Exploring Design Process Evolution in Architecture and Interior Design Firms

Thesis
Presented in Partial Fulfillment of the Requirements for the Degree Master of Fine Arts in the Graduate School of The Ohio State University

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Abstract

Architects and interior designers must work together and with others on the design team in a series of processes in order for the building projects they undertake to be successful. The two major processes that they go through are the creative decision-making process as well as the project timeline and process. These two processes must be able to work within one another in order to produce a successful outcome.

Along with changes in the creative decision-making and the project processes, two shifts are taking place in how architects and interior designers bureaucratically manage a project. The first is a shift in the type of technology used to share concepts and document design. The second is a shift in project management that begins to include the client (and other stakeholders) earlier in the process, thus increasing the size of the design team. These two shifts have a great affect on one another and are continuously co-evolving.

This thesis first defines processes historically used in the architecture and interior design professions through secondary research and a literature review. These discipline specific processes are compared and contrasted with processes gathered from general design and related disciplines such as engineering design, product design, and software design. Second, this thesis documents primary research (in the form of interviews), which seeks to identify processes that currently utilize new technologies and expanded project team within the architecture and interior design profession. In summary, the results are
analyzed, compared to secondary research, and a new process is suggested as the next step in the evolution of the design process.
Dedicated to my husband Jeff,

for all of your encouragement and continued support.
Acknowledgments

I would like to thank the following people, for without them, my graduate experience would not have been nearly as successful:

First, thank you to my graduate committee: my advisor, Jeff Haase, for supporting and understanding my goals of such a broad exploration; Heike Goeller for so expertly guiding my first attempts at getting my ideas on paper; and to Blaine Lilly for leading me to explore and understand topics tangential to architectural and interior design.

Thank you to the professionals who participated in my research. It is because of their generosity that I was able to understand their processes.

Many thanks to my graduate colleagues in the Department of Design, their excellence only encouraged me to do good work.

Finally, to my family, without their support, encouragement, and teasing, I wouldn’t be where I am today.
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Field of Study

Major Field: Design
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Chapter 1 Introduction

1.1 Introduction

For architectural and interior designers, there are two distinct types of processes that must occur concurrently. The first is the creative decision-making process of the designer that leads to a unique solution. The second is the specific project process that consists of phases and contractual agreements for the management of the project. Many factors affect a project’s management. These include staffing needs, contractual agreements and budgetary concerns, the types of technology used, the ability to gain and interpret necessary information that is received and communicated, and managing the client relationship. These factors have a great effect on the decision-making process that the designer uses in that they often dictate the amount of time that is available for a design to take shape.

The growing complexity of architectural and interior design projects led to the need for this exploration. It has been my experience that the processes within an architectural firm vary only slightly from other firms and slowly evolve over time. Between 2004 and 2009, however, a major shift began to occur in the type of technological software used. Previously, a two-dimensional drafting program was the typical software for producing architectural documents. A three-dimensional building information modeling system (BIM) entered the market, forcing a new process to emerge.
This evolutionary shift in technology had only a slight effect on the processes that architects and designers used, even with new processes and procedures suggested such as the American Institute of Architects’ Integrated Project Delivery (IPD) system (discussed in Chapter 2), among others. While these new processes were initially seemingly well received, they have been very slowly implemented. People are often resistant to change, and this could be a factor. Other factors may include the cost of educating employees on how to implement the new software and the time it takes to translate old projects to new standards. However, the complexity of projects and growing expectations of clients do not allow for the architectural and design processes to be stagnant.

The American Institute of Architects’ (AIA) contractual agreements are so structured, it leads to the question if this has become a hindrance to the incorporation of the IPD system and BIM software. The structure suggested by the AIA is so specifically defined that often the design and decision-making processes are interrupted or even stop completely to wait on others to complete their tasks, and then starts again sometimes weeks or months later. This interruption could be because a client must gain approval from a review board, an engineer must catch up to the work of the architectural firm, or many other factors beyond the architect and interior designer’s control.

The architect is generally the primary driver of the building’s design. It is the architectural team who works with the client to develop the project. The engineer, interior designer, lighting designer, and other consultants are often forced to wait for the architect to produce and communicate a design to them. This means that they always have an
outdated iteration of the building since the architect’s process does not stop once the information is handed off.

Two major shifts are happening, and have been developing in recent years. Both are reacting to and affecting the growing complexity of architectural problems and projects. The first shift is an evolution in the type of technology used to share concepts with the client, and ultimately to document the design for communication to the contractor. The second shift is the evolution and growth of the project team. The typical project team has evolved from individual consultants working on a project in partial isolation, to a much more collaborative and close-knit project team. The architect, interior designer, consultants, construction manager, client, and others are involved in more of the decision-making process than before. These shifts influence each other and evolve because of one another. For example, the evolution of technology has allowed the designer to more accurately communicate his design to the client at an earlier point in the process, bringing them closer to big picture decisions that are made at the beginning of the project.

These shifts have encouraged the following exploration of the design process within architectural and interior design firms, as well as the processes from related disciplines.

1.2 Introduction to research methods

The following chapters discuss the exploration of the architectural and interior design processes as well as processes from related disciplines. Chapter 2 begins with an investigation of processes through secondary research. General creative decision-making,
interior design, and architectural processes are the basis for this investigation. In Chapter 3, processes from related disciplines such as software design, engineering design, product design, and creative problem solving are also identified in order to investigate processes that may influence architecture and interior design. Chapter 4 introduces the idea of technological and product evolutionary theories as they relate to biological evolutionary theories. This exploration is helpful in understanding the difference between design processes discussed in literature and design processes as they exist in practice.

In Chapter 5, an investigation of the processes within architectural and interior design practices takes place. It is important to understand how designers translate these defined processes to their day-to-day activities. It is important in this research to speak with designers who have a wide variety of experiences in relation to the criteria identified in Chapter 5. The interviews enabled the production of diagrams of the processes that these professionals use to complete their work, as well as techniques and resources they may use to manage the design process. Insights summarized from the diagrammed processes and documented resources are then discussed.

Finally, Chapter 6 compares the insights found in primary research to the processes found in literature. The differences and similarities are identified and used to inform a combined process that can be used by architects and interior designers. A new process is defined and potential future work is identified.
1.3 Summary

This thesis documents the research done as part of the Master of Fine Arts program in the Department of Design at The Ohio State University. It includes the following steps:

1. An investigation of the interior design, architectural, and related processes discussed in literature
2. A comparison of the processes explored
3. An investigation of the interior design and architectural processes as practiced in the profession
4. A suggested process that is a result of both investigations
Chapter 2  Interior Design and Architectural Processes

The following chapter explores and defines the two types of processes that typically take place within architectural and interior design practices. First, an overview of the creative decision-making process is explored as defined by Koberg and Bagnall in *The Universal Traveler*. Second, the specific project process, as it is broken into phases by contractual agreements, is defined. The project process is discussed in architectural terms from the Royal Institute of British Architects (RIBA) and the American Institute of Architects (AIA). The processes defined by the AIA and RIBA are the foundation for interior designers working within architectural firms and must be understood prior to discussing the interior design process.

Third, the interior design process is defined by Kilmer and Kilmer, and by graduate students at The Ohio State University. Kilmer and Kilmer worked to define interior design methodologies at a very basic level, ranging from the creative to the pragmatic in *Designing Interiors*. This text is often used in educating interior design students at the university level. Finally, the work of Michael Brokamp and others under Professor Heike Goeller in the MFA in Design program at The Ohio State University is discussed.
2.1 The creative decision-making process by Koberg and Bagnall

The creative decision-making process is something that typically happens inside a designer’s mind. It is often a mysterious process that can be difficult to describe. In *How Designers Think*, Bryan Lawson, professor at the University of Sheffield, argues that “for those who would wish to draw a map…most of the route remains hidden, for it is what goes on in the designer’s mind which really matters” (1980, p. 24). Since most projects have a starting point and a finished project, it is tempting to try to describe this process in a linear or sequential fashion. However, an iterative or cyclical process may more accurately describe the thought process that creative individuals go through to produce a solution to a design problem.

In *The Universal Traveler* (1970), Koberg and Bagnall describe a basic decision-making process for creative individuals as a process of discovery. This process consists of three phases: 1. Analysis, 2. Concept, and 3. Synthesis. In the Analysis phase, facts are collected and information gathered to form a statement of problem. During the Concept phase, there is a transition from Analysis to Synthesis. The pieces of information collected during Analysis are evaluated, put together, and potential ideas are conceptualized, identifying options for a solution. During the Synthesis phase, ideas are combined to develop concepts, which are developed in more detail until one or more of the concepts are selected and implemented.

Koberg and Bagnall expanded this three-step process to consist of sub phases within each step. They describe basic activities that occur during each of these sub phases. The Analysis phase includes two sub phases: Accept Situation and Analyze. The
Concept phase includes two sub phases as well: Define and Ideate. The Synthesis phase includes three sub phases: Select, Implement, and Evaluate. See Figure 2.1.

![Diagram of design process](image)

**Figure 2.1 Koberg and Bagnall’s expanded process**

The Accept Situation phase requires the designer to come to an agreement with the client regarding the amount and type of work to be done. Accept Situation is followed by Analyze, the research phase. During this time, information is collected in order to understand the problem that needs to be solved.

The Define stage begins the Concept phase and requires a definition of the problem statement. One cannot solve a problem if the issue is not clearly defined. This stage is the transition between Analysis and Synthesis. Ideate, the traditional “design”
stage, follows the definition of the problem statement. It is when solutions are brainstormed and creativity flourishes. The Select phase starts the Synthesis process and encourages the designer to choose or narrow to one of his ideas. Often, at this time, the design process deviates from the linearity that has been constructed. Once a concept has been selected, the Ideate stage is often revisited in order to more accurately solve the design problem or the Analyze phase is revisited to gather more information. During the Implement stage, a design is fully realized. The building is built or the object produced. Every product or outcome then needs to be put through the Evaluate stage so that the level of success can be measured.

It is interesting to note that Kilmer and Kilmer describe the interior design process in a very similar way. (The Kilmer and Kilmer process is discussed in more detail in Section 2.3.) They use much of the same vocabulary and categorization as Koberg and Bagnall. *The Universal Traveler* provides methodology and processes for solving all types of creative problems, not only problems consistent with interior design or design in general. Thus, Kilmer and Kilmer do not introduce specific interior design or architectural activities as others describing a particular discipline might.

This creative decision-making process can be applied to many different problems and disciplines. It is not unique to architecture, interior design, or design. As some level of creativity is necessary in every discipline, the process definition remains general enough to fit this wide range. In the following sections, the creative decision-making process will be compared to specific architectural and interior design processes. The phases and activities that define each process will then be explored.
2.2 The history and current state of the architectural process

2.2.1 General History

The architectural process has its roots in the origin of the profession itself. Historically, the architects and designers of buildings were much more involved in the craft of constructing the structure. As building systems became more complex, the roles of those involved became more specialized and the profession evolved. In the eighteenth century, the profession began to be segregated. Particular types of necessary organizations have emerged since teams of people (as opposed to individuals) are now needed to solve a design problem (Fleck, 2000). Some emerged as engineers, specializing in the more scientific portion of the building’s construction. Others emerged as architects and began to specialize in the function and user interface of the building (Stankiewicz, 2000). Others honed their skills as craftsmen and became builders. Further evolution and growth in the architectural profession began to create other specializations within these groups, including project management, design, and interior design.

With this level of specialization, architects in small firms may wear many of the necessary hats: interior design, project management, and architectural design. However, the specialization of roles is by far the norm in large architectural firms, by nature of their large-scale projects. Architects also often have specializations within the general field. Some are design architects, some specialize in project documentation, and others take over the role of personnel and project management. Many firms also rely on consultants (within or outside of their firm) to perform the other necessary duties to complete a project: interior design, engineering, landscape architecture, etc.
As discussed in previous sections, some level of bureaucracy is necessary as firms evolve and grow. Not only do roles become more specialized, but also rules and procedures become more defined to help projects run smoothly and as planned. As the firm and project team grows, the level of communication and collaboration that is necessary also grows. In the mid to late nineteenth century in the United States, a group of architects began meeting in order to “elevate the standing of the [architectural] profession” (History of the American Institute of Architects, 2011). This group, which became the very influential American Institute of Architects, began to institutionalize the design process by developing fee schedules as well as contract document templates and procedures. This institutionalization of processes is discussed in Chapter 4.

### 2.2.2 As defined by the RIBA

In the *Architects Job Book*, the Royal Institute of British Architects (RIBA) suggests a typical process for architects. This “Plan of Work” process is inclusive of all of the steps necessary to manage an entire project. The stages are shown in Figure 2.2.

The RIBA also describes key tasks that should take place during each phase. During Preparation, the problem is defined and a design brief is developed. This assists the client in making the decision to proceed. The Design phase is broken down into Concept, Design Development, and Technical Design. This leads the architect through a process of starting with a broad concept, narrowing it in the Development stage, and finally designing the details. The process suggested begins with a few conceptual decisions and moves toward many very detailed decisions.
This is where the RIBA’s process differs from the creative decision-making process as described by Koberg and Bagnall. The process has been institutionalized to work within the bureaucracy of an architectural firm. During Pre-Construction, efforts are focused on selecting the contractor and assuring that they have the proper qualifications. This leads directly into the Construction phase during which the architect works very

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closely with the construction manager to oversee the building process. During the Use phase, the architect assists in the transition of the building to the owner and evaluates the building as it is being used, giving the architect valuable feedback that can be used on future projects. The process of gathering feedback is typically called post-occupancy evaluation.

2.2.3 As defined by the AIA, best practices

The American Institute of Architects (AIA) has been providing contracts for architects to use with their clients, construction managers and consultants, including engineers and interior designers, since they developed their first architect–owner agreement in 1888. As a professional organization, the AIA has tried to define tasks through contractual agreements that will work for both small and large architectural and interior design firms. These contracts have had a great effect on the project process. The AIA contracts are formulated in such a manner that the project moves from determining abstract concepts to visualizing and executing a concrete building.

The AIA defines a series of best practices as a resource for architectural firms. They describe the design process in terms of basic services during the following phases:

1. Schematic Design (SD)
2. Design Development (DD)
3. Construction Document (CD)
4. Bid or Negotiation (BN)
5. Construction (CA)
This process assumes that much of the information has been gathered prior to the contractual agreement and that the agreement begins immediately prior to the Schematic Design phase. A client generally comes to the architect with a problem statement or need, initiating the process and allowing the architect to begin designing and exploring concepts.

The AIA’s process is closely related to RIBA’s. While the AIA process focuses on broad phases at the end of which milestones are reached, RIBA suggests that more attention is needed in the Pre-Construction phase that contains Production Information, Tender Documentation, and Tender Action. Figure 2.3 compares the two processes.

The contractual agreements set up by the AIA (phases listed above) greatly influence the daily creative decision-making process of architects and interior designers. A firm’s billing schedule is usually coordinated at certain intervals (often at each phase) and directly relates to the number of hours determined and needed to complete the work. While the percentage breakdown by phase varies within each firm, the bulk of the hours are typically allotted for the Construction Document phase with the fewest hours allotted for the Schematic Design phase. Project managers monitor these hours and direct the project team according to the number of hours available. Therefore, the decision-making process sometimes has to be adjusted and abbreviated, not allowing for adequate time to be spent at particular phases.

While the RIBA process contains a phase that takes place during the use of the building (Use), the AIA process does not. Even though this is not included in the AIA’s project description, architects sometimes perform post-occupancy evaluations several
months after the building opens. Since the typical AIA process does not include this step, it often is skipped.

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Figure 2.3 Comparing AIA and RIBA processes
2.2.4 **As defined by the AIA, IPD**

In response to changing technologies, the AIA released a new type of contractual agreement, the Integrated Project Delivery (IPD) system. IPD suggests that successful projects employ “highly effective collaboration among the owner, the prime designer, and the prime constructor, commencing at early design and continuing through to project handover” (AIA, 2007). The goal of this process and contractual agreement is to employ and involve all interested parties at the start of a project.

Traditionally, architects are contracted first, followed by the engineers and other consultants, and finally the general contractor or builder, resulting in the project information to be passed from one party to the next, with the chance of lost information. With IPD, all stakeholders are present from the beginning, working parallel on the entire project, keeping communication open, and allowing for each to offer expertise when decisions need to be made. Open communication is the main driver to guarantee a successful IPD project. Good communication not only keeps the project team aware and ahead of all decisions and issues that may arise, but also shares the project risk collectively.

IPD also promotes the introduction of building information modeling (BIM) software. BIM is a category of 3D modeling software that assists in the visualization and documentation portions of an architectural project. It incorporates 2D drafting concepts and database scheduling abilities into a 3D modeling program. Most BIM programs can take a project from concept all the way through construction documentation, assisting in detailing and specification writing. The electronic building model that this type of
software creates contains major pieces of information about the project, including typical drawing information, such as plan and elevation views, as well as material and item specifications.

By incorporating this technology, architects, their consultants, construction managers, and owners can all share and work with the model created by the BIM software. This sharing diminishes the possibility of mistakes as a cause of information being lost in communication, as well as reduces the time a consultant needs in order to coordinate drawings. If information is transmitted daily between consultants, time will not be spent working toward an unnecessary end. The sharing of the model also allows construction managers to search for and solve conflicts between their subcontracting trades and manage scheduling more effectively, potentially leading to a faster, more cost effective project.

Even though there are great potential benefits to be had from the IPD process, as of 2009, only two completed projects were on record (LaBarre, 2009), both of which were for Autodesk, the manufacturer the leading BIM software, Revit. While there are traces of collaborative projects in the industry, why is there hesitation when the reward could be so great?

2.3 Interior design processes

2.3.1 As defined by Kilmer and Kilmer

The architectural processes from the RIBA and the AIA have greatly influenced how interior designers work. Since interior designers (in a commercial setting) are
dependent on working with architects and in compliance of their contracts, these processes and contractual agreements direct specific project management actions that must take place. In the United States, the AIA’s contracts are the most widely used in the construction and building industry. Therefore, no matter the creative process, interior designers must work within this framework.

In *Designing Interiors*, Kilmer and Kilmer describe the creative design process at a basic level, at an expanded level, as well as in conjunction with the necessary project specific activities for interior designers. The most basic process described consists of only two major phases, Analysis and Synthesis. During the Analysis phase, designers are to “identify, dissect, and analyze the problem” (Kilmer & Kilmer, 1992, p. 155). This is where project research is performed and ideas on how to approach the problem are brainstormed. The Synthesis phase suggests that designers “put the parts together to implement a solution” (Kilmer & Kilmer, 1992, p. 155). It is at this time where the formal design takes shape and particular detailed decisions are made.

Kilmer and Kilmer expanded the two-step Analysis and Synthesis process before including activities specific to the interior design profession. They incorporate feedback at all stages of the process and suggest that the process can be linear, cyclic, or a spiral or funnel. The steps are shown in Figure 2.4.
This expanded creative process comes much closer to providing a roadmap for the interior design process than the two-step Analysis – Synthesis process. It also has more in common with the processes from the RIBA and the AIA. However, it still includes necessary portions of the creative decision-making process.

The Analysis phase consists of four steps: Commit, State, Collect, and Analyze. The first step, Commit, is the acceptance of the project and contains activities that help the designer to understand the client’s need. State is an extremely important step. During State, the project must be defined clearly so that the following activities may be appropriately focused. Collect is the major research step for the project. Many types of
information are collected using observation, user group meetings, secondary research, and other methodology. At this time, all information gathered thus far is analyzed (the Analyze step) and early concepts begin to form. This is the end of the Analysis phase.

The Synthesis phase is broken down into the following steps: Ideate, Choose, Implement, and Evaluate. The Ideate step focuses designers on conceptualizing and brainstorming possible ideas for solutions. This may include frequent communication of concepts to the client in order to receive feedback. The architect and interior designer then select the most appropriate concept and develop it if necessary within the Choose step. Implement is the step where the object is built or created and the architect and interior designer become overseers of the construction process. During Implement, the design is handed over to the construction manager to be built. Finally, the Evaluate step invites the designer to review his or her design in order to learn from its success or failure.

Kilmer and Kilmer go on to coordinate many of the phases and terms from the AIA with the phases of the design process they have produced (1992). The portion of the process that most closely matches up with the architectural processes discussed is the Synthesis Phase, from Ideate through Evaluate. It is at this time when the contractual agreements are most effective and necessary. The phases that do not align are those prior to the Schematic Design phase from the AIA’s process and the Ideate step in this basic interior design process. Kilmer and Kilmer’s process elaborates more on the procurement of the contract, the feasibility, programming, and analysis of the project. This indicates that within the AIA’s process, there may need to be a Pre-Schematic Design phase, or
that these analysis activities may need to be performed in parallel with conceptualization. See a comparison of the two processes in Figure 2.5.

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**Figure 2.5 Comparing AIA and Kilmer & Kilmer processes**

### 2.3.2 *As defined by students of Professor Goeller*

At The Ohio State University’s Department of Design, many graduate theses under the direction of Professor Heike Goeller have focused on the design process and methodologies and have had various topics of focus. In 1986 Edward Dorsa focused on processes and methodologies that would help in designing products that would be more
competitive in the marketplace. He expanded the Synthesis phase in order to define how the input at the beginning of the phase (design objectives) transforms into the output at the end (drawings and models). By suggesting methodologies that ranked options and encouraged selections, attributes lists, visual entities lists, and visual elements lists brought the design from a concept to a specific design. Additional work by Kathleen Gibson in 1990 focused on the assessment of client preferences, which very few processes explore.

In 1993, Brokamp researched how a fully implemented series of methodologies could assist the designer in communicating with their client, specifically within the programming phase. He synthesized the process definitions of these other processes into one table that includes input, procedures, and output for this expanded process. The basis for Brokamp’s combined analysis is Sheffield University professor Bryan Lawson’s process as described in the 1990 version of How Designers Think. The process is as follows:

1. Briefing
2. Analysis
3. Synthesis
4. Evaluation

Brokamp expanded the process to include many project activities, but the basis is consistent with other described interior design processes.
2.4 Summary

While the AIA process is widely known as the standard for contractual agreements, the Kilmer and Kilmer process accurately describes the activities necessary to interior design, including pragmatic steps that relate to activities that should be achieved. Figure 2.5 shows how the processes from the AIA and Kilmer and Kilmer overlap. Since the contractual agreements are so ubiquitous, it is necessary to understand the relationship between the two processes.

Kilmer and Kilmer describe much more of the Analysis portion in their attempt to institutionalize the creative process for interior designers while the AIA’s contractual agreements begins during the Ideate phase. However, the AIA process describes the activities between Choose and Evaluate (Construction Documents, Bidding, and Construction) more accurately.

Many of these steps do not necessarily happen in a linear fashion, but in order to compare to the processes from other disciplines it is helpful for them to be visualized as such.
Chapter 3  Related Disciplines’ Processes

The following chapter discusses processes from disciplines that are closely related to architecture and interior design. These processes come from engineering, product design, and computer science and are necessary to understand because designers often collaborate with these disciplines. Also, some of the phases discussed in this chapter may be of use in describing a new process for architects and interior designers.

Thomas Mather is an Emeritus Professor at the University of Strathclyde in Scotland who worked to define decision-making in building design. The process discussed here is rooted in mechanical engineering and operations and exists as a subset to the RIBA Plan of Work process discussed previously.

Nigel Cross, Emeritus Professor of Design Studies at The Open University, defines the design process, as well as the management of the design process, in regards to engineering design. He discusses a creative decision-making process in *Engineering Design Methods* (Cross, 2000), which brings an interesting comparison to the Koberg and Bagnall process.

Defining the engineering process by Bruce Archer at the Royal College of Art, Stuart Pugh at the University Strathclyde, and Michael French at the University of Lancaster give a well-rounded view of the types of processes used within engineering, industrial, and product design. NASA and the Federal Aviation Administration (FAA) have both taken these engineering processes and institutionalized them to work within
large organizations. It is helpful to see the transition from the engineering creative process to the bureaucratic process.

Finally, additional related processes are defined. These are not as closely related to interior design and architecture as professions, but are based in the overall category of design and should be considered as well. Those defined here are the very basic 4d Software Process and the process as suggested by the design consultancy firm, IDEO.

3.1 General design processes

The architectural and interior design processes discussed thus far describe the overall project’s trajectory. In order to fully understand these processes, the influences from other disciplines, and how the processes might evolve, tangentially related processes must be explored. Many of these are based on the creative decision-making processes that an architect or designer must go through. These are often visualized as linear processes, but actually show some of the necessary phases for the creative process.

3.1.1 As defined by Maver

In 1970, Thomas Maver described the design process using Analysis and Synthesis terminology (1970). He expanded on the existing RIBA Plan of Work process, adding sub phases, which are specific to the decision-making process. RIBA has updated the terminology used in their Plan of Work process phases since Maver developed these sub phases. The terminology is shown updated in Figure 3.1 to the current RIBA Plan of Work phases, but Maver’s sub phases remain the same.
Maver describes Analysis and Synthesis as a process that does not encompass the entire project, but one that could be revisited and cyclical throughout all of the major phases. Each of the four steps (Analysis, Synthesis, Appraisal, and Decision) is completed during the Scheme Design phase. After a decision is made, Analysis will restart in conjunction with the start of the Detail Design phase. This theory invites us to think about the process of Analysis and Synthesis and how it can work within a project’s process in two different ways. (1) The Analysis – Synthesis process by Kilmer and
Kilmer exists over the entire process on a macro scale. (2) The Analysis – Synthesis process by Maver views the process on a micro scale and exists within each step of a larger process.

The arrow between the Appraisal and Synthesis sub phases, shown in Figure 3.1, indicates that a feedback loop is necessary. This accurately shows the process designers take in conceptualization and decision-making. Some argue that this loop is not the only one necessary. Certainly, as designers consider the implications of the decisions they are about to make, they can determine if additional research or analysis is needed, or that perhaps the synthesis of the idea could be performed in a different way.

Lawson also argues that the process of moving from the abstract to the concrete may not be accurate. He puts the steps into a more iterative cycle shown below in Figure 3.2, allowing a designer to move back and forth between each step at will, indicating that the creative decision-making process is not necessarily linear or sequential (Lawson, 1997).

![Figure 3.2 Lawson’s iterative process](image-url)
3.1.2 As defined by Cross

The Analysis and Synthesis steps from Designing Interiors and The Universal Traveler describe a full project’s process. This includes definition of the problem and research phases up front, as well as implementation and evaluation phases at the end of the project. John Chris Jones described design as a Divergence – Transformation – Convergence process in 1992. These phases are quite separate from each other allowing the problem may be investigated properly. Divergence allows for the extension of the boundaries of a design problem. Transformation involves using the designer’s creativity to test concepts. Convergence is the selection of a concept. This short process is similar to Koberg and Bagnall’s two-step Analysis – Synthesis process and exists separately from project constraints. In 2000, Cross further described the Diverge – Converge process on two separate levels. Over the course of a project, this process happens on a micro as well as a macro level. On a macro level, designers begin to explore potential project concepts broadly until a few ideas are selected. These are constantly further defined until one concept has been developed and implemented. On a micro level, as each decision is presented, many options are explored (Diverge) until the best option is selected (Converge).

Cross suggests that this type of divergent and convergent thinking can also be related to the strengths of those on the design team. Divergent thinkers are better at concept design and potentially the early parts of the project. Convergent thinkers are better at detail design and moving pragmatically though the project timeline. Cross maintains that both types of people are necessary on a successful project team, but that
different disciplines may be trained in either divergent or convergent thinking, ultimately allowing the project team to contain a wide variety of expertise.

3.2 Engineering and product design processes

The educational systems of architects and engineers teach them quite a different process by nature of the evaluations they receive. Lawson (1980) describes an experiment in which post-graduate architectural and engineering students’ problem solving processes were observed. He concluded the following:

An architect is taught mainly by example and practice. He is judged by the solutions he produces rather than the methods by which he arrives at those solutions. Not so the scientist who is taught a succession of concepts and methods of demonstrating the validity of those concepts. (p. 32)

Engineers are perhaps more closely related to design because they are affecting change and creating new objects. Engineering processes are rooted in scientific methodologies since they are often the ones responsible for the structural and mechanical integrity of a design. The engineering profession is more methodical in testing their designs, whether it is through knowledge of previous projects or through calculations and digital modeling. Therefore, engineering processes may be more fully defined and pragmatic than architectural or interior design processes.

3.2.1 As defined by Archer

At the Royal College of Art, Bruce Archer worked on the definition of systematic methods for engineering designers (1970, p. 288). He sought to combine the art of design
with the science of design in one methodical process. The process that he describes is compared below with Kilmer and Kilmer’s interior design process in italics:

1. Agreeing on objectives. (*Commit*)

2. Identifying the properties or conditions required by the objectives to be exhibited in and the end result. (*State*)

3. Determining the relationships between varying states of the properties and the varying degrees of fulfillment of their respective objectives. (*Analyze*)

4. Establishing the limiting and ideal states of the properties and hence the domain of acceptability implied by the objectives. (*Ideate*)

5. Identifying the laws controlling the interdependence, if any, of the properties.

6. Ensuring that the interdependence of the properties constitutes a realm of feasibility and that this lies at least in part in the domain of acceptability. (*Evaluate*)

7. Selecting an optimum solution within the arena thus delineated. (*Choose*)

Even though the terminology is vastly different, the engineering and interior design processes explored are quite similar. Phases 1 and 2 revolve around gathering the initial project information, agreeing to the terms of the contract and defining the problem. In Phase 3, the engineer gathers information that will inform his concepts developed in Phase 4. Phase 5 is unique to engineering and other more scientific professions. Unlike the architectural or interior design decision-making process, engineers have been taught the importance of checking and ensuring that their design will perform as desired. This
phase asks the engineer to look closely at their design in order to identify potential issues that may arise.

The main difference in Archer’s process, as compared to Kilmer and Kilmer’s process, is that the evaluation process happens before one concept is selected. This is indicative of the educational experience of engineers and the way emphasis is placed the value of the process and methodology rather than the outcome of their work. They also have additional methods such as mathematical algorithms and formulas that will assist in checking the validity of their designs. Once a solution is selected and the design is implemented, an additional evaluation phase may take place so that the engineering designer can understand the impact of the decisions made.

3.2.2 As defined by Pugh

In 1991, Stuart Pugh, Professor at the University of Strathclyde in Scotland, introduced the idea of “Total Design.” This process describes the “activity that encompasses product, process, people and organization” (1991, p. 5). Within the Total Design model, there is a set of activities called the Design Core, which lead a product development team from market analysis through selling the product, unlike Archer’s process, which concentrates on a shorter project timeline. The Design Core consists of seven stages, shown in Figure 3.3.
The aspect of this Design Core that is most applicable to this investigation is the Market stage, which consists of an investigation of the market and user needs. This is the point at which an investigation of the user group’s (or client’s) needs are observed and identified. Pugh describes that typically, the engineer or designer does not perform this investigation, but leaves this step to market researchers. He argues that these researchers “must become part of, and involved with, the design teams of the future; they all in a sense become designers since they contribute to the design activity” (Pugh, 1991, p. 30).

This concept is consistent with the suggestions from the AIA’s IPD process for all stakeholders (architect, owner, engineer, interior designer, contractor, etc.) to be contractually bound at the start of the project, rather than on an as-needed basis. Inviting
contributors from related disciplines to the design process widens the project team and creates the needs for designers to seek new ways of communicating with the diverse members of the team.

### 3.2.3 As defined by French

Thus far, the processes discussed have begun with an analysis of the problem. This indicates that someone (generally the client) has already identified that there is a need that has not been met. In working toward identifying an engineering design process, French (1985) created the following block diagram. The process is shown in Figure 3.4 below. The circles show stages reached and the squares show the working process. These distinctions help diagram the input and output of each phase in the sequential fashion that occurs within a project.

This diagram begins with the identification of the need. Even though there is no process square leading to the Need stage, this diagram indicates that some searching for and identification of the need must take place. When this phase is included in the design process, the designer has a better understanding of the context in which the need was established. When this phase is omitted from the design process, the designer must rely on the communication of the need from others and the information may not be complete. It is important for the designer to have a complete understanding of the problem before suggesting a solution.

French goes on to state that the Statement of the Problem is the result of the Analysis of the Problem. This phase includes an identification of limitations such as codes, and describes the criteria that will judge the success of the project. This expansion
of the seemingly simple Analysis phase is important. The activities, as such, do not exist in other processes and begin to approach methodologies that are agnostic of discipline.

Figure 3.4 French’s engineering process
The Conceptual Design Phase is “the phase where engineering science, practical knowledge, production methods, and commercial aspects need to be brought together, and where the most important decisions are taken” (French, 1985, p. 3). The description of this phase does not speak to the creativity that is necessary for conceptualization, but does provide important practical methods for decision-making.

The outcome of the Conceptual Design Phase is then viewed as a series of selected schemes. This feeds into the Embodiment Phase, in which the designer works through these schemes in more detail. This phase is a transition in the type of decision-making that needs to take place. It is where the broad ideas from conceptual design are selected, readying the concept to move into the detailing phase. The Detailing Phase is the final process during which “a very large number of small but essential points remain to be decided” (French, 1985, p. 3). For example, the decisions are based on what hardware to use rather than the big idea for the product.

Another unique quality of French’s design process is that the outcome is not a finished product. Instead, the outcome, for the engineering designer, is a set of working drawings that must be handed to the production team. Contrary to the interior design and architectural processes reviewed above, this indicates that the engineering designer is not involved in overseeing the production of their designs.

This differs from the Kilmer and Kilmer process in that there are fewer steps centered on collecting and analyzing existing information. Additional phases in French’s process are focused on selecting, detailing, and documenting the designs. In the Kilmer and Kilmer process, these activities are sub phases of the Implement phase. Perhaps
characteristics from creative decision-making processes such as Analysis – Synthesis can be combined with French’s process in order to assist the designer in considering all aspects of the problem statement.

3.2.4 As defined by NASA

The NASA Jet Propulsion Laboratory (JPL) has institutionalized engineering product design into a process where employees can suggest a project with the potential for it to be funded for exploration and eventually implementation. This process’s phases are much more defined and strict than others discussed within architecture or other types of design. This is because at the end of each stage, the fate of the project or mission is on the line. There is a formal review to determine whether the project should continue on to the next phase or not.

The process phases are set up as follows (Chao, Turner, & Ishii, 2004):

1. Pre-Phase A: Conceptual Study
2. Phase A: Preliminary Analysis
3. Phase B: Definition
4. Phase C/D: Design and Development
5. Phase E: Operations Phase

Pre-Phase A is the initiation phase. A project team proposes the project and NASA screens it for viability. Its scientific merit is reviewed and the study concept is presented to management. Once approval is given, the project moves on to Phase A, Preliminary Analysis. At this phase, the project plan is developed in more detail, including a budget determination, what is needed for the mission, and the project team. In
Phase B, the Definition phase, more detailed technical solutions are defined and explored in parallel with each other. At the end of Phase B, a peer group and a steering committee evaluate the mission and review budget, project management, engineering, and safety.

Phases A and B are mainly used to evaluate the validity and value of the proposed mission. It is during Phases C and D when the project’s design and detail development take place. A spacecraft is built and tested preliminarily during Phase D. It is during the Operations Phase E that the use and maintenance of a spacecraft is tested. Data is then collected and stored. This phase can be expanded into Launch, Cruise, Encounter, Extended Operations, and Project Closeout, thus bringing the project to a close.

The benefit of this type of process is that ideas can be explored and evaluated before they are fully developed. This helps an organization (in this case, NASA) to keep their operations budget and specific project funding in check while allowing concepts to be explored. At the end of any phase, if the project becomes too expensive or unrealistic, it can be abandoned. This type of gated system may or may not have a place within architectural project management as a whole, but could be adapted on a smaller scale within schematic design or design development phases.

3.2.5 As defined by the Federal Aviation Administration

The Federal Aviation Administration (FAA) has institutionalized the engineering design process so that it will fit into the necessary bureaucracy of a large organization. Like NASA, the FAA uses a gated process that allows stronger designs to proceed with funding and weaker designs to continue to be developed in the initial stages so that they
have a better chance at surviving. Their stages are defined as Mission Analysis, Investment Analysis, Solution Implementation, and In Service Management.

During Mission Analysis, trade studies are performed and concepts are defined. During Investment Analysis, a review determines that the project is ready to move forward with all requirements completely defined. Life cycle engineering costs are estimated and upon approval the project moves into Solution Implementation. During this phase that includes sub stages such as preliminary design, detail design, and verification, the main concepts are developed and creative decisions are made. Next, during In Service Management, the system is assessed for the level of success or failure of the design.

These specific phases supported by the FAA make the design process and creative decision-making process much more concrete. This level of bureaucracy has also become necessary due to the large size and complexity of the projects.

3.2.6 As defined by software designers

In *How Do You Design?*, Hugh Dubberly discusses the 4d Software Process, common in the software design world (2005). The group that most closely relates to the research discussed here is attributed to Hbirbals, a hospitality consulting firm. The 4d Software Process is shown in Figure 3.5. It includes the Analyze phase, but focuses more on separating the steps of the Synthesis phase. The fact that it contains a step beyond Assess or Evaluate is what makes this process unique: that is that the maintenance of the product (in this case the developed software) by the client is a crucial part of the process. If the client does not know how to perform necessary daily or weekly maintenance or
troubleshooting on the product, then it will not be useful to them for any sustained period of time.

![Figure 3.5 The 4d Software Process](image)

### 3.2.7 As defined by IDEO

IDEO is a multi-disciplinary design consultancy specializing in helping organizations grow by focusing on the human portion of every design (or non-design) project. Designers at IDEO have approached a wide variety of projects with “Design-Thinking” strategies including organizational design, brand strategy, product design, interaction design, and more. Design Thinking can be described as containing processes typical to design and looks to solve bigger societal problems (Jonas, 2011). IDEO’s process must encompass a wide variety of disciplines since IDEO embraces a multidisciplinary approach to projects. Dubberly discusses this process in *How Do You Design?* (2005).

The IDEO process consists of five phases. They are Observation, Brainstorming, Rapid Prototyping, Refining, and Implementation. In contrast to other processes explored thus far, the IDEO process does not begin with Analysis or a Statement of the Problem. It starts with Observation, or searching for a need. Potentially it is this Observation phase that allows them to more accurately define and propose solutions to the problem. The Brainstorming phase is consistent with other ideation phases. A second differentiation
between the IDEO process and others explored is the inclusion of Rapid Prototyping. This is somewhat consistent with Archer’s engineering design process, which placed the evaluate phase prior to the selection of a concept. During the Rapid Prototyping phase, many concepts and ideas are tested to ensure that the very best idea is selected. It is this Rapid Prototyping phase that allows IDEO’s designers to more accurately communicate their concepts to their clients at an early stage in the overall process. This communication creates a more collaborative project team, of which a client can be a part.

There is a difference between the Rapid Prototyping that can happen at a product design firm and the potential to use this process within architecture and interior design. It is the nature of the final outcome of the design processes. Product designers often can create prototypes of their designs, allowing for more iteration. However, buildings cannot as easily be created as mock-ups because of the longevity of the construction.

In order to narrow the concepts, the IDEO team then refines the concepts to be more concrete. It is at this time when input from all stakeholders is gathered. While all disciplines involved in a particular project are present for the whole process, this is the time when their expertise is most necessary. Engineering, design, business, and other services use their knowledge to produce the best product possible during the Implementation phase.

3.3 Summary

Many disciplines related to design have processes that are similar. General design processes lead the project from large concept ultimately to detailed decisions through the Analysis – Synthesis process. This can happen over the life of the project, or on a smaller
scale with every decision as discussed by Maver. The design process is also explored in a non-linear fashion, with phases being revisited or repeated throughout the project. Engineering design processes are more rooted in the scientific process, suggesting that an evaluation or testing phase is necessary prior to the final design decisions being made.
Chapter 4  Process Evolution and Project Management

Processes within architectural and interior design firms are not static. They evolve as new technologies, software, client needs and other factors evolve. The following chapter describes the theory of product and technological evolution through the lens of biological evolutionary theories as discussed by John Ziman, fellow of the Royal Society, and others in *Technological Innovation as an Evolutionary Process* (2000). Technological evolution is important to understand so that the relationship between technological shifts, team organization shifts, and the evolving design process can be better understood. This information will assist with the ability to suggest a process that allows for the evolution of the factors that affect the design process. This evolutionary theory is put into more understandable business management terms with the explanation of Gerard Fairtlough’s creative organizational business model. Fairtlough had a long career in upper management with Shell Chemicals UK and Celltech in England.

4.1  Process evolution

As discussed, design processes evolve in response to new technologies, software, client needs, and other factors. These factors are also in a continuous state of evolution. It is perhaps more accurate to describe this process as co-evolution. Some disciplines of engineering have begun applying biological evolutionary theories to artifacts and technologies as related to product design and engineering (Ziman, 2000). The theory is
that each generation of a particular product is slightly different, similar to biological evolution. A designer or organization tweaks the product to make it more desirable to the consumer. Over many generations of the product or artifact, the original design may or may not be recognizable.

The processes behind designing these products are continuous while each product is static. The product is a snapshot of the design that has been developed thus far. At the release of a new product, a company does not stop designing or it will get left behind. Consumers will not select the products that are not updated with the newest technologies, causing the product to disappear. It is the designer or organization that drives this evolution using information gathered from the consumer and other sources.

Technological evolution does differ from biological evolutionary theories, however. In biology, it is believed that evolution happens without design and that the selection happens by nature’s trial and error. With technology, each generation of a product is carefully researched, designed, and crafted in order to have the very best chance of succeeding. It is when the consumer makes his selections that the designer has little to no effect on the success of the product. James Fleck describes the theory that “the genetic code for an organism is written within the organism. In contrast, the equivalent for an artifact is written outside of the artifact proper…” (2000, p. 251). In technological evolution, the product or artifact does not evolve on its own as in biological evolution. The designer causes this evolution, creating a contrast between the two theories.

In the case of architecture, the co-evolution of many factors has a profound effect on the artifact that results from its process. The design process itself evolves much more
imperceptibly than the software and other technologies used to create a building. The influence of design and documentation software causes the process to evolve, which requires a new design and documentation software and so on. At certain points in this process, an artifact (a building, a process definition, or a software update) is defined and produced. This is the product that evolves over generations as mentioned above.

Design processes as discussed here are representative of a single artifact’s production. Neither individual designers nor design firms are finished conceptualizing and pushing their ideas further simply because one product has been produced. The design process always begins again with new information, new technologies, and perhaps an improved process. The genetic code for the artifact (in this case the designer) has evolved by learning the attributes that contribute to the success or failure of the project.

The question becomes, how do we define a process that allows for this evolution? Can we? Or will the definition of the process always be in need of updating?

4.2 Evolution and project management

Gerard Fairtlough wrote about the management of innovative organizations in 2000. He explains that organizations seeking innovative output exist within a map consisting of four factors on two axes. (See Figure 4.1.) The vertical axis is discovery-driven versus design-driven. Discovery-driven activities can be described as ones that result in finding an answer as opposed to working one out through algorithms (pharmaceutical companies, for example). Design-driven activities rely on the creativity and imagination of the solution. The horizontal axis consists of individualist versus collaborative working habits. The individualist is one who is entrepreneurial and works
alone toward innovative inventions. The collaborative investigator consists of larger teams of people such as research and development departments. “Collaborative innovation benefits from sustained interaction within a group of people, who develop shared tacit knowledge…” (Fairtlough, 2000, p. 268). Often the size of the firm determines the quadrant in which their management and design style resides. Typically small firms lie in the individualist – discovery-driven quadrant while larger firms are generally more collaborative, but can be either design- or discovery-driven.

![Figure 4.1 Fairtlough’s management axes](image)

Fairtlough also discusses the management styles of a company, as it exists in one of the quadrants. He points out that the bureaucracies in these companies can exist at many different levels, from organic rules and regulations to a very high level of bureaucracy consisting of many precisely defined processes. Depending on their processes, the collaborative quadrants have a management style that is both organic and bureaucratic. The processes discussed above in architecture and interior design firms are typically quite bureaucratic since they are governed by professional organizations and
contractual agreements. Very specific steps must occur in order to fulfill these contracts. However, within these firms and their bureaucratic project processes, designers must have the freedom to follow their own more organic design and creative decision-making process.

As companies’ processes and technologies co-evolve, “the likely result is a trend towards the bottom right of the matrix, a trend to design-driven innovation and towards large, highly collaborative organizations” (Fairtlough, 2000, p. 277). Companies are generally in business to grow larger and with that the amount of employees and their level of individual specialization grows. Thus, additional collaboration is necessary within as well as outside of the organization. The shifts in technology and project team organization are the factors that lead toward design-driven and highly collaborative processes.

By nature, organizations need some level of bureaucracy in order to function profitably. As discussed in Chapter 2, architectural professional organizations took it upon themselves to create a framework for contractual agreements. In the United States, the most widely used resources for mediating the process between architect and their clients and consultants are provided by the AIA.

4.3 Tools and resources needed to manage the process

There are many resources that must be managed in order for an architectural process to move through completion. In 1981, the AIA published a resource for architects, which describes methodologies and activities relevant to running an architectural firm. Former professor at Rensselaer Polytechnic Institute, David Haviland,
served as editor, combining contributions from a wide variety of architects working in the field. While published almost thirty years ago, the information is still relevant and applicable to architectural firms today. The volumes of this publication include: The Project Management Manual, Case Studies, The Process, and The Effective Project Manager. Most relevant to this study are the descriptions provided in The Process (Haviland, 1981), which are resources and day-to-day activities for the architectural project manager.

While project management must happen throughout the architectural process in order for the project to be successful, it is the allocation of people, time, money, facilities and technology that can have a great effect on the project’s processes and phases. This can either allow the creative decision-making process to proceed unchanged or restrict it based on fewer available resources. As discussed by Haviland (1981):

The goal of architectural project management is to make the most effective use of people, time, money, facilities and technology so that the projects brought into the office can be achieved on time, at an appropriate level of quality, to the client’s satisfaction and at a profit (p. 3).

These management practices can exist on a large scale (overall firm organization), a much smaller scale (creating work plans), and anywhere in between. The main goal is to create the environment in which the work can be completed efficiently. Project management resources, procedures, and practices can have an effect on both the project’s process as well as the creative decision-making process.
4.4 Summary

Understanding technological and process evolution is helpful in understanding how the design process and its products change over time. Even within a single organization, the process must be able to co-evolve with the technology that is used to produce the designs. As Fairtlough describes, each organization changes as it grows larger as do the processes within.
Chapter 5 Primary Research

While differences between the various processes are discussed above, the processes themselves, at the core, are fairly similar. The terminology of each process may differ but the activities and goals within each phase are comparable. The following chapter describes the primary research that investigates architectural and interior design processes, as they exist in the profession. First, Section 5.1.1 reviews the analysis and comparison of the four processes selected as examples for the primary research phase. Second, the workbook developed to help in interviewing professionals is discussed in Section 5.1.2. The goal for this workbook is to provide a way to assist the participant in documenting their design process, as well as managerial resources used during the project. Third, Section 5.2 discusses the selection of participants. Finally, Section 5.3 presents the results and analysis from the interviews and workbooks. The diagrams of the process gathered from professionals will be compared to the process defined in Chapter 6.

5.1 Developing the workbook

A workbook serves as the method of documentation for the processes that architecture and interior design professionals use on a daily basis. The intent for the workbook is to give professionals an overview of examined processes, to allow them to
discuss resources that assist in managing the design process, and to provide them with space to document their process.

5.1.1 Selecting example processes

Four of the processes explored in previous chapters were selected to be examples of documented processes for the purpose of the primary research discussed here. These processes were used to give research participants a wide range of processes to consider before diagramming the process that they use in their profession. The criteria used to select these processes are as follows:

1. Wide range of disciplines represented
2. Wide range of number of phases present
3. Understandable terminology used
4. Unique phases included, such as Observation (IDEO) or Maintain (4d Software Process)

The four selected processes are described in detail in Chapter 3. The following list describes the characteristics of each process that make them unique and useful to the workbook exercise. See Figure 5.1 for a visualization of how the selected processes’ phases compare and contrast.

1. Diverge – Converge (Cross, 2000) is at the core of the creative decision-making process.
2. The Engineering Design Process (French, 1985) begins with the Need phase during which the client’s needs are researched. There is a strong and
necessary relationship between engineers and architects, requiring the processes to be able to work within each other.

3. The 4d Software Process (Dubberly, 2005) shows the widest range of activities in a simple and understandable manner, making it possible for many types design to follow this process. This process continues to the Maintain phase, which few other processes show.

4. IDEO’s process (Dubberly, 2005) not only includes the Observation phase but also a Transition phase where the project team turns the finished product over to the owner. It is the widest reaching process in terms of discussing activities before the statement of the problem and after deployment. The Rapid Iteration phase is also unique because it allows the designer to visualize the concept for the client at an early stage in the process.

Each of these processes moves from the abstract to the concrete and follows the same general path in order to complete the project. This path begins with problems or projects as fairly vague statements or sets of needs provided by a client. Based on this information, the designer gathers additional information through research and/or observation, which is used to conceptualize possible solutions. Each concept is evaluated based on its validity and possible relationships to other concepts and pieced together like a puzzle. Every piece is selected and carefully considered before making a decision on one cohesive design. This design is implemented, thus making the qualities of the finished product known. It is at this time where some assessment regarding the success or
failure of the project is performed. The client then takes over the maintenance of the project.

The types of activities that occur within each phase take on a particular type of movement. As shown, each phase was determined by the activities that occur within it to be cyclic, linear, or exploratory. This exploration was in response to evidence that the design process, although shown typically as a linear process, may not necessarily be such. Each phase can also be discussed in a similar manner. During this analysis, many of the phases in which ideas are conceptualized were determined to be exploratory processes.
During the design process, many ideas are considered, left behind and potentially picked back up as new information becomes available. The designer does not move directly from one broad idea to the next more detailed idea, he jumps back and forth between concept and detail, potentially using one discarded idea to inspire a new one elsewhere in the project. These creative phases may seem hectic and unstructured to the non-designer, but this exploratory movement is important to the designer’s creative decision-making process.

5.1.2 Developing the workbook activities

In order to understand how architects and interior designers use the design process with the added logistics of a client, coworkers, budget, etc., interviews were conducted with area professionals. A workbook provides the structure for the interviews. The goal for this workbook is to gather resources that assist in the management of the design process, successfully or unsuccessfully. It also asks participants to diagram either the design process that they have experience using. This may be the process as it exists currently, or an ideal process that combines many projects’ experiences. These two activities will serve to seek variations from the prescribed interior design and architectural process so that the evolution of the process, technologies, and management resources can be identified. The workbook in its entirety can be seen in Appendix A.

The three-step workbook begins by asking the participant to brainstorm a list of certain resources that help to manage the design processes. The main goal is to discuss the most successful resources, but space is available to record the unsuccessful resources as well. Categories are given as prompts, but each can be interpreted loosely. These
categories were selected in order to understand the main parts of project management and are listed below with an explanation of the intent for each. Each category can have a profound positive or negative effect on the success of a project.

1. Client relations – tools that assist (or hinder) in keeping a positive relationship with the client
2. Technology use – hardware or software that may promote (or hinder) more efficient design or documentation
3. Necessary information – types of information that are necessary at a certain point in the project
4. Staffing needs – what expertise is needed and at which phase
5. Budget/contracts – documents or guidelines that assist (or hinder) the project as a whole
6. Other

The second step of the workbook asks the participants to diagram their design process with provided words and icons as well as their own vocabulary. Very little direction is given except that the participant should create as many phases as necessary to fully express the design process. On the page, a timeline indicates that the process must exist over a certain period of time, but it is not required to diagram the design process in a linear fashion.

There are words and icons available for participants to use in order to diagram their process. The words were collected from processes found in secondary research discussed in previous chapters. The icons are to indicate the type of process within each
phase: linear, cyclic, or exploratory. Using suggested words and icons for the workbooks allows for insightful analysis and comparison. The provided words and icons can be seen in Appendix A.

The third step of the workbook invites the participant to use the resources from the previous pages as a way to delve deeper into the phases of the process diagramed. This will provide information about what resources are most necessary at certain points in the process. For example, team organization and staffing may be necessary very early in the project timeline. This often takes place before the project is accepted or the problem statement is defined.

5.2 Selecting participants

In order to understand how architects and interior designers use the design process with the added logistics of a client, coworkers, etc., interviews were conducted with professionals from central Ohio. These professionals work in a variety of architectural and design firms and have a wide range of experiences. Ten professionals from central Ohio were selected based on the following criteria:

1. Level of experience
2. Type of experience
3. Specialization
4. Background
5. Size and type of firm

The goal of the interview and workbook session is for the participant to diagram and discuss the design process as it is used in practice in order to gain insights about
comparisons and contrasts between processes defined in literature and the professionals’ processes. The workbook discussed above describes the basic structure of the interviews.

Following this workbook exercise, an open-ended interview took place regarding the diagrams. The questions were based on the following:

1. On pages 2 and 3, please discuss the most important items you wrote down.
2. Please explain your process map, highlighting the most and least successful resources mentioned.
3. Is this your ideal process or one that you’ve used before?
4. How does the ideal process differ from the ones you’ve used?
5. Where does the process need to be most flexible?

Additional questions were asked as clarification based on the answers given and discussed.

5.3 Analysis of primary research

The interview session gathered qualitative data from the ten professional participants. This data was reviewed and compared collectively as well as individually. The insights discussed here will be compared to the previously discussed processes in later chapters.

5.3.1 Resource brainstorming

The categories for the managerial resources are open-ended, so participants described a wide variety of resources that they use on a daily basis. They provide some insights into how their design processes move forward when adding issues such as
staffing needs and client demands. Below, insights documented and discussed by participants in the brainstorming portion of the workbook are listed.

1. Video conferencing can be good and bad.
2. It is important to have technology that will allow for creativity in the beginning of the process, while more detailed software is necessary for documenting the design.
3. BIM and LEED processes help to save time because they require collaborative, detailed decisions at the beginning of the project.
4. Relationships with the client should be established up front, with clear project goals.
5. Email is good for touching base and keeping contact with the client, however reliance on it is not helpful to the overall relationship. Nothing is as good as a face-to-face meeting.
6. Email and smart phones have been critical in being able to respond to and communicate with the client at every point in the process.
7. Get client sign-off and feedback at each phase (if not more often).
8. Open communication is critical throughout the process, within the project team as well as with the client.
9. It is important to determine staffing needs at the beginning of the project, even if the employees’ time isn’t needed until later in the project timeline. The best way to manage these staffing needs is with a flexible work plan.
10. All resources are necessary everywhere. Ideally, project staff is consistent throughout entire project.

5.3.2 *Process diagrams*

Seven of the ten participants used part or all of the AIA phases as a basis for the organization of the process. This structure, as mentioned, is the most widely used in the building and construction industry. Designers have found ways to work within this structure while keeping their own creative decision-making design process in tact.

Participant 3 discussed the breakdown of time for the project team by phase. Interior design and architecture firms often split their total fee up into percentages based on the ratio needed at each phase. He stated that there is a shift in this breakdown, that more time is needed at the beginning of the project. Previously at his firm, the percentages were as follows: Schematic Design – 15%, Design Development – 25%, Construction Documents – 35%, and Construction Administration 25%. Today all of the phases are more consistent at nearly 25% since more of the “construction documentation is happening sooner because the BIM is already doing it for us.”¹

The issue of team organization and staffing was mentioned in nine of the interviews and workbooks. The organization of the team is an important step at the beginning of the project and can be critical to the project’s success. Having the most appropriate architects and designers working on the project can greatly affect the project’s outcome. It was also mentioned that it is best if this team can be consistent through the entire project. Participant 5 stated that the staff and computer aided drafting

¹ See full quote in Appendix C.
(CAD) resources may grow and shrink as the project progresses, “but the most successful projects are those that engage staff throughout the process.” ²

Having a good architectural team is one aspect, but this team must collaborate with consultants, the client, and other members of the project team. Collaboration and integrated teamwork were mentioned in half of the workbooks. Participants discussed the importance of collaboration from the beginning of the process. For example, it is when the interior designer is brought on to the project early that they can have the most benefit. Participant 2 explained a situation where she (as an interior designer) was included in a project from the beginning and suggested a certain HVAC configuration in order to achieve her goal of higher ceilings. “…it actually ended up being less expensive to do [the ductwork] around the outside and we got the [higher] ceiling height. [On later projects] the head of facilities…would still get me involved too late.”³ Similarly, Participant 1 described in the workbook that “for the best outcome: the entire process is collaboration between multiple groups.” These statements indicate the desire to work with all of the project stakeholders throughout the project timeline in order to be able to solve the problem.

Many participants also discussed the relationship between the architectural team and the client. Some described this relationship in depth. Because architecture and interior design are service professions, the client relationship is potentially one of the most important to a firm’s success. These relationships are often not described in the literature explored above, but were mentioned in most of the workbooks and interviews.

² See full quote in Appendix C.
³ See full quote in Appendix C.
Participants described the importance of creating a positive relationship with the client from the beginning of the project. Participants indicated that review and approval by the client is necessary at many intervals with one final client approval toward the end of the project. The client must approve the concept at certain phases in order for the architect to move forward with development. The final approval can take place prior to or after final documentation is complete. Participants 3 and 4 showed this in their workbooks and discussed in their interviews. Figure 5.2 comes from Participant 4’s diagrammed process.4

Some participants discussed that this relationship is a result of regular meetings with the client. These meetings are not only to seek approval for a design, but also to

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4 Participant 4 used varying vocabulary to express the process of presenting to the client and gathering feedback. The first, “presentation” followed by “select” is a process of presenting the client with several options and having them select one. This was also selected from the terms provided with the workbook. The second and third “present” were written by the participant and are documented at these phases to gather approval to move forward with the previously selected design.
maintain a high level of communication. The meetings should begin with a definition of the goals for the project, client, and architect. Participant 6 stated that the goals are a combination of “time, budget, and quality” and that “you can’t have all of these at their max.” She described a scenario in which the architect wants maximum quality while the client is looking for the project to be finished within a short time frame. This is the type of information that needs to be discussed at the beginning of the project so that a compromise can be made and the architect can deliver a successful project.

Additionally, another important component to having successful relationships with the client is continued contact after the project is complete. As mentioned, architectural firms rely on incoming projects to be successful. Having repeat clients can result in a higher degree of familiarity with a particular client’s goals and subsequently a higher degree of profitability. As discussed by four participants, this goal is achieved by maintaining a positive relationship with the client after the end of the project. Continued contact can assist in signing contracts with repeat clients.

Many participants spoke about the design process as if it were a direct result of the client’s wishes. One architect (Participant 6) and one interior designer (Participant 1) described the management of the process as either staying ahead of or responding to the client’s goals and concerns. This type of interaction is not described in many of the documented processes. The institutionalized processes from the AIA and the RIBA should describe the interaction between the designer and the client as well as the activities that happen within the architectural firm.

\[5\] See full quote in Appendix C.
Participant 8, an architect, diagrammed a very specific creative process within the Concept/Schematic Design phase that occurs at the beginning of the project. Figure 5.3 shows a recreation of this process. Immediately following the Statement of the Problem, a cyclic process begins with Brainstorming. Several concepts are developed and refined to a point at which they can be shown to a decision-maker (either the client or a project manager) for one to be selected before being moved into the Design Development phase. He went on to describe that this process (Brainstorm, Develop, Refine, Select) can apply to “many different levels [such as] a building’s general massing scheme but also to the way a staircase is detailed.” This process is essentially an expansion on Cross’s Diverge – Converge process or Koberg and Bagnall’s Analysis – Synthesis process.

![Diagram of Participant 8's design process]

**Figure 5.3 Participant 8 – design process**

### 5.4 Summary

As discussed in Chapter 1, two major shifts are happening in the architecture and interior design professions. The first evolution in the type of technology used and the

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6 See full quote in Appendix C.
second is the growth of the project team to include many more of the stakeholders in the design process. These two shifts have some effect on each other.

The technology that is most widely used currently is BIM software. The professionals that participated in this investigation discussed the importance of using BIM to assist them in conceptualization, visualization, and documentation. The participants also discussed in depth the importance of receiving approval and feedback from the client throughout the process, not only at the end of the project timeline. This indicates that during the early concept phases, the designer must be able to visualize and communicate their ideas concretely in order to discuss with the client. BIM software assists with communication by allowing the designer to more easily render their designs early in the process, and also requires for more detailed decisions to be made earlier in the process.

As the BIM software allows the designer to concretely visualize their ideas, the client and other stakeholders are more easily invited into the creative design process along with the architect and interior designer. Presentations are given and feedback from the client is received, even after the concept phase of the project, as discussed by many of the participants in this study.

Even though the creative decision-making process and the institutionalized AIA phases can be mutually exclusive, they must co-exist within the architectural or interior design project process. The participants diagrammed this iterative and sometimes cyclic process in their workbooks.
Chapter 6 Conclusion

The two evolitional shifts that have been occurring in the architectural and interior design profession are an evolution of the technology that is used and the growth of the project team. These shifts require a new look at the design process, as it exists within individual designers as well as within architecture and interior design firms. Interior design and architectural processes must be able to combine the creative decision-making process, which can be individualized, with the processes that have been institutionalized by professional organizations.

The following chapter first identifies desirable characteristics from processes found in literature and processes identified in primary research. Using these characteristics, a new process is defined in Section 6.2. This process is illustrated by discussing it in relationship to a hypothetical project in order to determine its validity. Finally, future work in this topic is identified.

6.1 Characteristics of investigated processes from literature and primary research

The following characteristics that have been identified through investigations described above will be divided into two groups: 1) creative decision-making processes and 2) project processes. The following section compares the research discovered from the two sources (secondary and primary research) and this comparison will be used to redefine the architectural and interior design process.
First, within the creative decision-making process, it was discovered that the processes defined must be loose in the terminology used. Each process is drastically individualized based on the designer, the discipline, and many more criteria. Koberg and Bagnall as well as Kilmer and Kilmer both describe this very simply as Analysis – Synthesis. Cross defines the process similarly as Diverge – Converge. This is perhaps too broad because it does not identify or explain the evaluation of concepts. All three expand their two-step processes into additional phases that are more descriptive. Maver adds the idea that within each of these phases, sub phases exist, consisting of Analysis – Synthesis – Appraisal – Decision. He also introduces diagrams that show the potential to move through each step in a non-linear fashion. Participant 8 also suggests sub phases in the form of Brainstorm – Develop – Refine. All of the processes investigated move generally from concept to detail in the types of decisions that are to be made. The AIA’s suggested Integrated Project Delivery process (as well as evolution in computer software technology) require that the detailed decisions be made much sooner than previous processes suggested.

The Archer and IDEO processes contain phases that are unique. Archer suggests that the evaluation of the concept should exist prior to selecting the final design. IDEO typically uses rapid prototyping to test concepts very early on in the design process. These are both helpful in ensuring that the most correct concept is selected, but is difficult to implement within interior design and architectural projects by nature of the final product.
Second, many of the processes discussed above are specific to a specific project’s process, how it works within an organization, and how the designer works with the client. The RIBA and the AIA both define basic processes that encompass the creative decision-making process, but institutionalize it in order for the organization to operate. The AIA process (Schematic Design, Design Development, Construction Document, Bid or Negotiation, and Construction) is the most widely used process of organizing fee structures in the United States architectural industry. Since the contractual agreements are set by the AIA and are legally binding documents, it is nearly impossible to move away from this system. Architects and interior designers must be able to and are working within this structure, as documented by the workbooks during primary research. The RIBA Plan of Work process is similar to the AIA phases, but instead lists additional phases that are more specific to the process of finding and working with the contractor.

A few of the processes from related disciplines contain additional phases that architecture and interior design may be able to borrow. Pugh discusses the Market Analysis step at the beginning of the design process. He indicates that this is often performed by a third party, but that these individuals need to be included in the design process, adding to the project team. French also emphasizes the definition of the Need as required by the client. French’s process ends at the point where the engineer turns over detailed design drawings to the manufacturer. This is contrary to the architectural and interior design processes that require the designer to oversee the construction process. It also removes the manufacturer or contractor from the design team. The 4d Software Process includes a Maintain phase at the end of the project. This allows the designer to
work with the client during the usable life of the product, allowing the client to be more involved with the design team. The inclusion of the client, market researchers, contractors, and others in the design process is documented by the AIA’s IPD process as well as primary research participants as being imperative to a successful project.

NASA and the FAA both have very specific procedures that define their design processes. They include gates at the end of each phase, allowing the project to either spend additional time in development or move forward to the next phase. This happens after feedback from others in the design team or organization. These gates are similar to the process of meeting with the client, presenting design ideas, and receiving feedback before proceeding, which is described by primary research participants.

6.2 Definition of new process

Using the ideas listed in the previous section, the process within architectural and interior design firms is updated. See Figure 6.1. The process is rooted in the AIA phases since it is the most widely used, as shown in primary research. Continuously tweaking this AIA process with input from literature as well as practice will allow for an evolution of the design process.

Starting with the broad phases, it is important to understand that the overall project must move through Analysis, Synthesis, and Evaluation in order for the architectural or interior design firm to be successful. These phases are borrowed from the creative decision-making processes discussed by Koberg and Bagnall as well as Kilmer and Kilmer.
Participants documented the Accept phase immediately prior to various phases within the process. This indicates that often the architect or interior designer is engaged at various points in the design process. It is typically the first phase in which the designer has contact with the client, but the amount of work developed on the project prior to this
can vary. A designer can move from the Analysis phase into a Research or Pre Schematic Design phase, but often the Need or Market Analysis phase has already been completed. In this case, the designer may move directly to the Schematic Design or Design Development phase.

Though the process is shown here as fairly linear, interior designers and architects typically move back and forth from one phase to the other, or the phases overlap and the lines become blurry. Over the life of a single project, each phase is encountered generally in the order shown, however, for the architect and designer, the process is quite cyclic. This cyclic process is two-fold. First, at the end of each project, the knowledge gained from the success or failure of the design is carried on and informs the subsequent projects. Second, as discussed by the research participants, one goal of the project is to create repeat business, causing the design team to move directly from the Use or Maintain phase directly back into the Accept phase.

In exploring the phases defined by the AIA, some activities are not addressed. The addition of a Pre Schematic Design phase allows for the designer to be involved in initial research, market analysis, or seeking a client’s need. This also allows for the clients and market researchers to be introduced to the design team early, creating the precedent for positive and open communication.

Some of the individual phases also need a bit of redefinition, to include activities that are not typical to architecture and interior design. During Design Development, activities such as Evaluate (from Archer) and Rapid Prototyping (from IDEO) can be implemented to test ideas. In the architecture industry, these activities can be more
difficult by nature of the product, but with the general contractor involved in the design team from the beginning, there may be space for these concepts to enter the process.

Because the general contractor is involved at the beginning, the Bid or Negotiation phase becomes less significant. The budget and construction schedule can be evaluated even more closely during the design phases, so that during Bid or Negotiation, the trade contractors are the only ones selected. This potentially allows for a shorter timeframe.

During the Construction phase, communication between the architect and construction manager often breaks down. Using this new process, the relationship will be established for the life of the project and it is more likely for the construction manager to collaborate with the architect or interior designer if an issue arises. They have been involved in the conceptualization of the design and can help see that it is implemented properly.

The Use or Maintain phase often is omitted in architectural and interior design processes. The post-occupancy evaluation is typically performed at the end of the Construction Administration phase, but is often not included in the contract with the client. However, the maintenance, evaluation, and feedback of a project are necessary for the life of the project. The evaluation of the design and feedback from the client give the designer and architect valuable information that can lead to additional work and a better relationship with this client, as discussed in primary research. This information will also educate the designer, allowing them to grow in the profession. The post-occupancy
evaluation and the evaluation of the design itself is a necessary step that should not be left out.

At each phase it is necessary to evaluate the project and receive feedback on the progress from the client and other members of the project team. These presentation and feedback sessions can work much like the gated process within NASA and the FAA. It is at this time when the review board, consisting of the entire project team (client, architect, engineer, market analyst, etc.), can request further development of a concept in a previous phase, or approve the design to go on to the next phase. Once the decisions are made, it is necessary for the success of the project not to revisit them at the risk of adding additional cost or affecting change on a wide number of other decisions.

Within many of the phases diagrammed in Figure 6.1 are the sub phases Analysis, Synthesis, and Evaluation. These are activities that happen on a very small scale as a designer is developing or refining concepts. These activities, as a whole, can take from as little as a few minutes for detailed decisions to many months for broader concepts. They are all necessary for interior designers and architects as part of the creative decision-making process, can be completed in any order, and are often cyclic rather than linear. The Evaluation portion should be completed with the client in order to gather feedback and approval on the design thus far.

The process suggested above is an evolution. First, it allows for the project team to grow and expand. Second, it accepts the new technologies needed for designers to be able to visualize their designs earlier. The process as documented here will continue to
evolve as new technologies, processes, and people become involved in the design process.

6.3 Defining Goals

Similar to the start of a project, each phase needs to have clearly defined goals. These are the goals that are to be evaluated at the end of each phase or at each gate. Every project will differ, but a scenario is described here as an example. A project is taken through the suggested process in order to understand the goals and outcomes. Since computer software has a great effect on the working processes of interior designers and architects, points at which computer software may be able to enhance the process are identified.

Before Pre Schematic Design, the organization (or client) has noticed a need for additional space. In this new process, they invite the architect, interior designer, market analyst, engineer, and other consultants to join the team, signaling the beginning of the Pre Schematic Design phase. During this phase, analysis and observation are performed in order to determine the size and type of space that is required to fulfill the client’s needs. The design team also conducts visioning sessions, which are research meetings that allow the client to discuss their aesthetic wishes. These wishes are often expressed through precedent images and descriptive words. During the Pre Schematic Design phase, the required spaces (including room types and square footage) and early styles are identified. Similar to the NASA and FAA gates, a presentation to the client will offer the opportunity to revisit these decisions and ultimately give the design team approval to
move forward. These and other decisions reached at the end of each phase should not be revisited once passed through to the next phase of the project.

At the start of the Schematic Design phase, the design team works with the client through regular meetings to make adjacency and programming decisions. The types spaces that were previously determined are developed into basic floor plans. If it is a project with exterior design involved, general shapes for the exterior are determined. This is the portion of the project where building information modeling (BIM) software should be introduced. The software should be able to assist in the early exterior design and programming of the building. Simple information regarding style and design should follow the preliminary concept and be modeled, requiring the design team to further define the concept. The software should also be able to estimate some of the information that is often difficult to pinpoint at this phase of the project. If the software can assist with items such as budget and construction schedule thus far, it will be able to provide the design team with valuable information. BIM software also allows the architect and interior designer to be able to communicate the design intent with the client through renderings and videos. The goals for the Schematic Design phase include the design for the exterior of the building, general floor plans, and using BIM software to show this exterior design and the preliminary programming. Because the software requires some style decisions to be made when creating floor plans, a bit of the interior design is also determined. Again, the client should give feedback on the areas that need additional work, or the approval to move ahead to the next phase.
The Design Development phase is the phase during which concepts are fully refined through additional meetings with the client. Designers should be adding information to the BIM model as decisions are made. As soon as this information is added to the model, there is an opportunity to render the design at any stage in order to communicate progress with the client. Physical characteristics of the building as well as the specification of materials used should all be included in the digital model. The software should be able to give more accurate budgeting and scheduling information since more detailed design decisions are present. By the end of Design Development, all design decisions should be made.

The Construction Documents phase, as discussed here, runs concurrently with the Schematic Design and Design Development phases. With the use of BIM software, as soon as a small portion of the building is modeled, the same level of construction documents is produced. As Schematic Design comes to a close and Design Development begins, even more complete documentation is available. There may be a short portion of the Construction Documents phase that happens after Design Development is complete. At this time, a certain level of quality assurance in the form of documentation review should take place. However, if the construction manager is fully integrated into the design team and the building’s digital model is fully shared, the need for traditional construction documents is reduced and this portion of the process is potentially eliminated. The goal for the end of the Construction Documents phase is to have complete documentation of the building.
Because the contractor has been integrated into the entire design process, the Bid or Negotiation phase is reduced. There may be the need to seek out sub contractors to complete the project, but general contractor, with the help of BIM software, has already estimated the cost and made key scheduling decisions. The goal for the end of the short Bid or Negotiation phase is to have the entire building team determined.

At this time, the Construction phase begins. The leadership of the design and architectural team now shifts from the architectural and interior designers to the construction manager. However, as questions regarding the design and building process arise, the contractor should seek consultation from the entire design team. The building’s digital model is updated as new decisions are made in order to keep a record of the finished product. The result of the Construction phase is a finished building ready for the client to occupy.

The Use or Maintain phase, within architectural and interior design, typically requires the entire design team to perform post-occupancy evaluations. These evaluations can range and may include the success of the design, workflow achievements, and the performance of certain building materials and details. The design team shares this information with the client and uses this knowledge to influence future projects with this or other project teams. If there are any outstanding conflicts between the intended design and the finished building, these are addressed and corrected by the project team. The digital model is turned over to the client so that it may be used when dealing with the daily maintenance of the building. Moving forward, facilities often perform their own small renovations and keeping an accurate digital record of these is essential to the
facility. The goals for the Use or Maintain phase include providing an accurate record of the finished building to the client, maintaining a positive client relationship, and evaluating the building based on various criteria in order to gather valuable information for the next project.

6.4 Topics for future work

Primary research showed that architects and interior designers believe that the lines between the phases are blurring. Because of BIM software, detailed decisions are being made earlier in the process, decreasing the need for separate Schematic Design, Design Development, and Construction Document phases. Currently, because the AIA contracts are so widely used and accepted, and the fees are structured around these phases, it is difficult to move completely away from this structure. Additional research could explore the duration of these phases, the potential for overlap, and how the contracts and fees might reflect these changes.

There is a need for architects and interior designers to be able to share their designs with the client earlier in the process. Advanced computer software and 3D rendering help with creating realistic images for the client to see, which is the first step to digital prototyping. However many questions may still arise. Product design firms such as IDEO use rapid prototyping (Dubberly, 2005) so that they and their clients are able to see a design in a physical 3D model instead of as an image. These mock-ups also assist the designer in evaluating designs and making educated decisions regarding the final product. Prototypes and mock-ups are difficult in architecture and interior design because buildings are so large in scale and complexity, but these concepts could be useful. The
missing connection for the architectural field is that between the digital and physical prototyping. Is it necessary to have a physical prototype or are there digital tools that will be able to communicate well enough? Additional exploration into the rapid prototyping or mocking up of architectural designs could greatly benefit the profession.

6.5 Summary

Architects and interior designers can address some of the issues within their processes by looking toward other disciplines. Since the complexity of architectural and interior design projects is growing and evolving, the process must evolve as well. Related processes often suggest additional phases or activities that can assist with this complexity. The growth of the project team requires designers to be able to communicate very specific design ideas to others on the project team at a much earlier stage. This currently occurs at a phase before the initial concept was developed historically. Primary research shows that designers are being encouraged to make more specific decisions at the beginning of the project’s timeline. This quick decision-making has been assisted by the evolution of technology and the introduction of IPD processes and BIM software.

The process suggested here is one snapshot of the evolution of the process within architectural and interior design firms. In contrast to the ubiquitous AIA process, it shows the cyclic nature of the overall process, the addition of a Pre-Schematic Design as well as a Use or Maintain phase, and the creative decision-making process that occurs within each of these phases. This process represents a combination of processes borrowed from related disciplines and processes as they occur in practice. As technology changes and
project teams grow, the architectural and interior design process will continue to co-evolve.
Bibliography


Appendix A Workbook

Design Processes

Beth Benzenberg
MFA Thesis Research
May 2010
Thank you for participating in my study. With this workbook, I am trying to identify and understand the design process and all of the resources that go into each phase. The items below are a sample of a few different types of design processes. Please review them briefly before moving on to the next page.

Some definitions of icons to help you out:
- Circular process
- Linear process
- Exploratory process
- Finished product
- Ideas

Name:
Date:
Where did you go to college?
What was your field of study?
Where do you work?
How long have you been there?
Position:
Have you worked at other firms? Which ones?

Recall the most and least successful parts of your projects within the past 6-7 years. Think about them in terms of various managerial items and resources that are important to running a project. Some items could include staffing, technology, budget, necessary information, and client relations. List up to three resources on this page and the next.

**Most successful resources**
- client relations
- technology use
- necessary information
- staffing needs
- budget/contracts
- other

**Least successful resources**
- client relations
- technology use
- necessary information
- staffing needs
- budget/contracts
- other
1. Please diagram your design process using the word and icon stickers. Notice that there are blank ones. Add your own terms or icons if you can't find what you need. Create as many phases as you see necessary.

2. Next, think about what types of resources are necessary at each step. (See pages 4 and 5 for your list of resources.) Consider the most and least successful terms that you listed on the last couple of pages and elaborate on the phases you created on these two pages.

Thank you again for your time. Your input is quite valuable!

Please list your preferred method of contact in case I should have questions about your work.
Appendix B Workbook Results
Recall the most and least successful parts of your projects within the past 5-7 years. Think about them in terms of various managerial items and activities. List up to three resources on this page and the next.

**Most successful resources**
- Appropriate people
- Technology
- Effective communication

**Least successful resources**
- Lack of understanding
- Poor communication
- Inadequate resources
1. Please diagram your design process using the word and icon stickers. Notice that there are blank ones. Add your own terms or icons if you can’t find what you need. Create as many phases as you see necessary.

2. The design process is circular, leading to various phases like brainstorming, conceptionalizing, analysis of problem, programming, etc. Each phase interacts with the others, and there is a feedback loop that refines the design. The process is cyclical, allowing for continual improvement.

Thank you again for your time. Your input is quite valuable!

Please list your preferred method of contact in case I should have questions about your workbook. Email: [email]
Recall the most and least successful parts of your projects within the past 5-7 years. Think about them in terms of various managerial items and resources that are important to running a project. Some items could include staffing, technology, budget, necessary information, and client relations. List up to three resources on this page and the next.

### Most successful resources

<table>
<thead>
<tr>
<th>Client relations</th>
<th>Staffing needs</th>
<th>Necessary information</th>
<th>Technology use</th>
</tr>
</thead>
<tbody>
<tr>
<td>• word-of-mouth</td>
<td>• skilled, experienced children's teacher</td>
<td>• budget estimate completed immediately or kept accessible</td>
<td>• internet, primarily email, phone calls, regular meetings</td>
</tr>
<tr>
<td>• referrals</td>
<td>• budget estimate completed immediately or kept accessible</td>
<td>• databases, easy access to project information</td>
<td>• phone, email, in-person meetings</td>
</tr>
<tr>
<td>• professional building mutual respect</td>
<td>• budget estimate completed immediately or kept accessible</td>
<td>• databases, easy access to project information</td>
<td>• phone, email, in-person meetings</td>
</tr>
</tbody>
</table>

### Least successful resources

<table>
<thead>
<tr>
<th>Client relations</th>
<th>Staffing needs</th>
<th>Necessary information</th>
<th>Technology use</th>
</tr>
</thead>
<tbody>
<tr>
<td>• not having decision makers in line to access</td>
<td>• skilled, experienced children's teacher</td>
<td>• budget estimate completed immediately or kept accessible</td>
<td>• internet, primarily email, phone calls, regular meetings</td>
</tr>
<tr>
<td>• budget estimate completed immediately or kept accessible</td>
<td>• budget estimate completed immediately or kept accessible</td>
<td>• databases, easy access to project information</td>
<td>• phone, email, in-person meetings</td>
</tr>
</tbody>
</table>

Budget/Contracts

- Deadlines, frequent, unclear, not realistic
- Budgets, frequent, unclear, not realistic
- Deadlines, frequent, unclear, not realistic

Other

- Speed for change demasiado ràpido
- Using teams once
Next, think about what types of resources are necessary at each step. (See pages 4 and 5 for your list of resources.) Consider the most and least successful items that you listed on the last couple of pages and elaborate on the phases you created on these two pages.

Thank you again for your time. Your input is quite valuable!

Please let your preferred method of contact in case I should have questions about your workbook. I'll call.
Recall the most and least successful parts of your projects within the past 5-7 years. Think about them in terms of various factors. For some, results could include staffing, technology, budget, necessary information, and client relations. List up to three resources on this page and the next.

<table>
<thead>
<tr>
<th>Least successful resources</th>
<th>Most successful resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>client relations</strong></td>
<td><strong>Newest Project</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Project 1</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Project 2</strong></td>
</tr>
<tr>
<td>necessary information</td>
<td>necessary information</td>
</tr>
<tr>
<td>staffing needs</td>
<td>staffing needs</td>
</tr>
<tr>
<td>technology use</td>
<td>technology use</td>
</tr>
<tr>
<td>Turn over</td>
<td></td>
</tr>
</tbody>
</table>
Participant 3
Participant 3
Recall the most and least successful parts of your projects within the past 5-7 years. Think about them in terms of various managerial items and resources that are important to running a project. Some items could include staffing, technology, budget, necessary information, and client relations. List up to three resources on this page and the next.

**Most successful resources**

<table>
<thead>
<tr>
<th>Client relations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone - quick turnaround</td>
</tr>
<tr>
<td>E-mail - illustrations correspond</td>
</tr>
<tr>
<td>Quick - personal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Necessary information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear, concise client programs for project</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Staffing needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience in industry</td>
</tr>
</tbody>
</table>
| Leadership 
| Communication skills |
| Meet individual expectations |

<table>
<thead>
<tr>
<th>Budget/contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal well defined</td>
</tr>
<tr>
<td>High contracts</td>
</tr>
</tbody>
</table>

Other

**Least successful resources**

<table>
<thead>
<tr>
<th>Client relations</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-mail is never returned</td>
</tr>
<tr>
<td>Item program - incorrect</td>
</tr>
<tr>
<td>Or in office - too</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Necessary information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming questions aren't answered</td>
</tr>
<tr>
<td>Solve the situation</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Staffing needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>No access with staffing companies due to cost</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Budget/contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of defined proposals</td>
</tr>
</tbody>
</table>

Other
1. Please diagram your design process using the word and icon stickers. Notice that there are blank ones. Add your own terms or icons if you can’t find what you need. Create as many phases as you see necessary.

2. Next, think about what types of resources are necessary at each step. (See pages 4 and 5 for your list of resources.) Consider the most and least successful items that you listed on the last couple of pages and elaborate on the phases you created on these two pages.

Thank you again for your time. Your input is quite valuable!

Please list your preferred method of contact in case I should have questions about your workbook.

[Space for contact information]
Recall the most and least successful parts of your projects within the past 5-7 years. Think about them in terms of various management items and allocate your resources, technology, budget, necessary information, and client relations. List up to three resources on this page and the next.

Most successful resources:
- [List items]
- [List items]
- [List items]

Least successful resources:
- [List items]
- [List items]
- [List items]

Participant 5
Recall the most and least successful parts of your projects within the past 5-7 years. Think about them in terms of various management forms and communication, technology use, necessary information, and client relations.

Least successful resources:
- client relations
- necessary information
- budget

Most successful resources:
- client relations
- necessary information
- budget

Other:
- technology use
- other
1. Please diagram your design process using the word and icon stickers. Notice that there are blank ones. Add your own terms or icons if you can't find what you need. Create as many phases as you see necessary.

2. Next, think about what types of resources are necessary at each step. (See pages 4 and 5 for your list of resources.) Consider the most and least successful items that you listed on the last couple of pages and elaborate on the phases you created on these two pages.

Thank you again for your time. Your input is quite valuable.

Please list your preferred method of contact in case I should have questions about your workbook. Email, phone, etc.
Recall the most and least successful parts of your projects within the past 3-5 years. Think of a project you were involved in where you were a key player. Some items could include staffing, technology, budget, necessary information, and client relations. List up to three resources on this page and the next.

<table>
<thead>
<tr>
<th>Most successful resources</th>
<th>Least successful resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>technology</td>
<td>necessary information</td>
</tr>
<tr>
<td>client relations</td>
<td>staffing needs</td>
</tr>
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<td></td>
<td></td>
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</tbody>
</table>

- Technology use: 
  - Client feedback is critical.
  - Our team needs to be more productive.

- Necessary information: 
  - Client feedback is critical.
  - Our team needs to be more productive.

- Staffing needs: 
  - Client feedback is critical.
  - Our team needs to be more productive.

- Other: 
  - Client feedback is critical.
  - Our team needs to be more productive.

- Budget contracts: 
  - Client feedback is critical.
  - Our team needs to be more productive.
1. Please diagram your design process using the word and icon stickers. Notice that there are blank ones. Add your own terms or icons if you can't find what you need. Create as many phases as you see necessary.

2. Next, think about what types of resources are necessary at each step. (See pages 4 and 5 for your list of resources.) Consider the most and least successful items that you listed on the last couple of pages and elaborate on the phases you created on those two pages.

Thank you again for your time. Your input is quite valuable!
Please list your preferred method of contact in case I should have questions about your workbook.
Recall the most and least successful parts of your projects within the past 5-7 years. Think about them in terms of various managerial items and technologies used. Note down necessary information, and client relations. Let up to three resources on this page and the next.

**Most successful resources**

- [Client relations]
- [Technology use]
- [Budget/contracts]

**Least successful resources**

- [Client relations]
- [Technology use]
- [Budget/contracts]
Recall the most and least successful parts of your projects within the past 5-7 years. Think about them in terms of various managerial items and resources that are important to running a project. Some items could include staffing, technology, budget, necessary information, and client relations. List up to three resources on this page and the next.

### Most successful resources

<table>
<thead>
<tr>
<th>Client relations</th>
<th>Technology use</th>
<th>Necessary information</th>
<th>Staffing needs</th>
<th>Budget/contracts</th>
<th>Other</th>
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### Least successful resources

<table>
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<tr>
<th>Client relations</th>
<th>Technology use</th>
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<th>Budget/contracts</th>
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Appendix C Interview Quotes

1 Participant 3: And I also want to, here at X, we have a percentage breakdown that we usually take to say, this much of our time will be spent in this field, in this phase, in this phase, in this phase. And I have to remember to get that, what that percentage breakdown is. It's also shifting around, because with the BIM, so much of the construction documentation is happening sooner because the BIM is already doing it for us. So, it's been shifting around.

2 Participant 5: One of the last things I said over here, although staff and CAD resources ramp up in CDs, I have an asterisk because the most successful projects are those that engage staff throughout the process. You guys know that. I think that is what allows people to take ownership of pieces and I think when people do that is when it's a win-win situation.

3 Participant 2: It was the first time the owner had me there early on. And the engineers saying you need an 8' ceiling across this servery and I'm looking at him going are you kidding me? I'm looking at the engineer and even before, I mean I kind of queried him a little bit before this owner was sort of reactive and volatile, trying to get him, what if? And X was telling him, what if the ductwork ran around the perimeter and we bumped up in the middle? And there was. And it actually ended up being less expensive to do it around the outside AND we got the ceiling height, so. And years since when I've talked to Y, who's the head of facilities there, I'm like, because he's still...I don't do any work for him anymore, would still get me involved too late. Y, I think you'll remember what I can bring to the table is more than just picking your carpet. I'm still, that's one of the proudest achievements in that building because that would've been miserable. If we would have let the engineers say, because of this requirement, they weren't thinking outside of...

Investigator: Yeah, it's crazy that it was less expensive, too.

Participant 2: It was less expensive because the way they ended up building the ducts bigger, I forget how it was. Somehow, it made it make sense even though we had these additional bulkheads to do it, so I reminded him of that. That's what I can bring to the table.
Participant 6: I have up here, I think time, budget, and quality are three things that affect each other. You can't have all of them at their max. You know, if you decrease the time, you're not going to get a good quality. So, I think just having an understanding of how things affect each other, whether it's the budget, the schedule, how decisions need to be made.

Participant 8: As a general rule, the design process starts off with some brainstorming that comes up with several different options to solve a problem. Those options are developed and refined to the point that they can be shown to a decision-maker, which most of the time is a client. For me sometimes it's my project manager or project designer. At which point, the client will select a scheme or approve a scheme and approve to move forward to develop a single scheme. And this design process, I've found that you can take this thing and shrink it down and it applies on many different levels to, let's say a building's general massing scheme but also to the way a staircase is detailed. They all kind of follow the same process where you come up with a couple of different schemes, you get approval, you develop those schemes, find conflicts, and then document a format.

Investigator: Ok, so it can happen on a grand scale and also on a day-by-day scale?

Participant 8: Absolutely, and what happens is that this process, I think, this process lives within every single step of this. That's what I'm trying to say.