin, the Germanic god, narrates how he hung on a windswept tree identified as the World Tree, *Yggdrasill* (Fig. 6-6), without any food or water and slashed with a spear, until, screaming, he was able to free himself and win the wisdom of the universe. Similarly, the archetypal fight between the forces of order (often personified by the Sun or the Hero) and chaos (often personified by the serpent) is echoed almost everywhere, from the Egyptian religion – where Ra, the all-powerful Egyptian sun-god, had to fight and defeat every night the monstrous, sinister serpent Apophis before he could re-emerge on the sky – to Apollo's slaying of the Python; to St. George (Fig. 6-5), St. Michael (Fig. 6-4), Thor (Fig. 6-3), Sigfried and so many others. And Isis, Egypt's archetypal mother, is often portrayed suckling her infant son Horus, in a way reminiscent of Christian statues (Fig. 6-7).

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[204] Jung, 1971f, pp. 157, 160

*Fig. 6-2*: Viking Age land memorial, depicting Thor slaying a dragon

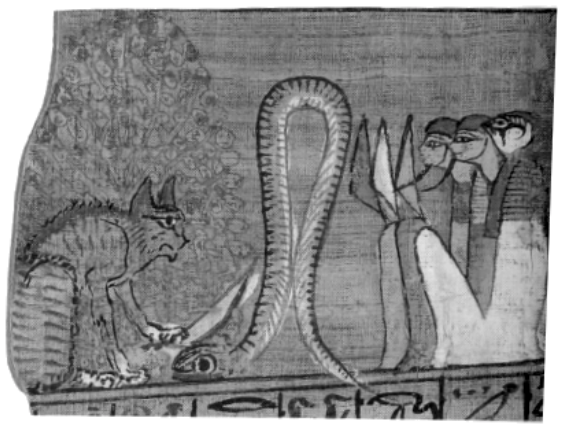


*Fig. 6-3*: Ra, in the shape of a cat, slaying the serpent Apophis (Egyptian papyrus)

*Fig. 6-4*: Dürer, Albrecht, "St. Michael's Fight against the Dragon", 1498; Woodcut. The theme is from Revelation xii.7: "And there was war in heaven: Michael and his angels fought against the dragon; and the dragon fought and his angels, and prevailed not; neither was their place found any more in heaven."

*Fig. 6-5*: Raphael, "St. George Fighting the Dragon", 1504-6

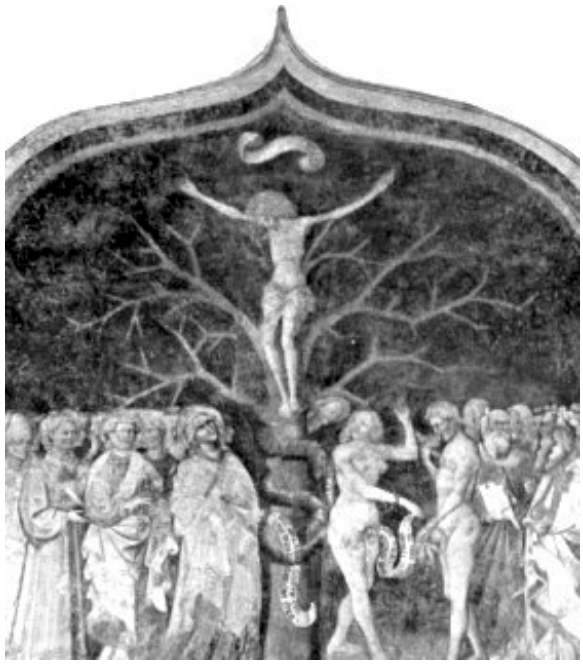


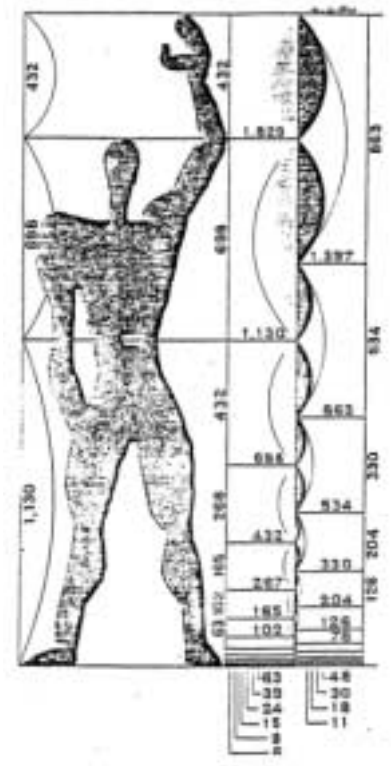
*Fig. 6-6 - Left*: *Yggdrasill*, the World Tree, from which Odin hang for nine days until he won the wisdom he was seeking (Viking Age carving from Urnes, Norway);

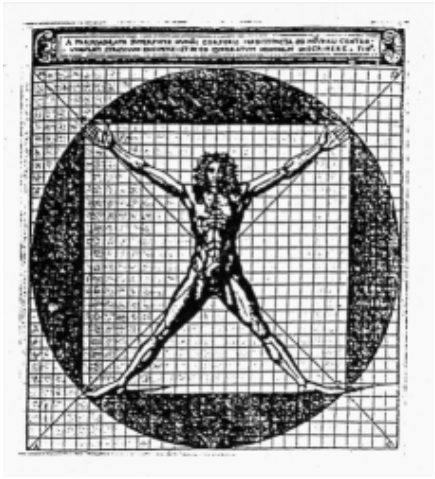
*Right*: Jesus crucified onto the *Tree of Knowledge*; medieval Italian fresco

*Fig. 6-7 - Left*: Isis, Egypt's archetypal Mother, suckling her son, Horus (Late Period BC sculpture)

*Right*: Jan van Eyck 's "Madonna in the Church" (detail), 15th century

Another example of the process of transformation of an idea through the ages – that of the human body having certain symmetries – is evident in a comparison between Le Corbusier's *Modulor* and Caesariano's man (Figs. 6-8 a&b). Le Corbusier utilised the Golden Mean to create his *Modulor* (Fig. 6-8a), a scale described by him as "a simple tool, a precise aid in finding an object's dimensions, that has two aims: an internal one, to give harmony to the work, and an external one, to harmonise and connect man to his work; a couple that is currently separated, if not competitive to each other."[205] Caesariano took on Vitruvius' teachings, and positioned his man inside a square grid. Interestingly enough, both share the same mid-point, on the navel, as does another similar sketch, dating from the 15th century, by Fransesco Di Giorgio, an Italian architect and artist (Fig. 6-8c).



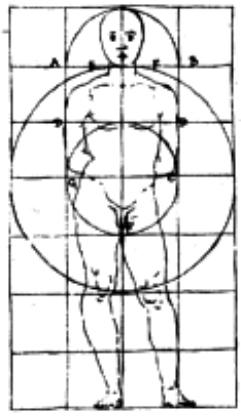
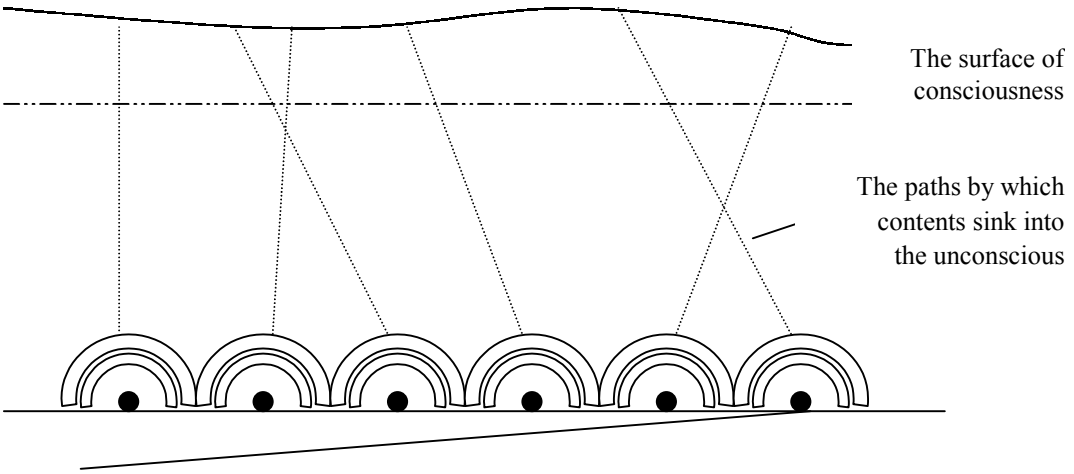


*Fig. 6-8a (left)*: Le Corbusier's Modulor
*Fig. 6-8b (top right)*: Caesariano's man
*Fig. 6-8c (bottom right)*: Fransesco Di Giorgio's sketch

[205] Le Corbusier, 1951

## Archetypes and Creativity

Because of their fundamental nature, archetypes can be described as existing at the bottom stratum of the psyche. External contents can be seen as 'sinking' into the unconscious, where they become attracted by the various archetypes, and take their place inside the unconscious (Fig. 6-9)[206]. Sometimes, after having been thus transformed by acquiring unconscious material, they can re-emerge into consciousness, seemingly 'amplified' by all the new material they are carrying with them. One way in which this commonly occurs, is through Art.




Archetypes and their attracting fields, which often deflect the contents from their course, by their power of attraction

*Fig. 6-9*: The way in which conscious material enters the unconscious

In this model, the effect Art has on people stems from its activation of an archetype within the observer. Obviously, the 'deeper' its origins within the artist's unconscious, the more profound the effect it will have upon on-lookers. In this way, one may distinguish between what can be termed "extraverted" and "introverted" art[207], depending on the 'depth' from which it comes.

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206 Adapted from the English report on Jung's lectures delivered at the *Eidgenössische Technische Hochschule* in Zurich, 1934-35; in Jacobi, 1973

207 Jacobi, 1973, p. 22. The terms "introversion" and "extraversion" are discussed in detail in chapter 4.

In Fig. 6-10, four different ways of generating art are portrayed. The first one (Fig. 6-10a) is a typical example of purely "extraverted" art; sterile copying of an external stimulus; perhaps even the copying of another artist's work. It has not been able to penetrate into the unconscious, and may be of excellent technique, but will have no artistic value; i.e. will fail to produce an empathic or sympathetic reaction on on-lookers. Another reason for this may be that the artist is blocking the unconscious content from re-emerging, and so this will again appear as "extraverted" art. This is depicted in the second example, Fig. 6-10b.

The third one (Fig. 6-10c) is an example of purely "introverted" art; its content stems directly from the unconscious, with little or no relation to the outside world. This will be very powerful, but potentially incomprehensible art, the sort of which may arise out of art therapy, but seldom appears in museums and art galleries. It stems from the very essence of human nature, and may move on-lookers. However, inspiration of this kind will not be under the conscious control of the artist, and will most probably control him. Jung describes this type of art as a kind of innate drive that seizes a human being and makes him its instrument. The artist is no longer a person endowed with free will and seeking his own ends, but one who allows art to realise its purposes through him[208]. As such, it is unsuited for architecture, which needs to be constantly balanced by science.

The fourth one (Fig. 6-9d) is an example of the balanced art that ideally characterises architecture. Inspiration and science are balanced, and the contents are allowed to be transformed by the archetypes and to acquire unconscious content before re-emerging into consciousness. The artist has it under his control, but his grip is not so tight that it cannot enter consciousness.

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[208] Jung, 1971f

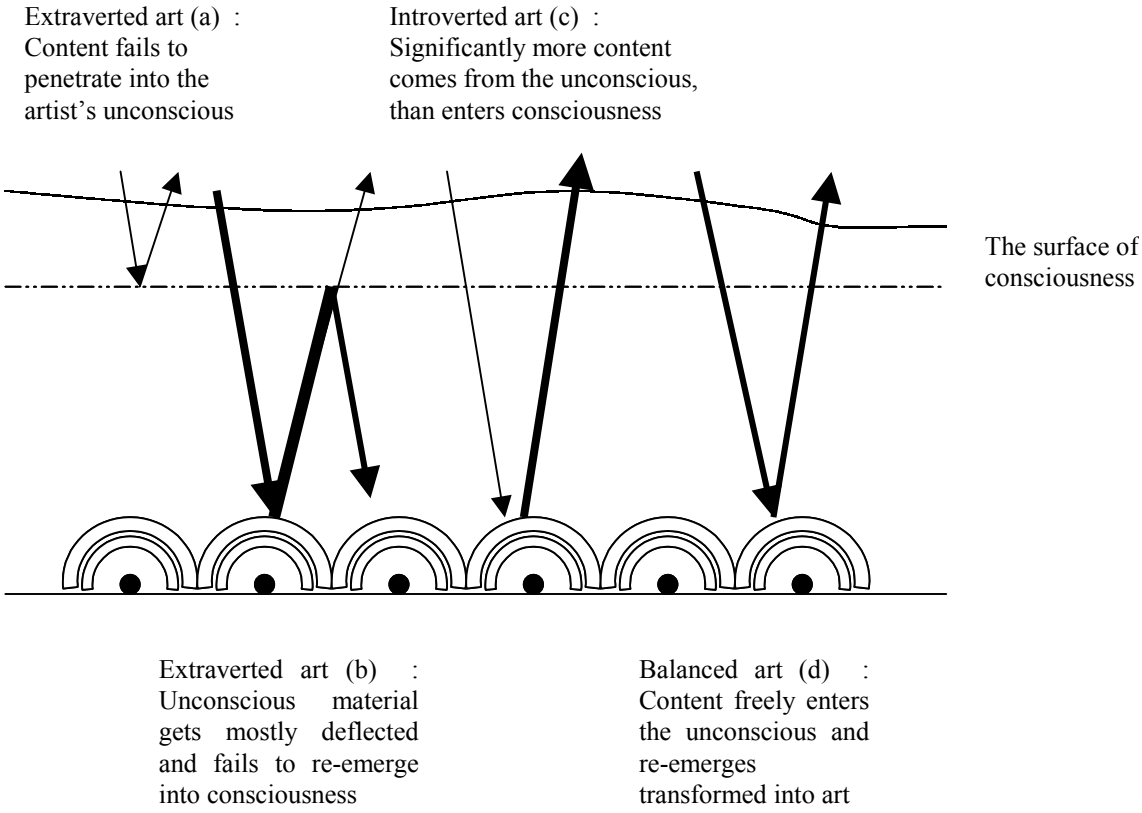


*Fig. 6-10*: The four forms of art

Taking into account the process described above, architecture can be described as an attempt to reconcile two attitudes that may at first seem irreconcilable: the relentless drive of the creative force, and the pragmatism of science. In the light of the creative process, creative life stands outside convention, with the artist trying to integrate this amorphous force, the creative process, into his work. Of course, someone surrendering to the creative process would fit the description of the extreme end of Art-oriented architecture, fully ignoring clients' pragmatic needs in the name of Art. At the same time, ignoring the creative process means losing the artistic elements of architecture and becoming no more than simply a builder; creating structurally sound architecture, but of no aesthetic ambitions. The effort, then, is to reconcile the two extremes; a need that is probably more evident in architecture than in any other form of artistic expression, since, as seen before, architecture can be defined as the very combination of Art and Science.

As for the universality of this theory, there is one possible notable exception. Various modern schools of creative arts have attempted to introduce a chaotic element into their work, thus eliminating any influence by the artist, conscious or unconscious. John Cage's music is one such example, as is Jackson Pollock's art (Fig. 6-11a) using an elaborate system of penduli and hanging brushes to guarantee an unprecedented degree of distance between artist and art. It is unclear how these are influenced by unconscious content, if at all. It can be argued that an archetype of chaos exists, which inspired these artists with the idea of a completely chaotic work of art. In that sense, the creative act was focused on the development of those techniques that would allow them to design or compose in a random way, and not in the results of this technique *per se*.

As with associationism, one of the consequences of this theory of creativity through archetypal metamorphosis of existing material is that the emergence of previously unseen concepts can only come by the random juggling of existing ideas into new forms; and it is always possible to identify certain common centres of influence, such as the archetypes of chaos and order. In other words, the invention of new forms is always possible; but that of new content, in the most genuine sense of the word, is not. This point is illustrated by Jaffee in her comparison of Pollock's No. 23 and the photograph of sound waves on glycerine (Fig. 6-11b)[209].

[209] Jung, 1989a, p. 265

*Fig. 6.11a*: Pollock's No. 23

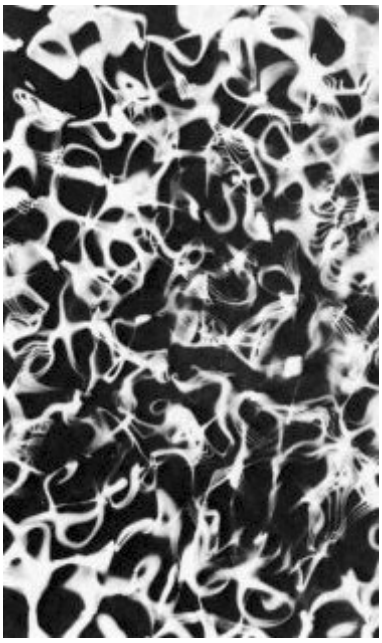

*Fig. 6.11b*: sound waves on glycerine

# "Good" vs. "Bad" Design

The theories mentioned above focus on the designer as the creator. He is the *expert*, solely responsible for the development of a "good" design. Quite what "good" is, is usually left vague. Attempts to describe "good" design often include (rather idiosyncratically) the word "honest". Thus, Kurt Rowland describes Fig. 6-12 as follows: "the modern and the older buildings in this picture look quite happy side by side; both are honest expressions of their times" [210]. The fact that one may think otherwise, is irrelevant; the author is obviously best judge of what kind of "neighbour" makes a certain building "happy". He then proceeds to explain "honesty" in design as follows: "A good man-made shape is one that is honestly designed; that is to say, where the designer has used his knowledge and his skill to produce the most efficient shape for its purpose."[211] The definition of "efficient

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210 Rowland, 1964, p. 88

211 *ibid.*

shape" is conspicuously lacking, as is the role of the public, which is fairly limited to that of the buyer: "If we buy badly designed shapes we become partly responsible for their designer's shortcomings. It is important to remember that a lowering of standards affects both the designer and the public for whom he designs".[212]

*Fig. 6-12*: Two "happy" buildings.

The roles and concepts are clear-cut: good design equals "honest" design, and the roles of designer and public are for the former to design, and for the latter to either encourage him by buying his works, or to discourage him, by not buying them. According to this line of thought, ordinary people lack an understanding of the deeper aesthetic values; they have unsophisticated palates. "You cannot prefer one taste to another if they both seem alike, if your palate does not detect a difference between them. Many people will see only a superficial difference between the two clocks (Fig. 6-13) [but...] the difference between them is fundamental. [...] People who are unaware of such differences miss a very great deal, and when they buy clothes and furniture, [...] if they make a happy choice of colours or shapes, it is probably more a matter of luck than good judgement".[213] Again, the fact that a designer has designed both clocks, and therefore will presumably disagree with this other designer's description of his work as "bad" design, is overlooked. It would appear that the author has successfully

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212 *ibid.*

213 *ibid*., p. 113

managed to identify a single, infallible (though obviously not universal) method for judging design[214].

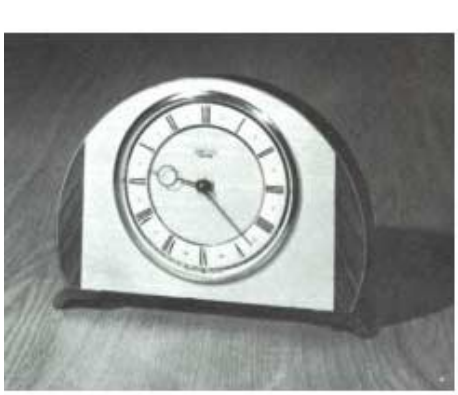

*Fig. 6-13*:

Examples of "bad" and "good" design, as cited by Rowland; the clocks (right) are tilted to be seen from an angle, giving them a "logical" shape.

At the same time, Rowland has contradicted himself by assigning the role of supreme arbiter to the public, which, not only shares responsibility for the designer's shortcomings, but ultimately has the power to ignore the artist, thus condemning him to obscurity. This unintentional acknowledgement of the social nature of creative design is important, because it directly contradicts the notion of the expert-designer operating in a social vacuum, which Roland effectively promotes when describing the designer as an individual trained to distinguish between good and bad design. In this latter view, the designer alone can decide what's right and wrong, and if the untrained public disagrees, they must look closer, until they manage to appreciate what he is offering them. Thus, describing a building, Rowland says: "At a first glance, you may think it looks rather unusual, but when you have studied it for a little while you will find that there is really nothing strange about it. It is in fact a logical shape"[215]. In other words, if you do not like it, it is your fault; you are not examining it carefully enough.

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214 It is interesting to note that Rowland's book was found in the library of the University of Edinburgh Department of Architecture; one suspects that it can also be found in a number of other architectural libraries.

215 Rowland, 1964, p. 82

Therefore, it is argued here that it is not Rowland's "logical" and "honest" shapes that are example of "good" design, but, on the contrary, that "good" design is that which has achieved an equilibrium between logic and emotion; aesthetics and practical considerations; form and function as defined within a specific social context.

## Achieving Balanced Architecture

As seen above, the development of balanced architecture depends greatly on the architect's ability to absorb external stimuli and transform them into design ideas. To achieve this, he needs to be open to external ideas; namely, to the client's needs. This requires a thorough understanding of the client's needs, which means that the building will be the result of a collaboration procedure between the architect and the client, during which the client's needs - both aesthetic and practical - will be isolated. Good communication and rapport is needed, and the results will most likely satisfy both parties. In the words of Bruce Goff, "I'd like to design the sort of house the client would design if he were a great architect."[216]

Architects of this type have to possess creative talents, and good communication skills. This requires them to have certain personality qualities developed. They must have no desire to dominate their clients, and be open to suggestions; both key qualities of good communication. Furthermore, they must be able to critically evaluate any idea suggested by the client, without accepting it blindly, but also without being negatively predisposed either. As for design, they will have to be creative and original – but not at the expense of practicality and to the disrespect of the client's practical needs. To do this, the creative element must be balanced by the pragmatic one. There are, then, two different types of qualities that an architect is asked to possess: one is good rapport with the client while not losing himself to the client's wishes; and good rapport with his own creative self, while balancing his creativity with the pragmatic considerations.

To achieve the first, an architect must be able to be balanced within himself. If he has developed his inferior functions and processes enough, it will be easier to collaborate with a client in whom they are the preferred functions. If, to use an example from the interviews with the practitioners, a Sensing-Judging architect is asked to collaborate with a client described as Intuitive-Perceptive, he may become very exasperated by the "ever-changing", "abstract" and "chaotic" nature of the client's demands, unless he remembers that the client is simply being true to himself, and the architect tries to be in touch with his own Intuitive-Perceptive side. This will allow him to understand the client's "whims", and not to reject them off-hand, thus jeopardising their relationship and failing to meet the client's own needs. At the same time, the architect needs to have a clear idea of his own identity, so as to use his own better developed Judging and Sensing to point out potential mistakes like, for example, structural dangers arising from the client's demands. It is this balance within one's self, then, that will allow an architect to possess the good communication skills that are so necessary to his work.

If he fails in this, the client will turn to someone who will not ignore their "whims". According to Duffy, this someone has increasingly been the builder, who places his emphasis on meeting the client's functional needs, and not caring so much about aesthetics (an attitude which indicates that, consistently with the architectural myth, Duffy himself probably perceives architects as Art-oriented Authorities):

> "We architects have become imprisoned by the professional structure we erected for ourselves one hundred and fifty years ago, in order to preserve our freedom. That supposed liberty was based on two constraints - separation from the builder and independence of the client. Why should it ever have to end?... The system we devised so long ago has become totally inappropriate because architects' relations with builder and client are under a new kind of pressure... Take the client's point of view first. For him a new building however exciting, or even unforgettable, is only an isolated event. His real problem is to accommodate changing activities, perhaps in several buildings old and new, over long periods of time... Had we really understood how the client uses buildings we should have been able to exploit this knowledge to ensure that buildings are constructed so that they are efficient to run, easy to use and simple to adapt. We have not succeeded in pleasing the client nor in mastering our

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[216] Golzen, 1984, p. 150

> one hundred and fifty-year-old enemy. In fact it could be said that we have demonstrated very effectively that client and builder together could get on very well without us".[217]

On one level, Duffy is essentially asking for the balance of art-oriented architecture with practical, pragmatic design. But there is a second, more esoteric claim as well, that is even more important: that the communication between architect and client has failed, and that it is this failing that has moved the client away from the architect: "Had we really understood how the client uses buildings…". What can be preventing architects from understanding how clients use buildings; an understanding one may assume would form the very cornerstone of architectural knowledge, except from a lack of those communication skills?

A second type of balance is that required in the relationship between art and science. As argued before, the type of psyche that allows the creative design that ideally characterises exciting architecture is one where stimuli in the form of content from the external world freely enters the unconscious, to re-emerge transformed into art. However, it also needs to maintain a balance between introverted and extraverted art; i.e. in the content entering the unconscious and that re-emerging out of it. Otherwise, the architectural design will have but minimum relation to the outside world, and it will probably fail to meet the functional needs. A balance between inspiration and science, then, is required for the architect to have creativity under his control.

Balanced architecture is defined throughout this thesis as that in which both artistic and practical client needs are successfully met. The two types of balance described above are necessary for it to be achievable. What they have in common is that they require the architect to have a balanced connection with his own unconscious. In the area of his transpersonal, communication skills, balance between his functions and processes and development of his inferior ones will help him develop good communication skills. This, however, requires him to have explored and developed those functions that he is most uncomfortable with, the ones that are

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[217] Duffy, 1982, p. 116

normally kept in the unconscious. Similarly, if he is to allow unconscious content to emerge in a measured way, he needs to have explored it, but without getting lost in it, losing the ability to rationally evaluate how appropriate creative ideas are in a given context. Or, for both types of balance to be possible, he needs first to have accepted, knowingly or unknowingly, the impact his unconscious has on his consciousness; described by Jung in the following words:

> "Whatever name we may put to the psychic background, the fact remains that our consciousness is influenced by it in the highest degree, and all the more so the less we are conscious of it. The layman can hardly conceive how much his inclinations, moods, and decisions are influenced by the dark forces of his psyche, and how dangerous or helpful they may be in shaping its destiny".[218]
>
> "Empirical psychology loved, until recently, to explain the 'unconscious' as mere absence of consciousness – the term itself indicates as much – just as shadow is an absence of light. Today accurate observation of unconscious processes has recognised, with all other ages before us, that the unconscious possesses a creative autonomy such as a mere shadow could never be endowed with".[219]

What is important is that all architects can belong to this category, provided they develop their contact with their unconscious which will facilitate the balance described here. Equally important is the fact that this balance may work out to the benefit of all parties. According to an architect, "developers like working with someone who understands their language. That doesn't mean that you have to dance to their tune. On the contrary, you have more chance of getting the design solution you want if you can demonstrate that it is financially viable."[220]

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218 Jung, 1971d, p.332

219 Jung, 1971f, p.141

220 Golzen, 1984., p. 42

# Conclusion

This chapter has dealt primarily with examining how balanced architecture can be achieved by reaching a balance within the various unconscious elements of one's psyche and between these and one's conscious thought. The analytic theories of the unconscious have been increasingly used in our century in an attempt to examine art, and the creative force can be argued to be uniquely suited to this examination.

In particular, it has been argued that architects need to balance their own function and process preferences if they are to maintain good communication even with clients of opposite personality types; and that they need to balance their own creative ideas with their knowledge of the functional needs of a building. It is these two types of balance that are possible through one's exploration of one's unconscious side, as well as by conscious effort. It is this conscious side of creativity that the next chapter deals with, discussing a number of factors influencing design, such as information technology advances, the advent of industrial democracy and various social changes among others.

# Chapter Seven

## *Use of IT/CMC in the Workplace*

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"Currently all of the project participants are computerized. The owner, architect. and contractor, are all using computer tools to expedite their work. The end product of their work however is a piece of paper that is thrown over the fence to the other parties, who then use computers to track what they do with it and generate a response, which is then thrown back over the fence on another piece of paper"

*Robert York*[221]

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# Introduction

The previous chapter examined the role of creativity and the unconscious in the design process. Once a designer has come up with a design idea, however, a conscious process of logical analysis, corresponding to Hadamard's fourth stage of verification, exposition and utilisation, begins. One of the most recent additions to the tools used by practitioners during this stage is Information Technology / Computer Mediated Communications (IT/CMC). The role of IT/CMC within the suggested new collaborative paradigm is the topic of this chapter.

Previous chapters described a series of interviews, aimed at identifying certain key-attitudes among designers; the most elusive one proved to be the attitude towards technology. Before the role of technology can be examined, it is important that the current design paradigms in relation to IT/CMC are described first. Towards this, a second set of interviews was conducted, using the same practitioners, aiming to explicitly examine the use of IT/CMC in the workplace, from the point of view of the Architectural-Construction-Design and Engineering (ACDE) sector. This chapter includes the results of these interviews, focusing on both attitudes and actual use of technology in the ACDE practice, in an attempt to examine their relationship with

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[221] Schulz, 1997

technology in further detail. Through the interviews, it became apparent that, although architects realise the need to provide the right working environment for their clients, this is an increasingly hard task in a rapidly changing technological situation. Furthermore, these technological changes are part of a wider set of changes; social and economic, that influence practitioners as well as their clients. The ways practitioners are coping are examined here, as well as the way technology is currently used.

## Survey Outline

This survey was less complex than the previous experiment. Practitioners were no longer classified according to the MBTI, but only according to two categories, depending on their attitude towards technology – Innovators and Commodity-users. The original hypothesis was that Innovators would be more influenced by technology in their design; they would use it more in their practice; and they would be better equipped to cope with the changes. To test this, a survey in the form of structured interviews was devised. Practitioners had to answer a number of questions (Appendix 'B'); this ensured that all points were examined. The answers were recorded, and correlated to their attitudes as identified by the previous experiment. Also examined was whether or not they were using IT/CMC, and what impact that might have on the way practitioners designed. If someone was not using IT/CMC, the interview focused specifically on why not, and what they would like to see changed before being tempted to do so.

Where a practitioner *was* using IT/CMC, the aim of the interviews included analysing its use's limits. It was found that not all practitioners use IT/CMC for the same things, and that some have implemented IT/CMC with more success than others. Success in this context is defined as 'using IT/CMC in a way that maximises production while minimising costs'. Any influence IT/CMC may have had on the company structure, productivity and profits was also discussed, in an effort to cover all possible aspects of impact.

# Methodology Description

This survey was designed as a straight-forward set of structured interviews. It was conducted using the same sample as the first one, which was necessary since the two were to be correlated. The questionnaire (Appendix 'B') was designed in a way that would allow an easy, fluid conversation that would still cover all aspects of their relation to technology. In all, twenty questions were devised, thematically organised in four groups, in a way that would allow as smooth a transition from one group to the next, as possible.

The first group, questions 1 to 6, aimed to identify the ways in which technology was used by architects in their everyday practice, and what, if any, impact it has had on the firm. They identified the type of the equipment used, and the length of time it has been used. Also, they examined whether the practice personnel has been reduced or increased due to IT/CMC introduction, and whether the firm has actually become more profitable.

The second set of questions (7 to 10) examined further whether the way these practitioners design has changed due to use of IT/CMC in their practice. Usually, at this stage in the interview they were asked to give examples of their work before they started using IT/CMC, and to compare it with examples of their work after; this invariably led to an extended discussion.

The third set of questions (11 to 20) further elaborated on the impact IT/CMC use has had in the areas of collaboration with other firms in the ACDE sector, and interaction with the clients. It was interesting to see whether increased use of IT/CMC by firms has aided - or in any other way influenced - collaboration between them. The relation with the client was another potential area where use of IT/CMC may have made an impact, especially if clients used IT/CMC themselves. Also, it became apparent that many clients see use of technology as a prerequisite nowadays; but whether this is a justified expectation needed to be examined.

# Survey Results

The conclusions from these interviews follow, organised in three main groups. The first one is titled "Use of IT/CMC in the Architectural Practice", and examines the ways IT/CMC was actually used by these practitioners on an everyday basis, and whether this has had any impact on the company costs and profits. The second group deals with the impact IT/CMC has had on the way practitioners design. Use of IT/CMC during the various stages of design is examined, as well as the changes that have occurred due to its introduction. The third group examines the various other changes that have been introduced to the practice, such as changing client and practitioners' expectations. These changes are quite wide; for this reason, they are discussed in a more open context that the other two groups.

## Group 1: Use of IT/CMC in the Architectural Practice

### Current Situation

Although practitioners interviewed were classified as Innovators or Commodity-users, it would probably be more accurate to say that they exhibited a wide range of feelings towards technology. Some described themselves as "technophiles", while others were self-described as "neo-Luddites". So, it was surprising that all interviewed firms were using IT systems for either design purposes, contract and work monitoring, or both, while one was using a 3-D Computer Aided Architectural Design (CAAD) system as well. Three firms were using CMC in the form of an Internet account. However, if the number of firms using CMC in the form of a Local Area Network (LAN) is included, the total number of CMC users is raised to seven.

While CMC is used less than IT, it appears that its use is on the rise. This is consistent with the findings of other surveys, that indicate that CMC is still in its early stages and spreading, while IT appears to be present in most workplaces[222]. Perhaps not surprisingly, none of them is using or considering any form of

teleworking. It appears that teleworking has only been adopted so far by the professions best suited to its use, such as journalists. It is possible, however, that in the future this too will become more widespread.

Interestingly, all firms would consider - depending on the cost - installing videoconferencing systems. This easy acceptance of videoconferencing technology even by people who reject other aspects of IT/CMC, may be partly explained by the fact that videoconferencing is considered to be an "extension" to the already existing telephone. Another possible reason may be that videoconferencing has been repetitively presented as a fact of future life by science magazines, documentaries and science fiction, while no one could have foreseen the advent of the Internet. And a third possible reason is that firms working in remote locations can achieve significant savings by reducing their travel expenses.

Still, personal contact is considered by all to be imperative, and collaboration with other firms through CMC is thought to be difficult. Generally, when considered, CMC is thought to assist in progress monitoring and remote collaboration. One firm has successfully created an FTP directory[223] on its server for one of its main clients, who can upload and download CAD files instantaneously, thus assisting collaboration. In this instance, the FTP directory replaced the courier who would be transferring documents from one firm to the other. Wherever decision making is involved, however, personal contact is deemed a prerequisite. Despite the ease with which a teleconferencing system could be installed in both client's and practice's offices, since they are both full users of CMC, they have not done so. This may be due to people not having got used to the full potential of IT/CMC, and therefore feeling uncomfortable using it. It may also be due to the fact that current IT/CMC systems do not allow for a large part of non-verbal communication. Even the most advanced videoconferencing systems can not show how sweaty, or firm a handshake

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222 Coyne, 1996c; Schulz, 1997

223 FTP (File Transfer Protocol) directory: a directory (folder) to which files can be sent (uploaded) or retrieved from (downloaded) by a remote user that has access to it. Access is normally controlled by means of a password.

is, while usually they exclude a plethora of other information, like body language (they normally show a small part of the upper body and head). Research[224] indicates that, since their beginning, humans have been developing subtle psychological mechanisms for handling negotiations – an evolution characterised as a "psychological arms race" - and many of these are impossible to use in a teleconferencing setting. For example, the *orbicularis oculi*, the muscle that raises the cheek, only contracts when people are genuinely happy[225], thus helping distinguish a genuine smile from a forced one; or the eye's iris automatically expands when a person has positive feelings for another. These are subtle changes that mankind has unconsciously learned to respond to[226], but that are not communicated successfully by current teleconferencing facilities[227]. It is possible that it is for such reasons, that people feel that conducting an important meeting in person is irreplaceable.

At the same time, use of IT/CMC has definite advantages over meeting in person; for example, evidence suggests that it is best to lie over the phone, thus minimising the body language information the other party can use to expose the liar[228]. And the asynchronous communication offered by e-mail is often advantageous, as it allows one to think carefully before answering. It also allows one to be more concentrated when replying, while a phone or a visit may disrupt an ongoing transaction, necessitating the sharing of attention between two, possibly totally different, matters. The freedom people allow telephones is unusually high; we answer them wherever we may be, whatever we are doing. Their synchronous manner of communication allows them to intrude in a very important way in our everyday life. However, e-mail allows one to read their message and reply to them when they are ready; it is a very different paradigm, with almost the only similarity being that they may both use telephone lines.

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224 Pinker, 1999
225 *ibid.*
226 *ibid.*
227 Negroponte, 1996

Still, and despite the advantages asynchronous communication offers over synchronous one, most of the practitioners interviewed seemed to prefer using the most transparent technological way of synchronous communication; the telephone. The reason seems to be simple conditioning due to repeated use of this medium, and ignorance of the alternatives more than anything else, as they have not used e-mail, while they have been using the telephone most of their life. CMC, therefore, is not yet widely used in the context of the ACDE practice.

IT is widely used for two main functions: first for the work documents, and second in a design context. Interestingly, an Innovator architect who described himself as a technophile, refused to use CAAD, arguing it leads to worse design than designing by hand, while a Commodity-user who described himself as a neo-Luddite was using IT to generate 3D animations. This directly contradicted the initial hypothesis that Innovators would use IT/CMC more than Commodity-users, and is consistent with the findings of the previous experiment, indicating that personal feelings towards technology itself do not necessarily influence practical needs and design beliefs.

### Costs and Profits

According to the practitioners interviewed, IT has had some important impact on the practices' financial status. Drawings are faster to produce, and changes are time-effective. The cost of paying a designer to make the changes by hand, a process that could take days instead of minutes, is therefore minimised.

This does not mean that the plans generated in such a way, however, are "better" than those generated by a slower process. Indeed, some argued that the speed of designing has had an adverse effect upon what they called the "design quality". For the process to be accelerated, one may assume that either the speed of conceptualisation has increased, or that of drafting. Although the latter is generally agreed on, it is possible that the former applies as well. Indeed, a number of

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[228] *ibid.*

practitioners mentioned a perceived 'uniformity' in CAAD design. This seems to verify this claim; that design is no longer thought out as carefully as previously. This subject is discussed later in detail, in the examination of the relationship between use of IT and Synthesis.

Many costs were associated with the introduction of IT in the workplace, and some not just financial. CAAD was deemed expensive in time and staff needs, as well as in acquisition, update and maintenance costs. Unfriendly programs can take time to learn, and even more time to learn so well as to be transparent in use. The objective in this case is to use something so fluently, that one forgets it is there - like a car, or a bicycle. To reach this level, however, one needs to spend a certain amount of time first, which practitioners often can not afford. That does not mean fluency is necessarily hard to reach; with the right, user-friendly program and good support, it should be relatively easy. In one such instance, an architectural firm needed just one week to make the full transition from drawing board to CAAD. They used what they described as a very friendly package, and the support team was in their office for no more than three days, teaching them how to use it. They claimed to have reached a satisfactory transparency level very rapidly – a few weeks, compared to a few months, as mentioned by other practitioners.

Then, the acquisition costs can be large, but this issue is further complicated by the fast IT development process, that usually means that hardware has a practically useful life of up to 5 years, before being unable to cope with new software. This is something many firms cannot afford. In the long run, some claim, it may be more profitable to spend more time making changes by hand. At the same time, engineer-focused Computer Aided Design (CAD) software was mentioned as having a major disadvantage, in that it is designed as a generic tool for any sort of design. That means that it asks practitioners to "think" in terms of absolute co-ordinates (XYZ or even just XY), and can therefore be unsatisfactory to their needs, that require them to think in terms of *volumes*. This was thought by a number of interviewees to have led to unsatisfactory design – something examined in detail later, in IT/CMC and Design.

An important factor of financial costs is the number of personnel required to run the practice, and this has been influenced by IT in some cases. While in other cases IT has not had any effect on the number of employees, when it has, the effect has commonly been to minimise the need for extra personnel. This is especially obvious in the case of a small architectural firm that used to employ four architects and two designers. After the acquisition of an IT system, two architects and one designer, or 50% of the personnel, were made redundant. The firm's director clarified that IT did not "take over" their jobs, but rather that it has allowed the remaining staff to work more productively and efficiently. This increase in productivity and efficiency has been mentioned by all interviewed, and seems to be one profit common to all interviewees.

It is interesting to note, however, that not all agree on whether increased productivity and the need for less personnel has also led to increased profits. Although the larger firms claim that it has (a manager's answer to this question was "Yes, yes! Definitely!"), the smaller firms' increased profits seem to be counter-balanced by their increased expenses due to use of IT, thus being unable to mention any significant change in their profits. Since they feel they would also be unable to compete without IT, it seems they are regarding it as a "necessary evil". This interesting paradox was also mentioned in the Sydney CMC survey (1995), and might be explained by the comment of a senior partner: "IT alone does not make any difference. The difference is in how you use the technology to make more profits." It seems that many firms have not yet managed to fully exploit use of IT/CMC.

### IT as a Constricting Factor

As indicated before, IT was regarded by all interviewed as a necessity. However, it is also thought by some to be a constricting factor as well, since the expenses are often forbidding for a small firm. In this view, the gap between a large and a small firm is widening, and the high quality of the design *presentation* (but not necessarily of the synthesis and the design quality itself) is regarded by clients as standard. A small

firm, therefore, may have problems competing with a larger one that can produce impressive animations on the basis of the synthesis quality alone. Still, the cost of the acquisition of a CAAD system is constantly dropping, and one can build a computer-based design studio for a fraction of the price needed a few years ago. This, of course, is a general trend in the IT community, with the emphasis being on creation of "faster-smaller-cheaper" technology.

Another problem that results in IT/CMC being a constricting factor mentioned by some is platform dependency. The AutoCAD format has become a *de facto* standard in the ACDE industry, and Apple users are often required to have PCs just for compatibility reasons, or to find some other way to translate between different formats used by different clients. One larger architectural firm in particular with an Apple LAN chose to buy a stand-alone PC for one client's AutoCAD documents; a choice that some smaller firms may not be able to make. This example, of course, illuminates another recent development, that the client feels the need to control the design process in such a way, and that they want to keep a copy of everything produced in electronic form. It is also interesting that the practitioner agreed to this demand, even buying a separate computer to accommodate this need. It can be argued that an attempt like that by the client to dictate the architect's way of working would probably have been unthinkable even a few decades ago. The architect would probably think of any produced plans as his intellectual property, and prefer to dictate to the client his own conditions for any sharing of that property. The fact this is no longer the case, signifies a change in the mentality of both the client and the practitioner, and is accordance to the changing perceptions within society and the architectural profession.

### General Trends in the Practice

From the above comments, there are two main conclusions: one, that practitioners almost always refer to IT when discussing "technology", and not CMC. One possible reason for this may be that CMC is still relatively new. While IT is also a relatively new aspect of architectural practice, and many architects are not sure how to approach it and what its benefits and disadvantages are, they seem to acknowledge its

existence. All of them have debated whether to acquire an IT system. However, only one practitioner had installed CMC hardware and software at the time of the interviews, although ten of them already had computers. Still, in the year since, three more practitioners have done so. Therefore, two trends can be isolated: first, that use of both IT and CMC is spreading; and second that practitioners are still trying to find ways to best take advantage of technology.

The second conclusion is, that practitioners are divided on their views on the impact of computers on the architectural practice. This division is often extending to their views on the very nature of their professions. Art-oriented architects seem to reject CAAD, seeing it as impersonal and 'cold'. Architects who have a more practical bias seem to appreciate it more, which is perhaps understandable since CAAD use appears to offer a number of practical advantages when used properly. This was a surprising finding, since the initial hypothesis was that the distinction would be along the lines of Innovators using IT/CMC more than Commodity-users. To examine this further, a more detailed study of the practices' use of IT/CMC was necessary.

Since all firms used IT in some form, a different approach in examining this aspect was devised, introducing a new criterion in the classification of practitioners. This became possible after observing that, although all firms used IT, they did so in markedly different ways. All used them as word processors, to keep records etc. Only some, however, used CAAD software during the design process. And a third group used CMC as well as IT. The correlations between these three groups and key-attitudes towards technology and design are shown in Table 7-1.

| | Technological Attitude | | Design Attitude | |
|---|---|---|---|---|
| | Commodity-user | Innovator | Pragmatic | Art-oriented |
| **Record keeping** | 13 | 17 | 9 | 21 |
| **CAAD** | 9 | 11 | 7 | 12 |
| **CMC users** | 2 | 2 | 3 | 1 |
| | | | | |
| **Non-users of CAAD** | 4 | 6 | 2 | 9 |

*Table 7-1*: Correlation between key-attitudes and IT/CMC use

As shown in Table 7-1, all thirty practitioners interviewed use IT for record keeping. Twenty of these use CAAD software as well; ten do not. Although the sample is too small to be statistically important, it is interesting to note that twelve of these IT owners who do not use CAAD are Art-oriented practitioners. Taken proportionally, the fact that 77% of Pragmatic practitioners use CAAD compared to 57% of Art-oriented ones seems to indicate that the difference between CAAD users and non-users seems to reside in the domain of design attitude, and not in the technological attitude. This is a remarkable indication, because it would seem to suggest that people who have positive feelings towards technology are still having difficulties using it in a context such as architecture; something that makes it a technological shortcoming, instead of an attitude one. This is consistent with the feelings expressed by practitioners during the first set of interviews, where technology was considered “too undeveloped” or “not intuitive enough” to be of real use in certain situations.

The question that arises then, is why do Art-oriented practitioners prefer not to use CAAD? The answer may lie in the fact that Art-oriented architects seem to think of architectural plans as art. During the interviews, it became apparent that some of these felt very strongly that printed plans had a lesser artistic value compared to hand-drawn ones; indeed, one refused to use CAAD solely for this reason. Although they stated that computers may be used to produce designs of artistic merit, they still exhibited a preference for hand-drawn ones, making statements such as mentioned

above regarding the personality of computer-designed plans, or the fact that they were thought of as "boring". At the same time, several Art-oriented practitioners mentioned using multimedia presentations, that they felt were better in covering the firm's artistic expressive needs. This again demonstrates that a better understanding of what each person means when using the terms "technology", "IT" and "CAAD" is necessary, before attempting a categorisation.

## Group 2: IT/CMC and Design

### IT and Synthesis

Regardless of the various uses of IT/CMC, the aim of the interviews was to find out how IT/CMC were changing ACDE practices. Therefore, synthesis, the cornerstone of architectural practices, has been an obvious major area of focus. It has been argued[229] that the increased use of IT by designers will inevitably affect the design product as well. In this survey, an effort was made to discuss this view with designers, ideally ones that have made the transition from the drawing board to the computer. Since this transition happened in the last five years in most cases, discussing the ways this transition has influenced the way practitioners design was not a problem. Generally, it was agreed that the design itself has changed in some important ways. Still, the overall impact was less profound than expected. This can be explained by a number of factors, discussed later.

The most important changes that have taken place in design after the transition from the drawing board to CAAD systems were the following, as mentioned by the practitioners interviewed.

### Uniform Synthesis

Synthesis now is criticised as being more uniform and repetitive, with frequent repetitions of architectural elements, and increased standardisation. One of the major advantages that use of CAAD systems has offered practitioners is the use of "cut &

paste" techniques. A designer no longer has to redraw by hand every bathroom or kitchen; he may use a design solution that has been used in the past, or even copy a ready-made solution from a library of architectural elements and solutions. While this has significantly reduced the time needed, it is also considered to have encouraged repetition. Standardisation is thought to be promoted, resulting in "carbon-copy" architectural forms.

This was the main argument against the use of CAAD mentioned by an architect who refuses to use IT for designing purposes, despite describing himself as a technophile. He explained his aversion from CAAD as follows:

> "One used to be able to see a drawing and say, 'Ah, yes, this is a drawing by Norman Gray'. Now, they all look the same! There's no way of telling them apart any more; no personality in them. Architects now make boring architecture".

This architect prefers to use drawing boards for design purposes, and uses an external firm specialising in architectural animations and visualisation whenever a particular client requires an animation or a non-traditional drawing, such as 3 point perspectives. Other architects, using CAAD themselves, seem to acknowledge to some degree the fact that use of IT has brought along some level of uniformity. As one commented, "it is only too tempting to start designing in simple geometrical shapes, since it is so easy to produce these with CAAD". And another admitted that "maybe it's true that we don't properly design the details as we might if we didn't use CAAD".

In fact, these comments can be interpreted in a variety of ways. One is that use of IT/CMC leads to 'boring' architecture, where 'boring' may mean too similar to existing architecture, or too similar to that of their peers using IT/CMC, or too heavily biased towards use of 'pre-defined' CAAD elements. The second one is that the drawings themselves are boring. The third is that the drawings are too perfect technically, being computer generated, and lack 'personality'.

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[229] Coyne et al, 1996a; 1996b

These different interpretations have to be examined separately. Architecture that is too similar to existing architecture cannot possibly be the result of IT/CMC use. Wide-spread use of IT/CMC by architects is relatively recent, and the actual hardware and software used is changing constantly. Therefore, it is unlikely that it is the cause for this alleged similarity.

The other views, that practitioners using IT/CMC may tend to design similarly, are also problematic. It is indeed easy to design basic geometric shapes with CAAD, as they involve less effort in most design programs. The interface, usually a mouse or a digitising tablet, is constraining, and architects using it would find it hard to design in a flexible, free manner. However, all practitioners interviewed said that they would never use computers for the initial sketching stages. They all think of computers as limiting in that stage, and prefer drawing boards and pencils. Therefore, CAAD is not used then, and can not possibly have any impact on the design. It could be argued that a practitioner using CAAD would be 'conditioned' by CAAD software (S/W) to think in basic geometrical shapes, but this again is questionable. First, and at least until all architects have been trained using CAAD systems from the beginning, it would mean that all the years of studying and acquiring professional experience can be negated by the relatively brief use of CAAD during a certain stage of design; something that intuitively sounds unlikely. And second, most senior architects only design during the initial, and arguably hardest, stages. The resulting sketches are then digitised by junior members of the practice. Therefore, it is even more unlikely that it would make any difference to the senior practitioners responsible for the design.

The second interpretation, that the drawings are 'boring', too perfect and lacking personality, seems to be more valid, as it concerns mainly an aesthetic criterion, and is therefore impossible to judge objectively. Hand-drawn watercolour drawings may be aesthetically better than rendered ones for certain clients, as well as certain practitioners. Others may prefer to focus less on the design presentation itself, like the architect who made the following comment about an architect using hand-drawn

watercolours: "Ben cares more about the drawing than the synthesis". This is an argument similar to that made by Bijl, who, pointing out that people who draw in a two-dimensional flat plane environment learn to equate lines with the spatial properties of things they have in mind when they draw, concludes that "people draw things, not drawings" [230]. Another interviewed architect argued that, on one hand it is very hard to measure "personality" in a drawing, and on the other, one should be able to understand the designer from the quality and the particularities of the synthesis: "even by looking at a *building* you are able to figure out who designed it". When dealing with these opposite views, one should consider the fact that the role of the drawing is complex. On one hand, it is a means to communicate a design idea to one's clients, subcontractors and peers. On the other hand, it may be seen as Art, and therefore open to criticism about its artistic qualities. As this largely depends on one's point of view, it has to be accepted as a largely subjective issue.

Interestingly, this debate has another side as well. In one case, reported by Richens, it was found that the perfection of the suggested plans had the effect of making the clients reluctant to propose changes. The architects managed to successfully solve this problem by making some changes to the CAAD S/W they were using, including a line setting that simulated the texture of a pencil. Feedback from the clients increased immediately after that, as clients were no longer intimidated by the finality conveyed by the perfection of the plans.[231] This is also supported by literature, since ambiguity in design during the sketching stages is considered to be an essential and stimulating part of the design process[232].

### Easy Editing

One of the major areas of IT/CMC impact on design, changes are now considered to be easy, fast and accurate. As a result, practitioners have greater flexibility in their design, and designs are more adjustable. The plan may be processed many times until the optimum result is reached, thus encouraging communication and stimulating

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230 Bijl, 1989

231 Richens, 1995

232 See, for example: van Dijk, 1995

debate between designers and clients. The original and revised plans are always perfect, and there are no scratches, notes and smudges.

The potential problems with feedback caused by the perfection of the plans was examined above, as was the proposed solution. There is another problem with editing, however, that is much harder to deal with; that of the interface used. Since screens have a limited size, it is only possible to either view portions of a design, or to zoom out in order to see it whole. The size of the complete building is obviously constrained by the screen size. This means that detailed editing can only be performed by zooming in. Since it is impossible to do this and view all of the design simultaneously, this may hinder editing, potentially resulting in out-of-scale parts of the design, or parts that do not tie in well with the rest of the design. The practitioner must have good mental visualisation abilities in order to avoid this.

Furthermore, the mouse commonly used by practitioners, is hardly a natural interface for editing and sketching. Its use, combined with the use of keyboard, can hinder creativity, and editing can be constrained due to this. There is no solution currently available, apart from the obvious, to print out the design, edit it by hand and return it to the digitising team to incorporate the changes in the design. Although the work of the digitising team will be significantly less than if they had to redraw the whole design, it is a relatively limited way of designing. Large screens, the size of a drawing board, would be ideal for this purpose, but there are still technological problems with their developments. Others have suggested virtual reality environments for the editing of design, but a valid metaphor for this new environment has still to be developed. The interface problem is examined in detail in later chapters.

### Drawing Board vs. CAAD

One of the main findings of the interviews was that designers do not use IT/CMC during the synthesis stage. This finding is consistent with most other research conducted in the area, which has also observed the little or non-existent use of CAD

systems during the early design stages[233]. This may be the reason why the overall influence of IT on design was found to be less profound than originally expected. A possible explanation may be the fact that IT has only been used by those interviewed for the last five years at the most. Therefore, designers used to the drawing board have not had enough time to make a full transition to IT. But this does not explain the obviously negative feeling those interviewed have towards the use of IT during the synthesis stage; one characteristically summarised their attitude saying "use of computers during the synthesis stage never fails to lead to bad design". Contrary to the advantages claimed in the use of IT for the final design, synthesis directly on a computer is believed to be poor, suffering from many restrictions and resulting in decreased productivity and efficiency.

As a result, all those interviewed use the drawing board for the synthesis. The CAAD stage follows, with some passing over their design to a second team or person who then uses IT to "digitise" it, while others do that themselves. In most cases, two distinct, separate teams appear to be at work. One architect suggested a separation in the architectural profession may be imminent. She claimed that nowadays some architectural students put a greater emphasis on the way their work will look when it is presented by IT means, than on the quality of their synthesis, while others are more interested in the latter. To best exploit each individual's special abilities, she suggested they are used appropriately, the latter to design and the former to "digitise". This seems to verify the argument that IT is not useful for the synthesis stage.

In the next chapter, it is argued later that IT does, indeed, have a role to play in this stage in the future. Still, the present 'dual' approach offers certain advantages until IT can reach its full potential. Any restrictions of the conceptualisation of the design because of a certain program's restrictions could be avoided with the division into two teams. The designer would not risk thinking in a limited and restricted way,

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[233] See, for example: Carter, 1993; Tovey, 1989; Hyde, 1989; Hyde, 1992; van Dijk, 1995; and Senyapili & Ozguc, 1994

knowing that he would have to work at a later stage with a specific program, perhaps with limited capabilities. Therefore, this would allow the designer greater freedom. At the same time, each member's special abilities would be taken advantage of. However, this poses a problem, as it can be argued that practitioners should possess an all-around knowledge of architecture and its practice, and that the best way to achieve this would be to make sure everybody was equally proficient in both areas – synthesis and visualisation. Therefore, those able to synthesise should be trained in use of IT, and those capable with IT should be trained in synthesis.

## Group 3: Changing Expectations

### Design Product Quality

The term "design product" refers here to the drawing or the model that is the result of the design process, and not to the design quality itself. Although it can be argued that a perfectly printed plan is better than a smudgy, hand-written one, that depends on its definition of 'better', as discussed above. Most people think that a perfectly straight line is always better than a wobbly one. Yet, just like some people will prefer a hand-drawn watercolour sketch to a printed plan, some prefer a wobbly line to a straight one. The drawing is just the medium in which designers present their ideas, and the quality of the synthesis is much more important than the "straightness" of the drawing's lines. According to this argument, the smudgy areas convey fine messages, such as the amount of time dedicated to the plan, or the fact that a particular detail may be problematic, and therefore may need more work. They bear witness to the development of the design, and often show the alternative experimentations and solutions. This debate is closely related to the one mentioned above, about the role of the drawing, and therefore has to remain unresolved. Should plans be treated as a piece of art, or as a means of visualisation? In the first case, it may be that use of CAAD means a layer of human involvement with the drawing is removed – that of manual editing using means that convey artistic messages – with the result that artistic quality is decreased. In the second case, use of CAAD helps create clear drawings, that may be better understood.

This practical side to the debate is again ambiguous. A practitioner observed that "builders just don't care if the lines are wobbly or not... They have enough trouble understanding current drawings to care about multi-coloured, multi-layered plans with an infinite number of details [on them]". However, another architect rebuffed this, claiming that builders often comment very favourably on the increased level of information available, and in fact sometimes ask her for more information to be included in a specific plan; something she is able to do in minimal time using their CAAD package. She also added that her drawings have improved a lot through use of CAAD, adding "I am delighted we have it; I was an awful draftsman before. CAAD has upgraded my level of drafting, and allowed my work to be consistent with [my partner's]". Perhaps most important, clients have come to expect 'perfect' plans. One practitioner acknowledged this, commenting that clients treated CAAD like a "driver's licence"; if a firm has it, they are deemed qualified. He claims they got some jobs that would have been impossible to get, had they not been using CAAD.

### Design Quality and Costs

The design quality is an ambiguous question, that probably has no objective meaning as such. One person's excellent design may be anathema to another. And even when a building has apparently failed as much as to be leaking, its design quality may be unquestionable to some. Bearing this dichotomy between objective and subjective design quality in mind, there have been various claims about the effect of IT/CMC on design quality.

One of them, is that design quality has benefited from IT use, as it allows experimentation and reduces the cost of developing and studying alternative design solutions. According to this claim, practitioners have the opportunity to spend more time in the initial schematic stages, where it is cheapest to explore design ideas, because their development and evaluation is rapid. Gábor Bojár offers the following graph of the breakdown of architectural fees[234]:

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[234] Bojar, 1995

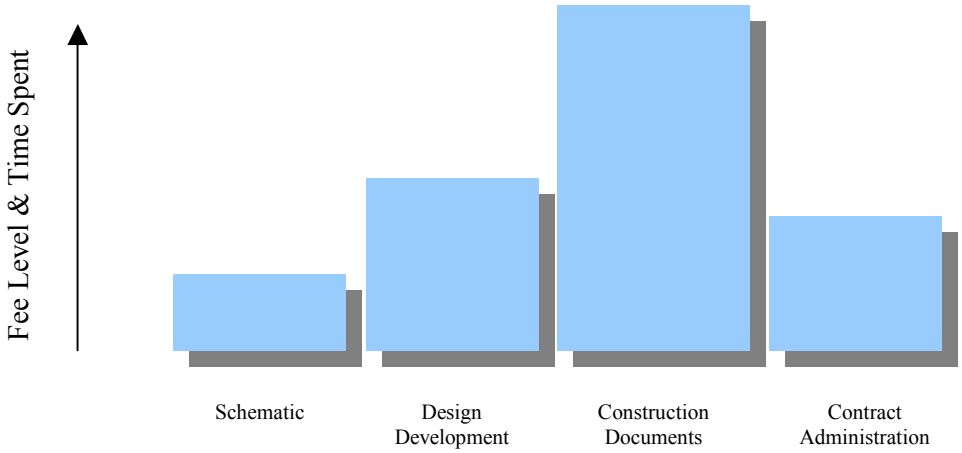


*Fig.7-2a*: Breakdown of Fees - Traditional Practice

He then argues that, through use of IT, this graph changes to that of next page (Fig. 7-2b):

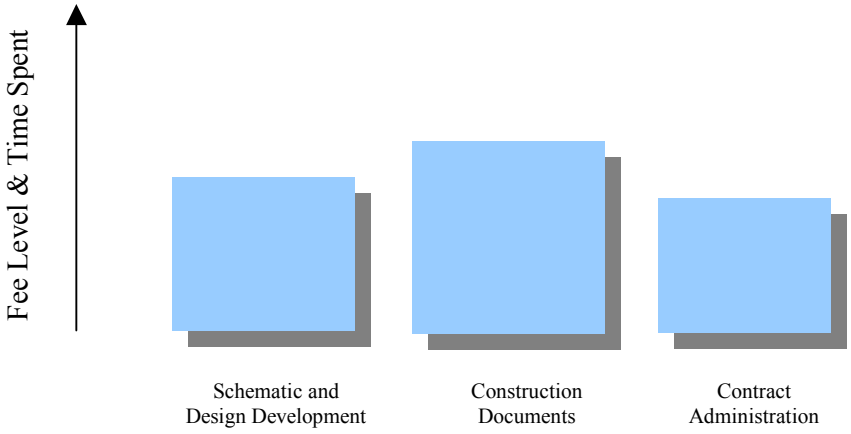


*Fig. 7-2 b*: Breakdown of Fees – CAD-Based Practice

The fees now have been much more evenly distributed through the various design stages, and can be significantly less, as the time involved also decreases. The reason for this change is that clients will pay lower fees for the documentation phase,

reflecting the fact that less labour will be expended, as the documentation process is largely automated. In the proposed new collaborative design paradigm, it is envisioned that more active and synchronous collaboration with the client will help improve the quality of design, leading to more balanced architecture, while at the same time help minimise temporal and financial costs. In this envisioned environment, schematic and design development will gradually merge into a single phase, and this phase will take up more time, as detailed computer models are developed and tested, instead of paper drafts. This development and testing of computer models is already happening to a certain degree, with several advantages and disadvantages over standard practice – examined below. The resulting curve is consistent with an ACADIA study[235] that showed that practices using 3D-based software spent more time early in the design phase, but less in the documentation phase. They levelled out their work loads and labour expenses, which helped minimise the hiring and laying off that is often necessary. It also has the advantage that changes take place in the inexpensive initial stages, which encourages the exploration of alternative ideas.

Therefore, 3-D software developed specifically for Architecture may have a different impact than 2-D generic one. The same ACADIA study showed that the labour expenses if architectural practices using no CAD software followed roughly the same work pattern as that of practices using 2-D software (Fig. 7-2a). This has also been observed by some practitioners, who claim that use of generic CAD tools is stifling design, and has been a major prohibiting factor for the development of successful CAAD tools.

The argument behind this claim is that a program developed for use by practitioners will offer two main advantages over a generic one. First, a program that recognises two parallel lines as forming a wall will simplify the architect's work. For example, if that wall's dimensions need to be changed, the program will automatically update all adjacent lines to meet that wall, and one change in a single

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[235] ACADIA, 1994

line will be automatically mirrored in the whole building. This will speed up the drafting process, increasing productivity.

The second advantage its use may offer a practitioner, is that it may also change his perception of the design, reinforcing its three-dimensional properties; reminding him that he should be designing in volumes, and not two-dimensional points. In fact, one architect had commented on that, claiming that another practitioner's design had failed because "their computers prevented them from using their brains. Instead of trying to picture the building, they thought like a computer – designing in XYZ points instead of thinking in volumes and space". Although the quality of the design is largely subjective, the argument seemed valid in that the building criticised appeared to blend poorly with its environment. And despite the fact that it can not be proven that it would be better if another software had been used, it seems a valid argument that spatial awareness may improve through use of three-dimensional software developed specifically for Architecture.

### Free Design - Modelling

According to a number of interviewed practitioners, it is now possible for a designer to design regardless of practical constraints that would previously make some extremely complex and detailed designs very difficult to produce on paper. In this sense, use of IT has allowed the designer greater freedom. For example, complex constructions and shapes that would be very hard to design by hand, are now possible in an easy, speedy and accurate manner. This is thought to have granted the designer a greater freedom in his design, freeing the conceptualisation of design from paper's restrictions. This is the case of Michael Hopkins and Partners, who claimed they could not have won the Glyndebourne Opera House competition without CAAD[236]. Their design was so complex, that it would have been impractical to draw by hand, and they would have had to abandon that particular design for an easier one, as the drawing process would be too costly.

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[236] Williams, 1995

What was also mentioned, however, was that designers that have grown accustomed to designing in a certain way, are usually reluctant to take advantage of this freedom, and their designs remain similar, regardless of the medium in which they are produced. This suggests that the medium may not be the issue in most cases, although in some it may play a greater part than in others. While there is no reason to doubt Hopkins & Partners, it is rare to conceptualise a design hard to visualise using paper. This, however, may be the result of an unconscious conditioning to the limitations of paper, and may change in the future. It is unclear to what extent use of paper may have caused conceptual restrictions, without the designers realising it. In the future, more buildings may be designed in a manner different from today's, as a result of software of increasing accuracy, leading to better prediction of structural integrity, and easier visualisation of new design ideas.

This argument is strengthened by the fact that recent designs – like the Sydney Opera – are taking advantage of modelling software that allows them to check the structural integrity of the building while designing. This is a general trend – use of complex mathematical models allows experimentation with new design ideas, and appears to encourage creativity. The sturdiness of the Sydney Opera is due to extensive tests of the concept by the engineers of Ove Arup, who successfully solved the technical problems posed by its curves.

This, however, leads to another problem, that of the perceived infallibility of models, leading to over-dependence on them. There is a great amount of data indicating that models can be mistaken. For example, one designer recently posted the following message in an Industrial-Design mailing list, warning against this[237]:

> "One of my current forensic investigations involves the hot commissioning failure of a $5 million prototype electric arc furnace where the 4000°F molten pool made short work of the refractory lining, then melted a hole through the thick steel shell and did a little piddle on the floor. That wasn't what the natty thermo model on the designers' computer predicted. Nor is it something the innumerate Hales can sort out in five minutes. However, Hales has a numerate 80-year old friend

[237] DRS, Iss. 8, April 1997

with a lifetime of practical experience in high temperature furnace design and together we should be able to sort out what went wrong. The furnace is being redesigned."

This emphasises the fact that reality is often very different than models. The earliest example of this difference is probably that of the Comet aeroplane. After a number of Comet aeroplanes had crashed in the fifties, the Royal Aircraft Establishment checked the cabins[238]. Captain Sir Geoffrey de Havilland, designer of the Comet, had tested the planes, concluding that the cabins were good for a service life of about 10,000 flights, or ten years. The RAE tests showed failure after only 3,000 flights. But even this was 3 times the actual flight number of the crashed Comets, who had only performed 1,000 flights. These incompatible differences were due to a few slight miscalculation: first, the de Havilland test did not accurately represent the actual cabin, since complete windows were not fitted into the test section. Second, the additional stress concentration around a hole in the fuselage (needed for a rivet) was not calculated, and third, the difference between the smooth operation of the testing machine and the turbulent behaviour of a plane in flight could not be accurately modelled.

The danger of over-dependence on models, however, is not necessarily recent, or due to IT/CMC. In the two previous examples, the furnace was developed using IT models, while The Comet was developed in the fifties, when no computers were used. This indicates that the means used to calculate the properties of a model may be largely irrelevant. And the 17,000-seater Kemper Arena in Kansas City, a spectacular sports venue, designed in 1973, that won the American Institute of Architects award, was destroyed when a storm with winds up to 70 mph resulted in the inward collapse of a 200-ft square section of the roof[239]. The piston-like effect of its fall blew out entire wall sections. An investigation revealed that uncommon wind suction effects had led to a build-up of rainwater over one part of the roof. Under the strain, a hanger failed, causing yet more water to collect over that area, until the whole roof eventually failed. The non-computer-based models used during its construction had predictably failed to anticipate such an unusual string of events.

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238 Salvadori et al., 1994, p. 124-126

239 *ibid*.

Had the same data been used in a computer model, the results would have been identical. Therefore, it is a modelling shortcoming; not an IT one.

Still, use of IT has led to new problems, emerging specifically because of its increasing use. The first one is that it is now significantly easier to develop a model on a computer, so model dependency is increasing. Because of IT's ability to speedily process large numbers of mathematical calculations, stress and load calculations are rapidly and easily processed. Due to the increase of computational capabilities, problems that even master designers were unable to analyse only a few years ago are now routine, and engineers put their faith in the solutions presented to them by IT.

The second problem, unique to IT, involves a built-in shortcoming of IT/CMC, and the possibility of problematic pieces of code in CAAD software – commonly referred to as 'bugs'. With more and more buildings based on CAD, there may be an increasing number of what Levy and Salvadori call "CAD – for 'computer-aided disasters'"[240]. They point out that bugs have been found in various architectural software packages, and engineers should not think their computer models are infallible. One statistic estimates there is one bug for every 30 lines of code; something like an advanced electric razor can have around 7,000 lines of code in it.

The third problem concerns the poor way IT/CMC are often being used in the workplace. In the ACDE sector, as elsewhere, wrong expectations – too high or too low – can reduce the reliability of models, the way IT/CMC will be used and the significance of the modelling results.

This unreliability of models is making things worse due to today's concept of redundancy and cost-effectiveness. A medieval stone-mason could use 10 ft-wide pillars where 2 ft would do, because he could not be certain of the structural integrity of the building otherwise, and because of the different socio-economic situation, but

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[240] *ibid.*, p. 49

today's engineers have to be more effective. This can often be catastrophic: When Hartford Arena collapsed in Connecticut in 1978 engineers found that the building would still be standing had just 5% more steel bars been added to the original[241]. The Hartford Arena roof collapsed due to miscalculations in the design of a new type of roof. Surprisingly ignored by architects, engineers and inspectors, the roof, during its erection and in its final position, but not yet burdened by the weight of the roof deck, was measured to have a deflection at the centre twice that predicted by the computer analysis. As LeMessurier observed, "any time you depart from established practice, make ten times the effort, ten times the investigations. Especially on a very large-scale project"[242].

# Discussion

## Social and Technological Impact on Design Activities

What emerged clearly from both the interviews and the examination of relevant bibliography, is that the relation of the architectural practice with IT/CMC is complex and multifaceted. On one hand, practitioners are using IT/CMC for their own needs. The internal use of IT/CMC by practices is ever increasing. Design quality alone can be hard to be recognised by untrained clients, who can be influenced by impressive CAAD drawings. As a result, firms are under pressure to acquire and use CAAD systems. The situation has changed rapidly in less than ten years, and will apparently continue to do so in the near future.

On the other hand, practitioners are also the people responsible for providing the workspaces that will take into account the implementation of IT and CMC. They now have to design not only for the people working in the buildings, but also for the machines they will be using.

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241 *ibid.*

A number of other factors are changing the current design paradigms as well. These are social and economic ones, and can often be seen as partly resulting from the advent of IT/CMC in the workplace. They include *new company structures*, *industrial democracy* and *post-energy crisis design*. All these factors will be examined below.

## Internal Use of IT/CMC

The first factor of change in the architectural practices due to the introduction of new technologies is the use of IT and CMC for the benefit of the architectural practice itself. For centuries, the training and work of the architect was conducted in a similar fashion; effectively, a single design paradigm, with a few variations, was used. Architects were taught how to think visually, how to tackle design problems, and how to identify their clients' needs. In the last few years, however, use of IT/CMC has instigated a number of changes. The training of architects now routinely includes use of CAAD tools, with a new emphasis on impressive design output.

IT/CMC impact on design itself from the practitioners' point of view was examined earlier. One general conclusion that was reached from the interviews is that, although the interviews included practitioners who refuse to use CAAD tools, all had at least one computer in their studio. IT/CMC has undoubtedly increased its presence in the architectural sector during the last years. The extent of this is evident in a 1996 California survey that showed that 97% of the production staff of the Architectural-Construction-Design and Engineering (ACDE) firms interviewed are using computers regularly, while 93% use CAD always or regularly[243]. Although these numbers may not accurately representative of the real situation elsewhere, they still demonstrate a general trend.

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242 *ibid.*, p. 205

243 Schulz, 1997

## New Company Structures and the Need for "Smart" Buildings

The second factor of change is the need for architects to provide rapidly changing organisations and companies with "smart" buildings. The term "smart building" is used by Francis Duffy[244] to generally describe buildings that take into account IT/CMC and try to best integrate them. "Smart" buildings can be especially hard to build, since they have to take into account a number of key issues.

An important issue is the influence of IT/CMC on methods of work in the office and, as a result of this, the number and type of staff employed. As positions become redundant and new ones are created, new company structures emerge. Architects are responsible for designing the new workplaces, taking into account the idiosyncrasies of their new users as well as the equipment they will be using. The main emphasis is on flexibility, and that includes great redundancy in the ability to accommodate rapidly changing technologies.

The demands of IT/CMC equipment on the office environment and all mechanical and electrical services can change rapidly. An example of this is offered by the building of Lloyd's new headquarters[245]. During 1978-80, a typical modern office block had an air-conditioning system capable of handling heat generated by equipment equivalent to 5 $W/m^2$. The brief for the new Lloyd's headquarters required a system to handle heat generated by 10-12 $W/m^2$ for equipment in the offices and 25 $W/m^2$ in the Underwriting Room. However, while the building was being built, it became clear that rapid changes in IT/CMC meant this would be inadequate. Although the emerging technology significantly reduced consumption, a whole range of new equipment meant that overall capacity needed to be upgraded to the equivalent of 25 $W/m^2$ in offices and some 50-60 $W/m^2$ in the Room. Naturally, this resulted in a great number of changes on the original design, that were costly both in financial and time terms, but were deemed necessary for the success of the new building.

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244 Duffy, 1992

Sophisticated organisations have become increasingly dependent on buildings, due to their integrated capacity to accommodate electronic equipment and intricate networks of cabling, vital to their survival. Unless flexibility is built in a building from the start, it may eventually be cheaper to demolish a building and rebuild it, than to adapt it to the new needs. This is observed in the City, where a number of corporate buildings dating only a few decades had to be demolished due to their inability to support their organisations' new needs[246].

On the other hand, there are other types of businesses less dependent on buildings. These have also been influenced by the increased flexibility and mobility IT/CMC offer. New company structures are tending to change timetables and co-ordinate complex tasks through ad hoc project work, as demonstrated by the Chiat/Day plan to get rid of their offices[247]. The new Chiat/Day management calls for small teams to assemble for particular projects, rent hotel rooms, use mobiles and laptops and then dissolve and reassemble differently for other projects. This emphasis on group activity and communication calls for a completely new type of workplace for this mobile type of business.

The economic environment is changing rapidly due to IT and CMC. The domestic market has been substituted by a global one, largely as a result of IT and CMC's communication capabilities. This, however, has numerous repercussions in the political and social environment, since it influences factors like employment and competitiveness.

Relevant to this are general changes in the working conditions. These are affected in the form of easier communication and feedback from the employees, automation of routine jobs, and office and factory environmental improvements, with the use of "smart building" design. Furthermore, IT and CMC allow teleworking, and a more

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245 Golzen, 1984

246 Duffy, 1992

flexible timetable than previously possible. Whether this will be as feasible as promised, however, remains an open question; yet, "hot desks" are already a reality in many workplaces. These are workstations that do not belong to any one individual, but are open to use by any employee who needs them. This has been possible by the use of common desktop packages throughout all of a firm's offices. It does not, however, constitute an example of "real" teleworking, in the sense of an individual working from his own home, as one will still have to go to the office. As far as "true" teleworking is concerned, Olson's study of full time work at home by computer professionals found reduced job satisfaction and organisational commitment, as well as a relatively high role conflict[248]. Regardless of that, however, there may be a trend towards what Francis Duffy describes as the "replacement of the huge mass of obedient, low paid clerical labour by upwardly mobile, highly educated, hard to please, well paid professionals and managers"[249].

Other changes in the working environment include control; IT and CMC allow for a closer monitoring of performance. However, they can also hinder managers if teleworking prevails, since that can make the actual estimation of an employee's production very difficult. Further controlling problems include the facts that people who work a substantial fraction of the time at home may be unavailable for meetings, less visible to their peers and therefore passed over for promotions. Moreover, it could be difficult to supervise these mobile workers unless they worked on a piece-rate system. Also, by reducing demarcation and creating new positions of control, IT and CMC can change the current power structure and hierarchy significantly, often replacing it with a network of collaborating people. As demonstrated by the Chiat/Day example, in some sectors the whole idea of the office is changing rapidly; leading Duffy to claim that the nine to five office day is anachronistic, and the office is likely to become a meeting place, like a club, rather than a place for so many

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247 *ibid.*, p. 144
248 Olson, 1983
249 Duffy, 1992

desks[250]. What time-sharing, interactive offices will look like, and how employees will be controlled, is still an open question.

At the same time, the architectural practice itself is changing, as was first observed by Fitch as early as 1965[251], and mentioned again by Duffy in 1992[252]. Larger multi-national practices replace the ethics of the individual architect by the ethics of the architectural office. Likewise, the client is often replaced by the corporation. Clients are often representatives who attend meetings and then report internally to some higher authority. Therefore, instead of a direct contact with a project inhabitants, the architect (or his representative) deals instead with their agents. Instead of first-hand observation of real people and their need and aspirations, the architect is given statistical data with which to work. This trend may be attributed to an increasing growth of economic scale, that leads to larger corporations having the capital necessary to build.

## Industrial Democracy

Another related factor of change is the advent of industrial democracy. Partly as a result of the emerging new company structures, industrial democracy results in the power to make decisions being distributed among a lot of people, many of whom prefer their own view of efficiency and comfort to that of the corporation[253]. This puts emphasis on the end user, and he is becoming a factor of increasing importance in the design of office workplaces. The automation of routine jobs through the increased use of IT/CMC results in the emergence of a creative, highly educated type of worker that will not deal with the tedious, boring sort of processes, and that demands a better working environment; and architects are the people to provide him with it.

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250 *ibid.*
251 Fitch, 1965
252 Duffy, 1992
253 Duffy, 1992, p. 144

## Post Energy-crisis Design

Finally, post energy-crisis design is taking advantage of the new capabilities of IT and CMC in the form of "intelligent" environmental control and lighting systems, that are part of the "smart" building. An increasing awareness of the need for environment-friendly way of life, combined with the new capabilities of IT/CMC in better controlling the office environment, has resulted in new buildings being designed so as to maximise the benefits from natural lighting and heating. New methods for taking advantage of environment-friendly and energy-effective techniques are now possible, with careful monitoring by computer systems. An interesting example of this is the 298.7 m high new Commerzbank in Frankfurt, the tallest inhabited building in Europe when opened in May 1997. The tower was designed in a way that would save 30-35% in energy costs through the use of cool water air conditioning and natural daylight via an empty central core[254].

## Successful or Unsuccessful Use of IT/CMC

A crucial factor on the success or failure of IT/CMC seems to be the way they are integrated into the existing working paradigm. Many people, especially in decision making positions, are still not very comfortable with the new technology, and either have very high, or very low expectations from it. In both cases, the technology will not be used to its full potential, and may even result in less profits for the firm. For example, the Department of Social Security announced in June 1997 that it had lost nearly £4 million as a result of the abandonment of a statistical project called Assist. One of the problems was that users had too high expectations, and refused to accept it when they found that it did not perform faultlessly. And, according to a study by the Standish Group, $81 billion was lost in the US in one year due to computer projects that went wrong or were finally abandoned[255].

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254 Source: Focus magazine, April 1997, p. 58

255 Source: Computer Weekly, 12 June 1997, p. 18

Furthermore, users need a great amount of support and time before they are able to use new systems. As a result, they spend more time getting used to their computers than actually working. Again, a demonstration of the problems this generates for firms is the fact that in 1996 200 million calls for support were answered by hardware and software developers. These are the calls that were actually answered; computer support firm Dataquest estimates that six out of seven calls in peak times are never answered. With a hypothetical minimum time of five minutes per call, one can estimate that a minimum of 16.6 million hours of work were lost in 1996 due to IT/CMC related problems. It comes as no surprise, then, that five out of ten best selling programs in the US are utilities fixing problems caused by other programs, or that several IT professionals are encouraging users to press S/W development firms for friendly S/W, as support costs for 1996 have been estimated in $4 billion[256].

The exact effect of IT/CMC technology within a firm, therefore, depends on several factors. Collins and Bicknell have isolated ten major factors of IT/CMC disasters. Numbered from 1 to 10, they are:

1. Over-ambition
2. Pride – a feeling among IT managers that they should know it all
3. Presumption – that computerisation must be a good thing
4. Pusillanimity – the character of chief executives who are in position to track the progress of projects, but fail to do so
5. Credulity – taking suppliers' promises at face value
6. Consultants
7. Tailored software – tampering with proven packages can be disastrous
8. Concealment
9. "Buck passing"
10. Lawyers[257]

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256 Source: Οικονομικός Ταχυδρόμος, June 1997, p. 110

257 Collins et al, 1997

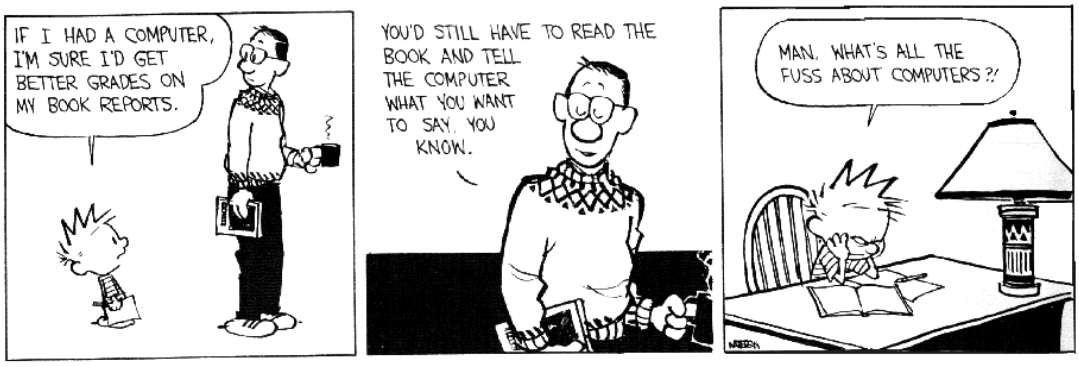


*Fig. 7-3*: Over-ambition is the foremost cause of IT/CMC failure in the workplace, according to Collins and Bicknell[258]

This catalogue shows the diverse nature of IT/CMC development and use in the workplace. Planning and installing of IT/CMC systems in the workplace and then getting the technology into use is often handled inappropriately. There were several anecdotal references to this during the interviews, including one by an architect and experienced IT/CMC user who discovered upon arriving at his previous firm a brand-new computer sitting in its box. Apparently it had been bought two years earlier, but no-one knew exactly what to do with it. The success of IT/CMC implementation, then, depends largely on how well it has been planned, from the users' point of view. IT and CMC can not be separated from the users; careful examination of their needs should actually precede the acquisition of an IT and CMC system. In Norway, participation has been institutionalised through laws requiring workers be informed of computerised systems early on in their planning and design stage, and be given positions on design committees[259].

This, however, seldom happens; too often people have to adapt to the technology they have installed. It is commonly said, and believed, that computer technology must be accepted, that there is no choice. People must be subjected to the constraints and capabilities of new technology as it becomes available. In fact, microchip

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258 Calvin and Hobbes (c) 2000 Watterson. Reprinted with permission of Universal Press Syndicate. All rights reserved

technology is very adaptable and can easily be designed to complement human skills and behaviour rather than determine them. The very nature of actual IT/CMC use can be either "deterministic" or "determining", and this, in turn, can make it successful or unsuccessful.

# Conclusion

In order to understand today's architectural practice, the ways in which IT/CMC are used by it have to be examined in detail. This was attempted by a second set of practitioner interviews, that had the explicit aim of identifying IT/CMC use by different practitioners. What was found through the interviews was that, within current design paradigms, IT has already had an impact on architectural practice; CMC much less so.

The main area of CMC use is the e-mail, that is increasingly used by practitioners as a communication tool. Videoconferencing, however, is not yet used. IT is used in two main separate areas: for the work documents, which are almost universally produced and filed electronically; and for the production of the design presentations and the blueprints. Commonly, it is not used during the synthesis stage, as it is perceived as a limited tool compared to paper for this function.

Through the interviews it emerged that CAAD's impact on design is perceived by practitioners as greater in three main areas. The first is costs and profits, in temporal and financial terms. IT is thought to have allowed great speed in the preparation of drawings, especially in editing them. This has also had an impact on the number of practice personnel. Larger firms seem to have benefited more compared to smaller ones, that often think of IT as a constricting factor, but most firms seem to think IT use will grow in the future regardless.

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[259] Source: Computer Weekly, 12 June 1997, p. 18

The second main area of impact is the design activity itself. This is perceived particularly in the areas of synthesis, where IT is thought to have promoted uniformity in design, something described by some as leading to "boring" design. Others, however, argued that CAAD allowed them to experiment with different ideas while aiding modelling and visualisation, especially three-dimensional one.

The third area of impact also concerns the design activity, where the boundaries between the schematic and design development are seen to be blurring, leading to a single stage. This affects both fees and the time spent in each stage, and represents an interesting paradigm shift.

These areas of impact are due both to the changing nature of the clients' needs, as their businesses change, and to the changes in the way practitioners design. Many practitioners now use IT, and CMC use appears to be increasing. The impact of IT in the architectural practice seems to depend on the type of the practitioner, but not as clearly as anticipated; the distinction did not seem to be between Innovators and Commodity-users, but between Art-oriented and Pragmatic practitioners, the first usually being more conservative.

Also, it appears that CAAD has so far failed to effectively support all stages of design, and is of limited use to the practitioners. It supports the visualisation stages, but is not allowed to play a greater role in the design process, and is just used as a substitute to the drawing board. It is almost never used during the initial sketching stages, and never with the client. It usually plays no part until the design has been largely conceptualised. As a result, it plays but a minor part in the emerging collaborative design paradigm, and is used only as a visualisation tool, and not as a development and collaborative one. It is believed, however, that IT/CMC can play a much greater part in the collaboration between architect and client, allowing them to design more collaboratively and to work closer together in all design stages. The technological shortcomings that have largely prevented this from occurring and the ways in which they may be overcome are examined in detail in the following chapter.

# Chapter Eight

## *The Role Of Technology*

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We need to get away from the notion of technology managing information and towards the idea of technology as a medium of relationships.

*Michael Schrage*[260]

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# Introduction

In previous chapters, it was mentioned that IT/CMC may be able to allow a better collaboration between architects and clients, leading to balanced architecture. The main needs identified included visualisation of the built form in a way easily understood by laymen, and depiction of heating and stress forces in design in a way that will force architects to take more into account practical considerations. Ideally, this would lead to a more equal collaboration between architect and client, even to the point where certain design activities could be performed by the two together.

This is envisioned in an environment that would not necessarily require any more than already existing technology. In this chapter such an environment will be described, as well as the available technology and a similar environment developed by Gross[261]; it is thought that this area could have great potential importance in design. Furthermore, various types of design technology are discussed, and Virtual Reality is examined as a possible design aid. This will conclude the third part of the main hypothesis; that IT/CMC can aid the collaboration between architects and clients within the context of a new collaborative design paradigm.

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260 Schulz, 1997

261 Gross, 1997a, 1997b, 1997c, 1997d, 1997e, 1997f; Do, 1996; Negroponte, 1996

# Available Technology

Modern Information Technology consists of three main parts: Input, Process and Output/Communication. It is the way these are utilised and shared between designers and clients that needs to be critically evaluated. So far, Input has been mainly by mouse. Despite the fact that processing power has multiplied manifold during the last decades and standard Output quality has progressed from 14" monochrome monitors to high resolution 17" and 21" real-colour monitors, input means have been largely identical for more than two decades, with the probable exception of the lightpen, which failed to take off[262].

Progress made in these areas includes pen-driven systems for input, ever increasing processing speeds, and virtual reality (VR) environments for output. Progress in output also includes the area of sound, the only other sense currently utilised by IT (although materials capable of transmitting sensual data are in various stages of development[263]). To this, one should add the recent and unforeseen development of the Internet as a medium of communication. Hailed by many as the greatest revolution in recent years, it still has to fulfil its potential in design collaboration. Still, it has changed the existing paradigms as much as to necessitate the inclusion of Communication as an extended method of Output. In this light, Communication is defined as Output to more than one persons, or more than one media.

# The Need For Change

Anyone having used the mouse knows that is an unsatisfactory sketching input device; the interviews with architects as well as recent research[264] confirmed this. According to many interviewees, this has largely prevented IT from being used

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262 Negroponte, 1996
263 Negroponte, 1996
264 Gross, 1997b

during the initial stages of design, when rapid development of ideas means that an equally rapid response is expected from the medium used to capture the design ideas. There is a very real need for designers to draw, acknowledged in literature[265] and demonstrated in usability studies of the *Archie* case-based design aid and informal observation of users of *Janus*, the *Cocktail Napkin* and other CAD environments; for designers, drawing is a non-negotiable demand[266]. Shone and Wiggins explain this demand as an integral part of the design process. In their words, "a designer sees what is there in some representation of a site, draws in relation to it and sees what he or she has drawn, thereby informing further designing"[267].

In *The Language of Drawing*, Hill emphasises the importance of uninhibited drawing with the following words[268]:

> Unlearn the stereotype that places drawing in the category of Art, capital A! Drawing, most of all, stimulates seeing. It is an inducement to stop labelling and to look... Drawing is essentially recorded gesture: *timid, rigid and conventional patterns of motor release, or gesture, prevent what you see and feel from flowing freely into what you draw*. Thus the student of Chinese painting and calligraphy is taught that "in no way should the brush be inhibited, neither by a feeble nor a stubborn mind, for freedom is the absolute aim. Freedom of gesture exhilarates... Emancipation of mind and freedom of gesture are in effect identical."

This freedom of movement is currently impossible using a mouse, and this poses a problem should one want to use a CAAD system to draw during the initial stages of design; paper would be the natural choice for that. Paper has several other advantages as well, that ensure its primary position in designing. These include its ability to be folded and unfolded to minimise the space it occupies, ease of manipulation, portability, instant response - when one presses a pencil tip on it, one can see the results right away - and universal availability. There are no protocol or compatibility problems, no plugs are necessary, and its weight is negligible. Also, everybody knows how to use it.

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265 see Laseau, 1989; Shone and Wiggins, 1992; Tovey, 1989

266 Gross&Do, 1997c

267 Shone and Wiggins, 1992, p. 156

268 Hill, 1966

Still, there are some disadvantages in paper as well: It is impossible to copy and paste its contents; one has to redraw everything. Furthermore, one cannot easily transmit or share its contents with someone not physically present (facsimile copies are usually restricted to A4 size; any larger sizes need to be scanned – usually in parts – and transmitted electronically, in which case it is much simpler to just do it in electronic form from the start, or to physically produce two copies and mail one, which would take a significant amount of effort and time), while electronic documents can be readily shared with anyone, with no reduction in quality.

It is these disadvantages that are largely responsible for the increasing use of IT/CMC, usually in the form of CAAD systems, in the practitioner's office. There are other factors as well, not the least of which the image one wishes to convey. However, it is doubtful that practitioners would use CAAD if it were not offering something it is hard for them to find in paper. In the survey described in the previous chapter, architects described two main advantages: the ability to draw things that would be too costly in time (and therefore economic) terms, and the ability to easily, fast and accurately edit their designs. This recognition of CAAD's advantages over paper are reflected on the following comments, made by Toombs[269]:

> "…My perception [is] that architect's resistance to CAD is linked, not to an aversion to technology *per se*, but to the means by which this is applied.
>
> Were a facility available whereby the act of drawing could be effected by the use of a pencil on a flat surface, which would record the designer's intention in much the same way as lead runs onto paper, then I believe there would be a strong market within the design professions…
>
> The advantage of this kind of facility would be to recognise how architects actually work in transmuting ideas "onto paper" and reworking options by layering them using sheets of tracing paper, developing an idea to fruition…"

The importance of the need for a new design medium is great, if indeed the suggested collaboration paradigm is to be used. One of the main factors preventing its usage is that, architects first sketch on paper and then transfer that design onto a computer model that allows clients to better visualise built form. Clients wanting to participate in the design activities, then, need to be as fluent as the architect in two-

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[269] S. Toombs, Royal Incorporation of Architects in Scotland Secretary&Treasurer; private letter to N. Rossis, September 4th, 1996 (Appendix C)

dimensional visualisation; something apparently improbable. Their feedback, then, needs to be incorporated onto the existing computer model; a time-consuming procedure, that hinders fluidity in the development of design ideas. Should the architect be able to sketch directly onto the computer, however, this problem would be greatly solved, and the collaboration could be significantly improved, making the design of balanced architecture easier. This is especially the case, since one of the major problems hindering collaboration between architect and client is that, most architects belong to an Intuitive personality type, whereas many clients to a Sensing one. As a result, the former are very good at thinking graphically, but the latter are very poor at it. Use of improved visualisation techniques, therefore, would be particularly helpful in allowing the two to communicate successfully design ideas; something that can have great impact on the design quality: research in England showed that fully 60% of all building problems arise from design errors.[270]

It is important, then, that the need for change is not perceived as an attempt to develop just an improved input system, although this will also have certain benefits. However, what will provide the maximum value to both architect and client is the improvement of communication offered by this new collaborative paradigm. The cost of creating the actual drawing documents represent around 2% of the total project cost[271]. Even if CAAD, 3-D modelling, Virtual reality environments etc., were to cut that figure in half, or even eliminate it, the savings would still not have enough impact to be of vital interest to either architects or clients. What will benefit from these technologies, however, is the quality of the documents themselves. If the building truly meets the needs of the owner, there is an enormous impact on the value of the project, but that is heavily dependent on the effectiveness of the collaboration between the owner and architect. If the construction change orders were cut in half, that could be an enormous difference, but again that is a function of how successful the communication was all involved parties. In Schrage's words,

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270 Freeman, 1975, pp. 303-308

271 Schulz, 1997

"The blackboard may have served us well for hundreds of years, but maybe it's time for a change. The issue isn't *automating* collaboration; it's using technology to enhance the collaborative relationship. Technology here doesn't substitute for people; it complements them."[272]

# Other Media

Except for paper, architects have traditionally used a plethora of other media to express their ideas. The most widely used medium is models, used to demonstrate the three - dimensional properties of the building. However, these can be hard to interpret, as they require a good knowledge of scale; the quaint-looking veranda of a model may easily prove intimidating, dwarfing the rest of the building upon construction. Also, models provide an excellent bird's eye view, but it is people who will be seeing it, from very different angles. Models can be laborious to construct, and even more so to amend. They usually lack a realistic texture, which can often be of immense importance to the 'feel' of the building. And, of course, there is no indication of what the interior space will look like. Models are useful primarily to architects, who have been trained to interpret them as space and volume representations, but can be useless to the untrained layman.

Trying to overcome this obstacle, innovative architects have come up with a number of approaches; for example the use of modelscopes to demonstrate the interior of a building. The most typical one is a combination of two or more communication channels; showing a model while talking to the client using common reference points. For example, the architect could describe a building as "this entrance is as large as that of the National Gallery, and the veranda is twice as wide." This has the advantage of giving the client a number of volumes and spaces he can identify, therefore assisting the model interpretation and conveying a feeling for the scale. However, it can be hard for the non-visually inclined, often belonging to a Sensing personality type, layman to fully comprehend the scale.

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[272] Schrage; in Schulz, 1997

Other imaginative approaches include going to a space known to the client - so he has a good feeling for it - and covering areas of it until a representation of the proposed space is made. At Lloyd's Chatham, Arup Associates had to consider how they would represent their design ideas. At a particular stage, they decided to use simple sheets of brown paper in their offices to indicate ceiling heights. As they comment, "these important elements of the design would have been difficult if not impossible for most people to visualise from drawings alone."[273] Apart from that, normal models were also used. However, the architects made an interesting distinction explaining that they used the brown paper approach not as a design tool, but "to what is required for the client's 'education'". Seeing their models in this twin role, they described them as "an invaluable aid not only to the design process but as a means of helping the different Lloyd's representatives to comprehend the proposals."[274]

At another stage, they used mock-ups, "the ultimate method of presentation"[275], as they define it. They built a full-scale mock-up of the dining room, and even sat on a table and had a full-course meal, to fully capture the feelings generated by it. Although by far the most expensive method, they decided that on larger projects like Lloyd's, it could be justified because of what they saw as "its value in developing the design, identifying the most effective construction methods, and enabling the client to fully understand the proposals before committing himself"[276]. Furthermore, they thought of it as a useful tool for marketing space to potential tenants. The reason they chose this solution despite its price, is that they believed mock-ups to be particularly useful where the building process involves a good deal of repetition, as in Lloyd's. They found that many of the problems which arise during the experimental stages of the design process were identified early, and solved. De-bugging was dealt with in a more relaxed atmosphere than when adherence to the programme is at risk; therefore, it was deemed money well-spent.

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273 Blackmore, 1990, p. 59
274 *ibid.*
275 *ibid.*
276 *ibid.*

It is interesting to note why they chose not to use computer modelling. Although they acknowledge that computer modelling has greatly enhanced the opportunities to show the client what different aspects of a building will be like, and has enabled him to be 'walked through' chosen parts of the interior, they confess to an element of unreality attaching to much that appears on a video screen, explaining that extra care needs to be taken to ensure that the viewer understands it properly. A counter-argument may be that people are used to media like television, and the danger of misinterpretation may have been exaggerated, but it nevertheless points out a perceived failing of the Output means available to IT users.

## Use of IT/CMC

Computer graphics have been a relatively recent development. Heavily visual industries like advertising and entertainment have been among the first to push their limits; it is commonly claimed in the computer industry that the best in computer technology can be found in games and game consoles. Areas like architecture and engineering have been justifiably reluctant to take advantage of still experimental techniques; a mistake in the design of a building would have far more important consequences than a mistake in a game. Still, most practitioners interviewed employ IT/CMC in their offices; while those who do not actually use it, have considered the possibility of doing so. Although the actual extent of IT use by design firms can be debated, the fact that this use will increase seems certain.

As discussed before, however, the key question in IT use is whether it is being put to its best possible use. IT and CMC open up a range of possibilities, few of which have been adequately developed. Certainly, no-one seems to be using IT in a collaborative paradigm such as suggested above, to create balanced architecture. One factor is that the technology is at a stage of rapid development, and there is not enough time to explore existing methods of operation, before it is time to move on to something new. As a result, people's attitudes change at a much slower pace;

practitioners simply cannot adapt fast enough. There is much anecdotal evidence that suggests that computers have often been bought at considerable expense only to be under-utilised or even not used at all, due to poor planning and to a basic failure to understand how they could be used profitably. The lack of understanding of the nature of the learning curve involved is a common problem, as people often make the mistake of thinking computers would simply take over and do their work for them.

It seems, however, that lately the situation has changed significantly. In the interviews, practitioners appeared to have learned from past mistakes, and to usually have realistic aims for IT/CMC. Also, it appeared they have come to expect less from IT. Still, the negative side of this scepticism, is that practitioners may fail to realise it when a genuine change can occur. The Internet is one such case; almost no-one had foreseen its growth, and as a result many firms were originally unwilling to invest in it.

As a further result of this failure, practitioners may tend to under-utilise existing technology. For example, relatively few designers use animations and walkthroughs. Or, many practitioners use the same simple primitives and meshes on a dark background for their CAAD files. However, if a simple photograph of the surrounding area were scanned into the background, it could provide an excellent source of information about the blending of the proposed design with the surroundings. There are certain advantages to this medium that are impossible to find in any other one; apart from animations and walkthroughs, these include editing capabilities unique to electronic media.

There are other failings in the use of IT/CMC by the architectural community, as well. The “if it isn’t broken, don’t fix it” attitude quoted by an interviewee, has the potential to stifle a practice. One of the firms interviewed used mail and messenger services to transmit their plans to and from construction sites, despite the fact that they had already bought computers for both the sites and the headquarters. Upon questioning, it was found out that at some point before 1990, they had examined the

possibility of acquiring modems; but modems were significantly slower then. Understandably, they found their speed unsatisfactory, and the idea was not followed. Believing that technology had remained stable, they did not think of re-examining that idea in light of the new advances – namely affordable ISDN lines and fast modems. Whenever these changes were mentioned to people in the firm, the standard answer "we tried it back then, and it didn't work" was given. Failing to realise how fast technology moves, they are still reluctant to fully utilise their resources.

This is understandable, especially with commodity users that tend to wait until technology has become significantly transparent before they first use it. Still, innovators always push the limits in their effort to develop new ideas. When the first multimedia applications were developed, they were little more than books-on-screen. Quite soon, however, they evolved into virtual environments with Internet links. The same seems to be happening on a larger scale. As practitioners become more fluent in their use of IT/CMC, they seem more eager to experiment; this should lead to improved use of the available technology. Three key impact areas can be identified. The first involves information *presentation*; i.e. virtual environments and free animations (instead of prepared walkthroughs) can be used to present information. The second area of impact involves information *creation*; i.e. the way that information itself is being created, as in Input means and novel human-computer interfaces (HCI). The third area is that of information *sharing*; i.e. in the way networks are being developed and used to communicate information rapidly throughout a company (as is the case with Intranets), or through the world (as with the Internet). Each of these three areas will now be examined in detail.

## Information Presentation: Output Changes

The first area of impact, and perhaps most developed recently, involves the way information is being presented by the computer to the designer and the client. This is of major importance, since it directly influences the ability of architect and client to

collaborate in an equal level, leading to more balanced architecture, even if they belong to shadow personality types, especially where Intuition and Sensation are concerned. It is very encouraging that IT is already being used by companies selling furniture and kitchens in a collaborative design manner. Clients are encouraged to bring the dimensions of their space, and then furnish it with the help of trained personnel using custom-made software. In a similar fashion, architects could quite soon be using IT to achieve better design solutions with the help and collaboration of their clients.

Throughout the various design phases, architects find themselves performing a variety of tasks, ranging from the most creative to the very mundane. When computers were introduced to the architectural profession, it was hoped that they would free architects of the mundane, manual tasks. Use of CAAD has grown dramatically over the decades, as the technology has steadily improved. It has aided in the automation of tasks and in the management of information, especially in the later phases of the design process.

The most promising of the Output technology advances is arguably that of Virtual Reality (VR), and therefore it deserves to be examined in more detail. Designers and clients using a virtual space could have the ability to explore together the space, in a way natural to both. As such, it could provide a common language, something currently missing, but much needed, and as a result, they would be able to design together. This is already happening in some areas, with excellent results, although only to a limited extent in architecture. An engineering company using VR to develop virtual prototypes, describes the development process as follows[277]:

> "A customer can experiment with seat positioning or reach for controls, just as they would in an actual full-size model. Recently, we were able to … show a customer two different machines from the same family of equipment. The customer was able to evaluate the aesthetics of the two machines by using the virtual prototypes, and, because [VR] provides a true sense of scale, to recognise the size differences".

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[277] Interview with Brian Rauch, Computer Weekly, 28 August 1997, p. 24

For balanced architecture through an equal collaboration to be possible, the most important change brought on by improvements in visualisation is the alleged democratisation of the design process. People with limited engineering background can now participate in the design process and provide input before expensive resources are committed.

So far, VR has been implemented in a small number of cases in architecture, that highlight its potential. These include the following:

- As marketing and presentation tool by furniture companies in Europe, Japan and the USA.
- At the University of North Carolina, VR technology was used in a church addition walkthrough. Later it was appropriately used in the design of the University's new computer science block, Sitterson Hall. Hardware consisted of a helmet containing visual screens and a steerable "treadmill" operated by the user to control speed and direction.[278]
- The VPL (Inc.) Virtual Reality system was released around 1989. It was used commercially in Matsushita's Shinjuku store which sells kitchens in Tokyo.[279] It was also used in the Berlin-based multi-media centre, Art and Com.[280]
- In Australia, the Advanced Computer Graphics Centre at The Royal Melbourne Institute of Technology is notable for its research into VR technology. They describe themselves as a "Research group specialising in high performance 3D real-time computer graphics and its application to HCI (Human Computer Interface) and application domains such as design. VR is a natural component of our work."[281]

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278 Sherman & Ludkins, 1996

279 *ibid.* p.65. Despite many technical drawbacks - the cartoon-like graphics, bizarre noises and no tactile resistance - the "demo" is popular and helps the company sell kitchens, if only through the publicity surrounding the project.

280 *ibid.*, p.70. The VPL system was far more refined than that used previously in the Tokyo kitchen display showroom. The graphics were more crisp, sounds more realistic and movements more controlled.

281 *ibid.*, Interview with Leong Lin.

- At the University of Washington, an addition to a building was designed using existing virtual reality resources[282].

The latter will be examined in detail, as a case study in the actual use of VR. It has been chosen because it is recent, very well documented and demonstrates the qualities of VR and the problems its users face. Unfortunately, VR does not seem to have been tested in a collaborative paradigm such as the one described here yet. All its uses seem to be one-sided; expert designers using it among themselves.

# A Case Study in VR

In 1994, and as part of an eight-week design studio project for graduate students of architecture at the University of Washington, an addition to a building was designed using existing virtual reality resources. In addition, the design implemented with VR was compared to designs implemented with more traditional methods. Both immersive and non-immersive VR simulations were attempted[283].

The goals of the project were to explore how architects can use today's virtual reality technology in the early stages of the design process, and to examine its advantages and shortcomings. In addition to a general observation of the use of VR in the design process, the exploration focused on four issues. These were:

- The effect of the type of interface (immersive or non-immersive) on the designer's ability to study the design.
- The effect of the level of abstraction of a complex 3-D space on the perception of that space.
- The utility of VR as a design medium during the earlier phases of the design process.

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282 Campbell et al, 1994

283 *ibid.*

- The utility and acceptability of fly-throughs as a tool for representing and presenting architectural designs.

## Methodology

The designs from the class were developed from schematic design, through design development, to presentation and evaluation; it was not intended that the project included detailed development or the production of construction documents. The design represented with VR technology was compared to designs generated by other students, whose projects were designed by hand and with traditional 2-D and 3-D CAD.

In its earliest stages, the design was developed with sketches and small physical models. The information from these was input into a CAD modelling program. The database from the CAD program was then exported and converted for use in real-time fly-throughs with VR technology. These simulations were recorded onto VHS tape for record keeping and for further study of the design; a detailed journal of the design and simulation processes was also kept for later analysis.

The design was developed over several weeks, and each week a fly-through was conducted and recorded. It became apparent that the delay between the conception and visualisation of design ideas did not provide direct or immediate feedback in the design process. However, the simulations did provide a way to examine the CAD model and detect flaws in its construction. The simulations allowed the opportunity to evaluate design elements such as proportion, scale, and order; these things were not immediately apparent to designers using CAD models alone.

## Project Results

Throughout the project, a number of comments were made that demonstrated that a different paradigm was indeed leading to differences in the design. For example, about mid-way through the process, the realism of the representation was enhanced. The urban context of the design was represented by massing models, and abstract

elements of trees, furniture and people were added to enhance the sense of scale. By making the furniture transparent, they were able to evaluate the spatial implications of the design with and without the furniture; something believed to be a "useful design feature"[284].

This ability had an unforeseen side-effect: it was found that the use of VR early in the design process forced the detailed development of the interior space as much as the exterior. By having the opportunity to "go inside" the design, the designer "was forced to solve complex connections and details which would not have been apparent with other media"[285]. As a result, the design "developed much more than those of other students not using VR as a design medium. With VR, the designer had to develop the entire three-dimensional model to a convincing level of detail, whereas other students concerned themselves with only specific views and details"[286]. Apart from leading to a higher level of detail, it was found that the use of VR led to the designers adopting viewpoints that could not be easily achieved in the real environment. This proved to be useful for inspecting interior details, and for evaluating the building from a number of viewpoints, thus offering "a better perception of space and the opportunity to see the design from the inside"[287]. As a result, the designer was able to perceive spatial characteristics of the design that may not have been apparent with other design media; "three-dimensional media enhance the perception of three-dimensional space"[288].

The weekly videos of the walk-throughs as the design developed, gave the critics the opportunity to visualise it as it progressed. The videos "replaced the need for physical models and made clear what was not apparent in CAD drawings. The response from design juries was very positive… [They often found the videos] very convincing and conveyed that the design would make a very believable building…

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284 *ibid.*
285 *ibid.*
286 *ibid.*
287 *ibid.*
288 *ibid.*

[and were] able to visualise one's design intentions more clearly with VR than with traditional means of representation"[289].

## Comments

From the project results, some interesting conclusions can be drawn. It was claimed in previous chapters that IT can be used to allow clients and architects to better visualise the built form, while forcing the architect to take into account practical considerations at an early stage. These claims seem to be validated by the experiment results. The students were was forced to deal with details early on. Although the VR model used did not provide heating and structure feedback, it can be assumed that they would have been forced to deal with these factors at an earlier stage as well, should they have been presented to them.

Furthermore, a better perception of space was mentioned, which supports the claim that it could aid visualisation. If architecture students found they could benefit from use of VR to better perceive space, one may assume the same would be true for laymen as well, although further research would be needed to verify whether Sensing personality types would benefit as much. Still, the view that this would, indeed, be the case is further reinforced by the fact that the juries, some of whom may not have belonged to Intuitive personality types, decided there was no need for physical models, since they could visualise one's design intentions more clearly with VR than with traditional means of representation.

These results allow one to be optimistic that balanced architecture through use of IT to achieve an improved collaborative design is a realistic possibility. At the same time, however, further recommendations made show that the technology has not matured enough for VR to become mainstream yet.

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289 *ibid.*

These recommendations can be divided in two categories: one, the technical ones, and two the theoretical ones. Technical recommendations include the need to develop a Head Mounted Display with higher resolution; also algorithms which can abstract detailed geometry in a way which retains the aesthetic character of the represented object; and finally to develop inexpensive VR systems that accommodate multiple participants and real-time communication. The weight and cost of the display and the technology necessary prohibit its use; however, all these problems will most probably be solved with time, as IT becomes more powerful, and new algorithms are developed.

The second group of recommendations is more important, however, as it shows a need to change paradigms. They involve topics that need more research, and are not of a technical nature, including the need to develop methods for moving through virtual environments which do not contribute to a decrement in the sense of scale of space; and to develop a "hyper geometry" format for management and display of complex databases; as well as immersive world-building toolkits for use by architects and designers in virtual environments.

The problem behind the need to develop better methods for moving through virtual environments can be solved relatively easily, as computers become faster and higher levels of detail become more easily available, adding to the realism of the design and conveying an accurate sense of scale. The development of a "hyper geometry" format, however, is part of a larger problem, that of data visualisation and interfaces. Researchers are trying to develop new paradigms for data management. For example, interfaces that take advantage of the ability humans have to remember where objects are in 3D space are being explored in spatial data management research[290], and more recently researchers have begun to consider whether it is possible to transfer some of the cognitive load to the perceptual domain[291]. As well as graphical output, other possibilities include the use of sound within virtual

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290 Lippman, 1980; 1981

291 Robertson et al, 1991.

environments; it may be used, for example, to relate directional cues corresponding to virtual world events, or to provide audio feedback in response to user interactions, as demonstrated in the AVIARY project[292]. This facility was used in a recent research project which modelled the acoustic properties of 3D environments in real time[293].

## Virtual Space

The problem of the development of immersive world-building toolkits is effectively a paradigmatic one. An important change in paradigms is that of our concept of space. The basic advantage of the virtual environment is that it may be as real as 'real' space, but the reality of space depends on the kind of space one is talking about. As many researchers have pointed out[294], there are different kinds of space. Most people distinguish between at least four different kinds:

1. *Sensing space:* the space we communicate with using our senses, for instance the view of the room in which we are now, and the sounds around it.
2. *Conceptual space:* this same room as we think of it when we close our eyes or when we go to another room. The space which an architect can 'see' mentally from a plan and a section is also a conceptual space.
3. *Behavioural space:*the space in which we can move around. A hole sawn in the floor of a room forces us to walk around; as a result, the behavioural space is more restricted than before, although the sensing space remains unaffected.
4. *Physical space:*the continuum to which the laws of physics apply. For example, the physical space contains the air inside a room. If we open a window, we connect this body of air with the atmosphere outside; as a result, the room may become cold and draughty, although the conceptual and behavioural spaces remain unaffected.

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292 AVIARY - A Generic Virtual Reality Interface for Real Applications

293 Binns, 1991.

294 Russell 1948, Beth 1950, Bollnow 1963, Prak 1968, Prak 1977

To these, a new space is now added, the *virtual space*. This is the electronic, non physical space inside our computers, that is possible to access using special interfaces. Physical laws do not necessarily apply here (unless specifically programmed into the model), and there is a level of freedom impossible to duplicate in reality. However, it can be argued that this space is equally "real" as the other four, and this is the space to which virtual reality is referring. Interestingly, except for physical space, the other three kinds of space may be demonstrated in virtual space in exactly the same way as in real space. For example, the space one enters when wearing a head-mounted display, may look the same as the real one (sensing space); he may also be able to look back and see the back side of the room, as he remembers it (conceptual space); and he may be unable to walk through a wall (behavioural space). The physical space itself may be *demonstrated* through the other kinds of space; for example, the opening of a window may result in the sound of the wind rushing into the room (sensing space 'mimicking' the change in the physical space). This emphasis in the emulation of sensing space is what makes this approach so appropriate to Sensing personality types. Furthermore, as technology progresses, it may even be possible to add more senses to virtual space; for example, one may be able to feel the wind as a chill on his body, or smell the sea if opening a window overlooking a digital ocean, thus making it a perfect visualisation tool, even for Sensing personality types.

# Information Creation: Input Changes

One major problem facing designers using VR is the lack of appropriate design paradigms. To be able to develop a virtual environment, one needs faster development tools, and a knowledge of how to use them. If the proposed paradigm of architect-client collaboration and easier development of balanced architecture is to be practical, the rapid construction and manipulation of virtual elements in virtual space is necessary. This necessitates a change in both the input paradigm and interface. There are currently a number of available interfaces for inputting visual information to a computer. These include the keyboard, the mouse, the lightpen, digitising tablets, touch-sensitive screens and scanners.

All these have one disadvantage in common: they are inadequate when fast visual input is needed. That is why they are not used in sketching; paper is still the best medium for this. It is unthinkable to designers that they will have to pause before sketching a line, input a few keystrokes or click the mouse and then move on to the next line. That is the reason why all practitioners interviewed claimed to be disappointed with current computer capabilities, where sketching is concerned. The best available method of inputting information is perhaps the lightpen, but that has the disadvantage that, unless one is drawing on a laptop resting on one's lap, the posture is uncomfortable for the arm. The second best method is probably the digitising tablet, used with a touch-sensitive stylus. However, this requires some training for the hand-eye co-ordination to be perfected, before the unfamiliar act of drawing on the tablet while looking at the screen can become fully transparent. This is a more generic problem, not limited to CAAD, as demonstrated by the recent success of Personal Digital Assistants (PDAs), designed explicitly to be "better than paper"[295]. These use a touch-sensitive display with a stylus to allow rapid input of data.

The success of this approach in relation to design activities was confirmed by Gross' series of experiments using a tablet-pen combination. It was found that users of a new interface developed using a digitising tablet with a touch-sensitive stylus needed a significant amount of training before users were able to use it successfully. Much of that time was devoted to learning the feel of the tablet-pen ensemble, the pressure sensitivity range of the pen, and adjusting hand-eye co-ordination. His team observed shorter learning periods when they put paper on the tablet and ink in the pen and encouraged users to ignore the computer monitor and look only at the paper. He concludes: "This suggests that using a touch sensitive display (as in notepad computers) would shorten the learning period"[296].

The best input scenario would involve direct input/output in a virtual environment. An example of this is found in the AVIARY report[297], where the reader is asked to "imagine a system in which it is possible to sketch in 3D[298]". Few new 3D design paradigms have been proven effective; one of these cited in the AVIARY report is the PDMS[299]; a piping design program to design chemical plants. Complex networks are assembled from a library of parts, interconnected by varying lengths of piping. In a similar VR application, one would be able to "construct such a design, ideally using voice input to call down appropriate parts, and plugging them into their correct positions and orientations with a dataglove. Design rules could be applied to each connection, and tolerances, accurate positioning, and lengths of piping could be checked"[300]. However, such a system does not exist yet, and has therefore never been tested against reality. Voice recognition is still far from perfect, and it may well be that the technical constraints are still too great.

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295 Marketing logo of 3Com, and the stated design aim of Palm (formerly Palm pilot).

296 Gross, 1997b

297 AVIARY - A Generic Virtual Reality Interface for Real Applications

298 Schmandt, 1983

299 CADCentre Ltd, High Cross, Madingley Road, Cambridge CB3 0HB. PDMS, Piping Design Management System.

300 AVIARY – *ibid.*

Still, it would be wrong to ignore the potential it has. If implemented successfully, it could prove an excellent medium for design. It is certainly true that attempting to present certain types of information in two dimensions can be very difficult. Three-dimensional rotation is often used to convey geometrical shape, and animation is used to show time-dependent behaviour. With the addition of colour, a variety of symbols and other display techniques, the overall effect can become too difficult to comprehend, resulting to a cognitive processing overload[301]. VR may have that the potential to remove part of the cognitive load and replace it with perceptual processing, thus aiding both designer and client.

Until VR has had a chance to mature, however, an alternative input interface should be developed. Three-dimensional graphics have been researched for over thirty years. One prevailing problem has been the manipulation and development of a three-dimensional world through a two-dimensional, flat screen. With the exception of Negroponte's work at the MIT in the 70s, few attempts have been made during this time. More recently, Gross' development of the *Napkin* is a step in that direction, but even this is based on Negroponte's work; indeed, it is very surprising that there have not been more attempts to create a better input interface. A description of what such an interface should include, and what consequences its use might have, is provided in the following part.

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[301] Feiner and Beshers, 1990

| Input Method | Advantages | Disadvantages |
|---|---|---|
| | | |
| Keyboard | Common interface | Long learning curve for first-time users; Obtrusive in design |
| Mouse | Common interface; more natural than keyboard | Inaccurate; Obtrusive in design; "designing with a mouse is like drawing with the tip of your nose" [302] |
| Tablet | Use of natural pencil and paper metaphor | Needs special training due to the unnatural eye to hand co-ordination |
| Lightpen | Use of natural pencil and paper metaphor | Unnatural and tiring posturing |
| Touch-sensitive display with pen | Best use of natural pencil and paper metaphor | Expensive in large sizes; difficult to carry around |
| VR environment | Integration of input and output | Still experimental; new metaphor means long training curve |

*Table 8-1*: Comparison of Different Input Devices

# Virtual Pad

## The Case for an Alternative Input Interface

The need for the development of a better sketching tool was demonstrated above. From the interviews with practitioners, it emerged that what they need in order to feel aided by a CAAD system at the initial design stages, is something that will not disrupt the creative process in any way. Furthermore, ease and speed of development is all-important if the designer and client are to act collaboratively during the design process. VR may prove to be successful in this, but so far it is too early to tell whether it will indeed fulfil its potential. Therefore, right now pencil and paper are

[302] Comment by an interviewed architect, Ben Tindall, of Tindall Architects

ideal for this, but useless when one wants to repeat certain elements, if one needs to use something already drawn in the past or if one needs to share the design with someone not physically present. This also disrupts the creative process. What designers want, is a medium that will be completely transparent, that is, they will forget it is there at all times, but which will also allow them to cut, copy, insert, paste and forward. In other words, they need a paper with computer editing facilities, connected to a network.

As mentioned in previous chapters, that there can be a significant difference between the concepts in the minds of the designers and clients, and the actual building. Differences in personality types make the communication between the two even harder. So, both practitioners and clients ideally want to be able to see what the rough sketch will look like, if it were to become a finished plan. Some evaluation of properties such as lighting, structural integrity, heating and compliance with the building regulations would also be very helpful, even during these early stages. It would be better to be able to weigh a design idea against reality the earliest possible, instead of making costly changes at later stages. The current process involves the development of the design through all the stages, after which comes the evaluation. This way, many problems can only be discovered after the building has already been built, and any changes can only be made at great expense. This also stifles creativity. Practitioners want to be able to see the final plan while designing, when they are still working the idea in their mind, and it is still flexible.

As known to researchers of CAD and Artificial Intelligence (AI) systems, these ideas are hardly new. These, as well as much more ambitious ideas, have been tested in the past, with limited success. That is usually the reason why there is limited interest in the area at the moment. However, two major changes have occurred since, that need to be taken into account: first, that technology has evolved to the point that the most powerful machines used through the 70s and even the 80s seem incredibly slow, and the rate of evolution seems to be increasing. And second, many of the initial CAD experiments were over-ambitious. Although it is possible we may still

find a way to imitate the creative process, it has been realised that it is not feasible at the moment. Therefore, a new system should make no such attempt; the burden of creative design resides with the practitioner, and the system should used as a tool. This may represent a backtracking to some people, but it seems a reasonable approach.

There are two major components to any system that aims to improve the input process while aiding the designer: first, the actual hardware involved, and second the software responsible for the recognition and manipulation of drawn objects.

## System Description

Several attempts have been made to write software that will create such a system. Some are pretty simple, while others involve complex Virtual Reality models, goggles etc. One area these attempts have focused on, relates to the creation of a flexible, paper-like or drawing board-like medium, that will allow one to draw on it, as if it were a paper. This drawing board would serve as a touch-sensitive screen. Although this would be ideal, there are still technical problems with it, such as the designer casting his shadow on the board, the viewing angle causing problems, video camera distortions etc.[303] Still, the paradigm of a digital drawing surface used with a pen, would provide the most natural way of design. Information would be processed in real-time, and feedback would be offered. The output would ideally be through the construction of a virtual environment. This would allow for the maximum degree of freedom on the behalf of the designer, as well as the maximum collaboration between him and the client. Such a system can be called 'Virtual Pad', and should be relatively easy to construct.

### Input/Output

The main problem facing the developer of a 'Virtual Pad' is that of the screen: large screens are still hard to manufacture, and as a result are expensive. Research on

flexible screens is going on at Cambridge[304], but it will most likely still be years before something marketable comes out of it. Yet, a simple LCD screen with a pressure sensitive stylus would also be a successful interface, albeit with the twin disadvantages of relatively small size and difficulty of transport, if not on a laptop. Still, it is far more natural than most other approaches (see Table 7-1). For example, when one uses paper, one stretches it on a hard surface, anyway. And colours would not be necessary; since most designers sketch with a simple pencil, a significantly cheaper black and white LCD screen may be used. Alternatively, there are inexpensive layers that can be applied to an existing screen, adding touch sensitivity. Therefore, it would be a natural and inexpensive interface, readily available with today's technology.

### Software

This leaves the question of the software a practitioner needs. An application of this type would generally consist of a number of elements, that can be roughly classified into two categories: the input/output elements and the evaluation elements. The first concern the recognition features and the translation into a CAD model. The second, the various ways a construction can be evaluated. As mentioned before, these include lighting, heating, structural integrity and compliance with building regulations.

An attempt to create the first is the "*Cocktail Napkin*", developed by Mark Gross. Although his work is still experimental, it provides invaluable insight into the nuances of such software. The "*Napkin*" is a recognition software, used by designers to convert their initial sketches into plans, therefore aiding them in the visualisation process. His findings offer valuable insight as to what is needed – and, more important, what is *not* needed – to accomplish the aid asked for by practitioners. From his work, the following five points can be summarised[305]:

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303 Hoon, 1996

304 Negroponte, 1996

305 as summarised from Gross, 1997f; Do, 1996a and Do, 1996b

- First, designers use only a small set of basic geometric shapes such as ovals and rectangles, lines and hatch marks.
- Second, a small set of symbols is used in conventional ways to represent sun, lighting, sight lines, noise, furniture, walls and windows, doors, and people.
- Third, designers interpret other designers' diagrams or texts about architectural concepts in a similar way.
- Fourth, designers reveal a preference for drawing either a sectional or a plan view to illustrate different concepts.
- Finally, use of a touch sensitive display (as in notepad computers) would make the input process more natural.

From these, two main guidelines may be surmised: first, that a computer based diagramming tool could provide limited pattern recognition facilities only, and still be useful to the majority of designers. Second, that the preferred means of input would be a touch sensitive display with a stylus. This means it should be easy to create using existing resources.

### The World, the Laws and the Objects

In order for the virtual environment to be realistic, a number of 'physical laws' should be introduced into the model, referred to here as *world*. Collision detection is an important one, although one might wish at certain times to disable it. A world may contain *objects* whose *behaviour* is governed by the 'laws' of that world. These 'laws' express the relationships between the objects themselves and between the objects and the user; for example, an opening on the wall may enable the user or another object to pass through it, but a closed door may not. Each object will carry its own *properties*, and will inform the world, which will then apply the 'laws' according to these. However, the world itself will have its own fundamental set of default properties, that may be applied to any objects that do not have their own set of properties. This could be useful should one wish to update the list of objects, importing new ones, but then neglecting to define their properties.

These properties would have to include shape, size, mass, colour, texture, location, and velocity (if the world is to include moving objects and not be limited to static ones) as fundamental properties of an object. Default properties may be for example that an object is static (velocity=0), blue, 100% of its size unless too large to fit the world, and located at the centre of the room. The properties for the world would define the laws operating in it. If, for example, a simple 3D world follows the basic Newtonian laws, this defines the default behaviour of objects in this world. If a particular object is to behave in a more complex way, perhaps with deformation, then some modification of the default behaviour of this object must be made. This new behaviour need only be invoked in situations where it applies. For a deformed model this would be on collision for example. When the new behaviour is not applicable, the object can be left in the hands of the world model.

### Process

The end product should be light, cheap and with software smart enough to be able to aid the designer. Its use is envisioned during the collaboration between architect and client within the collaborative paradigm developed earlier. During a number of design stages, architect and client would use the product to rapidly visualise and develop the built form, making changes through a collaborative, interactive process that would aim in the development of balanced architecture. This would be of particular help if one or both belong to Sensing personality types, allowing them to visualise the built space in a far better way than if simple plans were used.

The main function of the software would be to “translate” the original sketch into 3D CAAD model objects, so as to allow for easy editing and improved visualisation. Doors, windows and furniture would be “understood” and substituted with exact representations, probably from an existing library, and these would now be easily changed in shape, position or otherwise edited, being objects.

The designer and the client would then look at the plan, and feed back to it, editing his original sketch, and so on. Minimal sophistication is required – Gross’ five points mentioned above mean that the application needs only to recognise a

limited set of shapes, which the architect would learn. Since only the architect needs to input the changes, no training of the client would be necessary, IT providing the common language for the two. Also, and since internal volume visualisation is what is currently lacking most conspicuously, a simple extrude feature of a plan would suffice to generate that. Therefore, the practitioner would sketch a 2D floor plan, which would be transformed into a 3D model by extrusion at a given height (e.g. 3 m). Such programs already exist, but lack an intuitive interface. As an architect said, "drawing with a mouse is like drawing with the tip of your nose". To this end, something as simple as a touch sensitive monochrome Liquid Crystal Display (LCD) Pad could be used.

### Limitations

In the above descriptions, there are a number of built-in limitations. For example, only a small number of shapes can be recognised; the extrusion of the plan can result to only certain forms of buildings being developed etc. These, however, are thought to present little trouble for most buildings. In most cases, modern buildings have perpendicular angles, and walls of the same height. However, since a designer will most likely want to visualise an unusual design, the proposed system should be able to support it. Therefore, it should support manual operations and editing of the 3D model. This can be done either in the same environment, or in an alternative modeller. The idea behind the 'Virtual Pad' is not to replace existing CAAD S/W altogether, but rather to complement it, offering an alternative means of input and the tool that the new collaborative design paradigm can use. To ensure this, the application should be able to import/export models and their properties in any of the industry standards (e.g. VRML, FACT (Electric Image), LWO (Lightwave), DXF (AutoDesk), DOG, OBJ (Wavefront) etc.)

Naturally, this will necessitate the interruption of the collaboration until the detailed plans have been produced; something that the designer would have to do on his own. It may be that a more advanced S/W will be able to meet these needs for details more successfully. Still, even in its simplest form the S/W will still be able to

offer both architect and client a rough visualisation of the built form and an editing tool that surpasses a two-dimensional sketch on paper.

### Modules

The S/W description offered here is modularised. This is done mainly for descriptive purposes, although they may also be actual modules, combined to create a single program. The modules are as follows:

#### *Computer Mediated Communication (CMC) Module*

CMC capabilities could be built-in, or the environment could collaborate with de-facto Internet videoconferencing standards, such as CU-Cme, NetMeeting etc., allowing integration with existing videoconferencing tools. This would allow the S/W to become a collaboration tool both among architects and among architect and client, should they be unable to meet in person. As it is believed that this area will become increasingly important in the future, it is important to facilitate export of information to Internet tools. The CMC module would ensure this.

#### *Model Making Module (MMM)*

This is the main working environment, that would really consist of four parts:

- The first part is the **input/editing** of the sketch. This should be made in as natural a way as possible; for example, the back side of the stylus could be used as a rubber. The need for ease of input has been described above, and this is the part that will benefit from it.

- The second part would be the **object recognition** S/W, that would allow lines drawn on the Sketch Pad to be translated into architectural objects, such as doors, windows etc. The designer should be able to define his own shortcuts and objects. For example, one architect may use two parallel lines to depict a wall, while another one may wish to use a single one for the same purpose; both should be able to 'train' the system to understand their sketch. Furthermore, it should be possible for a designer to enter his own objects; for

example, a certain type of window should be able to be imported from another 3D CAAD S/W. Objects in DXF or DOG format should be recognisable.

- The third part is the **substitution** part, that involves the substitution of the hand-drawn elements by pre-drawn elements, from an in-built, updateable library.

- The fourth part involves the easy **transition from 2D to 3D**, preferably automatically. The generation of a 3D model from 2D plans is currently a complicated matter, but it could be made much easier. For example, once the floor plan is completed, the walls could be extruded, creating a 3D space. Then, windows, doors and other openings recognised during the third stage, could be imported into the environment. Ease of drawing is not needed here, and editing these (for example, moving a door) using the mouse would probably be a better input device. This would allow the rapid implementation of alternative suggestions, encouraging clients to take a greater part in the design process, thus creating a *de facto* collaborative design paradigm.

### *Editing Module*

Once the sketches are completed, it should be possible to edit the generated environment. Apart from simple edits like those mentioned above, it is possible to expand the S/W's capabilities to include more sophisticated object editing, such as node editing in 3D. The objects and their attributes should be editable as well, and this could be performed by the same module. The world itself and its attributes and laws should be able to be defined at this level, as well as the default properties that should be applied to objects. The shape of the objects could be interpreted as another property, but it should be possible to make changes to this in an alternative CAAD S/W, and then import the result into the 'Virtual Pad', in order to define its properties.

### *Feedback Module*

This environment would ideally be complemented by a module that would visualise feedback concerning lighting, energy consumption and structural integrity. This would greatly enhance the usability of the S/W, as it would enable the practitioner to rapidly examine a number of different design ideas, keeping the ones that excel from all points of view. If developed, it would be the most sophisticated module of the whole S/W; however, a number of programs already offer such calculations, albeit in a 2D output, that can be improved. Figure 8-2 depicts the wind speeds at Holy Island. The use of multiple colours is an efficient way to graphically represent such data, but the visualisation is limited in two dimensions, which can be misleading. The envisioned feedback module would combine such representation means with real-time walkthroughs that would allow a fuller exploration of space properties.

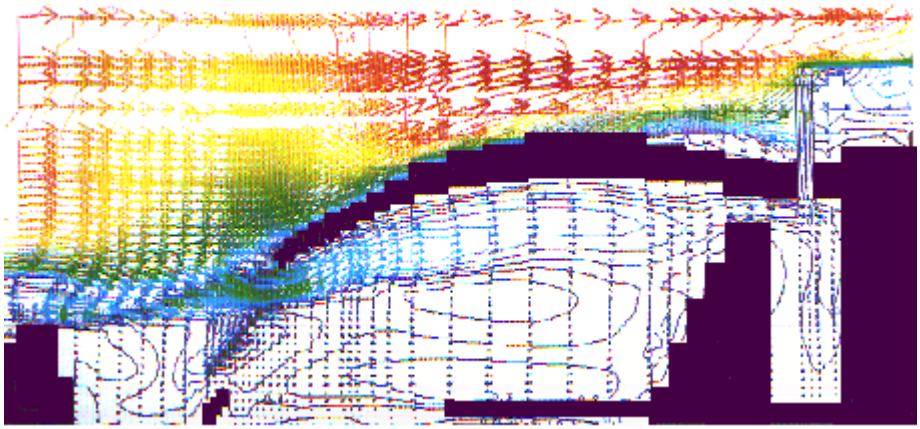

*Fig. 8-2:* Graphical representation of wind speeds at Holy Island

Ideally, a VR environment would be generated by the model making module, to be viewed by the client. The architect will also need to share this environment, which means there will have to be two screens and one VR helmet: the VR helmet would be used as an output device for the client, one screen would allow the architect to share the client's view, and the second screen would be the LCD screen, on which the architect will implement any suggested changes (Fig. 8-3).

At a later design stage, the manipulation of this 3D space could be made to include texture rendering, or to render the surfaces with actual images from the building, as the creation of built form evolves. In this manner, the use of the collaborative design paradigm would be complete.

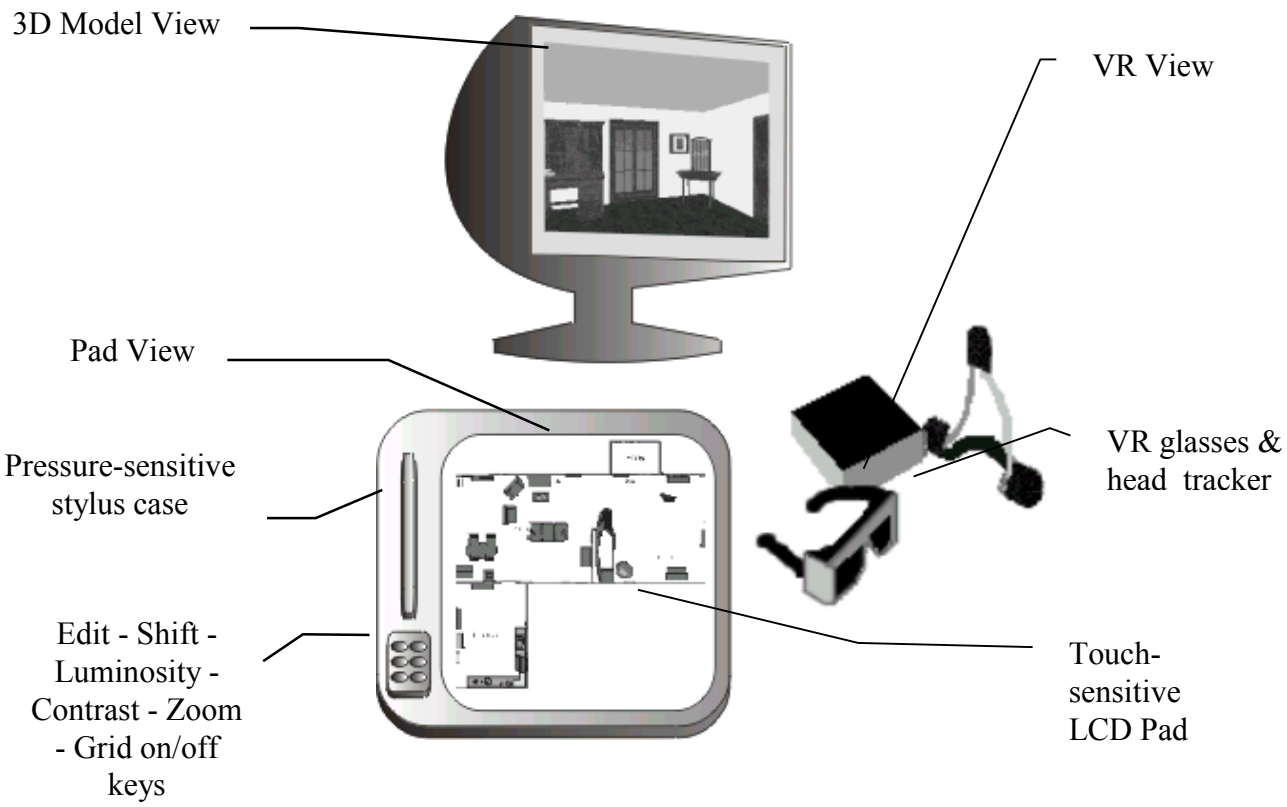


*Fig. 8-3*: Pad & Screen Display

## Not Only for the Plans

So far, emphasis has been on the plans, and the drawing stages of design. Following the paradigm shift emphasising communication between architect and client described in previous chapters, it is important to include the later stages of design as well; namely the building stage. While it could be argued that by then the idea of the

built form should have formulated, this is only true in a general way. When actually visiting a building under construction, one is met with ladders, mud, scaffolding and non-existing floors and roofs. Only the roughest skeleton of the building can be perceived, and even that through an number of obstacles. It is nearly impossible to visualise the finished form; hence, a number of changes actually take place long after construction has begun.

For this reason, visualisation should follow the progress of the construction, and not be restricted to the 'drawing table' design. Both clients and architects need to constantly compare and re-interpret the built form with their previous conception of it. This again may be better accomplished through use of IT/CMC. Using a digital camera and a laptop, photographs of the naked rooms with cement walls can be taken, creating a QuickTime VR (QTVR) 3D image within minutes, and then manipulating it to show alternative wall or floor colours and textures, furniture, decorative styles etc. Such a system could be easily combined with the 'Virtual Pad' to allow a better integration of the various design stages.

To allow that, the 'Virtual Pad' manipulating software should be allowed to import photographic images, scanned in or imported through a digital camera. Images are two-dimensional, but can easily be used to 'coat' the surface of 3D models (texture rendering), creating the illusion that this is indeed a 3D representation of the actual space. From the programmer's point of view, this could be an extension of the *colour* and *texture* properties of that object. This can be easily accomplished with today's means, and requires no special technology. Furthermore, the combination of a laptop and a digital camera would mean that architect and client could accurately interpret and visualise a room as it will look once the building is completed, as soon as the columns and walls are in place. Even the views from the windows would be accurate, being actual pictures instead of computer generated images.

# Information Sharing: On the Network

It would be a mistake to limit architecture to the desktop, when it could be easily integrated with the Internet. Architecture can benefit from such an integration in a number of ways. For example, a client may want to browse through a catalogue of newly built homes on an real estate agents web site. Having seen floor plans and structure layouts of several houses, he may want to better conceptualise the building's design when built. The look of details such as a domed ceiling in the living room with bay windows can be accurately displayed. Similarly, he may be able to visualise the space for a washer and dryer in the laundry room, or how his bedroom set will fit in the master bedroom suite. With technologies such as VRML and QT, clients are already able to see what their new house will look like by walking through the virtual model long before it's built. In addition, a VRML model can allow them the freedom to change and customise this house, right down to the faucet on the kitchen sink.

Furthermore, a recent informal world-wide survey among design and architectural firms which are already connected to the Internet found that 82% of the participants already use the Web to obtain product information[306]. Although the survey is biased in that the sample consisted of firms that already have an online presence, the fact that such a great percentage uses the Web for information purposes is interesting in itself, and possibly indicates that information search and retrieval is going to be an important part of the Web's future use by architectural and design firms.

Apart from this use, there are three further main areas of possible future impact IT/CMC may have:

- *Visualisation* — Use of three-dimensional models allows architects and real estate agents to display their properties in a more natural way. Instead of looking at 2D pictures, clients can walk through the virtual home understanding the

height, width and depth all in just one representation. As VR technology prices drop, becoming widely available, the visualisation of virtual environments through VR helmets should provide a better means of visualising built space, greatly helping clients, particularly Sensing ones, visualise the built form.

- *User Interaction* — There may be design activities that could be performed almost exclusively by the clients, who would then use the resulting design as a blueprint to demonstrate to the architect their desired design. Clients could customise the built environment by changing windows, paint colour or bathroom fixtures. Already, a number of applications have been developed aimed at the layman, and allowing them to visualise built space in three dimensions. Some, like Bröderbund's 3D Home Architect and Visual Home, are too limited to be used professionally by architects, but are very easy to use, and are therefore clearly aimed at the lay-person, who could explore several design ideas himself before visiting the architect with a clearer view of his needs and desires.

- *Multimedia Integration* — VRML allows for multimedia integration. Designers can add a streaming audio file that would download and start playing when clients "entered" the house, providing them with information about the rooms and the various customisation possibilities. Alternatively, the immersion feeling can be enhanced using surrounding sounds to convey the feel of the space.

- *Ease of Updates* – The use of the Internet for distribution of VRML and QT files ensures that updates are easily and instantaneously available to users, while a significantly wider library is available than what can be provided by a single package. This is of obvious importance to estate agents, who may have to update the houses offered on a daily basis. Furthermore, it is interesting to note that virtually all commercial applications developed during the last few years such as 3D Home Architect and Visual Home include a CMC module, that allows users to download libraries of objects that are regularly updated. The use of common

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[306] Ofluoglu, 1999

protocols by these applications ensures that users are offered a wide selection, that would be too costly to distribute using physical means such as CDs.

The problem currently presented by such concepts is technical; namely, the low bandwidth utilised by existing modems and telephone lines. This problem is gradually being overcome, as ISDN prices drop, becoming available to the wide public. At the same time, new technologies, such as streaming video and audio or improved compression algorithms, help solve the problem of transferring large files through limited bandwidth. With no other significant problems presented to such a concept, there seems no reason why it could not be realised within a few years.

# Conclusion

In order for the proposed collaborative design paradigm to be successfully implemented, an improved way of interfacing IT is needed. This would be beneficial to both practitioners and clients, but particularly to Sensing personality types. Communication and collaboration, then, could benefit greatly compared to today's use of paper as a visualisation medium; a natural means of communicating ideas, but with several disadvantages, especially for these types. Developments in IT make the development of better tools financially and technologically possible.

CAAD should support all stages of design, but is currently of limited use to the practitioner. It supports the visualisation stages, but is not allowed to play a greater role in the design process, and is often used only as a substitute to the drawing board. It is almost never used during the initial sketching stages, and never with the client. It usually plays no part until the design has been largely conceptualised, and no part once the plans are completed. To be useful during more design stages, CAAD tools should offer support in at least three more areas:

- Architect-client collaboration, especially within the proposed collaborative paradigm,
- the synthesis stage, and
- the building stage

One possible way to accomplish this, through the 'Virtual Pad', was examined above. An important conclusion is that 2-D visualisation could be substituted by 3D one, with features including:

- Walkthroughs, QuickTime-VR-like sketch-type models, VR environments, and
- 'natural' visualisation of practical data, like surroundings, lighting, energy consumption visualisation, drafts, cold and hot spots and structural elements.

One such tool, developed with a change in the architect – client collaboration within a particular design paradigm in mind, was described here. There is no doubt that better interface tools will be available in the future; however, the new possibilities these open must be properly exploited. New collaboration paradigms can be developed as new communication tools emerge, and they have the potential to change the role of the architect. It is important that researchers of cognitive psychology as well as architects and IT/CMC researchers examine these possible changes, and suggest not only ways to improve the current situation, but also ways through which the transition to new paradigms will be best accomplished.

# Chapter Nine

## *Conclusion*

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We need to get away from the notion of technology managing information and towards the idea of technology as a medium of relationships.
*Michael Schrage*[307]

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Architecture has always been an unusual practice, trying to combine two potentially opposite elements: science and art. Through the ages, the architect commonly had to find the correct balance between the two by himself, being both the scientific and artistic expert. The client's role was perceived by the architectural myth as that of the silent partner in this partnership. Today's architect, however, has a harder role to play. On one hand, he is expected to be the architect – expert he has traditionally been. On the other hand, today's environment demands a more democratic relationship between architect and client, with the 'mythical' element in architecture losing its importance, and new emphasis being placed on communication and collaboration. In one sense, the architect is asked to become more of a manager and a consultant, while maintaining his artistic and scientific qualities.

It is within this environment that the proposed new **collaborative design paradigm** is developed. It is argued that it is more appropriate to its context than the alternatives offered by current design theories. The main arguments in favour of this are its emphases on collaboration and communication, but also its ability to encompass more aspects of the design activity. Unlike most alternative design theories that consider design an isolated event – albeit usually implicitly rather than explicitly – the proposed collaborative paradigm is as interested in the activities taking place outside the drawing board as on it.

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[307] Schulz, 1997

Furthermore, it is hoped that this new paradigm will benefit both architects and clients, helping them create together what was termed here **balanced architecture**. This term, born out of the necessity to overcome the subjective nature of definitions of "successful" architecture offered by various architectural critics, was not defined here as "honest", "good" or "happy" architecture, but as architecture that meets both aesthetic and practical needs. To paraphrase, it is architecture that pleases both architect and client.

It has also been argued here that this paradigm does not belong to the future; architects are already using it, for a number of reasons, social and economic. They seem to prefer to pretend that they do not, however; and architectural peer respect seems to belong to those who appear to be almost contemptuous of their clients. Architects seem to have to please two different masters; their peers, and their clients. Unfortunately, they both seem to have widely different criteria for their favour; the former rewarding the *avant-garde*, the exciting and the unpredictable, while the latter preferring the practical, the every-day and the predictable. Or, at least, this is part of the common preconceptions about the two groups, referred to here as the **architectural myth**.

It has been attempted here to assess the validity and accuracy of this myth. As a result, architects were classified in four main categories, according to their attitude towards design, and towards their clients. This classification was bipolar in each case, with **art-oriented** and **pragmatic** architects forming the two opposing poles of the first attitude, while **authorities** and **enablers** are the corresponding poles in the second one. A third attitude was also introduced, because an integral part of the proposed collaborative paradigm is use of Information Technology (IT) to aid collaboration between the two parties. Examination of this attitude – attitude towards technology – also led to a bipolar classification, with **innovators** and **commodity-users** forming the two opposing poles.

This largely arbitrary classification was based on a limited sample of 30 interviewed architects; as such, its general applicability would be very questionable on its own. For this reason, it was co-related to the Myers-Briggs Type Indicator (MBTI), which – although it can be criticised – proved to be a valuable tool towards further understanding of the architectural types. It was thus found that the suggested types did correspond to specific types as described by the MBTI. Furthermore, the collaboration between architect and client could be interpreted in this analytic fashion, to provide valuable insight on its success or failure. It is hoped that further work in this field, with larger samples, will verify these findings and expand on them, to allow architects and clients to improve their communication to each other.

Better understanding of what may appear as annoyingly idiosyncratic behaviour may help reduce some of the tension that can be part of every collaboration. To quote Jung, "if one does not understand a person, one tends to regard him as a fool"[308]. For the collaboration to be successful, it is necessary for both architect and client to have reached at least some awareness of their own least developed functions. It is through understanding and accepting these sides of their personality that they will stop projecting them onto the other party, thus communicating with that party. We understand another person in the same way as we understand ourselves; what we do not understand in ourselves we do not understand in the other either[309].

This psychological balance is one of the main challenges facing architects – among everyone else. The other – unique to architects – is the balance between the creative force, commonly referred to as art, and the scientific side of architecture – commonly referred to as science. Art and science – or form and function – are paired by a number of architectural definitions, often portrayed as opposing poles in a bipolar system. Balanced architecture is the result of a balance between the two, and this is generally accepted to be the mark of great architects. It is hoped that the role played by the twin balances in the architect's psyche – between his own inferior and

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[308] Jung, 1971g
[309] Jung, 1971c

superior functions, and between his logic and creativity – will be further examined by future research. It is hoped that this will be in the context of analytic psychology – a tool largely underused by researchers today, but which can make significant contributions to our understanding of transpersonal and creative activities such as design.

Regardless of the psychological balance mentioned above, however, other factors influence the success of the architect and client collaboration. Architects may be unable to communicate designs using existing media such as paper and two-dimensional diagrams. Clients with no design training whatsoever are asked to visualise spaces and volumes as successfully as architects trained for years in that area. This problem can be overcome by IT's visual representation abilities, especially within the context of the proposed collaborative paradigm. Such a system, called here **Virtual Pad**, was described here; according to it, architects design directly into the computer, and discuss their design together with their clients, realising changes as these are envisioned. Visualisation of structural, heating and sound data may help both understand and remember the practical constraints of their design.

Furthermore, and to support all stages of design, CAAD tools should offer support in at least three more areas; architect-client communication, the synthesis stage and the building stage. The proposed Virtual Pad is one possible way to accomplish these aims, allowing the rapid development of 3D virtual environments that will include walkthroughs and the 'natural' visualisation of practical data. It can be particularly well integrated within the proposed collaborative design paradigm, in an attempt to facilitate the creation of balanced architecture.

It is hoped that further research will be made in this area. Both clients and architects can benefit from a truly intuitive system that will allow rapid development and visualisation, improving on the awkward input means existing today and allowing them to design together. The Virtual Pad should be actually built, and

research should be conducted to examine the hypothesis that it will improve collaboration between the two parties. Such research can focus on a number of issues commonly raised during design activities. These may include not only the success of the resulting design in terms of balanced architecture and the success of the collaboration in terms of the proposed collaborative paradigm, but also the speed of the design development, the use of the interface during the initial sketching phase, and, of course, architect and client feedback on the system.

There can be no doubt that better interface tools will be available in the future. In one sense, the main challenge is not technological, but conceptual; how does one design a virtual design environment for use with VR? This is a challenge that has to be met by researchers, and not by programmers, and as such it is hoped that it is one that universities will finally meet. As new communication tools emerge, it becomes apparent that past design paradigms are proving insufficient to fully describe the richness and multi-faceted nature of contemporary design activities. New paradigms need to emerge, extending beyond the existing ones. It is important that researchers from a number of diverse fields, including analytic and cognitive psychology as well as architecture and IT/CMC develop these, as these new paradigms will most probably influence both areas.

It is in this belief that research of this nature should encompass diverse fields and not be limited in a single field that this thesis was written. Although challenging, it is hoped that more research will attempt to bring together ideas from a wide range of apparently separate fields. It is believed that this will allow any emerging paradigms to be as rich as possible, and that future generations of architects will be able to collaborate freely with their clients, making design a mutually satisfying experience; an “elaborate game for grown-ups”.

# Index of Figures and Tables

# Appendix 'A'

Questionnaire given to practitioners during the first survey (Chapter 5 – *Architectural Types and Attitudes*):

This is a confidential questionnaire to be used in conjunction with the Myers-Briggs Type Indicator. The aim is to identify different attitudes in different personality types. All names will remain confidential, and all participants will receive a free copy of the results.

---

**Name**: _____

**Gender**: _____

**Personality Type (if known)**: _____

**Age Group**: **20-30** ❑ **31-40** ❑ **41-50** ❑ **51-60** ❑

---

1. What are your feelings towards technology in general?

| | |
|---|---|
| Negative | ❑ |
| Neutral | ❑ |
| Positive | ❑ |

2. Do you own/use regularly any of the following:

| | |
|---|---|
| mobile phone | ❑ |
| laptop computer | ❑ |
| personal computer | ❑ |
| Telephone | ❑ |
| Videocamera | ❑ |
| Hi Fi Stereo | ❑ |

3. Are you connected to the Internet?

**Yes** ❑ **No** ❑

4. How do you feel towards the following statements: (Strongly Agree / Agree / Indifferent / Disagree / Strongly Disagree)

| Statement | SA | A | I | D | SD |
|---|---|---|---|---|---|
| | | | | | |
| "I enjoy using technology" | | | | | |
| "I wish I could own every new gadget" | | | | | |
| "I couldn't live without my mobile phone" | | | | | |
| "I couldn't live without the Internet" | | | | | |
| "Things are done much better using computers than by hand" | | | | | |

| Statement | SA | A | I | D | SD |
|---|---|---|---|---|---|
| "Computer art is no art" | | | | | |
| "In a few years' time all buildings will be designed using computers" | | | | | |
| "Buildings designed using computers are superior to ones drawn exclusively by hand" | | | | | |

5. If your feelings towards technology are negative, could you describe why?

6. How do you think a successful practitioner should relate to technology?

7. How do you think a successful practitioner should be using Computer Aided Design?

8. If you don't use IT/CAD or feel they are not as developed as they should, what would you like changed in IT and CAD to improve them?

9. What is your understanding of the word "technology"?

10. What do you think is more important; the aesthetic qualities of a building, or whether it meets the practical needs of its inhabitants or not?

11. Designing a new building, do you focus chiefly on its aesthetic qualities, or its practical side, e.g. orientation, economic use etc?

12. If you realised while designing a building that an N-S orientation would make it look better and blend better with its surroundings, but an E-W one would allow greater economy in energy consumption, which solution would you be inclined to put forward?

13. What do you think the relationship between architect and client should be? How does it change if you are dealing with committees instead of individuals?

14. How is your general relation with your clients?

15. Can you describe one very negative experience with a client?

16. Do you think a practitioner should heed his/her clients opinions, and to what extent?

17. Do you think clients should be allowed to dictate the design of their buildings?

18. If a client's suggestion was fine technically, but in poor taste, how would you react?

19. Do you feel the need to 'educate' your clients?

20. Do you think it is feasible?

# Appendix 'B'

Questions asked during structured interviews (Chapter 6 – *Use of IT/CMC in the Workplace*):

1. What IT/CMC equipment (software and hardware) are you using in your firm?
2. How long have you been using it for?
3. Has the general practical style of work changed since you started using IT/CMC?
4. Has the use of IT/CMC had any influence in the number of personnel needed?
5. Has the cost for IT/CMC been effaced?
6. Has the firm become more profitable due to IT/CMC use?
7. Has the way you are designing changed, because of the use of IT/CMC?
8. If you answered yes to question 13, how has it changed? (go to question 16)
9. If you answered no to question 13, how are you designing?
10. What is your use of IT/CMC during the initial synthesis stage?
11. Are you collaborating with other firms in the Architectural-Construction-Design-Engineering (ACDE) sector? In what ways?
12. How are you currently collaborating with your clients?
13. What do your clients expect from their architect?
14. Is the architect able to meet their expectations better, thanks to IT/CMC?
15. What is the clients' contribution to design? Has there been any change?
16. Do you believe clients' contribution to design will change in the future?
17. How do you believe the architect's work and his collaboration both with other ACDE firms and with his clients could be improved?
18. What do you think will be the future role of the architect?
19. Are there any plans for future upgrades (e.g. videoconferencing)?
20. What do you think the situation will be like in ten years' time?

# Appendix 'C'

THE
ROYAL INCORPORATION OF ARCHITECTS
IN SCOTLAND

Our ref: 1/P.Z

R I A S
15 RUTLAND SQUARE
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FAX NO 0131 228 2188

04 September 1996

Nicholas Rossis Esq
Department of Architecture
University of Edinburgh
20 Chambers Street
EDINBURGH
EH1 1JZ

Dear Nick

**VR SKETCHPAD**

Further to our previous discussions, I write to confirm my perception that architects' resistance to CAD is linked, not to an aversion to technology *per se*, but to the means by which this is applied.

Were a facility available whereby the act of drawing could be effected by the use of a pencil on a flat surface, which would record the designer's intention in much the same way as lead runs onto paper, then I believe there would be a strong market within the design professions, and not only in architecture.

The advantage of this kind of facility would be to recognise how architects actually work in transmuting ideas "onto paper" and reworking options by layering them using sheets of tracing paper, developing an idea to fruition.

Your ideas for a VR sketchpad following this kind of format would therefore be of considerable value, and would have a considerable market too, I would suggest.

Yours sincerely

Sebastian Tombs FRIAS RIBA ACIArb
**SECRETARY & TREASURER**

cc: John Pelan



Leter sent by Sebastian Toombs, RIAS secretary, to Nicholas Rossis, 1996

# Bibliography


- ACADIA, ***http://www.acadia.org/***
- AIA: *" '97 AIA Firm Survey Report"*, Washington DC: the American Institute of Architects, 1997
- AIA: *"Architects' Handbook of Professional Conduct"*, Washington DC: the American Institute of Architects, 1980
- Akin, O., *"Psychology of Architectural Design"*, Pion, London, 1986
- Allen, Edward, *"How Buildings Work : The Natural Order of Architecture"*, Oxford Univ Press, 1995
- Alexander, C., *"Notes on the Synthesis of Form"*, McGraw Hill, New York, 1964
- American Institute of Architects (AIA): *"Architect's Handbook of Professional Practice"*, Washington DC: The American Institute of Architects; *http://www.aia.org/*
- Arnheim Rudolf, *"New Essays on the Psychology of Art",* University of California Press, 1986
- Arnheim, Rudolf, *"Visual Thinking"*, University of California Press Ltd., 1989
- AVIARY - A Generic Virtual Reality Interface for Real Applications, ***http://www.crg.cs.nott.ac.uk/~dns/vr/aviary/***
- Avril, Gough, Thorne, Harrison G., *"Portraits of Type : An MBTI Research Compendium"*, 1994
- Βαρελίδη, Γ., *"Αρμονικές Χαράξεις στο Έργο του Mario Botta"*, ΔΣΑ, 1992
- Bayne, Rowan, *"The Myers-Briggs Type Indicator: A Critical Review and Practical Guide"*, Singular Pub Group, 1995
- Baudrillard, Jean, *"Revenge of the Crystal"*, Pluto Press, 1990
- Bernie, F.G, *"The Client's Problem"*, Paper PSA/NFBTE Conference on *"New Paths To Building Efficiency"*, October 1973
- Beth, E.W., *"Wijsgerige ruimteleer"*, Antwerpen, 1950; in Prak, 1977
- Bijl, Aart, *"Computer Discipline and Design Practice Shaping our Future"*, Edinburgh: Edinburgh University Press, 1989
- Binns, Graham, *"A Virtual Sound Environment Using Geometrical Ray Tracing"*, Project report, Department of Computer Science, University of Manchester , July 1991
- Blackmore, Courtenay, *"The Client's Tale - The role of the client in building buildings"*, RIBA Publications, 1990
- Boden, Margaret A., ed., *"Dimensions of Creativity"*, MIT Press, London, 1996
- Bollnow, O.F., *"Mensch und Raum"*, Stuttgart, 1963; in Prak, 1977
- Boughey, Howard N., *"Blueprint for Behaviour: the Intentions of Architects to Influence Social Action Through Design"*, unpublished PhD dissertation, Princeton University, Ann Harbor, Michigan, 1969
- Bojár Gábor, *"Architecture Through the Looking Glass"*, RIAS Computer Conference *"Communicating the Vision"*, Glasgow, November 1995
- Breton, A., *"Surrealist Manifest"*, Paris, 1946; in Jung, 1971b, p. 257
- Briggs Myers, Isabel, *"Introduction to Type"*, Oxford Psychologists Press, 1994
- Briggs Myers, Isabel, McCaulley, Mary H., *"Manual : A Guide to the Development and Use of the Myers-Briggs Type Indicator"*, Consulting Psychologists Press, 1985
- Building Design and Construction, *"Owner Survey - How Owners Decide"*, April 1980
- *"Byzance, Entre L'Orient et l'Occident"*; Hellenic Ministry of Culture, ICOM, 1993
- Bush, Vannevar, *"As We May Think"*, The Atlantic Monthly, July 1945, *http://www.isg.sfu.ca/~duchier/misc/vbush/vbush-all.shtml*
- Campbell, D.A. and Wells, M., *"A Critique of Virtual Reality in the Architectural Design Process"*, HITL Report No. R-94-3, 1994.
- Cannell J.B, *"What Does A Client Expect From His Builder"*, Building Technology and Management, *8*, February 1970

- Carne, G.C., and Kirton, M.J., *"Style of Creativity: test scores correlations between Kirton Adaptio-Innovation Inventory and Myers-Briggs Type Indicator"*; in *Psychological Reports*, Vol. 50, 1982, pp. 31-36
- Carskadon, Thomas (compiler), "Compendium of Research Involving the Myers-Briggs Type Indicator", November 1995
- Carter, K., *"Computer Aided Design: Back to the Drawing Board"*, Creativity and Cognition, proceedings, Loughsborough, April 1993
- Collins, Tony & Bicknell, David, *"Crash"*, Simon & Schuster, 1997
- *Computer Weekly* magazine, June 12, 1997
- *Computer Weekly* magazine, 28 August 1997
- Constantine, L. & Lockwodd, L., *"Model-Driven User Interface Design: A Usage-Centered Approach"*, User Interface 97, Cambridge, Massachusetts, November 3rd 1997
- Coyne, Richard, F. Sudweeks, D. Haynes, *"Who needs the Internet?", Draft*, 1996a
- Coyne, Richard, Fiona McLachlan, *"Designing the Unfamiliar"*, 1996b
- Coyne, Richard, S. McLaughlin, S. Newton, *"Information Technology and Praxis: a Survey of Computers in Design Practice"*, *"Environment and Planning B: Planning and Design"*, Vol. 23, pp. 515-551, 1996c
- Cross, N. (ed), *"Design Participation"*, Academy Editions, London, 1972
- Cuff, Dana, *"Negotiating Architecture: A study of Architects and Clients"*, PhD Thesis, University of California, Berkeley, 1982
- Cuff, Dana, *"Design-by-drawing: a Process of Image Creation and Negotiation"*; in Sthough and A. Wandersman, 1980
- Damer, Bruce, *"Adventures in Avatar Cyberspace: Interacting and Designing in Virtual Worlds on the Web"*, User Interface 97, Cambridge, Massachusetts, November 3rd 1997
- Darke, J., *"The Primary Generator and the Design Process"*, in W.E. Rogers & W.H. Ittelson (eds) *New Directions in Environmental Design Research*: Proceedings of EDRA 9, pp. 325-337, Washington EDRA, 1978
- De Bono, Edward, *"De Bono's Thinking Course"*, Ariel Books, 1987
- De Chirico, *"Sull Arte Metaphisica"*, Rome, 1919; in Jung, 1971b, p. 254
- Design Research Society (DRS) mailing list, ***http://www.drs.org.uk/***
- Do, Ellen Yi-Luen, *"What is in a Diagram that a Computer Should Understand?"*, ***http://wallstreet.colorado.edu/napkin,*** 1996a
- Do, Ellen Yi-Luen, *"The Right Tool at the Right Time - drawing as an interface to knowledge based design aids"*, ***http://wallstreet.colorado.edu/napkin,*** 1996b
- Duffy, Francis, *"The Changing Workplace"*, London: Phaidon Press Ltd., 1992
- Eastman, C.M., *"On the analysis of intuitive design processes"*, in G.T. Moore (ed) *"Emerging Methods in Environmental Design and Planning"*, MIT Press, Cambridge, Mass., 1970
- Evans, P. and Deehan, G., *"The Keys to Creativity"*, Grafton, London, 1990
- Feiner, Steven and Beshers, Clifford, *"Visualizing n-dimensional virtual worlds with n-vision"*, ACM Computer Graphics, 24(2):37-38, March 1990
- Fitch, "American Building I : The Historical Forces That Shape It", 1965
- Focus magazine, April 1997
- Freeman, I.L. *"Architect's Journal"*, V 161, 1975
- Gadellaa, L., W. Koek, C. Veldhuis and A. Velthuyse, *"De Waardering van Vorm en Functie Door Ontwerpers en Bewoners*", Utrecht, 1973; in Prak, 1977
- Goldstein, K.M., and Blackman, S., *"Theoretical approaches to cognitive style"*; in F. Fransella (Ed.), *"Personality: theory measurement and research"*, London: Methuen, 1981, pp. 121-133
- Golzen, Godfrey, *"How Architects Get Work - Interviews with Architects, Clients and Intermediaries"*, Architecture and Building Practice Guides Ltd., 1984
- Grant, W.H., *"Behaviour of MBTI types"*, Research report, Auburn, AL: Auburn University Student Counselling Service, 1965

- Gray, H. & Wheelwright, J.B., *"Jung's Psychological Types and Marriage"*, Stanford Medical Bulletin 2, 37-39, 1944; in Myers-Briggs, 1995
- Gross, Mark, *"The Electronic Cocktail Napkin - A computational environment for working with design diagrams"*, ***http://wallstreet.colorado.edu/napkin,*** 1997a
- Gross, Mark, *"Recognizing and Interpreting Diagrams in Design"*, ***http://wallstreet.colorado.edu/napkin,*** 1997b
- Gross, M. and Do, Ellen Yi-Luen, *"Ambiguous Intentions: a Paper-like Interface for Creative Design"*, ***http://wallstreet.colorado.edu/napkin,*** 1997c
- Gross, M. and Do, Ellen Yi-Luen, *"Drawing as a Means to Design Reasoning"*, ***http://wallstreet.colorado.edu/napkin,*** 1997d
- Gross, M. and Do, Ellen Yi-Luen, *"The Right Tool at the Right Time - drawing as an interface to knowledge based design aids"*, ***http://wallstreet.colorado.edu/napkin,*** 1997e
- Gross, M., *"The Fat Pencil, the Cocktail Napkin, and the Slide Library"*, ***http://wallstreet.colorado.edu/napkin,*** 1997f
- Gundlach, R.H.&Gerum, E., *"Vocational Interests and Types of Ability"*, *Journal of Educational Psychology*, 22, p. 505, 1931
- Gunton, Tony, *"Business Information Technology; End User Focus"*, Prentice-hall Int., London, 1988
- Gutman, R., *"Architectural Practice: A Critical View"*, Princeton, New Jersey: Princeton Architectural Press, 1988
- Hadamard, Jacques, *"The Psychology of Invention in the Mathematical Field"*, Dover Publications, 1945
- Harker, S.P.D. and Eason, K.D., *"Representing the User in the Design Process"*, Design Studies, Vol. 5, No 2, April 1984, pp. 79-85
- Harris, F., *"Service A Client Needs From The Building Team"*, Paper NJCC Annual Conference Proc., April 1971
- Hegel, Georg Wilhelm Friedrich, *"The Logic of Hegel"*, 2nd edn., Oxford, 1892; in Jung, 1971b
- Hill, E. *"The Language of Drawing"*, Prentice-Hall, 1966
- Higgins G. and Jessop N, *"Communications In The Building Industry"*, Tavistock Publications, 1963
- Hoon, Park, *"The Use of paper as a Digital medium"*; in *Edinburgh Architecture Research*, Univ. of Edinburgh, Vol. 23, pp. 128-143
- Huws, Ursula, Werner Korte and Simon Robinson, *"Telework: Towards the Elusive Office"*, New York: John Wiley, 1990, in Kling, 1993
- Hyde, R., *"Design Procedures in Architectural Design"*, Design Studies, Vol. 10, No. 4, 1989
- Hyde, R., *"Design Problems and Evaluation Procedures"*, Architectural Science Review, Vol. 35, No. 1, 1992
- Isaacs, Ellen A., *"Designing an Interface for an On-line Graphical Virtual World"*, User Interface 97, Cambridge, Massachusetts, November 3rd 1997
- Jacobi, Jolande, *"The Psychology of C.G.Jung"*, Yale University Press, 1973
- Jacobson, Carolyn McKinnell, *"Cognitive Styles of Creativity"*; in *Psychological Reports*, Vol. 72, 1993, pp. 1131-1138
- James, William, *"Pragmatism: A New Name for Some Old Ways of Thinking"*, London and New York, 1911; in Jung, 1971b
- Jones, John Chris, *"Design Methods - Do We Need Design Methodologies?"*, John Wiley & Sons, 1997
- Jouven, G., *"Rythme et Architecture"*, publ. Dover, 1960
- Jung, C.G., *"Ο Άνθρωπος και τα Σύμβολά του"*, publ. Αρσενίδη, Athens, 1989a
- Jung, C.G., *"Τα Σύμβολα της Μεταμόρφωσης"*, publ. Αρσενίδη, Athens, 1989b
- Jung, C.G., *Psychological Reflections"*, edited by Jolande Jacobi, Routledge&Kegan, London, 1971a

- Jung, C.G., *"The Collected Works"*, Vol. 6, Princeton University Press, Princeton, New Jersey, 1971b
- Jung, C.G., *"The Collected Works"*, Vol. 8, Princeton University Press, Princeton, New Jersey, 1971c
- Jung, C.G., *"The Collected Works"*, Vol. 11, Princeton University Press, Princeton, New Jersey, 1971d
- Jung, C.G., *"The Collected Works"*, Vol. 14, Princeton University Press, Princeton, New Jersey, 1971e
- Jung, C.G., *"The Collected Works"*, Vol. 15, Princeton University Press, Princeton, New Jersey, 1971f
- Jung, C.G., *"The Collected Works"*, Vol. 16, Princeton University Press, Princeton, New Jersey, 1971g
- Kandinsky, W., *"Über die Formfrage"*, in Jung, 1971b, p. 263
- Kant, Immanuel, *"Critique of Practical Reason and Other Writings in Moral Philosophy"*, Chicago, 1949
- Kaplan, R., Kaplan S and H.L. Deardoff, "The Perception and Evaluation of a Simulated Environment", in Man-Environment Systems, 1974, **4**, pp. 191-192
- Kaufmann, Edgar, *"9 Commentaries on Frank Lloyd Wright"*, Architectural History Foundation, 1990
- Kirton, M.J., *"Adaptors and Innovators: problem solving in organisations"*; in K. Gronhaug & G. Kaufman (Eds.), *"Innovation: a cross-disciplinary perspective"*, Norwegian University press, 1988
- Klee, P., *"Über die moderne Kunst"*, Berlin, 1953; in Jung, 1971b, p. 263
- Kling, Rob, ed, *"Computerization and Controversy: Value Conflicts and Social Choices"*, second edition, Academic Press, 1996
- Köstler, Arthur, *"The Act of Creation"*, Arkana, 1990 (reissue edition)
- Lansing, J.B. and Marans, R.W., *"Evaluation of Neighborhood Quality"*, in: *Journal of American Inst. Planners*, 1969, **35**, May, pp. 195-199
- Larson, Magali Sarfatti, *"The Rise of Professionalism: a Sociological Analysis"*, Berkeley: LA: University of California Press, 1977
- Laseau, P., *"Graphical Thinking for Architects and Designers"*, Van Nostrand Reinhold, New York, 1989
- Lawson, Bryan, *"How Designers Think"*, Architectural Press, London, 1980
- Le Corbusier, *"The Modulor"*, Faber and Faber, London, 1951
- Lippman, A., *"Movie maps: an application of the optical videodisc to computer graphics"*, ACM Computer Graphics , 14(3):39-42, July 1980
- Lippman, A., *"And seeing through your hand"*, in Proceedings SID 22(2) Computer Graphics, pages 103-113, 1981
- MacKinnon, D.W., *"The Personality Correlates of Creativity: A Study of American Architects"*, Berkeley, CA: Institute of Personality Assessment and Research, 1961
- Marc, F., *"Briefe, Aufzeichnungen und Aphorismen"*; in Jung, 1971b, p. 262
- Maver, T.W., *"Appraisal in the Building Design Process"*, in Moore, 1970
- McCaulley, Mary H., *"Jung's Theory of Psychological Types and the Myers-Briggs Type Indicator"*, Center for Applications of Psychological Type , 1981
- McKim, Robert H., *"Thinking Visually"*, Wadsworth Inc, 1980
- Messick, S., *"Personality consistensies in cognition and creativity"*; in S. Messick and Associates (Eds.), *"Individuality in learning"*, Jossey-Bass, 1976, pp. 4-22
- Miners T.W. and Shaw V.A, *"Productivity In Building: The Role Of The Client"*, South African Builder 1970 *48* June
- Morton, Scott, *"The Corporation of the 1990s: Information Technology and the Organizational Transformation"*, Oxford University Press, Oxford, in Stowell, 1995
- Moore, G.T. (ed), *"Emerging Methods in Environmental Design and Planning"*, MIT Press, Cambridge, Mass., 1970

- Myers, I.B., *"The Myers-Briggs Type Indicator"*, Palo Alto, CA: Consulting Psychologists Press, 1962
- Myers, Isabel Briggs, with Myers, Peter B., *"Gifts Differing"*, Davies-Black Publishing, Palo Alto, California, 1995
- National Joint Consultative Committee*, "Client's Guide: The Role Of The Client In The Design Of Buildings"*, RIBA, 1973
- Negroponte, Nicholas, *"Being Digital"*, Coronet Publications, 1996
- *Newsweek*, article by Douglas Davis with Mary Rourke, October 4, 1976, pp. 66-69
- Norman, Donald A., *"The Invisible Computer : Why Good Products Can Fail, the Personal Computer Is So Complex, and Information Appliances Are the Solution"*, MIT Press, 1998
- Norman, Donald A., *"The Design of Everyday Things"*, Doubleday Books, 1990
- *Οικονομικός Ταχυδρόμος* magazine, June 1997
- Ofluoglu, Salih, *"Building Product Information on the Web"*, Edinburgh Architecture Research, Vol. 26, 1999, pp. 187-198
- Olson, Margrethe H., *"Remote Office Work: Changing Work Patterns in Space and Time"*, Communications of the ACM, 1983, in Kling, 1996
- Olson, Margrethe H., *"Work at Home for Computer Professionals: Current Attitudes and Future Prospects"*, ACM Transaction on Information systems, 1989a, in Kling, 1993
- Ostwald, Friedrich Wilhelm, *"Grosse Männer"*, Leipzig, 1919; in Jung, 1971b
- Pearsall, Judy, *"The Concise Oxford Dictionary"*, Oxford University press, January 2000
- Perkins, David N., *"Creativity: Beyond the Darwinian Paradigm"*; in Boden, 1996
- Pinker, Stephen, *"How the Mind Works"*, Penguin Books, 1999
- Plattner, P., *"Glücklichere Ehen: Prakzische Ehepsychologie"*, Bern: N. Huber, 1950; in Myers-Briggs, 1995
- Powys R.O, *"Improving Communications In The Building Industry. Communications Affecting The Client"*, *Building Economist*, 1981 *20* June and *Chartered Builder*, 1980/81 *31* Summer
- Prak, Niels L., *"The Language of Architecture"*, The Hague, 1968
- Prak, Niels L., *"The Visual Perception of the Built Environment"*, Delft University Press, 1977
- Progressive Architecture, *"Twenty-seventh Annual Progressive Architecture Awards"*, jury comments for Michael Graves' design award, January 1980, p. 98
- Radford, A.D., *"Computers in Australian Architectural Practices"*, Red Hill, ACT, Australia: RAIA Education Division, 1988
- RIBA, *"Architectural Practice and Management Handbook"*, RIBA Publications, London, 1965
- RIBA, *"Architect's Appointment"*, RIBA Publications, London, 1990
- Richens Paul, RIAS Computer Conference *"Communicating the Vision"*, Glasgow, November 1995
- Rifkin, Jeremy and Heilbroner Robert L., *"The End of Work"*, Putnam Pub Group, 1995
- Roskil, Mark; "What is Art History?", Thames and Hudson, 1982
- Rossis, Nicholas, *"Εκλεκιστικές Κατοικίες στην Κηφισιά και Αρμονικές Χαράξεις"*, Thesis for the Pireas Institute of Technology, 1994
- Rossis, Nicholas, *"Information Technology/Computer Mediated Communications (IT/CMC) in Architectural Practice"*, ECAADE 1996
- Rossis, Nicholas, *"Design Methodologies"*; Edinburgh Architecture Research, vol. 24-25, Edinburgh, 1997
- Rossis, Nicholas, *"The Architect's Role in the Information Age"*, EuropIA, April 1997
- Rossis, Nicholas, *"IT/CMC: Effect on Design"*; Edinburgh Architecture Research, vol. 23, p. 176, Edinburgh, 1995
- Rowe, P.G., *"Design Thinking"*, MIT Press, Cambridge, Mass., 1987
- Rowland, Kurt, *"The Development of Shape"*, GINN and Company Ltd., Oxford, 1964
- Rushkoff, Douglas, *"Coping in Cyberia: Life in the Trenches of Cyberspace"*, Kirkus Associates, 1994

- Salvadori, Mario G. and Levy, Matthys, *" Why Buildings Fall Down : How Structures Fail"*, W.W. Norton & Company, 1994
- Salvadori, Mario G., *"Why Buildings Stand Up : The Strength of Architecture"*, W.W. Norton & Company, 1994
- Sherman, Barrie and Ludkins, Phillip, *"Licensed to Work"*, Cassell Academic, 1996
- Schmandt, Christopher, *"Spatial input/display correspondence in a stereoscopic graphic work station"*, ACM Computer Graphics , 17(3):253-261, July 1983
- Schopenhauer, Arthur, *"The World as Will and Idea"*, London, 1883; in Jung, V.6
- Schön, Donald, *"Displacement of Concepts"*, London: Tavistock Publ., 1963
- Schrage, M, "Shared Minds: The New Technologies of Collaboration"; in Schulz, 1997
- Sthough, R and Wandersman, A (editors), *"Optimising Environments: Research, Practice, Policy"*, proceedings of EDRA-II, Charleston, SC, 1980
- Schulz, Robert C., *"Information Systems and Architectural Practices"*, UCLA, 1997
- Senyapili, B. and Ozguc, B., *"Proposal for Improving Computer Aid in Architectural Design"*, Architectural Science Review, Vol. 37, No. 4, 1994
- *"Shatapatha Brahmana"*, transl. By L. Simon; in Jung, 1971b
- Shone, D.A. and Wiggins, G., *"Kinds of Seeing and their Function in Designing"*, Design Studies, Vol. 13, No. 2, 1992
- Sidwell, A, *"Project Procedures - The Client's Dilemma"*, Quantibuild, 1973
- Spranger, E., *"Types of Men"*, Halle, E. Germany: Niemeyer, 1928
- Spool, Jared M., *"Market Maturity"*, User Interface 97, Cambridge, Massachusetts, 1997
- Spool, Jared M., et al, *"Web Site Usability: A Designer's Guide"*, Morgan Kaufmann, 1998
- Thompson, Henry L., Thompson, Grenae D. (ed.), *"Jung's Function-Attitudes Explained"*, Wormhole Publications, 1996
- Thurstone, L.L., *"A Multiple Factor Study of Vocational Interests"*, *Personnel Journal, 10*, pp. 198-205, 1931
- Toombs, Sebastian, RIAS Secretary and Treasurer, letter to N. Rossis, September 4th, 1996
- Tovey, M., *"Drawing and CAD in Industrial Design"*, Design Studies, Vol. 10, No. 1, 1989
- Van Dijk, C.G.C., *"New Insight in Computer-Aided Conceptual Design"*, Design Studies, Vol. 16, No. 1, 1995
- Van Wegen, HBR., *"Onderzoek naar de belevingswaarde van vier bouwmaterialen met behulp van de semantische differentiaaltechniek"*, Rapport CA. 70.12.01, Delft, 1970; in Prak, 1970
- Vernon, P.E., *"Implications for School Administration of the Personality Structure of Educational Personnel"*, unpublished doctoral dissertation, University of Alberta, Alberta, Canada, 1938
- Vitruvius, *"The Ten Books on Architecture"*, ca. 1st cent. AD, transl. by M.H. Morgan, NY: Dover, 1960
- Ward A.J. et al, *"Communication In The Building Industry - The Client"*, Paper to Faculty of Building, 1972
- Weisberg, Robert W., *"Creativity"*, W.H. Freeman, 1986
- Wigglesworth G.H, *"The Client's/Designer's Views"*, Paper PSA/NFBTE Conference on *"New Paths To Building Efficiency"*, October 1973
- Williams Edward, RIAS Computer Conference *"Communicating the Vision"*, Glasgow, November 1995
- Willcocks, Leslie & Mason, David, *"Computerising Work"*, Paradigm Publishing, 1987
- Wood, Stephen, *"The Transformation of Work: Skill, Flexibility and the Labour Process"*, London: Unwin Hyman, 1989
- Yancey, W.L., *"Architecture, Interaction and Social Control; the case of a large-housing project"*, in: J.F. Wohlwill and D.H. Carson, *Environment and the Social Sciences*, Washington, 1972, pp. 126-136
- Zeller, Eduard, *"A History of Greek Philosophy from the Earliest Period to the Time of Socrates"*, London, 1881