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AN ASSESSMENT OF THE USE HAND, DIGITAL  
AND HYBRID GRAPHICS IN CONTEMPORARY  
LANDSCAPE ARCHITECTURE PRACTICE

by

NATALIA CHUPRAKOVA

Presented to the Faculty of the Graduate School of  
The University of Texas at Arlington in Partial Fulfillment  
of the Requirements

for the Degree of

MASTER OF LANDSCAPE ARCHITECTURE  
THE UNIVERSITY OF TEXAS AT ARLINGTON

May 2016

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April 18, 2016

Abstract

AN ASSESSMENT OF THE USE HAND, DIGITAL  
AND HYBRID GRAPHICS IN CONTEMPORARY  
LANDSCAPE ARCHITECTURE PRACTICE

Natalia Chuprakova, MLA

The University of Texas at Arlington, 2016

Supervising Professor: James Richards

Visual representation is a critical component of professional landscape architecture practice. The tools that are used for visual representation production are hand, digital and hybrid graphics. This thesis evaluates the existing representational tools available in professional practice within United States. It takes into consideration factors such as professional position, years of accrued experience in the profession, level of professional degree and type of landscape architecture practice and shows how the various factors noted above influence choices made regarding graphics type preference. Furthermore, this study evaluates the role that given graphics types play in the design process, as well as current trends and tendencies in graphics use within contemporary landscape

architecture. Based on these questions, a national online survey was conducted and sent to randomly selected full and associate members of the American Society of Landscape Architects (ASLA). More than 400 individuals responded, with an overall response rate of 17%.

The data obtained from the survey suggest that use of hand graphics relates to the professional experience and position of respondents. Their use of digital graphics relates to their years of experience and specific types of practice, and respondents' use of hybrid graphics correlates with the type of practice. The data also show that different graphics types are best suited to have different stages of the design process. Thus, hand graphics are used primarily during the inventorial and conceptual stages; digital graphics are preferable in the design development and final stages, and hybrid graphics are used with equal frequency for all stages of the design process. The data also indicates that certain tasks are employed to produce each of the three graphics types. An additional finding shows that different graphics types are selected based on the type of communication participants with whom landscape architecture professionals interact.

## TABLE OF CONTENTS

Acknowledgements.....	iii
Abstract.....	iv
List of Illustrations.....	ix
List of Tables.....	xiii
Chapter 1 INTRODUCTION.....	13
1.1 Overview.....	13
1.1.1 Hand Graphics.....	14
1.1.2 Digital Graphics.....	17
1.1.3 Hybrid Graphics.....	19
1.2 Problem Statement.....	22
1.3 Research Questions.....	23
1.4 Research Limitations.....	24
1.5 Definition of Terms.....	24
Chapter 2 LITERATURE REVIEW.....	26
2.1 Graphics Functions.....	26
2.1.1 Graphics as Understanding.....	27
2.1.2 Graphics as Thinking.....	29
2.1.3 Graphics as Dialogue.....	32
2.2 Aspects of Graphics Types Selection.....	37
Chapter 3 RESEARCH METHODS.....	39

3.1 Research Design .....	39
3.2 Sampling .....	43
3.2.1 Sample Size.....	44
3.2.2 Determining Sample Group .....	45
3.3 Data Collection .....	46
3.4 Definition of Research Terms.....	46
Chapter 4 DATA ANALYSIS AND FINDINGS.....	48
4.1 Response Rate.....	48
4.2 The Current Use of Different Graphics Types in Relation .....	49
to the Background of Respondents .....	49
4.2.1 Total Years of Experience .....	49
4.2.2 Level of Professional Degree .....	52
4.2.3 Current Position in a Company .....	55
4.2.4 Type of Practice .....	59
4.2.5 Type of Service .....	61
4.3 Design Process and Graphics Types.....	64
4.3.1 Factors Affecting the Use of Graphics Types On Different	
Stages of the Design Process .....	64
4.3.2 The Use of Graphics throughout the Design Process .....	66
4.3.3 Graphics Types In Relation To the Type of Drawing.....	67
4.3.4 Communication with Target Groups.....	70



4.3.5 Tools and Materials.....	72
4.3.6 Graphics Production by Consultants.....	75
Chapter 5 CONCLUSIONS.....	77
5.1 Summary of Findings.....	77
5.2 Implication of Findings to the Landscape Architecture Profession.....	81
Appendix 1 Cover Letter .....	83
Appendix 2 Survey Instrument .....	85
Appendix 3 Informed Consent Document .....	97
References.....	101

## List of Illustrations

Figure 1-1 An exploration sketch. ....	15
Figure 1-2 Functional diagram.....	15
Figure 1-3 Photorealistic landscape simulation created with AutoCAD 3D, Accurender NXT and Photoshop.....	17
Figure 1-4 Hand drawing made on a SketchUp model base.....	20
Figure 1-5 Hybrid drawing which was first hand drawn with fine point pen, then scanned and enriched with photo entourage and textures with Photoshop.....	21
Figure 2-1 Series of thumbnail sketches as exploration of the place.....	27
Figure 2-2 Sectional drawing of proposed trail management. ....	30
Figure 2-3 Conceptualizing the design idea on the perspective drawing .....	31
Figure 2-4 Sketch on Napkin, architect Antoine Predock .....	32
Figure 2-5 Design for the marina on Petty Island.....	33
Figure 2-6 Humphry Repton’s “Before and After” drawings.....	34
Figure 4-1 Years of work experience in landscape architecture.....	48
Figure 4-2 Frequency of hand graphics use in relation to work experience. ....	49
Figure 4-3 Frequency of digital graphics use in relation to work experience .....	50
Figure 4-4 Frequency of hybrid graphics use in relation to work experience .....	50
Figure 4-5 Average rating of graphics types use in relation to work experience .	51
Figure 4-6 Professional degree level.....	52

Figure 4-7 Frequency of hand graphics use in relation to professional degree level	53
Figure 4-8 Frequency of digital graphics use in relation to professional degree level	53
Figure 4-9 Frequency of hybrid graphics use in relation to professional degree level	53
Figure 4-10 Average rating of use of graphics in relation to professional degree level	54
Figure 4-11 Position in a company	55
Figure 4-12 Frequency of use of hand graphics in relation to position in a company	55
Figure 4-13 Frequency of use of digital graphics in relation to position in a company	56
Figure 4-14 Frequency of use of hybrid graphics in relation to position in a company	57
Figure 4-15 Average rating of different graphics types use in relation to respondents' positions in their companies	57
Figure 4-16 Type of practice	58
Figure 4-17 Frequency of hand graphics use in relation to the type of practice	59
Figure 4-18 Frequency of digital graphics use in relation to the type of practice	60
Figure 4-19 Frequency of hybrid graphics use in relation to the type of practice	60
Figure 4-20 Frequency of hand graphics use in relation to type of service	61

Figure 4-21 Frequency of digital graphics use in relation to type of service .....	61
Figure 4-22 Frequency of hybrid graphics use in relation to type of service .....	62
Figure 4-23 Average rating of importance of the factors affecting the choice of graphics type in design process.....	64
Figure 4-24 Average rating of graphics types use in design process.....	65
Figure 4-25 Frequency of hand, digital and hybrid graphics use for different drawings .....	67
Figure 4-26 Hand, digital and hybrid graphics use to communicate with different groups.....	70
Figure 4-27 Hand graphics tools use .....	72
Figure 4-28 Digital graphics tools use .....	73
Figure 4-29 Professional help use for graphics production .....	74

List of Tables

Table 3-1 Research Questions Overview.....**Error! Bookmark not defined.**

## Chapter 1

### INTRODUCTION

The purpose of this chapter is to give an outline of the background information regarding graphics tools currently used in professional landscape architecture practice and to provide a statement of the problem addressed by the research. Also it defines research questions, describes the limitations of the study and provides a list of terms definitions used in the thesis.

#### 1.1 Overview

Visual representation is an essential component of the landscape architect's profession, and is needed throughout the entirety of the design process, from inception to completion. The methods available by which to understand existing conditions, process possibilities and articulate ideas have varied throughout history in conjunction with the evolution of technological progress. For many hundreds of years, hand rendered graphics served as the primary tool for representation in landscape architecture. Furthermore, as Nadia Amoroso observes, the invention of computer and graphic software “enables a great leap forward in the ability of landscape architects to present visual representations of the ways in which nature and built environment have changed and will continue to change” (Amoroso, *Digital Landscape Architecture Now* 2012, 9).

### 1.1.1 Hand Graphics

In contemporary discipline-specific literature, hand graphics are usually cited as a traditional method of visualization. With its roots in prehistoric times, when people used mineral pigments and burnt sticks to draw flat, primitive images, hand drawing has evolved in conjunction with advances in both technology and human understanding of the world. The invention of three point perspective enabled artists to represent three-dimensional objects on a two-dimensional plane. Similarly, hand graphics are a powerful tool of landscape visualization in different forms, such as plans, sections, perspectives and axonometric drawings.

The introduction of computer generated graphics to render accurate and photorealistic images and animation, hand drawing is “becoming a lost art” (Amoroso, *Digital Landscape Architecture Now* 2012, 4). At the same time, research literature also suggests that at some stages of design process, hand graphics are the most frequently used tool, which is markedly important (Ballew 2005). Moreover, James Richards articulates a rationale for positing his belief that demand for hand drawing will continue to increase, "...as more tech-savvy graduates enter the marketplace and better digital visualization tools become available, my work as consulting designer diagramming and sketching on the “front end” of complex projects – is flourishing. I’m hand drawing more now than ever in my 30-plus-year career” (Richards 2013, 7).

As Amoroso emphasizes, the " ... appropriate choice of medium and drawing typology depends upon the intended function of the drawing" (Amoroso, *Digital Landscape Architecture Now* 2012, 17). In current landscape architecture practice there are several realms wherein computer graphics cannot be easily substituted for hand graphics. The speed of creating a drawing, along with the compactness of materials needed, make it a universally ideal tool for exploring spatial relationships, capturing fleeting impressions of a location, as well as generating and demonstrating ideas in the process of discovery (Richards 2013). Figure 1-1 demonstrates a hand drawn sketch as a tool to explore a location, its elements, spatial relationships, and perception. Another area that utilizes hand drawing is diagramming. Professionals in many fields use diagrams to expedite their thinking with more or less abstract symbols, as in Figure 1-2. Both drawing types, sketches and diagrams, are important parts of the creative form-finding process. As Marc Treib observes, during this process, "new or unrecognized relationships or ideas emerge that stimulate creativity. Perhaps for this very reason the drawing has remained the primary vehicle for conceptualization in architectural and landscape design" (Treib 2008)





Figure 1-1 An exploration sketch (Image: James Richards)

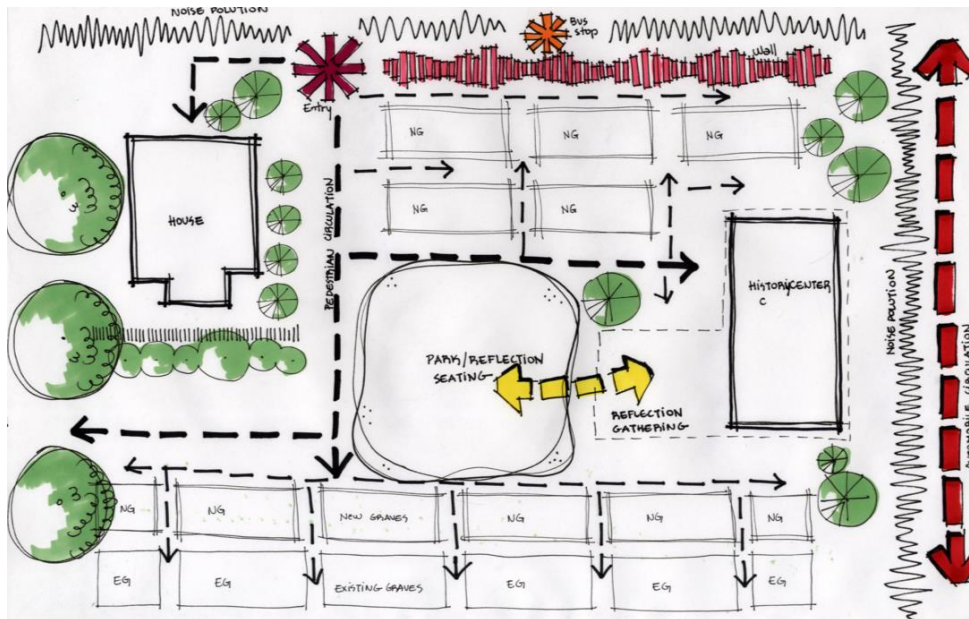


Figure 1-2. Functional diagram. (Image: Marina Pereira.)

### 1.1.2 Digital Graphics

By the middle of the 20th century, computer technologies emerged that would eventually become widely used across a spectrum of human endeavors and activities. The creation of the first Computer-Aided Design (CAD) systems in the 1950's, which were then made available for use on personal computers in the 1980's, provided new opportunities for professionals to use computers and software in their work. Since then, computer-aided design and drafting computers appear to have played an important role in landscape architecture practice by providing greater accuracy, improved productivity, efficiency and quality of drawings (Sipes and Overdorf 1999).

3D landscape visualization became another key component for landscape architecture visualization. The earliest effort to place 3D symbols in a landscape image took place at the Harvard Spatial Analysis Laboratory in 1969. Based on this principle, Geographic Information Systems (GIS) became used by 1973. The earliest adoption of 3D computer tools for producing static images in landscape architecture occurred in 1985 (Ervin and Hasbrouck 1999). Further development of 3D technologies was accelerated by the booming growth of virtual reality technology in the digital gaming industry (Herwig and Paar 2002), which laid the foundation of use the real-time rendering, video editing and motion graphics in landscape architecture practice.



Figure 1-3. Photorealistic landscape simulation created with AutoCAD 3D, Accurender NXT and Photoshop.

The use of different types of digital graphics today is wide and includes all stages of the design process. The visual deliverables produced with digital graphics have a very high level of accuracy and realism, although for various reasons, digital graphics have not replaced hand graphics in the offices of professional landscape architects. One study shows that “over half of the respondents indicated that their design has been affected by the use of computers. Their design has been affected in many ways, from geometric forms being used in computer design, to the opportunity to explore more design options more quickly” (Ballew 2005, 63). “Using digital media affects how we think and thus how we

design... Computer programs are precise even when we want them to be fuzzy”  
(Treib, *Drawing/Thinking: An Introduction*. 2008, 10).

### 1.1.3 Hybrid Graphics

A wide range of available media and processes to create graphic visualization allows professionals to combine them within the parameters of one drawing; such drawings are commonly regarded as hybrid drawings. In the field of biology, hybrids constitute the offspring of dissimilar parents. The term "hybrid graphics" usually refer to “those in which two or more previously separated mediums are combined, or those which apply an accepted or innovative medium to unexpected surface” (Dee 2008, 70).

After the introduction of CAD, designers typically used computers for drafting and printing on different types of paper: bond, vellum or mylar. Drafts printed on bond paper could then be hand rendered with colored pencils or markers following an enhancement of linework with ink. In cases using vellum or mylar, images could be rendered on the back side to prevent line work from bleeding. The results of this method were highly defined, accurate and informative drawings (Cantrell and Michaels 2010). Along with the evolution of computer technologies, the spectrum of hybrid graphics has become even wider, as designers began to experiment with the various techniques available. According to M.S. Uddin, “As experimentation progressed, drawings evolved into a hybrid expression of several drawings combined into one, creating interest

within the general population, as well as in design community itself' (Uddin 1999, 1). Hybrid graphics now include a wide range of hand and digital media combinations, for example: ink linework drawn over a digitally produced 2D image on a 2D base; printing the image directly on watercolor, rice, Canson or other types of paper with post-manipulation using water, watercolor, or colored pencils on printed image; scanning hand-created textures such as watercolor and using textures in Photoshop or rendering software; combining photo, digital and hand drawn images into a photomontage, etc.

The characteristics of hybrid graphics are very similar to the characteristics of biological hybrids. 1. Hybrids can combine traits seen only separately in one parent or the other. A hand drawing made over a photograph or digital 3D wireframe looks like a common hand drawing, but proportionally and contextually reflects reality (Figure1-4). Moreover, if a regular paper and ink hand drawing is done on a tablet instead, it still has all of the visual characteristics of hand rendered graphics, but can be edited as easily as can a digital drawing.

2. Hybrids possess the intermediate morphological characteristics of both parents. Graphic drawings can be made, for example, by using hand rendered linework in ink, with the texture and entourage processed in Photoshop. (Figure1-5)





(a)

(b)



(c)

Figure 1-4 Hand drawing made on a SketchUp model base. (a) original SketchUp 3D model; (b) hand drawn ink linework traced over 3D model; (c) final result after hand coloring with markers and colored pencils and Photoshop postprocessing (Image: Jim Leggitt,)



Figure 1-5. Hybrid drawing which was first hand drawn with fine point pen, then scanned and enriched with photo entourage and textures with Photoshop (Image: Brian Lin,)

3. Hybrids may become larger or more vigorous than their parents. Similarly drawings created with both hand and digital graphic tools can have almost infinite variations without the limitations of their parental graphics types.

### 1.2 Problem Statement

“The excitement for computer-aided design is natural, especially for a generation raised on digital games, the push button, and the mouse” (Barron 2008, 112). Some literature suggests that the use of computer technologies has overtaken the use of hand rendered graphics (Mertens 2010, 10). Other experts (Treib, Representing landscape architecture 2008) emphasize the importance of hand drawings and identify distinct stages of the design process wherein they

cannot be replaced by computer graphics. Additionally, Amoroso posits that using traditional and digital tools together “has enabled a greater connection between fine art, landscape architecture and architecture proper” (2012, 9).

Little research about the use of hand and digital graphics in contemporary landscape architecture has been done in the past decade. That which has, suggests the equal importance of hand and digital graphics in everyday professional practice (Ballew 2005). There are no studies about hybrid methods as a separate representational tool. A study of the specific shortcomings and advantages of using different representational tools at different stages of the design process therefore has a place.

### 1.3 Research Questions

The main goal of this study is to evaluate the existing representational tools available in professional landscape architecture practice within the United States. By administering a survey to landscape architecture professionals, it is possible to identify current patterns in the use of different graphic types, the activities and the tasks in which these types are utilized, and the graphics skills that help landscape architecture practitioners work most effectively.

The specific research questions of this study are:

- What are the current trends and tendencies in graphics use within contemporary landscape architecture?



- What are the factors affecting the choice of graphics type on different stages of the design process?
- Is there a relationship between the professional background, position, education level and experience and the choice of preferred graphics type?

#### 1.4 Research Limitations

One limitation is that the study lies on the assumption that all landscape architecture practitioners have equal access to the whole range of available hand and digital graphic tools, and can thus make an informed and independent choice of the most suitable graphics type for their professional tasks. In reality, they can be limited in their choices by differing factors, especially with regard to the choice of available graphics software. Even though they may have access to some free software such as Google SketchUP or trial versions of commercial software, some landscape architects may not see any necessity to search for new drawing tools.

#### 1.5 Definition of Terms

**Design Process:** series of steps that landscape architects or other professionals use in creating functional products. The design process includes multiple steps: defining a problem; inventory and analysis of current conditions; conceptualizing ideas; developing and provisioning; final result. (Bagnall and Koberg 2003)

**Sketch:** a quickly produced freehand drawing which is usually used as a recording, exploratory or demonstrational tool. (Richards 2013)

**Diagram:** a simplified drawing that can illustrate a process, clarify a set of relationships, or describe a pattern of change or growth (Ching 1998).

**Plan drawing:** drawing of orthographic projections on a horizontal picture plane, usually drawn to scale (Ching 1998).

**Section:** an orthographic projection of an object as it would appear if cut through by an intersecting plane (Ching 1998).

**Elevation drawing:** an orthographic projection of an object on a vertical picture plane parallel to one of its sides (Ching 1998).

**Eye-level perspective drawing:** a drawing representing three-dimensional objects on a plane as they are seen by the eye. (Amoroso 2012)

**Bird's eye perspective:** a drawing representing a view from a high angle as if seen by a bird in flight. (Ching 1998).

**Sectional perspective:** a drawing combining section and perspective drawings in one. (Ching 1998).

**Axonometric drawing (Parallel projection):** an orthographic projection of a three-dimensional object inclined to the picture plane in such a way that its three principal axes are drawn to the true scale (Ching 1998).

## Chapter 2

### LITERATURE REVIEW

The purpose of this literature review is to examine existing information relevant to this study of an assessment of the use hand, digital and hybrid graphics in contemporary landscape architecture practice. It provides the reader with background knowledge of different graphic types and their applications in landscape architecture, associated methodologies, and gaps in research. The literature review also helps to define and narrow the problem addressed in this research. This literature review contains two sections, describing the functions of graphics in a design process, and various factors affecting the choice of graphics type.

#### 2.1 Graphics Functions

Visual representations are crucial for landscape architects to express and communicate their vision. A majority of tasks, which landscape architecture professionals undertake on daily basis, are communicated in a graphic form. “In the design, the role of drawing expands to include recording what exists, working out ideas, and speculating for the future. Throughout the design process, we use drawing to guide the development of an idea from concept to proposal to constructed reality” (Ching 1998, 2).

### 2.1.1 Graphics as Understanding

Every design process starts with a problem statement that specifies an understanding of existing conditions and contextual analysis. During this step, the designer graphically documents both the rational and irrational site conditions. The rational side of site analysis includes a site's existing infrastructures. "Designers should always investigate whether the existing site has any exceptional properties, such as ecologically valuable areas, which should be protected and developed, and whether it has any historical significance that should be taken into account" (Mertens 2010, 20). The designer also captures all of a site's physical properties, including existing vegetation and access routes, as well as less visible conditions that includes, for example, geometrical relationships between the site's objects, its spatial characteristics and aesthetical qualities (Hooman 2009).

Irrational site analysis refers to the perception of space as bodily experience (Mertens 2010, 20). It can include anything what cannot be captured by the sense of vision, but instead, the other senses. It also includes some intuitive understanding of a space which is, in general, a resultant of a multisensual understanding combined with mental perception, and even imaginative faculties of our mind (Hooman 2009).

There are a wide range of graphics tools that help us to understand a place from the both its rational and its irrational sides. Photographs, maps, diagrams,

and sketches, made by hand or digitally, or by a combination of both, comprise a partial list of techniques that give the designer an opportunity to deeply explore select points of interest.

Freehand drawing is probably one of the most powerful tools for this task. Drawing the sketches for recording and understanding the surroundings is essential. Doing so allows the designer to capture important details or even to abstract them. (Figure 1-6) Designers need to know what to leave suggested rather than explicitly recorded (Edwards 2008). The level of abstraction chosen by the designer creates the ability to gather as much rational and irrational information as possible. “Visual data collect the sensations perceived while making the drawing” (Barron 2008, 113).

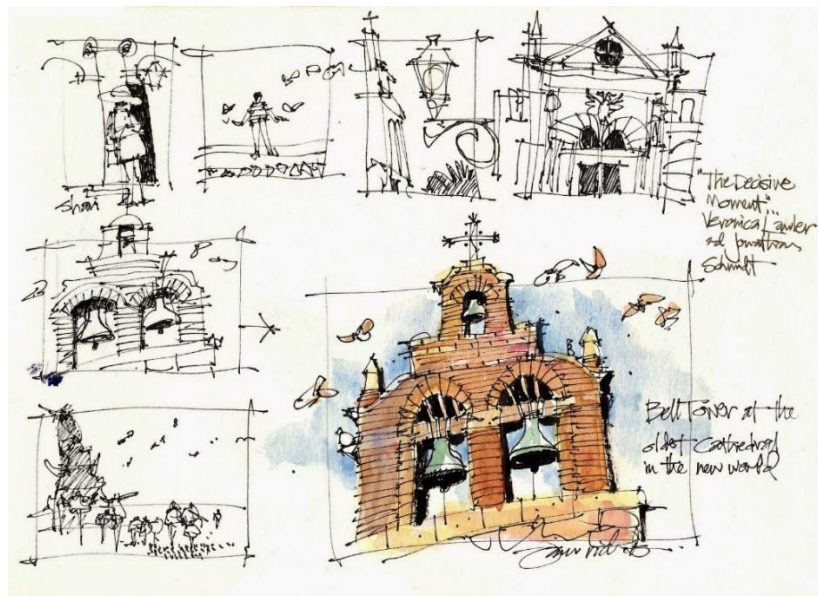


Figure 2-1. Series of thumbnail sketches as exploration of the place  
(Image courtesy: James Richards)

The sketchbook was and still is an important tool for the landscape architect as it “provided a form of research and a library of plans and details to crib at a later stage” (Edwards 2008, 1). The newest technologies make this tool even more powerful by adding photography and digital drawing tablets to the toolbox.

Another tool that tends to have different levels of abstraction is diagramming, a type of drawing that explains the relationships between some elements inside the space and between the space and its surroundings. Kasprisin and Pettinari differentiate real, semi-abstract and abstract diagrams (Kasprisin and Pettinari 1995). Real diagrams represent “existing conditions, while the semi-abstract and abstract diagrams show selected qualities. Selected qualities can be defined as organizational structures or order-involved parts and their relationships, along with physical characteristics that contribute to the intrinsic worth of the whole structure plus characteristics” (Kasprisin and Pettinari 1995, 35).

### 2.1.2 Graphics as Thinking

Drawing is an act of thinking, a process of finding ideas. Designers draw to visualize their ideas on paper and into the material world. To draw here is “to demonstrate the foreseen, or to make visible something that does not yet exist.” (Hooman 2009, 34). Drawing is a main engine in conceptualization in landscape

architecture practice. “Whether created functionally or metaphorically the conceptual sketch embodies the heart of the work, its essence” (Treib 2008, 15).

There are some parallels between the everyday human thinking process and the drawing thinking process. Both operate by virtue of language, and language is a collection of meaningful symbols. “Lines stand for something else—in the same manner that words represent ideas, actions, intentions, etc.” (Hooman 2009, 34). Words create meaningful phrases just as drawing enables designers to work with the shape and content of the built form, to access historic and contemporary form, and to access the opportunities and implications of new forms (Kasprisin and Pettinari 1995). “Drawing, like the language of words and mathematics, sees to give meaning and order to very complicated worlds” (Edwards 2008, 29).

The many types of graphics and tools are used by designers during the conceptual and developmental phases of the design process. At the beginning of the process, drawings are usually loose and schematic, as well as quick. Having all these characteristics, sketches and diagrams play an important role at this stage. These informal drawings stimulate ideas through reinterpretation and lead to other design solutions (Hutchinson 2011, 72).

When a designer goes further in refining ideas, other drawing types are added. Schematic plans, sections and elevations show the placement of proposed elements on a plane and provide “a useful way to communicate and develop a

scheme at many stages of design” (Oles 1979, 15) (Figure 2-2). Plans, sections and elevations provide “a measured and descriptive visual layout of landscape design “(Amoroso 2015, 5).



Figure 2-2 Sectional drawing of proposed trail management  
(Image: Asakura Robinson,)

The main disadvantage of planar drawings is that they don't show the third dimension of the real world. Lockard thinks all concepts must exist in perspective, because “we speak of ‘space’ and ‘spatial relations’ and ‘spatial sequences.’” He suggests using perspective drawings as early on as possible in the stage of studying the design in order to prevent spatial mistakes (Lockard 1968). Eye-level



perspective drawings capture the essence and character of the space and provides a sense of depth (Amoroso 2015, 5) (Figure 2-3).



Figure 2-3 Conceptualizing the design idea on the perspective drawing  
(Image: James Richards)

### 2.1.3 Graphics as Dialogue

When an idea is born it must be communicated to the people who are interested in it. We can demonstrate that graphics is a designer's language that designers use to communicate their ideas to communication participants. Edwards divides all communication participants into three major groups. The first includes colleagues, project team members, staff and consultants. The second consists of those who build the physical project: builders, manufacturers and tradespeople. The third group is comprised of decision makers: owners, clients, financiers,

enforcement officials, and the public (Edwards 2008). Communications with these three groups have both similarities and differences.

When designers communicate their ideas to other designers, they look for “rapid and continual feedback of the highest possible quality in order to test and develop options” (Edwards 2008, 3). To share the ideas visually with their colleagues, designers use all available and appropriate techniques. At the earliest design stage, the initial design can be, for example, a sketch on a napkin (Figure 2-4).

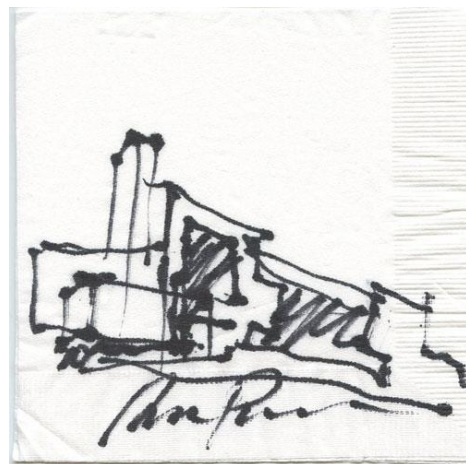


Figure 2-4 Sketch on Napkin, architect Antoine Predock

Further development of the design requires more complex techniques.

Development schemes, for example, can be plans made “by mapping components of a project layout” (Sheppard 1989, 13). Contextual, or various perspective images are also very useful for this type of communications. Sheppard uses the term “visual simulation” to define “visual pictures or images of proposed projects

or future conditions, shown in perspective views in the context of actual sites” (Sheppard 1989, 6). This wide range of drawings can be produced by different graphics types: by hand, with Computer-Aided Design programs, image processing software, three-dimensional modeling and computer animation (Figure 2-5). Sharing ideas with colleagues through visual simulations has a number of advantages, including:

- The main idea of a principal designer can be delivered to other teammates without detail loss;
- Aesthetic issues can be studied at this early stage;
- Alternative design prototypes can be easily displayed (Sheppard 1989).



Figure 2-5 Design for the marina on Petty Island

Communication with decision-makers resolves other problems, but uses the same range of graphic materials. Being those, who “select, fund and approve,” members of this target group desire to see and understand the proposed idea as a clear picture (Oles 1979, 3). “They tend to perceive a projected design scheme most accurately and understand it most thoroughly when it is shown in representational terms, as it will actually be seen in its natural context” (Oles 1979, 4). And again, the most descriptive types of presentational images here are various visual simulations of proposed designs. In use since their invention by Humphry Repton in the beginning of 19<sup>th</sup> century, “Before and After” drawings are one of the most powerful tools used in the dialogue with decision makers (Daniels 2008) (Figure 2-6).

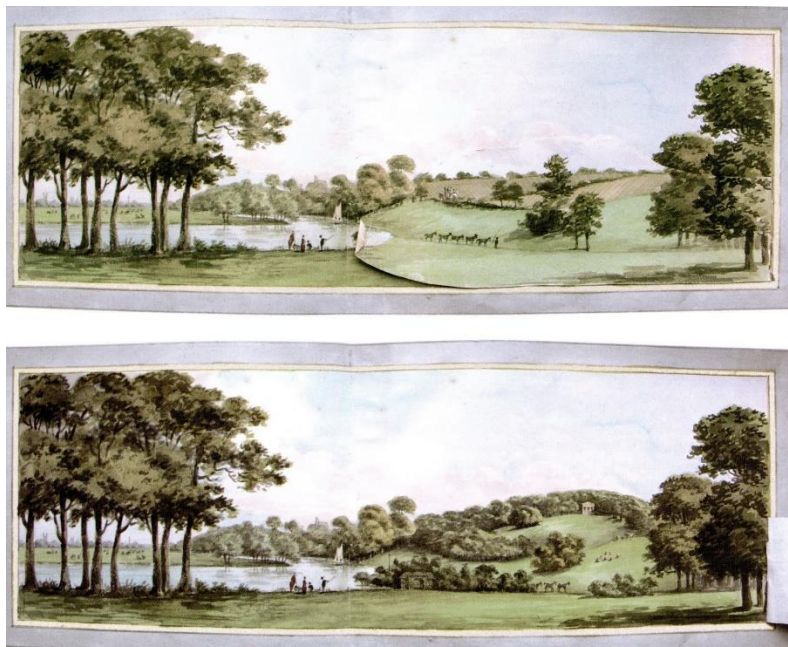


Figure 2-6 Humphry Repton’s “Before and After” drawings

Sheppard points out that using contextual presentational imagery, or visual simulations, is beneficial because “they can do much to bring people toward a consensus on the project and allow them to focus on real issues, eliminating time-wasting debate on whether the information they have to evaluate is adequate or correct” (Sheppard 1989, 37)

Communication with developers, builders and contractors differs from the two previous categories in many ways. The main purpose of this type of communication is to instruct those who bring the project to its physical reality. “Contractors are directed and legally bound by graphic and written documents such as working drawings, shop drawings, specifications, the contract, change order, and addenda” (Oles 1979, 3). Various descriptive and detail drawings are used here: plans, elevations, sections, and other detail drawings. Traditionally, the drawings listed are produced by hand and a set of drafting tools. With technology’s evolution, a wide range of computer drafting software has become very popular. To support the construction documents, designers can use visual simulations. Sheppard describes two main situations wherein these can be most valuable:

- When materials and layouts are not standard and cannot be precisely dimensioned in construction drawings;

- “Where the design exists in a perspective simulation only or where a plan or non-perspective design drawing cannot be fully trusted as correct” (Sheppard 1989, 23).

## 2.2 Aspects of Graphics Types Selection

When it comes to the selection of the media or type of graphics used for producing visual materials, various factors play a key role. Authors specify different characteristics affecting the choice of graphics types. Oles lists the criteria of choice hand drawing media that can easily be applied to the selection of digital and hybrid graphics. Some of those criteria are:

- Eradicability, or erasure capability;
- Speed, or providing instant feedback and ease of refining the image;
- Reproducibility, or ability to create copies;
- Economy, or inexpensiveness and availability;
- Portability, or ease to retrieve, store and carry (Oles 1979, 20-21).

Cantrell underscores efficiency and editability as important factors affecting choice of media. Even though these categories are mentioned as major advantages of digital media, the author asserts that specific factors “must be considered during all phases of the representation process. A drawing created digitally is no more editable or efficient than [is an] analog drawing unless the tools are used correctly” (Cantrell and Michaels 2010, 17). Brown describes lack of training as an important

factor in graphics type selection. According to Brown, some professionals are not taking advantage of the opportunity to fully integrate available technology into their office in a manner consistent with professional practice (Brown and Charles 1995, 2).

Some authors take into account factors that can be described as subjective. Thus Ballew finds some correlation between age, position, professional experience, educational level of the practitioner, and the importance of computer and hand drawing (Ballew 2005). Another author finds that there is either no, or only a weak correlation between a practitioners age, gender, the age of a company, and the use of 3D modeling software (Yan 2014). In summary, these personal profile factors can affect the choice of graphics type in some cases.

## Chapter 3

### RESEARCH METHODS

This chapter describes the methods used in this study to achieve the proposed research objectives. This chapter has four sections: (1) research design; (2) sampling methodology; (3) data collection procedures; and 4) research terms glossary. The first section presents a description of the survey instrument as it relates to the research objectives. The first section also includes the reasons for choosing the instrument, as well as identifying the organizational structure of the survey. The second section describes the research population, selection of the sample group and sample size calculation. The third section includes the strategies used to distribute the instrument and collect the data. The last section defines the related statistical terms used in chapter 3.

#### 3.1 Research Design

For this study, a national online survey in the form of a questionnaire was determined to be the most efficient instrument for data collection. The questionnaire is the most obvious, easily adaptable tool for use in Internet-mediated research (Hewson 2002). Questionnaires are also a time efficient and easily standardized tool for data collection (Sommer and Sommer 2002). Because all respondents are asked the same questions in the same way, this standardization of inquiry inherently eliminates the opportunity for interviewer bias.



There are many advantages to using the Internet as an instrument to administer to solicit data collection. The major advantage thereof is the reduction of time spent and costs associated with research, since the distribution of the questionnaire via the internet eliminates the costs of producing hard-copies of materials as well as distribution costs, such as postal expenses. Additional advantages over traditional methodologies include allowing the researcher access to a greater number and more demographically diverse cohort of research participants. Data collection in an electronic format also allows for ease in processing the results (Hewson 2002).

The survey contains twenty-eight (28) questions (Table 3-1). Most of them are closed-ended questions, although additional space is allotted for participants to provide open-ended answers, particularly in response to questions asking them for their evaluations or opinions. This approach provides consistency in the investigation of particular topics, the inclusion of a large number of participants, as well as provision for the researcher to compare responses from multiple groups of participants. At the same time, since space is provided for open-ended responses, the investigator is able to draw from a broader range of possible answers (Sommer and Sommer 2002).

Survey questions were organized so that related questions were grouped together according to applicability within first, a Profile Section, and second, a separate Graphics Section, thus providing respondents with easy to understand,

logically sequential inquiries (Sommer and Sommer 2002). Questions 1-6 in Section 1, the Profile Section are used to gather general information about a participant’s professional background, level of degree, company type, and geographical location. Section 2, the Graphics Section, includes questions 7-28, which address: 1) the current incorporation of particular types of graphics in professional practice and the use of these types of graphics at different stages of the design process; 2) factors affecting the participant’s choice of a particular graphics type; 3) experience with a particular graphics type; 4) preferred media; 5) use of graphics made by a third party. Table 3-1 provides a detailed description of survey questions along with the key words and specific types of questions included in the instrument.(Appendix 2)

Table 3-1 Research Questions Overview

Research Question Context	Section	Question #	Key Word	Format
Profile	Profile	1	Work experience	Multiple choice
		2	Education	Multiple choice
		3, 4	Company description	Multiple choice
		5	Position	Multiple choice

		6	Geographic location	Multiple choice
Incorporation in professional practice	Graphics	7,8,9	Work experience	Rating Scale (frequency of use)
Choice of graphics type		10,11,12,13	Design process	Matrix; Rating Scale
Use of graphics type		14,15,16	Design process	Multiple choice
Use of graphics type		17,18,19	Drawing types	Multiple choice
Use of graphics type		20,21,22	Clients	Multiple choice
Use of graphics type		23,24,25	Tools	Open-ended
Use of graphics type		26,27,28	Third party production	

The survey was built electronically via SurveyMonkey (www.surveymonkey.com) (Appendix 2). A brief description of the survey's purpose, pertinent information about the researcher, as well as general instructions for taking the survey were all provided via a cover letter accompanied by a survey link (Sommer and Sommer 2002). This cover letter with a link to the survey was distributed to participants via email. In order to increase the likelihood of participant response and return rates, a second letter to remind participants to

submit their surveys was sent a week after the initial survey and cover letter were distributed. Copies of the cover letter and the survey instrument can be found in Appendices 1 and 2.

### 3.2 Sampling

According to Trochim, a theoretical population is comprised of a group used to generalize research findings (Trochim and Donnelly 2006). The theoretical population for the present study is drawn from members of the American Society of Landscape Architecture (ASLA). This professional organization was chosen because it serves as the “national professional association representing landscape architects.” There are a total of seven categories of ASLA membership, full, associate, student, student affiliate, international, affiliate and corporate. The theoretical population used for this study is comprised of members belonging to two of those seven categories, these being both full and associate members. Whilst full membership is available for “individuals with a degree in landscape architecture and/or licensed to practice landscape architecture who have three or more years of professional experience,” associate membership is available for persons who are graduates of a landscape architecture program who have fewer than three years of professional experience (ASLA.org).

For the current study, the questionnaire was distributed to ASLA members who meet the following criteria:

- They are individuals;
- They have a degree in landscape architecture and/or license to practice landscape architecture;
- They have some professional experience in the field of landscape architecture;
- They are USA practitioners.

Thus the theoretical population for this study is comprised of persons who are either full or associate members of ASLA in the United States. According to statistics furnished on the ASLA web site, there were 10,499 full members and 1,853 associate members as of December 2015, which constitutes a total of 12,352 members (ASLA factsheet 2015).

The theoretical population for this research was determined according to the following two steps: 1) calculation of sample size, and 2) determination of the sample group itself.

### 3.2.1 Sample Size

An online sample size calculator ([www.surveysystem.com](http://www.surveysystem.com)) was used to calculate the sample size for the current research. The variables used for the calculation were a desirable confidence level of 95%, and a confidence interval of 5% from a total population of 12,352. Thus the size of the sample group is 373. Taking into consideration an expected response rate, however, necessitates that this number be increased. According to recent research literature, the average

response rate of 25% is derived from a total of a 10-40 % return rate (Hewson, 2002). A precedent study on the same population (Yan 2014) gives us a 13% response rate. The present study is based on a 14% response rate consisting of a total sample size of 2,640.

### 3.2.2 Determining Sample Group

So that professionals from different states would be equally represented, a research probability sampling method was utilized to determine a sample group from the theoretical population. A probability sampling method uses some form of random selection (Trochim and Donnelly 2006). This method allows each member of the population to have an equal chance of being selected as a research subject.

According to the ASLA Member Directory, the number of members varies from state to state. In order to represent all states proportionally, a stratified random sampling was utilized. This type of sampling divides the theoretical population into homogeneous non-overlapping subgroups and then a random sample taken from each subgroup (Trochim and Donnelly 2006). The subgroups for the current research are comprised of professionals from all fifty states, or 50 subgroups. The total population of the present study is 12,352, the sample size of 2,640 making up approximately 21% of the total population. According to proportionate stratified random sampling methods, 21% of full and associate members from each of all 50 states were included (Trochim and Donnelly 2006).

### 3.3 Data Collection

Data collection occurred over a two-week period beginning on March 1, 2016. Initial requests were distributed by e-mail on March 1, 2016. The follow-up requests were sent out one week after, on March 8, 2016, to those who had not responded. Contact e-mail addresses of study participants were taken from the ASLA Member Directory. The online survey was closed on March 15, 2016.

It is usually necessary to gain permission for collecting data to ensure that respondents have given their informed consent to participate in the research, and that the research itself does not pose potential harm to respondents. For this study, explicit permission was obtained by the researcher through the Institutional Review Board (IRB) of the University of Texas at Arlington in March 2016 (see Appendix 3).

### 3.4 Definition of Research Terms

**Confidence level:** a measure of the reliability of a result. A confidence level of 95 per cent or 0.95 means that there is a probability of at least 95 per cent result reliability.

**Confidence interval:** a range of values that is likely to contain an unknown population parameter.

**Population:** The entire group of people from which the researcher wishes to generalize the study findings.

**Response rate:** the number of people who completed the survey divided by the number of people who make up the total sample group.

**Sample group:** the selected elements chosen for participation in a study.

**Sampling:** the process of selecting a group of people on which to conduct a study.



## Chapter 4

### DATA ANALYSIS AND FINDINGS

This chapter describes the data analysis methods and their results. To analyze the data, both qualitative and quantitative methods were utilized, along with the incorporation of some descriptive statistics. This data analysis chapter contains three sections. The first section explains the survey response rate, the second investigates the relationships between the respondents' backgrounds and their choice of graphics type preference, and the third describes additional factors affecting those choices.

#### 4.1 Response Rate

Of the 2,640 invitations that were sent out, a total of 443 survey responses were returned, with a total response rate of 16.8%. This response rate fits within the parameter frame of between 6% and 75% identified in the literature (Hewson 2002). The most recent study available indicates that the response rate for surveys distributed by email using the same population, ASLA members, is 13% (Yan 2014).

Although the received response rate is relatively low, it is nonetheless comparable with other online surveys. The initial sample group was large and included 21% of the total number of all full and associate ASLA members. Another reason to consider the survey results as acceptable is that the random

selection of the sample group from the population allows for the generalization of results from the sample to the population (Trochim and Donnelly 2006).

#### 4.2 The Current Use of Different Graphics Types in Relation to the Background of Respondents

In order to study the current trends and issues pertaining to the use of hand rendered, digital and hybrid graphics in landscape architecture, the most important survey questions concern how often professionals use these types of graphics in their professional landscape architecture practice. To show a detailed picture thereof, survey responses to these questions were analyzed in relation to the respondents' backgrounds.

##### 4.2.1 Total Years of Experience

When asked about the number of years of experience acquired within the discipline of landscape architecture, 48.7% (211) of the 433 professionals responded that they have twenty (20) or more years of work experience in the field. By contrast, only 12.5% (54) respondents have less than 5 years of work experience in landscape architecture. (Figure 4-1)

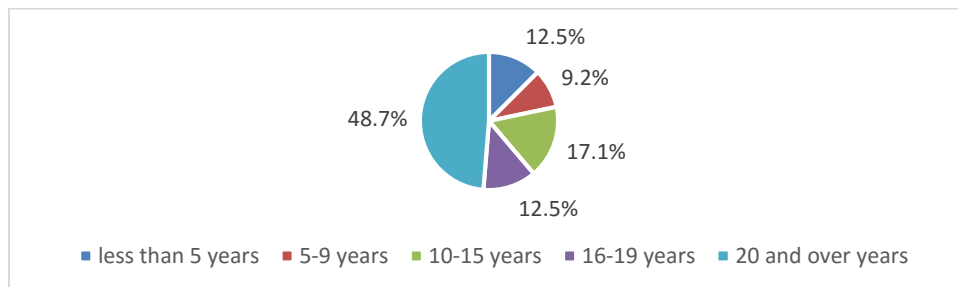


Figure 4-1 Years of work experience in landscape architecture

The relationship between the length of professional experience and the frequency of graphics type use in the professional work was examined. As previously discussed in chapter 1, the history of digital and thus hybrid graphics in landscape architecture is relatively brief in comparison to the overall history of the profession and practice of landscape architecture. Considering this fact, one might assume that those practitioners with the greatest amount of accrued professional experience would be apt to use hand graphics more frequently than would practitioners with less experience and alternatively, that professionals with less experience will be apt to use digital technologies more frequently. Figure 4-2 shows that 68% of practitioners with twenty (20) or more years of experience use hand graphics “often” and “very often.” In comparison, only 39% of practitioners with less than five (5) years of experience use hand graphics “often” and “very often.” At the same time, respondents from all experience categories answered “never” with equal frequency when they were asked how often they use hand graphics.

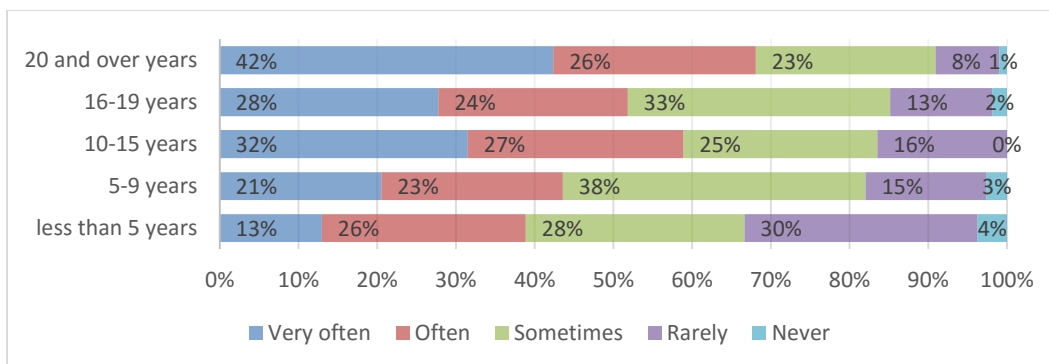


Figure 4-2 Frequency of hand graphics use in relation to work experience

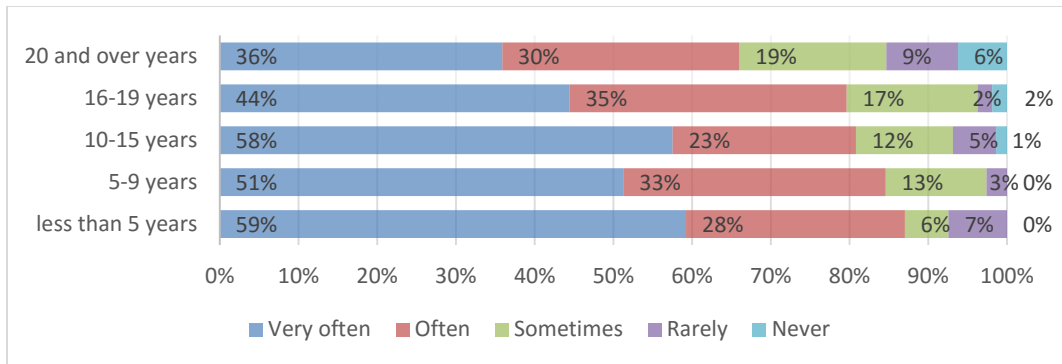


Figure 4-3 Frequency of digital graphics use in relation to work experience

Figure 4-3 shows that 66% of practitioners with the greatest amount of work experience use digital graphics “often” and “very often.” This frequency slowly increases in conjunction with a diminishment in accrued years of experience. At the other end of the scale, 87% of practitioners use digital graphics “often” and “very often.” 6% of professionals with twenty or more (20+) years of experience “never” use digital graphics in their work.

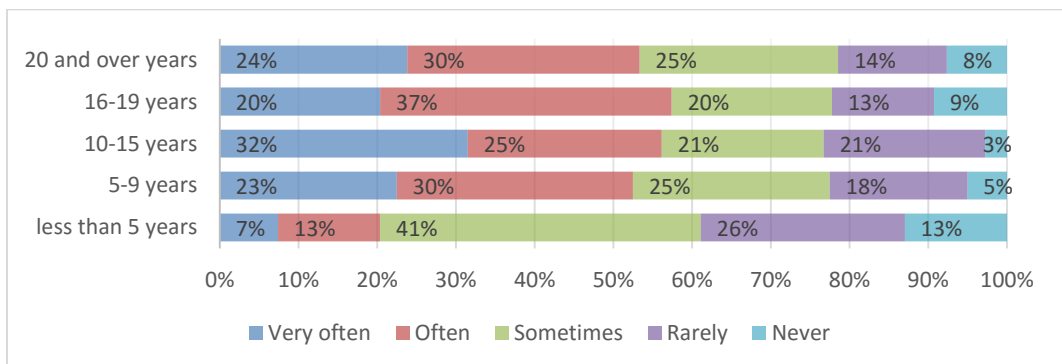


Figure 4-4 Frequency of hybrid graphics use in relation to work experience

Figure 4-4 reveals a marked contrast in the frequency with which hybrid graphics are used by landscape architecture professionals with less than five (5) years of experience, versus all others practitioners.

On average, the frequency of hand graphics use is highest amongst practitioners with the most experience and diminishes gradually in conjunction with a reduction in accrued years of experience. In contrast, the use of digital graphics gradually increases commensurate with fewer accrued years of professional experience. Insufficient evidence was found to conclude that there is a difference in the use of hybrid graphics among groups with varying years of work experience.

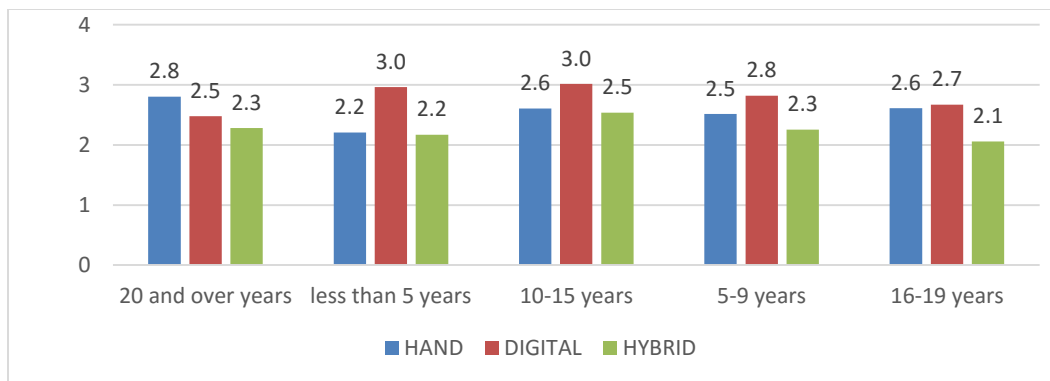


Figure 4-5 Average rating of graphics types use in relation to work experience

#### 4.2.2 Level of Professional Degree

The respondents’ predominant degree levels reached in landscape architecture or related fields is 54.5%, (233) of 427 who have earned a Bachelor’s degree. 43.6% (186) respondents have earned a Master’s degree, and 0.5% (2)

have earned Doctoral level degrees in the landscape architecture field. 6 respondents, or 1.4% of professionals, selected the “Other” category, which includes Accredited Landscape Architecture Certificate after Extension Program and Associate Degrees earned in fields related to landscape architecture, such as Horticulture (Figure 4-6).

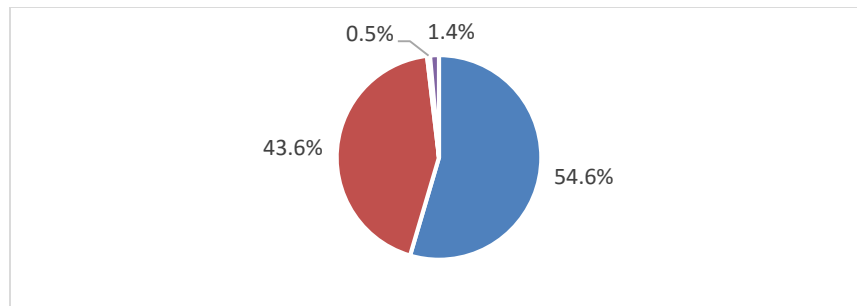


Figure 4-6 Professional degree level

The relationship between the respondents’ levels of education and the frequency of their graphics type use in professional work was also examined. Between the two groups of respondents holding Bachelor’s and Master’s degrees, the distribution of graphics types use frequency is fairly even. Because the number of respondents with earned Doctorate and Other degrees is so small, it is difficult to draw any conclusions based on survey data. Therefore, there is no evidence that the frequency of different graphics types used is related to the education level that landscape architecture professionals have reached (Figures 4-7, 4-8, 4-9).

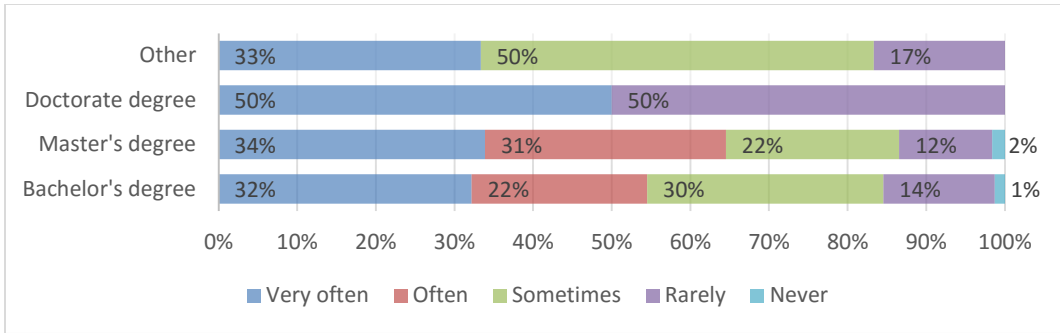


Figure 4-7 Frequency of hand graphics use in relation to professional degree level

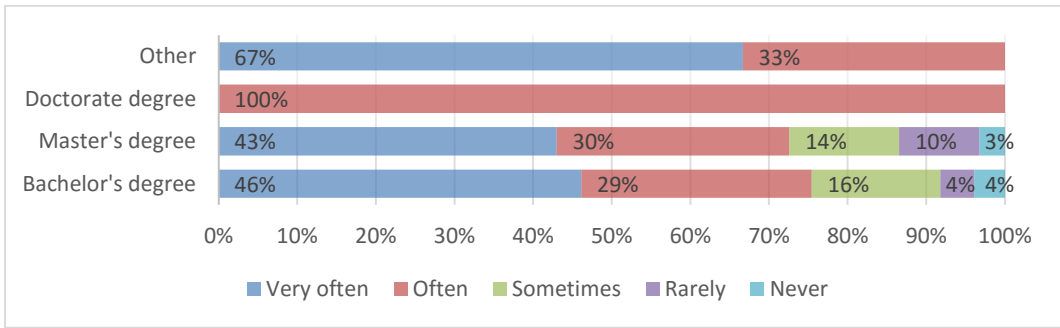


Figure 4-8 Frequency of digital graphics use in relation to professional degree level

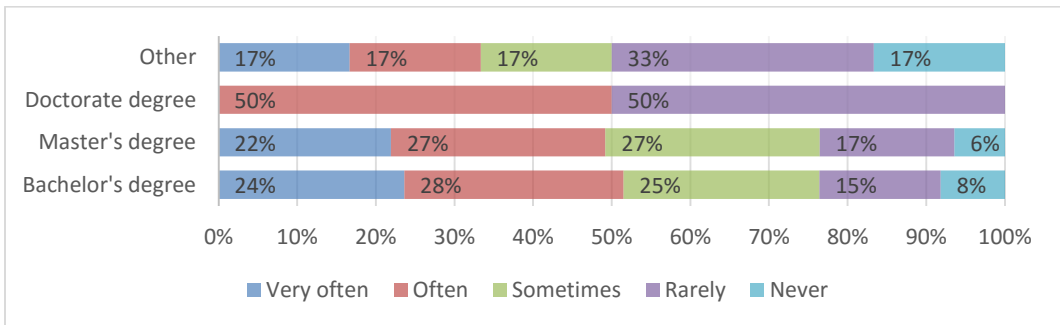


Figure 4-9 Frequency of hybrid graphics use in relation to professional degree level

On average, respondents with both Bachelor’s and Master’s degrees use all three graphics types equally in their professional practice, and use hand and digital graphics slightly less frequently than do respondents with other levels of education. In contrast, they do use hybrid graphics slightly more often than do the other groups. Concomitantly, the low number of respondents with doctorate degrees (2) doesn’t allow for any significant conclusions about the frequency of graphics use for this group. (Figure 4-10)

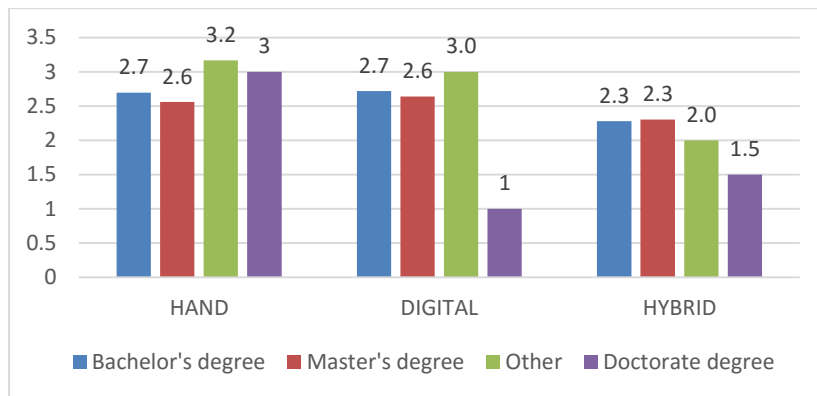


Figure 4-10 Average rating of use of graphics in relation to professional degree level

#### 4.2.3 Current Position in a Company

When asked about current employment positions held within a company, 10% (46) out of 442 respondents identified themselves as entry level landscape architects; 18% (78) as senior level landscape architects; 22% (98) as project managers; 13% (57) as principals; 26% (115) as owners. 10% (48) of participants chose the “Other” category, which includes, but is not limited to retired



professionals, educators and persons not working in the landscape architecture field (Figure 4-11).

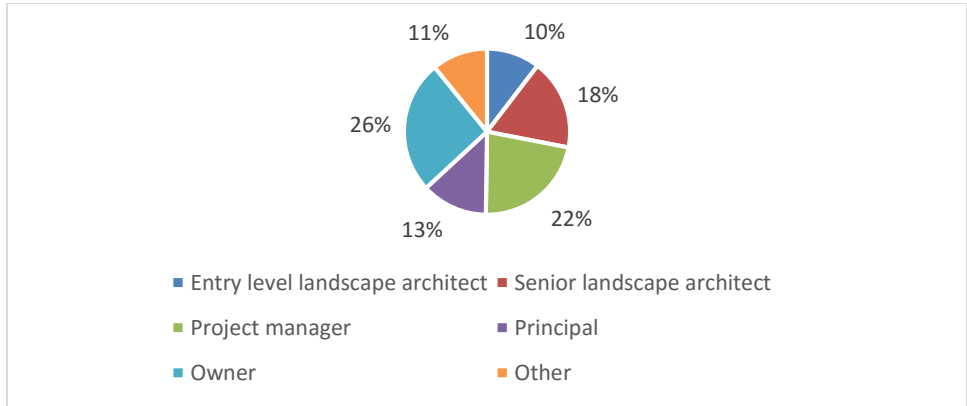


Figure 4-11 Position in a company

An analysis of data shows that a fairly equal number of owners and principals use hand graphics “often” and “very often” (77% and 73% respectively), which is about one third more frequently than do professionals at project manager, senior and entry-level positions (46%, 44%, and 43% respectively) (Figure 4-12).

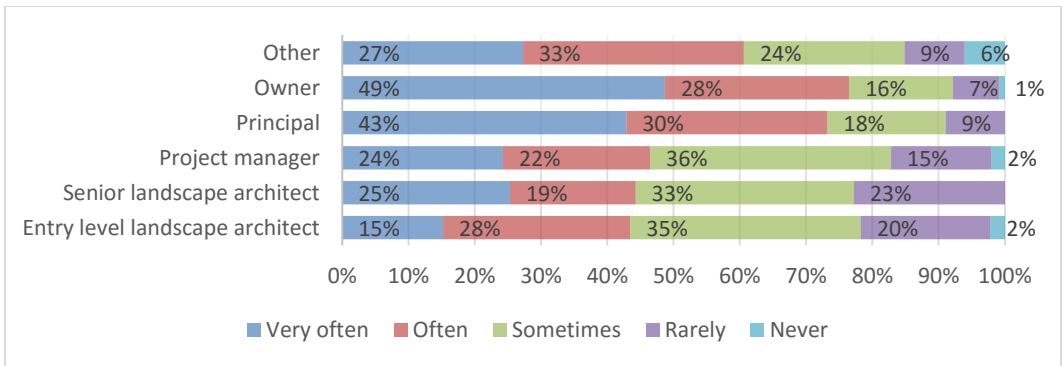


Figure 4-12 Frequency of use of hand graphics in relation to position in a company

Figure 4-13 shows that professionals who hold different positions use digital graphics for their work with slightly different levels of frequency. Owners, principals and project managers tend to use digital graphics less often than do entry level and senior level professionals. 4% of owners and principals, and 5% of project managers, never use only digital graphics, whereas there are no entry-level professionals who never use digital graphics.

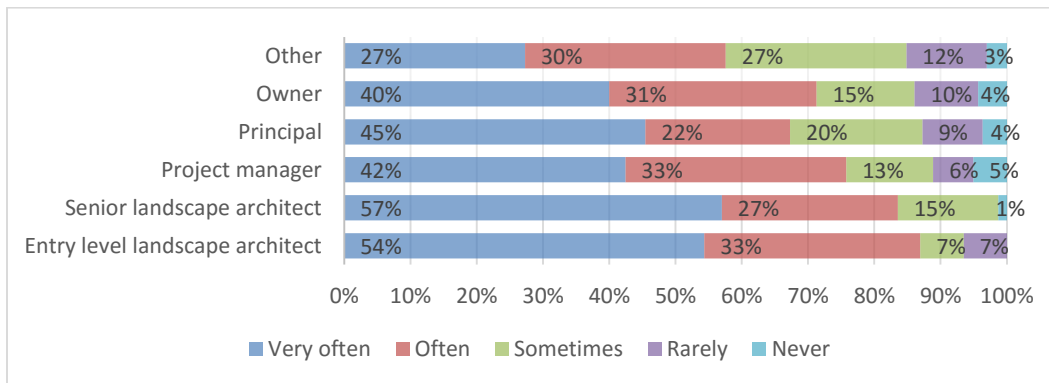


Figure 4-13 Frequency of use of digital graphics in relation to position in a company

There is a noticeable contrast in hybrid graphics use between entry-level professionals, and those who are principals or company owners. 63% of owners and 61% of principals use only hybrid graphics “often” and “very often,” whereas only 26% of entry-level professionals employ hybrid graphics in their work (Figure 4-14). At the same time, there are a fairly equal number of owners and entry-level specialists who never use only hybrid graphics (10% and 9% respectively).

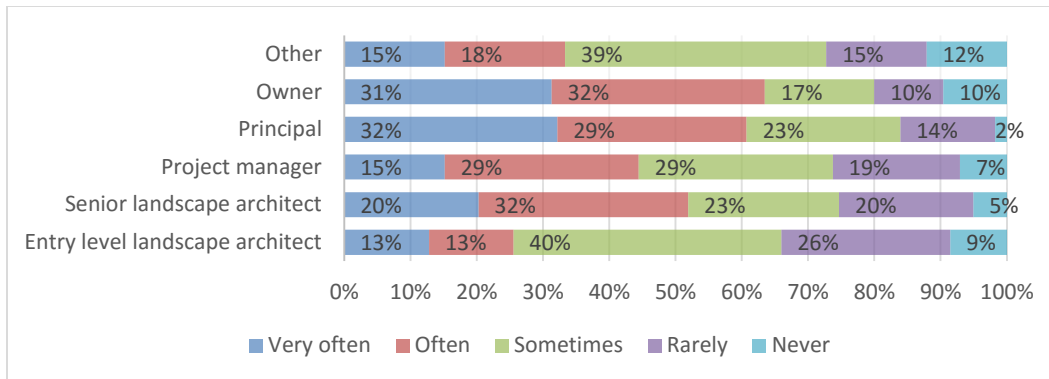


Figure 4-14 Frequency of use of hybrid graphics in relation to position in a company

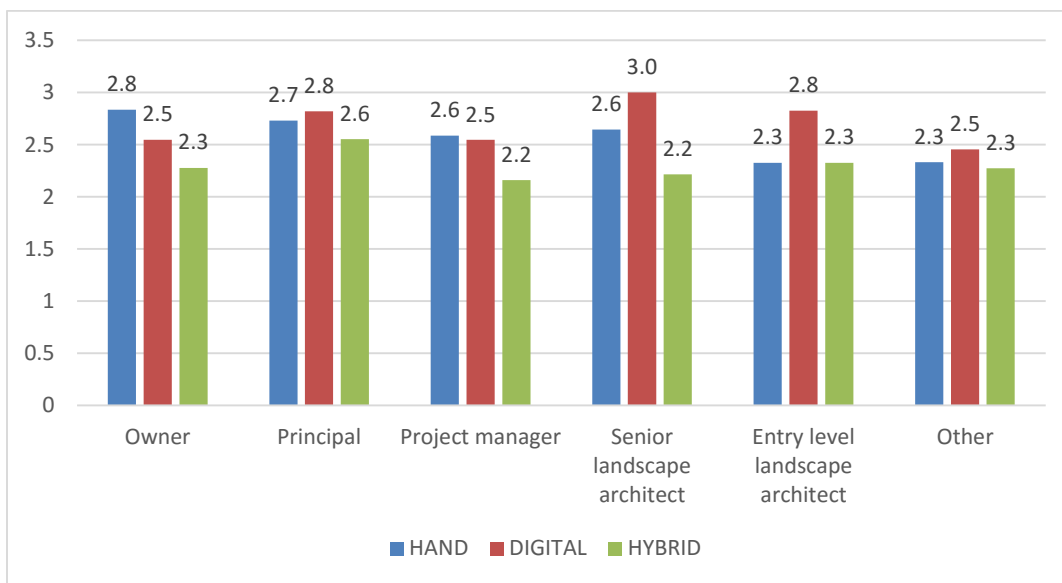


Figure 4-15 Average rating of different graphics types use in relation to respondents' positions in their companies

The average rating of hand graphics use is lower for entry-level landscape architects and those in the “other” group in comparison to the remaining groups. The average rating of digital graphics use for owners, principals and “others” is

lower than for entry-level and senior-level landscape architects, and project managers. No significant evidence was found to conclude that there is a difference in the use of hybrid graphics among groups with different positions (Figure 4-15).

#### 4.2.4 Type of Practice

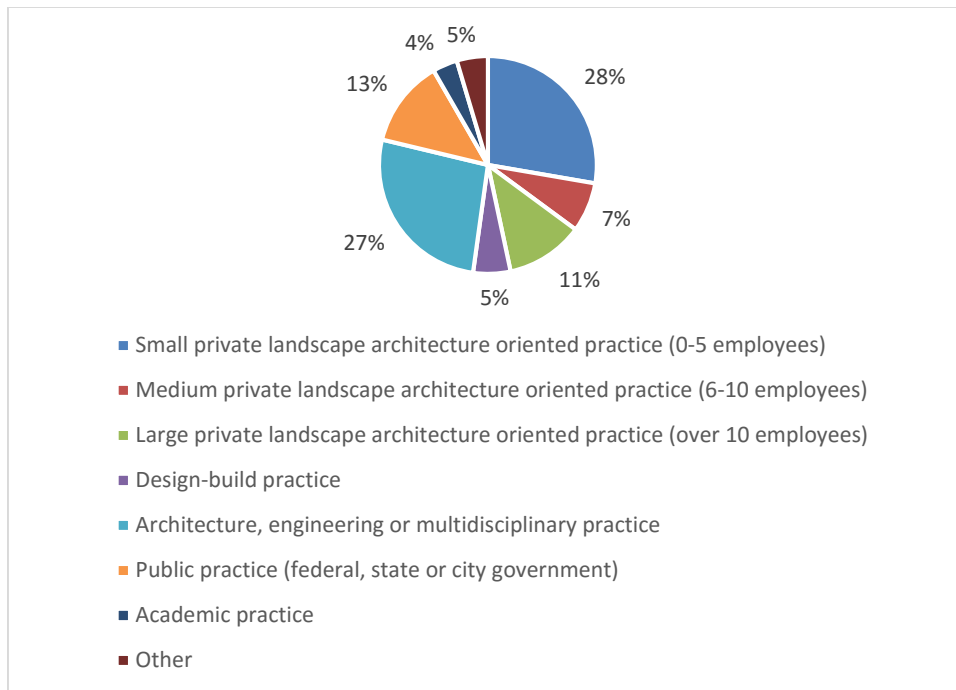


Figure 4-16 Type of practice

The two most predominant types of professional practice reported by survey respondents are small private landscape architecture practices with up to 5 employees, 28% (120), and architecture, engineering or multidisciplinary practices, 27% (115). 13% (56) respondents work at a public practice, and 11% (50) work for large landscape architecture companies. 7% (32) work for medium

landscape architecture companies, 5% (24) for design and build companies and 4% (16) in academic practice. The remaining 5% (20) work in other, not-generally categorized practices, including, for example, non-profit organizations, or retired professionals.

Respondents working in public practice or architecture, engineering or multidisciplinary companies use only hand graphics in their work less frequently than do other groups of respondents (Figure 4-17).

Respondents working in architecture, engineering or multidisciplinary companies, as well as large and medium sized landscape architecture companies, tend to use only digital graphics more often than do those who work for design and build or small landscape architecture practices (Figure 4-18).

Respondents working for public, multidisciplinary and small landscape architecture practices use hybrid graphics in their professional work less frequently than do professionals in other groups (Figure 4-19).

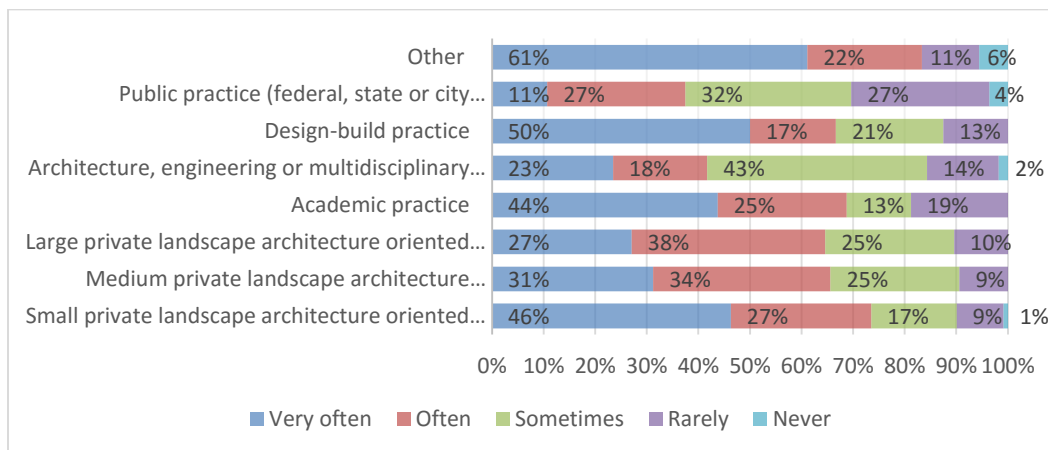


Figure 4-17 Frequency of hand graphics use in relation to the type of practice

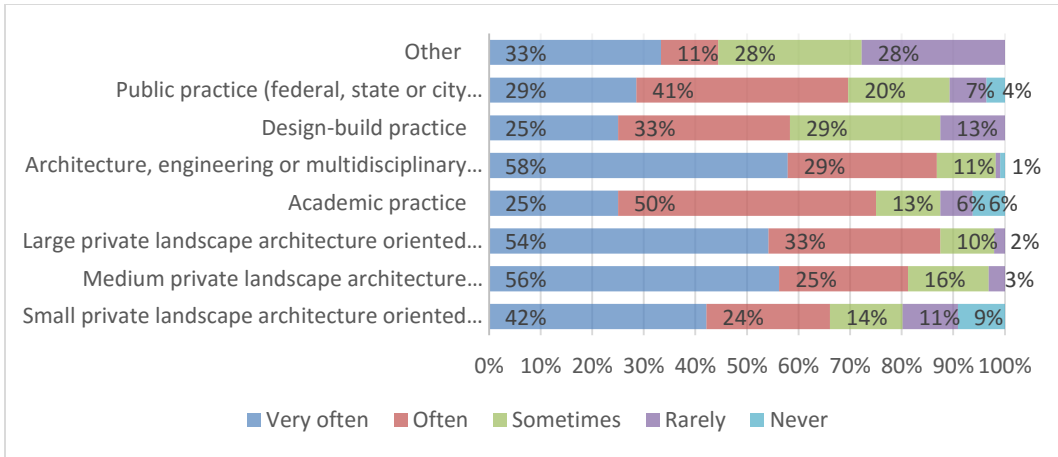


Figure 4-18 frequency of digital graphics use in relation to type of practice

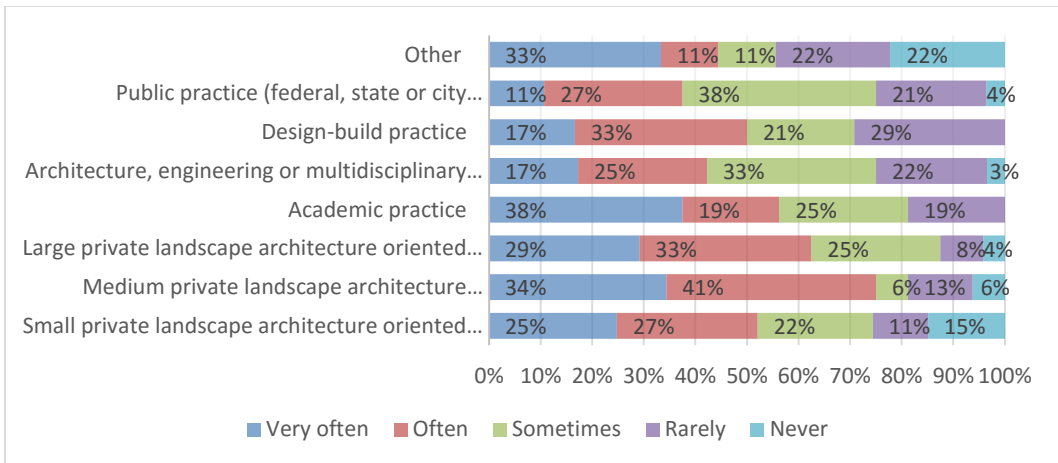


Figure 4-19 frequency of hybrid graphics use in relation to type of practice

#### 4.2.5 Type of Service

The frequency of different graphics types used was analyzed in relation to the type of services the respondents' company provides. This analysis didn't show a significant difference with respect to the selection of different graphics types

used based on the types of services provided by respondents' companies. At the same time, there is a difference between the frequencies of use between the graphics types. Thus, digital graphics are used more often for all types of services than are other graphics types (Figure 4-20, 4-21, 4-22).

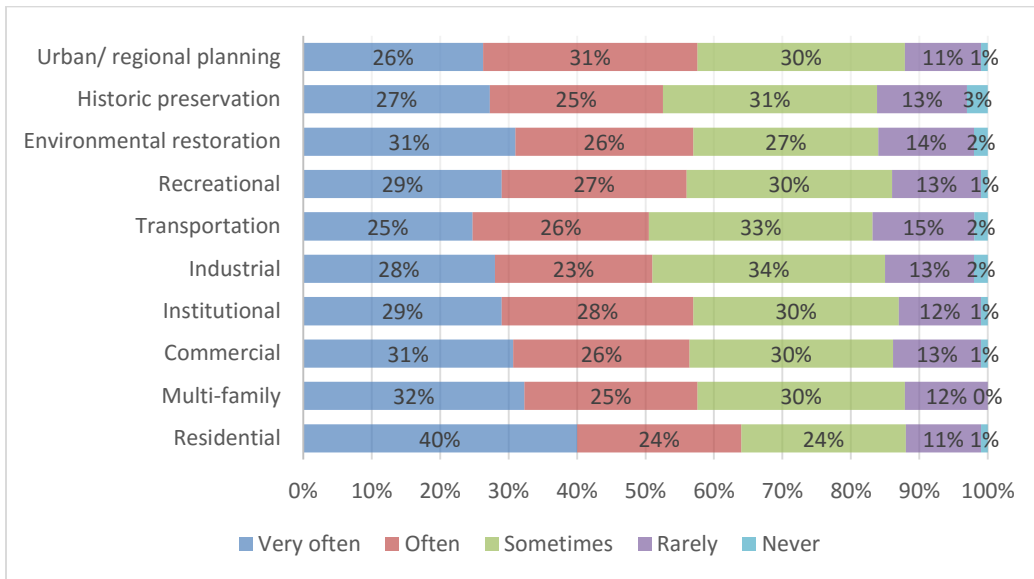


Figure 4-20 Frequency of hand graphics use in relation to type of service

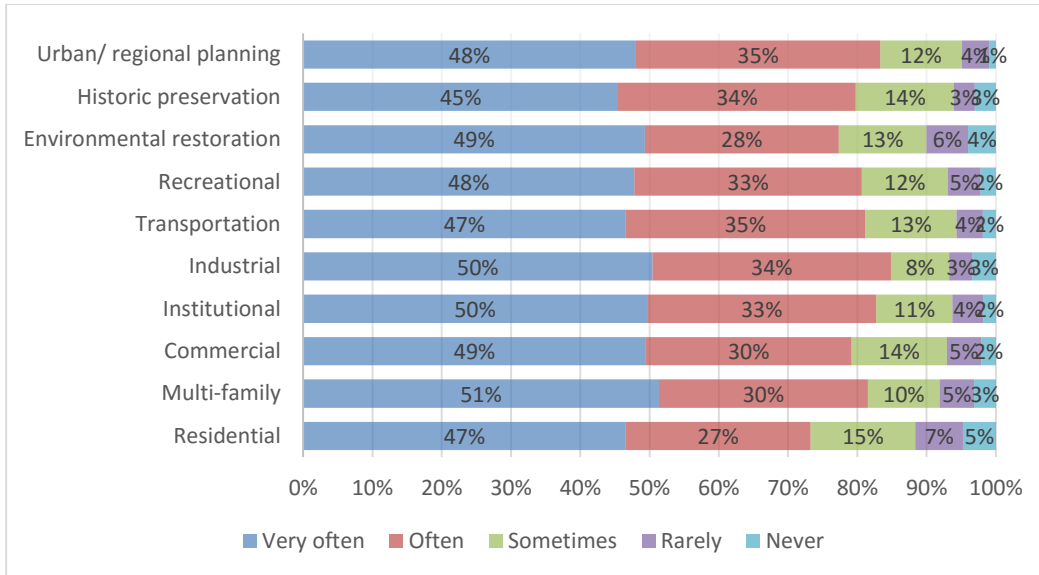


Figure 4-21 Frequency of digital graphics use in relation to type of service

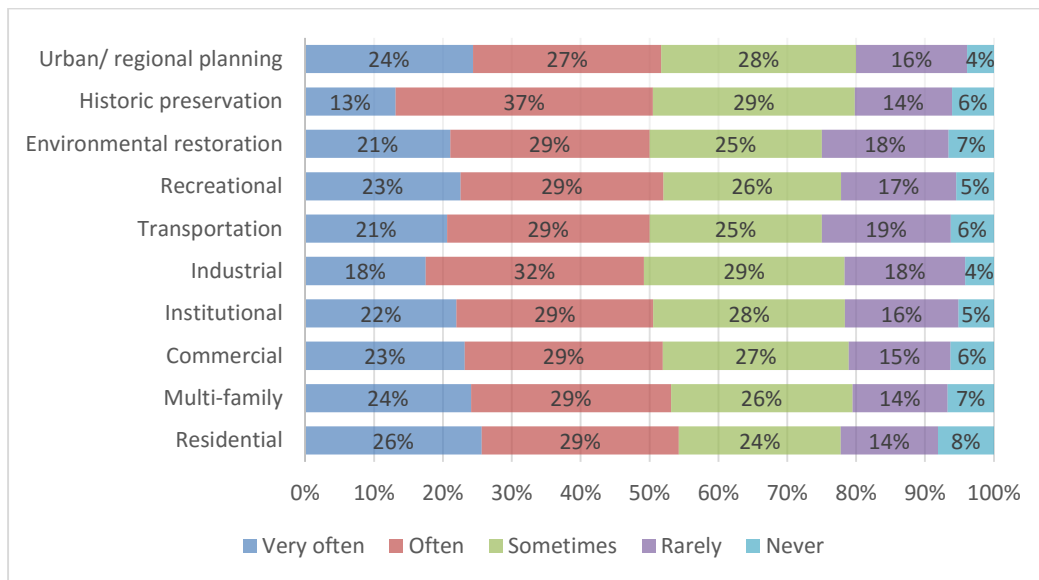


Figure 4-22 Frequency of use hybrid graphics in relation to type of service



### 4.3 Design Process and Graphics Types

#### 4.3.1 Factors Affecting the Use of Graphics Types On Different Stages of the Design Process

A set of questions was used to determine the factors affecting the respondents' choice of graphics type in their professional practice. Respondents were asked to select one of the Likert-scale ratings of importance (1-not at all important, 2- not very important, 3- somewhat important, 4 important, 5– very important) provided for each of the four main stages of the design process, the inventory and analysis, conceptual, design development and final output stages.

These factors were:

- Time Efficiency
- Cost
- Accuracy
- Ease of Editability
- Ease of Understanding for Clients
- Proficiency/ Knowledge of Media
- Ease of Learning

The factors average ratings were calculated for each stage of the design process, in order to show the relative importance of all identified factors. The most important factors for all stages are: Ease of Understanding for Clients and Time Efficiency. The least important factors identified are: Ease of Learning and

Proficiency/ Knowledge of Media. Ease of Editability and Accuracy are more important during the design development and final output stages and less important during the inventorial and conceptual stages (Figure 4-23).

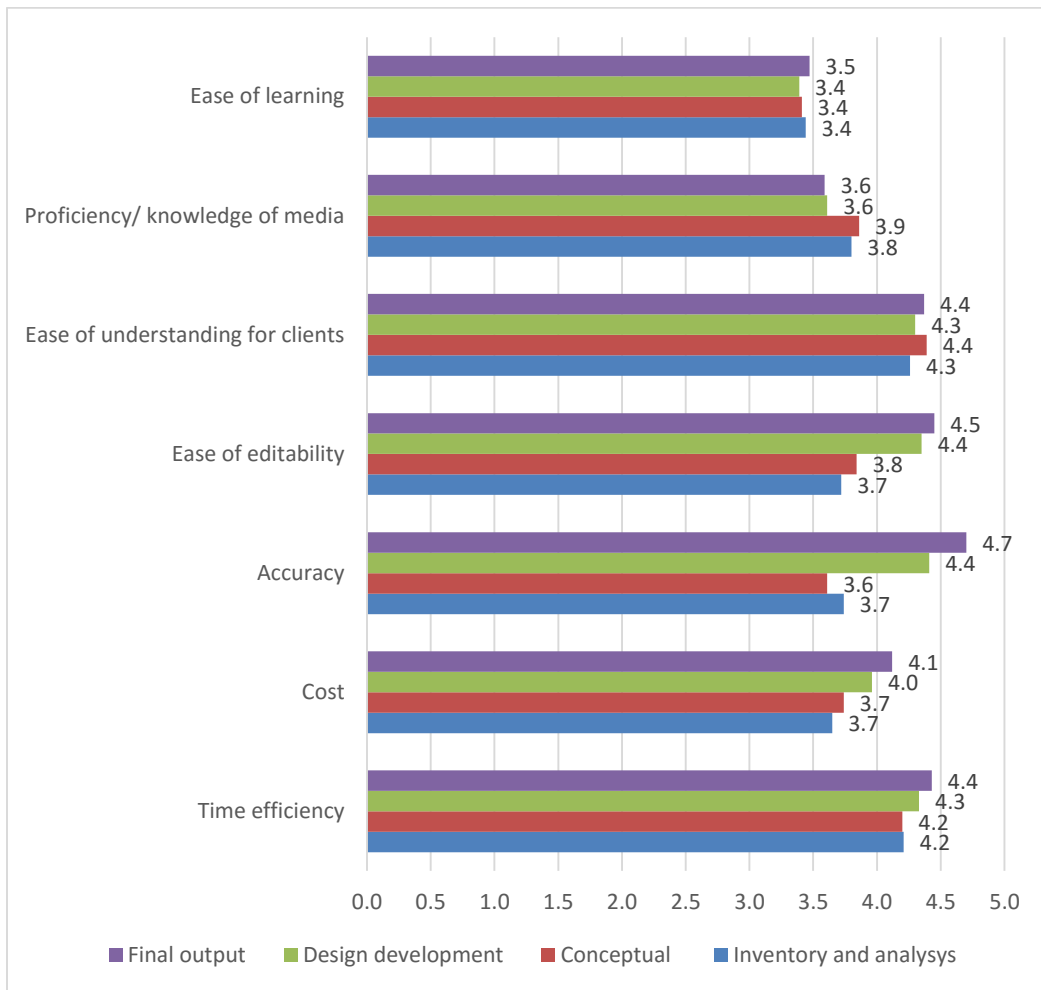


Figure 4-23 Average rating of importance of the factors affecting the choice of graphics type in design process

### 4.3.2 The Use of Graphics throughout the Design Process

A set of questions was utilized to measure the frequency of graphics types used in the four main stages of the design process. Respondents were asked to select one of the scale ratings (5-very often, 4- often, 3- sometimes, 2- rarely, 1- never) provided for each graphics type. The average graphics type rating was calculated for each stage of the design process. Hand graphics are more frequently used during the inventory and analysis and conceptual design stages, and has a below average frequency of use during the design development and final output stages. In contrast, digital graphics are used less frequently during the inventory and analysis and conceptual stages, and are used more frequently for the developmental and final output stages of the design process. Hybrid graphics are used on slightly above the average level during the first two stages of the design process and less than average during the last two stages, design development and final output stages (Figure 4-24).

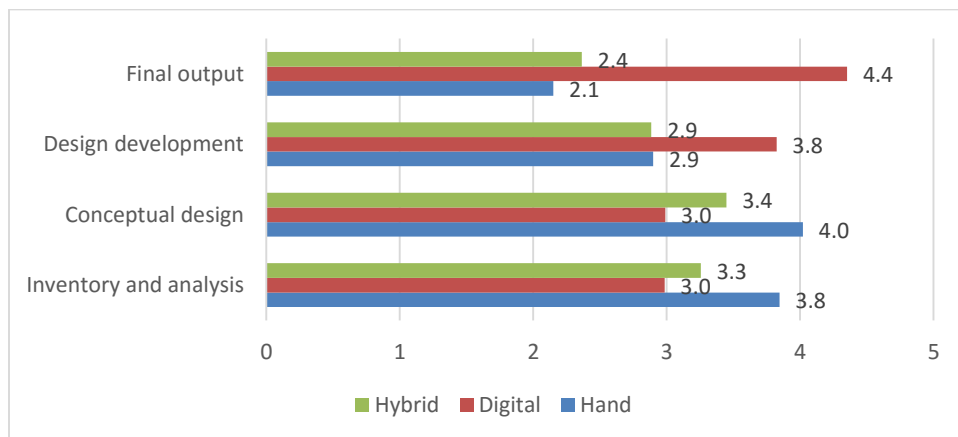


Figure 4-24 Average rating of graphics types use in design process

### 4.3.3 Graphics Types in Relation to the Type of Drawing

A set of three questions was used to determine what types of drawings are produced with hand, digital and hybrid graphics. Respondents were asked to choose from a list of all types of drawings for each type of graphics. There were ten listed drawings types, along with the option, “Other,” which included room for respondents to specify an answer other than the ten types listed. The results show that hand graphics are used primarily for sketches and diagrams, and are used less so for aerial and sectional perspectives, and for axonometric drawings. For sketches and diagrams, hand graphics prove to be the most user friendly type of graphics in comparison to other types. Digital graphics are least utilized for sketches, but most utilized for plans, sections, elevations, and all kinds of perspectives. Hybrid graphics are more useful for the production of most of the drawings, except for axonometric and sectional perspectives. In comparison to other graphics types, hybrid graphics are the most usable tool to produce plans, elevations, all perspectives and axonometric drawings. The reason for this latter finding is best expressed by one of the respondents: “Hybrid drawings give the most flexibility” (Figure 4-25).

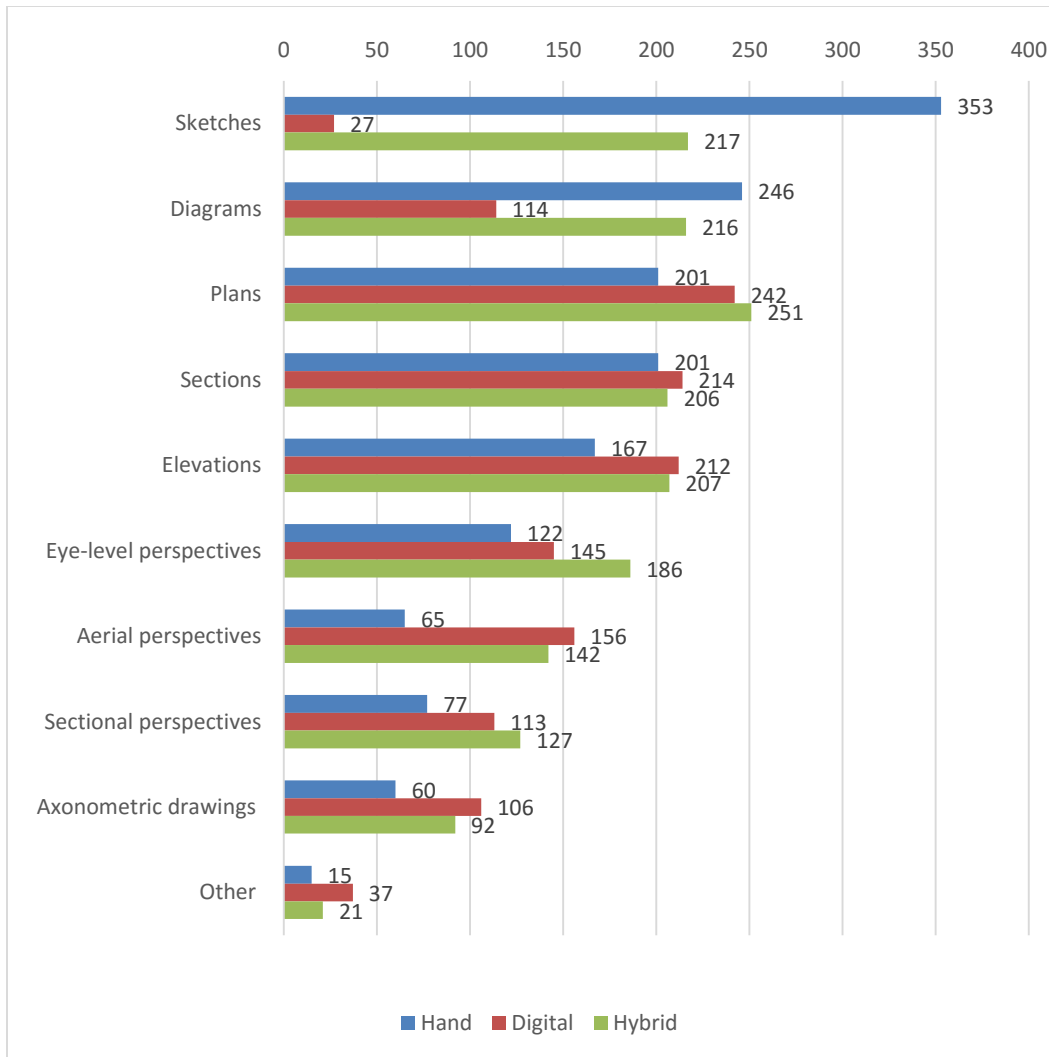


Figure 4-25 Frequency of hand, digital and hybrid graphics use for different drawings

Responses to the “Other” category included, for hand graphics, the following:

- “design details that do not translate easily with CADD, like the pattern or a stone wall face or custom wrought metalwork”

- Design details
- Preliminary Grading Plans
- Ideas and brainstorming. “Hand graphics are part of the thinking process.”

Seven respondents pointed out that they don’t use hand graphics exclusively for any of the drawings. One respondent answered: “We require 100% digital deliverables at all stages of project development.”

The “Other” category for digital graphics includes:

- Material sheets
- Construction documentation
- Details and specifications
- GIS maps

Eight respondents indicated that they do not use digital graphics exclusively for any of the drawing types.

Hybrid graphics uses beyond those listed, are:

- Storm-water watershed maps (delineated by hand then drafted in CADD)
- Planning stage and Design Development summaries
- “We hand render all of our plans once created digitally”

Five respondents indicated that they do not produce any of the drawings types with hybrid graphics.

#### 4.3.4 Communication with Target Groups

A set of three questions was used to determine the frequency of graphics types used with regard to communicating with target groups. For each type of graphics used, respondents were asked to choose from a list of all groups of clients with whom they communicate. Nine groups of clients were listed, along with the option, “Other,” which included room for respondents to specify an answer. The results show that hand graphics are used most frequently in communications with private individuals and less frequently with for-profit organizations. Digital graphics are used most frequently for communication with contractors, architecture or engineering professionals, and government representatives. Digital graphics are used least frequently in communications with for-profit and non-profit organizations. Hybrid graphics are utilized more frequently to communicate with developers, individuals, architectural and engineering professionals, and the general public. In comparison to other graphics types, hybrid graphics are the type most frequently utilized to communicate with any group of clients (Figure 4-26).

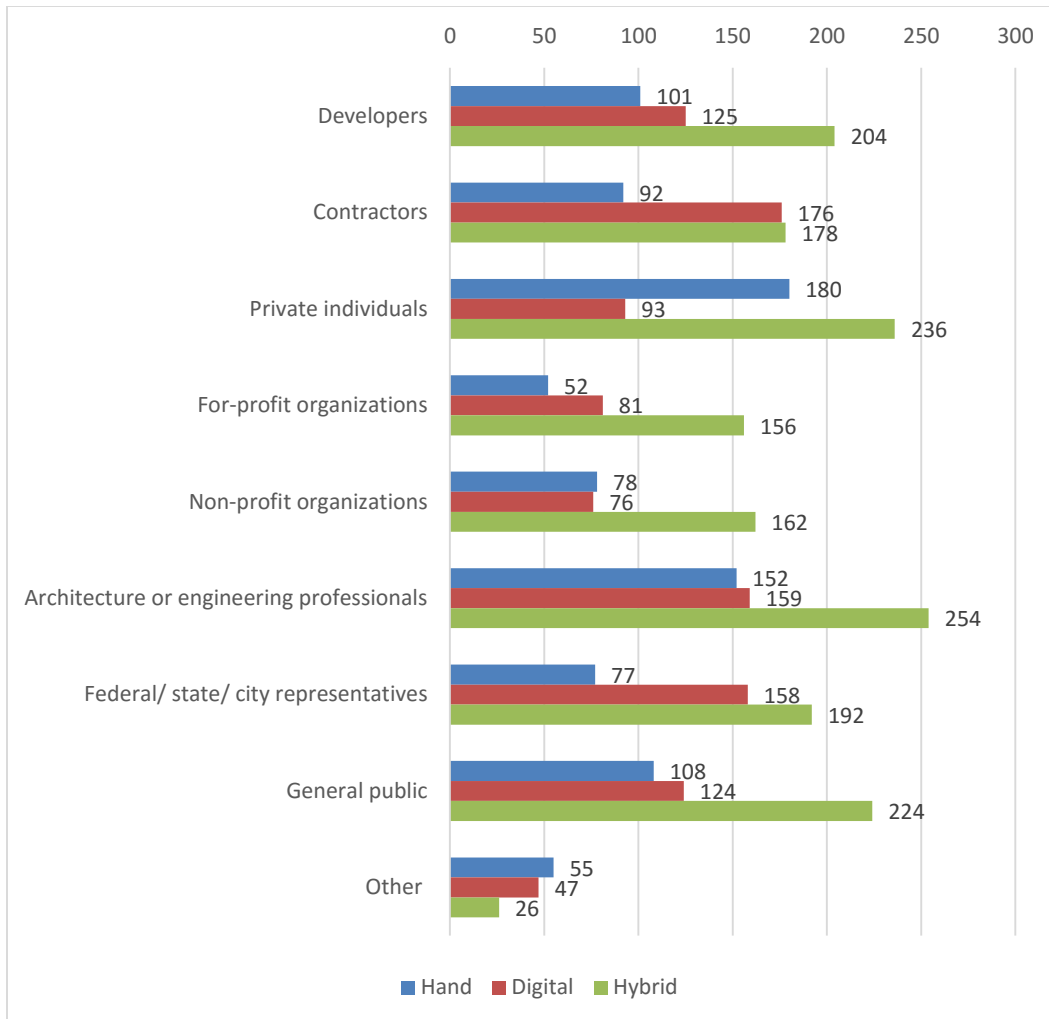


Figure 4-26 Hand, digital and hybrid graphics use to communicate with different groups

Other answers for hand graphics included: “Other resource specialists (botanists, archaeologists, geologists, etc.);” community associations and advocacy groups; children; campus clients; colleagues. Three respondents use hand graphics for all target groups, and five for none of the target groups. Twenty-two (22) respondents do not use hand graphics to communicate



exclusively with any group of clients. Four respondents pointed out that their graphics choices are based on client specific, but instead on a project specific basis.

For digital graphics, the “Other” choice included that following answers: maintenance staff; utilities; institutional administrators. Two respondents use digital graphics for all groups of clients, twenty-six (26) don’t use digital graphics exclusively, and six (6) respondents stipulated that the choice to use digital graphics is related not to the client, but to the project.

#### 4.3.5 Tools and Materials

A set of three questions was used to determine the tools used for creating each type of graphics. Respondents were asked to answer open-ended questions. The results were separated into categories depending on the most common answers. There are sixteen (16) categories for hand graphics. Figure 4-27 shows the frequency with which hand graphics tools are used. The category “Other” contains that following answers: grid paper; pastels; moleskin; Mayline drafting table; “whatever is at hand”; “Me and myself. I like to hand draw everything. Plus I have copies of specifications I have done over the years that I re-use if appropriate.”

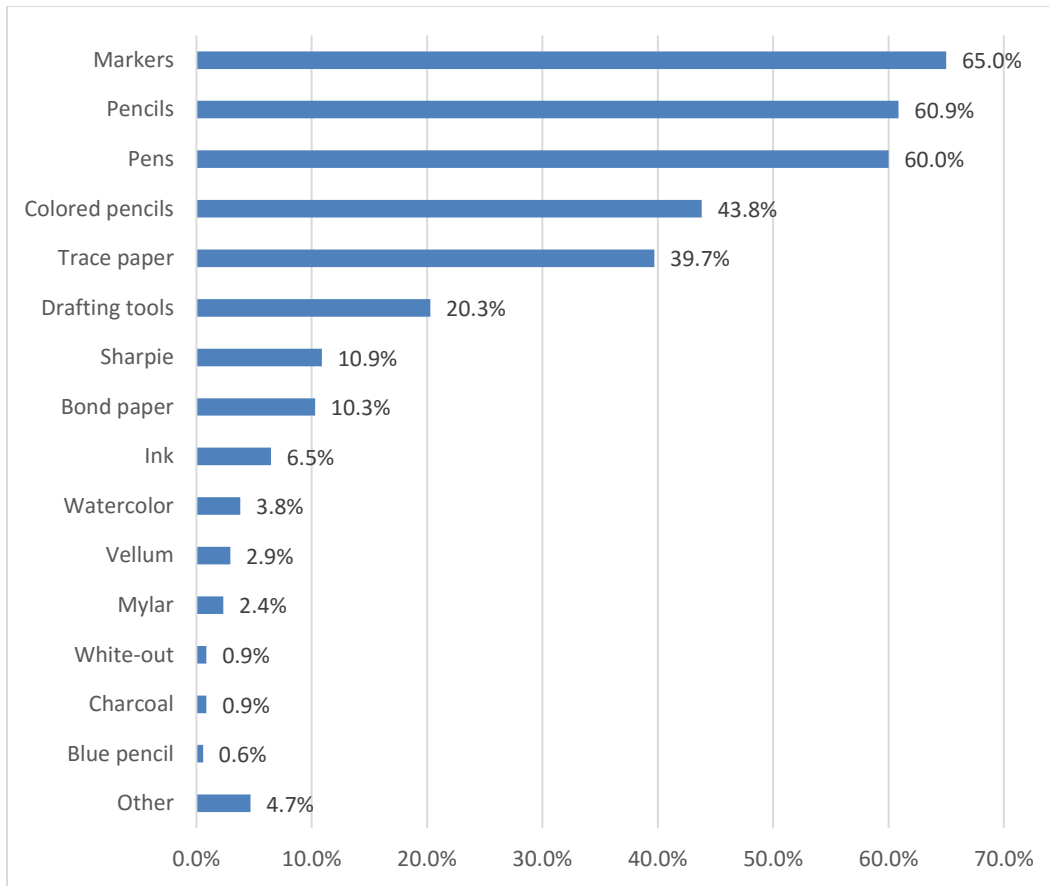


Figure 4-27 Hand graphics tools use

Twenty-eight (28) categories are based on the answers given for the creation of digital graphics. Figure 4-28 describes what software and hardware respondents use in their professional practices. The most frequently used software includes the Autodesk AutoCAD drafting programs and Adobe Photoshop for image editing. Other Adobe Creative Suite programs are used by about one quarter of respondents. The remaining programs are not as popular as those listed

above, but include other CAD programs, 3D modeling and rendering software.

The category “Other” contains mostly different rendering software.

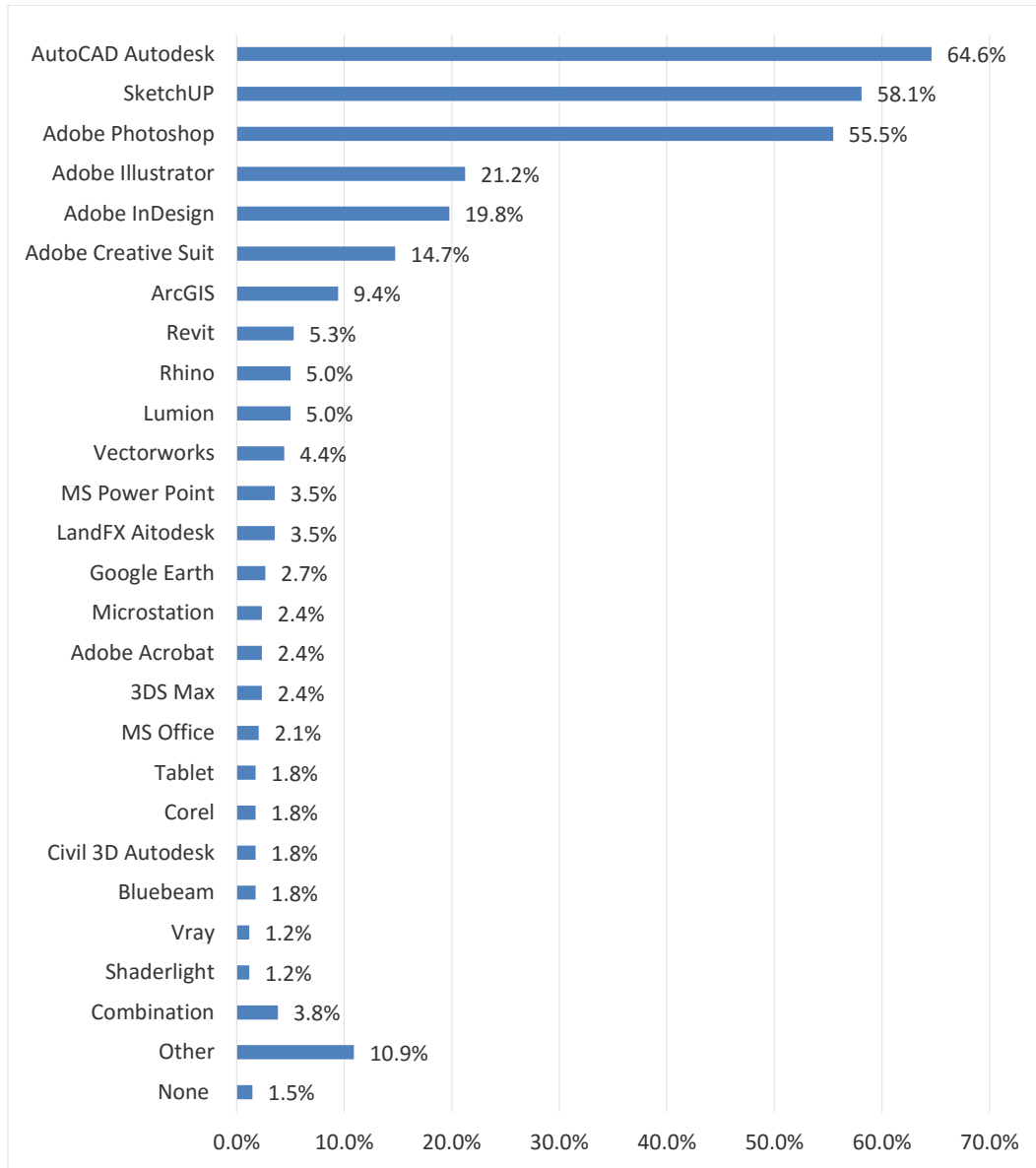


Figure 4-28 Digital graphics tools use

The method of categorization used for the aforementioned graphics types does not allow for clearly categorized responses with respect to hybrid graphics. Because the question was open-ended, the answers were not consistent in meaning; these included listings of the tools most frequently used for hand and digital graphics, or for the description of techniques. It is possible, however, to divide those techniques into a few groups, which are: marker or colored pencil renderings of CAD generated drawings (29 respondents); hand drawing over digitally generated 2D or 3D bases (18 respondents); hand graphics, scanned and then processed with image-editing software (23 respondents). Eleven (11) respondents answered that they never use hybrid graphics.

#### 4.3.6 Graphics Production by Consultants

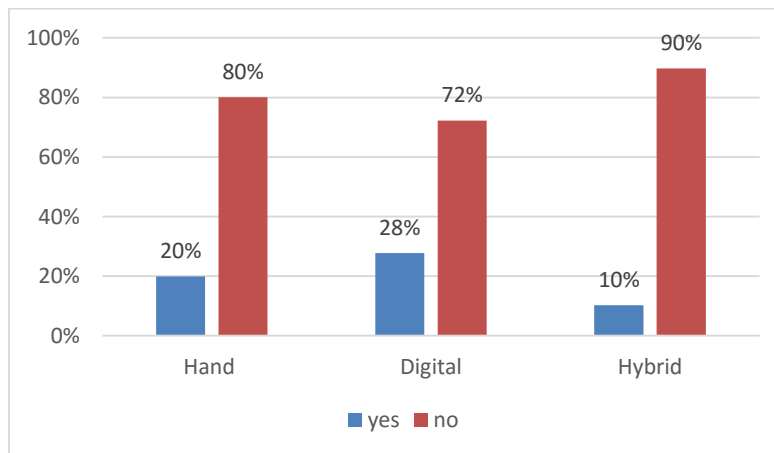


Figure 4-29 Professional help use for graphics production

The last set of questions determines if the respondents hire professional artists or graphic designers to produce their drawings. Respondents were asked to

answer three “yes” or “no” questions. Room for comments was provided for each. Figure 4-29 illustrates the distribution of answers for each graphics type. Obviously, most of the respondents do not delegate the production of drawings to professional artists.

Those respondents who did answer “yes” to the questions posed also specified reasons for the outsourcing of graphics production. For hand graphics, those reasons are: high quality demand (26 % respondents); specific drawing production – perspectives (25% respondents); production materials for final presentations (14%); client’s request (12 %). Categories for digital graphics: client’s request (16%); time efficiency (14%); high quality demand (12%); absence of software or hardware to produce some drawings (12%). Time efficiency (7%) and quality demand (13%), are reasons that professional artists are employed to create hybrid graphics. In summary, response to this question with respect to all graphics types indicate that there is a high demand for various graphics skills needed for in-house professionals.

## Chapter 5

### CONCLUSIONS

This chapter summarizes the general findings of the study and then explains the implications of this study in terms of the landscape architecture profession

#### 5.1 Summary of Findings

Before data collection, a hypothesis was formulated positing that there would be differences in the use of different graphics types in relation to years of work experience, professional education level, position, type of practice, and type of service.

After examining the data, it was found that the use of hand graphics is directly proportional to the years of professional experience, whereas the use of hybrid graphics does not relate to this variable. The use of digital graphics is inversely proportional to the years of accrued professional experience at both ends of the scale. Respondents with more twenty or more (20+) years of experience use digital graphics less frequently, and respondents with less than five (5) years of experience use them more often. There was no relation found between the use of digital graphics and additional years of experience categories. When comparing this research to earlier research (Ballew 2005), it was found that the dynamics of hand graphics use in professional practice are the same, but that the described negative correlation between professional experience and digital graphics use is partially repeated in the results of the current study.

The use of hand graphics is directly proportional to the position; the higher the position, the more frequently hand graphics are used by the respondent. For digital graphics use, some difference in relation to the position was found, but there are no direct or inverse relationships between these variables. For example, owners use digital graphics with the same frequency as do project managers, as do principals and entry-level landscape architects. There are no relationships between position and use of hybrid graphics. In comparison to Ballew's 2006 findings, the use of digital graphics no longer reflects a correlation with respect to the position of the user.

When it comes to the type of practice, the data shows that hand graphics are used with equal frequency by all types of practices, with the exception of public practice and architecture, engineering or multidisciplinary practice. Practitioners in these two types of practices tend to use hand graphics significantly less often than do those in other types of practices. Digital graphics are used less in design-build and small landscape architecture companies than in other types. The use of hybrid graphics is the category most clearly related to the type of practice. Hybrid graphics are used least often in public and multidisciplinary practices, with average frequency in design –build, academic and small landscape architecture practices, and with the highest frequency in medium sized landscape architecture companies.

When the relationships between professional degree and choice of graphics types were examined, no sufficient evidence was found to conclude that there are obvious differences related to these variables. Similarly, there is no sufficient evidence to indicate that the choice of graphics types somehow relates to the type of service.

When it comes to the design process, the different graphics types vary in importance at different stages thereof. Thus, hand graphics are used primarily during the inventory and analysis and conceptual design stages, and digital graphics are used most frequently in the design development and final output stages. The frequency of hybrid graphics use is the same as hand graphics in design development and final output, but during the analytical and conceptual parts of the process, hybrid graphics are used more often than are hand graphics and less often than are digital graphics.

There is a major difference in graphics use when it comes to the production of specific types of drawings. The main technique used to produce sketches and diagrams is hand graphics, whereas digital graphics are rarely utilized for this purpose; hybrid graphics are used for these by half of the survey respondents. There is no significant difference in the use of graphics types used to produce sections. For other types of drawings, hybrid and digital graphics are used more often than are hand graphics.



All graphics types play different roles in communication with different groups of clients. The usage of hybrid graphics prevails in communication with most target groups with the exception of contractors. For this group, hybrid graphics share their place with digital graphics. When comparing the use of hand and digital graphics, both are used with comparable frequency for such categories as non-profit organizations and architecture or engineering professionals. The use of hand graphics is preferable above the use of digital graphics in communications with private individuals. In all other cases, landscape architecture professionals prefer the use of digital graphics.

The whole palette of traditional hand drawing materials has been utilized in today's practice, with markers, pencils, pens, colored pencils, and trace paper used most frequently. The three pillars of contemporary digital graphics for landscape architects are Autodesk AutoCAD, Adobe Photoshop and SketchUP, which cover the professional demands in drafting, image processing and three-dimensional modeling. The comparison with the Ballew's 2006 study shows a dramatic growth in the use of SketchUP, which has grown from 4% in 2006 to 58% at present. The hybrid graphics utilize all the tools listed for hand and digital graphics. Traditional hybrid techniques such as the hand color rendering of digital drawings or hand drawing overlaying a digitally generated 3D model now shares a place with relatively new technologies, such as drawing on a digital tablet.

There is relatively little demand for professional drawing services. One fifth of the respondents outsource hand graphics production to professional artists, whereas about one third do so with respect to digital graphics. For hybrid graphics, the number is even lower. The major reason for employing professional artists is to obtain high quality materials, which are usually both labor intensive and time consuming.

In summary, the research findings show that all three graphics types are widely used in contemporary landscape architecture, and each has its own niche in many aspects of the design process and drawing production. The traditional tool of the landscape architect, hand graphics, is still actively utilized as a stand-alone technique as well as a part of relatively new hybrid graphics. It is too early to determine whether or not hand graphics are truly “a lost art.”

## 5.2 Implication of Findings to the Landscape Architecture Profession

While the demand of hand, digital and hybrid graphics skills is high in the various areas of professional landscape architecture, it is essential for all practitioners to possess command of all these skills, including evolving those skills in conjunction with evolving changes in modes of production. The key to success here is to start developing these skills as early as possible in the process of earning professional degrees within the discipline. It is important to teach students traditional visualization techniques as well as to keep abreast of the newest ones as they emerge.

It is necessary to better adjust existing digital and hybrid graphics to the needs of landscape architects to make doing so both more temporally efficient and more affordable for practitioners. There is an opportunity for landscape architects to start working with software and hardware developers in order to obtain the products that best fit their professional needs.

### 5.3 Opportunities for Future Research

- Because this thesis extends 2006 Lisa Ballew's research, and because the use of all three types of graphics studied are evolving, it would be useful for this topic to be revisited in another 5-10 years.
- What graphic skills are most desired from new graduates, based on current job descriptions, and surveys of employers?
- Because hybrid graphics using digital tablet technology is a relatively new development and is rapidly evolving, it would be worthwhile to determine how and to what extent digital tablets are being used by landscape architects.
- How would the results of this research compare to similar research in other creative fields, such as industrial design, graphic design, computer game design, film animation and others, and to determine what lessons could be learned from those fields.
- Which graphic methods are more requested by clients in the different phases of the design process, and why.

Appendix 1  
Cover Letter

To: (E-mail)

From [natalia.chuprakova@mavs.uta.edu](mailto:natalia.chuprakova@mavs.uta.edu)

Subject: Survey for Landscape Architecture Professionals.

Dear landscape architecture professional.

I am a landscape architecture graduate student at The University of Texas at Arlington working on my Master's thesis entitled: "An Assessment of Using Hand Graphics, Digital Graphics and Hybrid Graphics in Contemporary Landscape Architecture Practice". The purpose of this survey is to identify a position of different types of graphics in landscape architecture practice and determine the factors affecting the choice of certain type.

Your participation in a survey is voluntary. You may withdraw your participation at any time.

The information you provide will be kept strictly confidential. The only people who will see the survey responses will be my supervising professor James Richards and myself. No information allowing company and individual identification will be published.

Thank you for your participation in this research. If you have any question concerning this survey please don't hesitate to contact me at any time.

Best regards,

Natalia Chuprakova

MLA Candidate

University of Texas at Arlington

[natalia.chuprakova@mavs.uta.edu](mailto:natalia.chuprakova@mavs.uta.edu)

214-244-0434

Appendix 2  
Survey Instrument

**An Assessment of the Use Hand Graphics, Digital Graphics and Hybrid Graphics in Modern Landscape Architecture**

**SECTION 1**

2. How long have you been working in landscape architecture?

- less than 5 years
- 5-9 years
- 10-15 years
- 16-19 years
- 20 and over years

3. What is highest degree you have received in landscape architecture or related fields?

- Bachelor's degree
- Master's degree
- Doctorate degree

Other (please specify)

4. How would you best describe your position? Please choose one option.

- Entry level landscape architect
- Senior landscape architect
- Project manager
- Principal
- Owner

Other (please specify)

5. How would you best describe the type of practice you work in? Please choose one option.

- Small private landscape architecture oriented practice (0-5 employees)
- Medium private landscape architecture oriented practice (6-10 employees)
- Large private landscape architecture oriented practice (over 10 employees)
- Design-build practice
- Architecture, engineering or multidisciplinary practice
- Public practice (federal, state or city government)
- Academic practice
- Other (please specify)

6. What type of services does your company provide? Please check all that apply.

- Residential
- Multi-family
- Commercial
- Institutional
- Industrial
- Transportation
- Recreational
- Environmental restoration
- Historic preservation
- Urban/ regional planning
- Other (please specify)

7. In what state is your practice currently located?



**An Assessment of the Use Hand Graphics, Digital Graphics and Hybrid Graphics in Modern Landscape Architecture**

**SECTION 2**

8. How often do you use hand graphics in your professional practice?

Very often                  Often                  Sometimes                  Rarely                  Never

9. How often do you use digital graphics only in your professional practice?

Very often                  Often                  Sometimes                  Rarely                  Never

10. How often do you use hybrid graphics (both hand and digital together) only in your professional practice?

Very often                  Often                  Sometimes                  Rarely                  Never

**An Assessment of the Use Hand Graphics, Digital Graphics and Hybrid Graphics in Modern Landscape Architecture**

11. Please rate importance of the following factors affecting your choice of graphics type on inventory and analysis stage of your design process

	not at all important	not very important	somewhat important	important	very important
Time efficiency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accuracy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of editability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of understanding for clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Proficiency/ knowledge of media (hand graphics)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

12. Please rate importance of the factors affecting your choice of graphics type on conceptual design stage of your design process

	not at all important	not very important	somewhat important	important	very important
Time efficiency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accuracy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of editability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of understanding for clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Proficiency/ knowledge of media (hand graphics)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

13. Please rate importance of the factors affecting your choice of graphics type on design development stage of your design process

	not at all important	not very important	somewhat important	important	very important
Time efficiency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accuracy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of editability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of understanding for clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Proficiency/ knowledge of media (hand graphics)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

14. Please rate importance of the factors affecting your choice of graphics type on final output stage of your design process

	not at all important	not very important	somewhat important	important	very important
Time efficiency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accuracy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of editability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of understanding for clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Proficiency/ knowledge of media (hand graphics)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ease of learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

## An Assessment of the Use Hand Graphics, Digital Graphics and Hybrid Graphics in Modern Landscape Architecture

15. At what stage of the design process do you use hand graphics only?

	Very often	Often	Sometimes	Rarely	Never
Inventory and analysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conceptual design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Final output	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16. At what stage of the design process do you use digital graphics only?

	Very often	Often	Sometimes	Rarely	Never
Inventory and analysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conceptual design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Final output	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. At what stage of the design process do you use hybrid graphics both hand and digital together?

	Very often	Often	Sometimes	Rarely	Never
Inventory and analysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conceptual design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Final output	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

An Assessment of the Use Hand Graphics, Digital Graphics and Hybrid Graphics in Modern Landscape Architecture

18. What type of drawings do you produce with hand graphics only? Please check all that apply.

- Sketches
- Diagrams
- Plans
- Sections
- Elevations
- Eye-level perspectives
- Aerial perspectives
- Sectional perspectives
- Axonometric drawings (parallel projection)
- Other (please specify)

19. What type of drawings do you produce with digital graphics only? Please check all that apply.

- Sketches
- Diagrams
- Plans
- Sections
- Elevations
- Eye-level perspectives
- Aerial perspectives
- Sectional perspectives
- Axonometric drawings (parallel projection)
- Other (please specify)

---

20. What type of drawings do you produce with hybrid graphics both hand and digital together? Please check all that apply.

- Sketches
- Diagrams
- Plans
- Sections
- Elevations
- Eye-level perspectives
- Aerial perspectives
- Sectional perspectives
- Axonometric drawings (parallel projection)
- Other (please specify)

**An Assessment of the Use Hand Graphics, Digital Graphics and Hybrid Graphics in Modern Landscape Architecture**

21. With what group of clients do you use hand graphics only to communicate with? Please check all that apply.

- Developers
- Contractors
- Private individuals
- For-profit organisations
- Non-profit organisations
- Architecture or engineering professionals
- Federal/ state/ city representatives
- General public
- Other (please specify)

22. With what group of clients do you use digital graphics only to communicate with? Please check all that apply.

- Developers
- Contractors
- Private individuals
- For-profit organisations
- Non-profit organisations
- Architecture or engineering professionals
- Federal/ state/ city representatives
- General public
- Other (please specify)

23. With what group of clients do you use hybrid graphics both hand and digital together) to communicate with? Please check all that apply.

- Developers
- Contractors
- Private individuals
- For-profit organisations
- Non-profit organisations
- Architecture or engineering professionals
- Federal/ state/ city representatives
- General public
- Other (please specify)

**An Assessment of the Use Hand Graphics, Digital Graphics and Hybrid Graphics in Modern Landscape Architecture**

24. What tools do you use for hand graphics?

25. What tools do you use for digital graphics?

26. What tools do you use for hybrid graphics?



**An Assessment of the Use Hand Graphics, Digital Graphics and Hybrid Graphics in Modern Landscape Architecture**

27. Do you delegate hand graphics production to a third party (professional artist, illustrator etc)?

yes  no

If yes, please explain

28. Do you delegate digital graphics production to a third party (professional artist, illustrator etc)?

yes  no

If yes, please explain

29. Do you delegate hybrid graphics (both hand and digital together) production to a third party (professional artist, illustrator etc)?

yes  no

If yes, please explain

Appendix 3  
Informed Consent Document

## INFORMED CONSENT DOCUMENT

### **Principal Investigator**

Natalia Chuprakova  
Program in Landscape Architecture  
College of Architecture, Planning, and Public Affairs  
E-mail: natalia.chuprakova@mavs.uta.edu  
Phone: 214-244-0434

### **Faculty Advisor**

James P. Richards  
Associate Professor of Landscape Architecture  
Program in Landscape Architecture  
College of Architecture, Planning, and Public Affairs  
E-mail: [jrichard@uta.edu](mailto:jrichard@uta.edu)  
Phone: 817-272-2801

### **Title of Project**

An Assessment of the Use of Hand Graphics, Digital Graphics and Hybrid Graphics in Contemporary Landscape Architecture Practice

### **Introduction**

You are being asked to participate in a research study about using hand graphics, digital graphics and hybrid graphics in contemporary landscape architecture practice. You are being selected because you are a full or associate member of American Society of Landscape Architects. Your participation is voluntary. Refusal to participate or discontinuing your participation at any time will involve no penalty or loss of benefits to which you are otherwise entitled. This research will be compiled into a thesis format. Please ask questions if there is anything you do not understand.

### **Purpose**

The purpose of this research is to identify current trends, opinions, and aspects to applying hand, digital and hybrid graphics in the field of landscape architecture. This study will produce quantifiable data on the current use of different graphic types in landscape architecture practice. Educators in the field will be able to incorporate insights from the study into curriculum design and course development in order to best educate students. This knowledge can also be used in developing continuing education curriculum for landscape architects.

**Duration**

Participation in this study will last approximately 15 minutes.

**Number of Subjects**

The number of anticipated subjects in this research study is 2500.

**Procedures**

The procedures which will involve you as a research subject include:

1. You will read and sign informed consent document
2. You will fill online survey

**Possible Benefits**

Educators in the field will be able to incorporate insights from the study into curriculum design and course development in order to best educate students. This knowledge can also be used in developing continuing education curriculum for landscape architects.

**Possible Risks/Discomforts**

There are no perceived risks or discomforts for participating in this research study. Should you experience any discomfort please inform the researcher. You have the right to quit any study procedures at any time at no consequence.

**Compensation**

There will be not compensation for participation in this study.

**Alternative Procedures**

There are no alternative procedures offered for this study. However, you can elect not to participate in the study or quit at any time at no consequence.

**Voluntary Participation**

Participation in this research study is voluntary. You have the right to decline participation in any or all study procedures or quit at any time at no consequence.

**Confidentiality**

Every attempt will be made to see that your study results are kept confidential. All data collected from this study will be stored in Office of the Program Director, room 109 CAPP Building for at least three (3) years after the end of this research. The results of this study may be published and/or presented at meetings without naming you as a subject. Additional research studies could evolve from the information you have provided, but your information will not be linked to you in anyway; it will be anonymous. Although your rights and privacy will be

maintained, the Secretary of the Department of Health and Human Services, the UTA Institutional Review Board (IRB), and personnel particular to this research have access to the study records. Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law, or as noted above. The IRB at UTA has reviewed and approved this study and the information within this consent form. If in the unlikely event it becomes necessary for the Institutional Review Board to review your research records, the University of Texas at Arlington will protect the confidentiality of those records to the extent permitted by law.

### **Contact for Questions**

Questions about this research study may be directed to Natalia Chuprakova or Pr. James Richards. Contact information is listed below.

Natalia Chuprakova  
214-244-0434  
[natalia.chuprakova@mavs.uta.edu](mailto:natalia.chuprakova@mavs.uta.edu)  
Pr. James P. Richards  
817-272-2801  
[jrichard@ut.edu](mailto:jrichard@ut.edu)

Any questions you may have about your rights as a research subject or a research-related injury may be directed to the Office of Research Administration; Regulatory Services at 817-272-2105 or [regulatoryservices@uta.edu](mailto:regulatoryservices@uta.edu).

### **Consent**

By clicking “ACCEPT” below, you confirm that you are 18 years of age or older and have read or had this document read to you. You have been informed about this study’s purpose, procedures, possible benefits and risks, and you may print a copy of this form using the “Print” function in your browser. You have been given the opportunity to ask questions before you make a decision regarding your participation, and you have been told that you can ask other questions at any time.

You voluntarily agree to participate in this study. By clicking “ACCEPT” below, you are not waiving any of your legal rights. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.

ACCEPT; I voluntarily agree to participate in this study  
DECLINE; I do not wish to participate in this study

## References

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