AN ABSTRACT OF THE DISSERTATION OF

Nancy L. Wolford for the degree of Doctor of Philosophy in Apparel, Interiors, Housing, and Merchandising presented on February 28, 2000. Title: Universal Design Standards for Single-Family Housing.

Abstract approved: Redacted for Privacy

Jeanette A. Brandt

The purpose of this study was to determine the level of awareness and use of selected universal design features and products in single-family housing by Oregon housing contractors. Also researched were barriers and incentives to use as well as the position and opinions of these housing contractors on the viability of universal design standards becoming part of the residential building code.

This study used a self-administered, mail survey questionnaire developed by the researcher. The Dillman Total Design Method (Dillman, 1978) was used as the basis for the survey instrument and its administration. A random sample of housing contractors indicating single-family residential construction as a primary focus of business was taken from the Oregon Construction Contractors' Board list. One hundred sixty-four surveys were returned for use in analysis.

Data analysis included descriptive statistics, mean, and frequency distributions. Paired sample t-tests were used to determine differences between awareness and use of universal design. Multiple regression and Pearson correlations were used to compare universal design use and selected demographic characteristics.

Paired sample t-tests determined whether or not added cost to implement universal design affected use. Kendall's tau tests compared viability and mandated use of universal design as part of the building code. The MANOVA test compared current voluntary use and housing contractors' opinions about specified characteristics of universal design.

These analyses found that of Oregon housing contractors surveyed, there was a greater awareness than use of universal design, which was significant. Barriers and incentives to use were important considerations in the process of adopting universal design. Cost and demand by clients were most often cited. A majority of respondents felt that incorporating universal design standards as part of the building code was a viable idea, even though they disagreed with it. Specified demographic characteristics of housing contractors did not play a significant role in either awareness or use of universal design. Added cost to implement universal design was found to be associated with its use. The more there was an indication of additional cost, the less the use of universal design.

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Universal Design Standards for Single-Family Housing

by

Nancy L. Wolford

A DISSERTATION

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Doctor of Philosophy

Presented February 28, 2000
Commencement June 2000

Doctor of Philosophy dissertation of Nancy L. Wolford presented on February 28, 2000

APPROVED:

_Redacted for Privacy__________

Major Professor, representing Apparel, Interiors, Housing, and Merchandising

____Redacted for Privacy ________________

Chair of Department of Apparel, Interiors, Housing, and Merchandising

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Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

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ACKNOWLEDGMENT

A project like this required the cooperation, support, and encouragement of many people who need to be acknowledged. To name each person individually would take too many pages and I would be fearful of omitting someone, as there have been so many influential people at this stage of my life. However, there are some who do need to be mentioned and my apologies to those not mentioned, you are certainly not forgotten.

I would especially like to thank those who responded to and participated in the survey, creating the data for this research. The information they provided was invaluable and without it this project would not have happened.

Specifically, I would like to thank the members of my doctoral committee. Jeanette Brandt, my major professor, whose continued thoughtful guidance, encouragement, and unwavering faith in my ability and determination to complete this project helped make it happen. The members of my committee, Victoria Douglass, Karen Hooker, Arlene Holyoak, Mark Edwards, and Mary Ann Sward, for their support, encouragement, flexibility, and valuable input throughout the process.

In addition, the faculty of the Apparel, Interiors, Housing and Merchandising Department, all my design and teaching colleagues, friends, fellow graduate students, as well as the students I have had the privilege to teach over the years, provided continued support, encouragement, inspiration, and good times, too. These are too numerous to mention, but you know who you are. The generous hospitality of Carol and Don Caughey was very much appreciated as well.

Finally, I am indeed grateful to my wonderful family, both near and far. Their love, encouragement, interest, and support did not waver. While there are too many to name them all, I need to mention a few. My sister, Janet, was supportive and encouraging, keeping me on track, reminding me how "easy" I had it with the computer (she typed her thesis from start to finish, all 192 pages, at least four times!). The memory of my own parent's, Flora and Alfred Hatch, their influence and love was ever present and kept me going. I would like to think that they would be proud of their youngest child and this accomplishment. My "other parents," Margery and Lyle Wolford, have been here for me throughout, their home a welcome and loving haven whenever I needed it. I am so lucky to have you, I could not ask for better. My children, Len and Laura have been wonderful, so supportive and encouraging, letting me visit them (or they visit me), take them shopping, or out for a meal whenever I needed a break. I think they might even be proud of me. They are, indeed, the best.

Last, there is my husband and best friend, Dan. I am not sure I can find the words to adequately express my love and appreciation. This endeavor would not have been possible had he not been willing to take over so many things, make sacrifices, and wholeheartedly support me throughout. His encouragement and love have been unwavering and kept me going when I otherwise might have faltered. I am, indeed, fortunate.

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DEDICATION

To my family and the memory of my parent's, my inspiration.

Universal Design Standards for Single-Family Housing

CHAPTER 1

INTRODUCTION

Universal design features, and products in the design of buildings are those that meet the needs of people of all ages and abilities to the greatest extent possible at little or no extra cost. Use of such concepts is not currently widespread in the single-family housing environment, despite an increasing awareness of these design features and the availability of products. This increased awareness and availability are due, in part, to the passage of the American with Disabilities Act (ADA) and the Fair Housing Act Amendments, which affect public spaces and multi-family housing, respectively (DeMerchant & Beamish, 1995). There has been resistance on the part of the home building and design industries to adopt and include universal design features and products in their single-family home designs, from tract and spec houses to custom homes (Belser & Weber, 1995). When homeowners do want to include universal design features and products in their homes, they often have to undergo an exhaustive search to find a design and/or construction professional willing to implement them (Guetzko & White, 1991). How can home design, construction and building professionals become more aware of, adopt and use universal design in the construction and design of single-family housing?

The heightened awareness of and mandate for accessibility requirements for public and multi-family spaces has brought about an increased awareness and interest in similar types of requirements for single-family residential spaces, particularly by the aging and physically disabled segments of the population (Robinson, Yeatts, & Mahoney, 1994). It is projected that there will be an increase in both the number and percentage of both of these segments of the population in the United States by the year 2030, particularly as the large population of baby boomers age (United States Bureau of the Census, 1995). The lobbying efforts of advocacy groups, such as the American Association of Retired Persons (AARP) and Veteran's organizations, have also been proactive and instrumental in heightening the awareness of and desire for universal design elements in single-family residential spaces on the part of all consumers. Yet adoption and use by housing contractors and designers, as well as consumers, has not had widespread occurrence.

Another interest in universal design has come from the professional design and housing community. The code of ethics of the American Society of Interior Designers (as well as other professional design, architecture, and housing organizations) states "the designer shall at all times consider the health, safety, and welfare of the public in spaces that he or she designs" (American Society of Interior Designers [ASID], 1988). This component has also become an important segment of the National Council for Interior Design Qualification (NCIDQ) examination, the test for measuring the minimum competency in the practice of interior design, and required of the professional housing and design organizations for professional membership status as well as for certification or licensing in many states. One of the six sections of this examination is devoted entirely to the knowledge of building and barrier-free codes (Ballast, 1992). Likewise, this knowledge of and competency with building and barrier-free codes is a part of the Standards and Guidelines for Professional Level Programs as outlined by the Foundation for Interior Design Education and Research (FIDER) (FIDER, 1995). These include the following components: "The curriculum incorporates design for diverse populations, e.g. age, culture, income, physical abilities, etc." (p. 5), competency in "Universal design, i.e. human factors, anthropometrics, ergonomics" (p. 7), competency in "Laws, codes standards, and ordinances, e.g. ADA,. . ." (p. 7), and competency in "Reference materials, i.e. codes, regulations, and standards" (p. 9). Are housing professionals trained under these guidelines implementing universal design in their single-family residential housing projects as they are for public and multi-family spaces?

Problem Statement

While there has been an increased awareness and knowledge of universal design, a majority of housing contractors and designers have either ignored the concept or confused it with accessible, adaptable, barrier-free, ADA, or handicapped design. Only a few appear to specialize in or incorporate this aspect of design that pays particular attention to individual user's needs, regardless of age or ability (or disability) (DeMerchant & Beamish, 1995). There also has been a hesitancy on the part of both the professional design/build community and the home-owning public to build or modify a home that could be labeled or stereotyped as "special" or "different," not fully understanding the difference between universal and accessible design (Filion, Wister, & Coblentz, 1992).

Research has identified universal design elements for residential dwellings, including the single-family residence, and recommendations have been made. Guidelines for designing these spaces are available (e.g. American National Standards Institute [ANSI], 1986; Casto & Day, 1977; DeMerchant & Beamish, 1995; Jones, 1995; Raschko, 1982; U.S. Department of Housing and Urban Development [U.S. DHUD], 1991). Complete, consistent recommendations, however, for universally designed single-family residential spaces are not available in a concise, easy to use format, or are they a part of the building codes currently in use. Recommendations vary widely among the different sources and are often conflicting or contradictory (Beasley & Davies, 1995). This has made it difficult for designers, architects, builders, and contractors to understand which ones to use and apply, particularly in their single-family housing construction practice (McLeister, 1998). There is a need for universal design standards for single-family housing construction to be developed and adopted, not only to assist the home design and building professionals, but also homeowners and other housing consumers.

Purpose Statement

The purpose is to provide a better understanding of the present awareness and use of universal design features and products in single-family housing design and construction by Oregon single-family residential housing contractors.

Research Questions

1. What level of awareness and use do housing contractors have of universal design features for single-family housing construction?
2. What are the barriers, if any, to the adoption and use of universal design features in residential construction by housing contractors? Are there incentives that would encourage their use of universal design?
3. What is the position of housing contractors on the viability of universal design standards becoming a part of the residential building code?

Null Hypotheses

The null hypotheses for this study are:

1. There is no significant difference between awareness and use of universal design features by single-family housing contractors.
2. There is no association between universal design awareness and use of universal design in single-family housing construction and demographic characteristics of housing contractors: Gender, age, level of education, occupational title, and years in business.
3. There is no association between universal design use and added cost to implement universal design features in single-family housing construction by housing contractors.
4. There is no association between identified barriers to use and the use of universal design in single-family housing construction by housing contractors.

5. There is no association between the viability of and the opinion about mandated use of universal design standards as part of the building code for single-family housing by housing contractors.
6. There is no association between current voluntary use of universal design and housing contractors' perceptions of each of the following characteristics of universal design: a) similar appearance, b) similar cost, c) ready availability, d) information readily available, and e) current use of universal design features and products by other home building professionals in the state/area.

Users and benefactors of these findings include: home design and construction professionals; education professionals and the institutions which train building and design professionals; home building product and materials manufacturers; professionals who work with special populations such as senior citizens and the disabled; real estate professionals; and planners, policy makers, government officials, and others who deal with the building codes and policies that affect single-family housing construction. Also benefiting would be interior designers, architects, and all home-owning consumers.

Definition of Terms

The following terms and their definitions were used in this study.

Accessible design: Accessible design in housing generally means that the dwelling meets prescribed requirements for accessible housing as mandated by the U. S. Department of Housing and Urban Development (HUD). Most accessible design features are permanent and fixed in place to meet unique personal needs (Mace, 1990, p. 1; Malizia, 1993, p. 203).

Adaptable design: Adaptable design looks no different from the design of other dwellings. It has features that can be easily and readily added, adjusted, or removed to meet the needs of persons of all ages with varying types and degrees of disability (Mace, 1985, p. 152; Mace, 1990, p.2).

Aging in place: The term that has been used to describe the phenomenon of growing older within a specific environmental setting, usually one's own home (Silverstone & Horowitz, 1992, p. 27).

Americans with Disabilities Act of 1990 (ADA): The ADA requires employers to provide "reasonable" accommodations, including access, for persons with disabilities in new and renovated public spaces and accommodations (American with Disabilities Act, P.L. 101-336, 1990).

Barrier-free design: Design that eliminates the obstacles (or barriers) in a space, making it fully usable and accessible by people of varying sizes and abilities (Peterson, 1996, p. 5).

Fair Housing Amendments Act of 1988 (FHAA): The FHAA extends civil rights protection to the design and construction of housing, specifically newly constructed dwellings in structures with four or more units to be built with minimum wheelchair access and to contain specified adaptable features (U. S. DHUD, 1991).

Housing contractor: A licensed and registered building professional whose primary focus of business is the building and/or remodeling of single-family houses.

Lifespan design: Refers to "(housing) design for the life span of all people" (PSI International, 1987, p. 1). It is design that allows people to function fully, regardless of changes due to size, age or physical ability (Peterson, 1996, p. 6).

Real life design: Takes into account that most people don't fit the stereotypical norm, acknowledging a wide range of physical and mental abilities and impairments. It is design for real life, adapting to people rather than people adapting to design (GE Appliances, 1995).

Universal design: A way of designing a building at little or no extra cost so it is both attractive and functional for all people, regardless of ability or disability (Mace, 1985, p. 147). Universal design addresses the scope of accessibility and suggests making all elements and spaces accessible to and usable by all people to the greatest extent possible. This is accomplished through thoughtful planning and design at all stages of any design project. Universal design requires an understanding and consideration of the broad range of human abilities throughout the lifespan (Mace, 1990). It is a philosophy of design that makes it easy for almost anyone to use (Gould, 1998).

Assumptions

The following assumptions were used in this study:

1. Respondents answered the self-administered, written questionnaire truthfully and accurately.
2. The instrument accurately measured the awareness and use of universal design features and products by housing contractors.

Limitations

The following were limitations of this study:

1. The use of the Oregon Construction Contractors' Board list might limit the ability to generalize the findings of this study to housing contractors in other areas of the United States, because of regional characteristics.
2. Respondents might have their own definition of universal design, which might not be the same as that used in this study.

CHAPTER 2

REVIEW OF LITERATURE

This review of literature includes the following: the theoretical framework and research related to universal design. The theoretical framework used and its applications in housing research are presented. The review of universal design research includes the evolution and definition of the concept; its awareness and use by housing design professionals (housing contractors, home builders and designers) and consumers; universal design requirements; and the adoption of universal design standards in single-family housing construction.

Theoretical Framework

In looking at the awareness and use of universal design for single-family housing design and construction by housing contractors, the innovation-decision process of Rogers' (1995) diffusion of innovation theory served as a useful theoretical framework. The diffusion or adoption of any different, new, or innovative idea is generally the result of movement through a multi-staged continuum, from knowledge to persuasion to the decision itself, adoption or rejection, then implementation, and finally confirmation (Figure 1) (Rogers, 1995, p. 163).

This model can be applied to the innovation-decision process of the concept of universal design for single-family housing. Figure 2, developed by the researcher for this study, was adapted from the Rogers' (1995) innovation-decision model. In

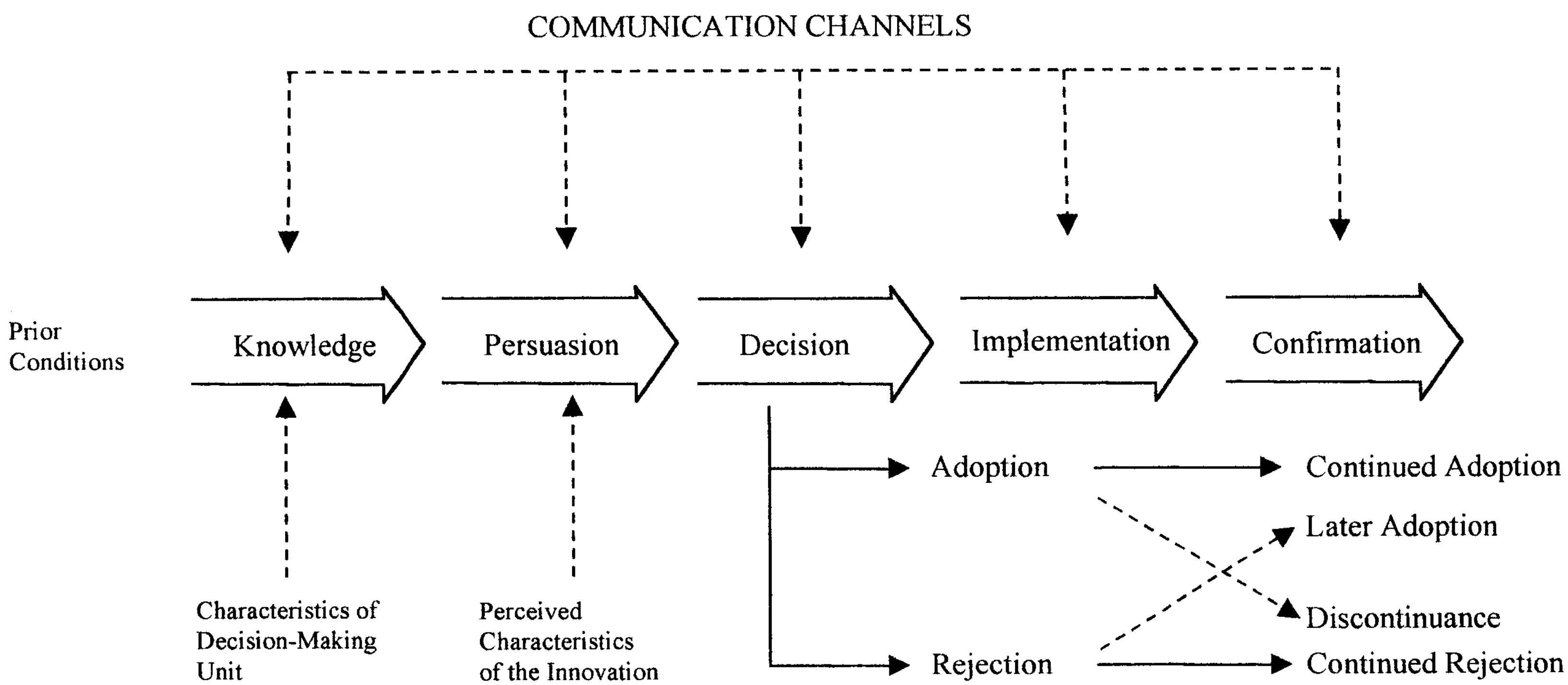

Figure 1: Innovation-Decision Process (Rogers, 1995, p. 163)

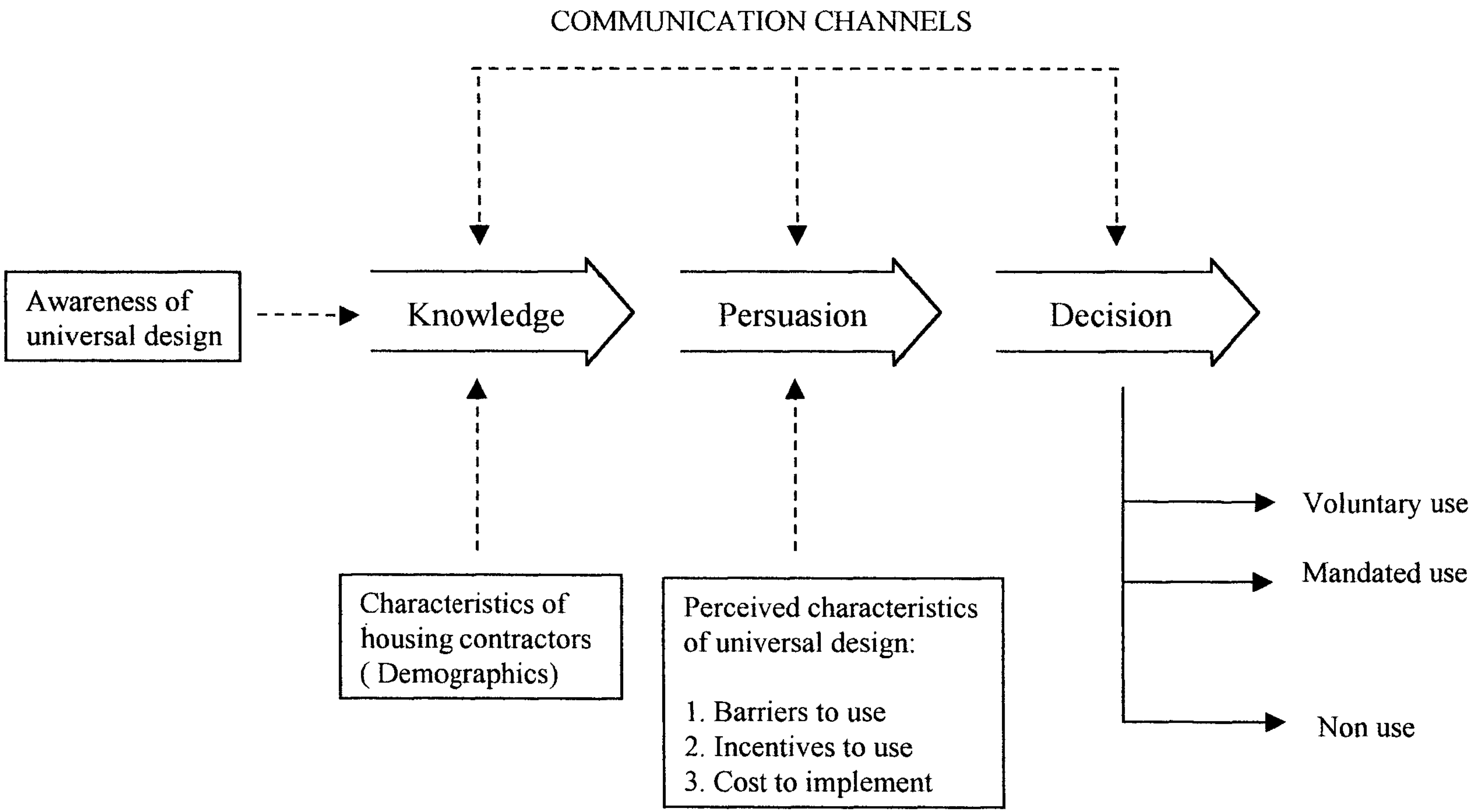

Figure 2: Innovation-Decision Process for Adoption of Universal Design by Housing Contractors

this model, knowledge about universal design comes from prior conditions, such as awareness from education, previous practice, or need, as well as from the characteristics of the decision making unit, the housing contractor. From knowledge, the process moves to persuasion, which also is influenced by some perceived characteristics of the innovation (universal design). These characteristics include barriers to use, incentives to encourage use, and cost to implement. It is these characteristics that can influence the decision, adoption (voluntary or mandated) or rejection, of the universal design (the innovation). Implementation and confirmation (of universal design) cannot be concluded in this study, as this process can take many years. The National Association of Home Builders (NAHB) found that housing innovation technologies could take 15 to 20 years before being adopted by the majority of home builders (NAHB, 1990). Communication channels exist between each of the steps in the innovation-decision process, serving as the feedback mechanisms for exchange of information throughout the process.

The innovation-decision process model has been used in related areas of housing research, primarily as a result of the needs and changes created by the energy crisis of the early 1970s. Combs, Parkhurst, and Madden (1987) used the Rogers' (1995) model in identifying attributes and dimensions of attributes of solar heating systems (innovation). They found that different attributes and dimensions of attributes (advantages, compatibility, and observability) were important. Their findings suggested that informational content that was presented depended on the likely stage of adoption of their audience (builders). The energy crisis of the 1970s created a need for alternative solutions. The same could also hold true in the 1990s for information presented to both housing contractors and consumers about single-family housing universal design. Is there a need?

McCray and Weber (1981) found that numerous risks (or barriers) influenced the adoption of innovative housing systems (passive solar and earth-sheltered) by intermediaries (such as housing contractors). The risks to adoption (for these intermediaries), they found, needed to be reduced in order for innovations (in housing) to be accepted and used. Likewise, the risks to the adoption by builders of universal design for single-family housing need to be reduced (as well as identified) to encourage more widespread adoption of the concept and practice.

Ha and Weber (1991) used the innovation-decision process to study the acceptance of energy-efficient housing structures. They found that certain characteristics of the intermediaries or change agents, such as gender, age, and education, were important to the adoption process. Belser and Weber (1995) also found this to be true for home builders when designing and building for the aging population. Will the same hold true for housing contractors concerning universal design? In their study of kitchen designers as change agents in designing for aging in place, Guetzko and White (1991) concluded that while professional designers had the knowledge and knew the importance of design features (universal design) that promoted aging in place, they infrequently implemented them in their practice, and then usually only when requested by a client. Why does this occur? Could the same be said for use of universal design by housing contractors?

Universal Design

The term, universal design, evolved as a response to a conceptual dilemma that had plagued advocates of barrier-free environments since 1961 when the first American National Standards Institute (ANSI) accessibility standards were enacted. This section briefly summarizes the development and evolution of the concept and definition of universal design, universal design awareness and use by housing professionals, consumer awareness and use of universal design, barriers to use of universal design, universal design requirements, and adoption of single-family housing universal design standards.

Evolution of the Concept of Universal Design

The concept of universal design began with the wheelchair "barrier-free" or "accessible design" requirements developed specifically for the disabled population. The next stage was adaptable requirements, finally evolving into universal design.

Accessible design. The issue of designing for accessibility became a U. S. federal regulatory matter because people with disabilities were being denied equal opportunity, an outgrowth of the Civil Rights Movement of the 1960s (Barrier Free Environments, 1991). The solutions provided by the development and expansion of design guidelines for the disabled widely expanded opportunities and access to spaces for these special populations.

The early local and state accessibility codes included specifications and minimum requirements to provide people with disabilities basic access and were often confused as they varied from jurisdiction to jurisdiction. Housing designers, contractors, and builders were often not familiar with the rational for these minimum specifications or were confused as to which ones applied. They tended to create spaces that met the codes and were fully wheelchair accessible, but looked clinical or institutional, and were often expensive as well (Barrier-Free Environments, 1991).

These design problems became even more apparent as housing designed for accessibility became more difficult to rent or sell to the able-bodied consumer because of its 'different' appearance. Malizia (1993) concluded that the negative views of accessible housing were based on the more than 20 years of experience with accessibility requirements. There was a movement by accessibility advocates to provide special housing features to meet the needs of disabled clientele. The housing industry responded to the legislative requirements with 'handicapped housing' that may have complied with the letter of the law but, in many instances, resulted in units that were less attractive, often more expensive, and less marketable than comparable "normal" housing.

Adaptable design. Problems created by poorly designed accessible or "handicapped housing" were solved by the development and implementation of adaptable design methods and features (Center for Accessible Housing, 1991). Both people with disabilities and those in the home building industry were dissatisfied with most fixed and different-appearing accessible housing units mandated by state and federal laws (U.S. DHUD, 1987, p.6).

Adaptable housing looked like any other housing, but was made more accessible by having the ability to add, remove, or adjust features such as cabinets, counter tops, and shelving (Center for Accessible Housing, 1991). Adaptable features were usually applied to kitchen and bathroom items and equipment such as counter tops and cabinets which could be raised, lowered or, in some instances, removed to facilitate usage (Malizia, 1993). Adaptable design offered basic universal design features that could be adapted easily to the specific needs of the user (Center for Accessible Housing, 1991).

The term 'adaptability' was first used in the 1986 ANSI accessibility standards. The Uniform Federal Accessibility Standards (UFAS) established by the U.S. General Services Administration (U.S. GSA) provided specifications for adaptable environments but were limited to residential kitchens and bathrooms. The UFAS (U.S. GSA, 1984) indicated that accessible dwelling units might be designed for either permanent accessibility or adaptability. They recognized the complementary nature of accessibility and adaptability, providing the housing designer, builder, and contractor with flexibility in the development of design alternatives to meet barrier-free specifications.

The 1998 Fair Housing Amendments Act required certain accessibility and adaptability features in newly constructed multi-family housing, those with four or more units. All elevator-accessed units and ground floor units in non-elevator buildings of such structures must have minimum wheelchair access, accessible light switches and electrical outlets, reinforced bathroom walls to allow grab bar installation, and kitchens and bathrooms usable by those in wheelchairs (U.S. DHUD, 1991).

The Americans with Disabilities Act (ADA) of 1990 was the most comprehensive piece of legislation, one that prohibited discrimination against people with disabilities in public spaces and accommodations. The ADA took a step towards universal design, since the intended goal of ADA, equality, was the foundation upon which universal design was based (Null & Cherry, 1996). Not only was this legislation important for those permanently disabled, but also for the growing population that was aging who eventually might need some of the same environmental accommodations. Universal design was legitimized by ADA, putting it into what many consider to be its rightful position (Behar, 1996).

Universal design. Universal design, also called real life design, lifespan design, and a variety of other terms, goes beyond the accessible, barrier-free, and adaptable design concepts that preceded it. The intent of universal design was to eliminate the need for stigmatizing, different-looking, and often more expensive "special features and spaces for special people" (Covington & Hannah, 1997, p. 30). The concept of universal design was to simplify life for as many people as possible by making housing usable by more people for little or no extra cost. Universal design takes the approach to design that includes spaces, elements, and products that, to the greatest extent possible, can be used by everyone, regardless of age or ability (U.S. DHUD, 1988). Human needs and abilities throughout the lifespan were the consideration, an attempt to meet the needs of people of all ages, sizes, and abilities.

Homes and other facilities incorporating universal design can be used safely and effectively by almost everyone and be attractive and aesthetically pleasing as well (U. S. DHUD, 1996).

Single-family housing providers, including designers, builders, and contractors now had a new principle to guide their future home construction and remodeling activities. Universal design has merit in meeting the goals of more function, security, and safety in housing for all household members (Malizia, 1993).

Universal Design Definitions

As universal design has evolved, the principle and concept have been defined similarly, but with varying, slightly different foci. These definitions are presented in Table 1.

Table 1

Universal Design Definitions

Source	Definition			
Mace (1985)	Accessible	Adaptable	Safe	Supportive
Behar (1991)	Accessible	Adaptable	Affordable	Aesthetic
Wilkoff & Abed (1994)	Safe	Convenient	Functional	
Steinfeld (1994)	Wide range of fit Clarify environment		Low energy expenditure Easily adjusted	
Null & Cherry (1996)	Accessible	Adaptable	Safe-oriented	Supportive

Table 1, Continued

Wylde (in Holmes,1997)	Useable Neutral Inclusive Visible Elegant Redundant Simple Adaptive Logical
Story, Mueller, & Mace (1998)	Equitable Use Flexibility in Use Simple & Intuitive Use Perceptible Information Tolerance for Error Low Physical Effort Size & Space for Approach & Use
Kansas State University (1999)	Accessible Adjustable Adaptable Attractive Affordable

The term "universal design" was developed and first used by Mace (1985), who defined it as supportive, adaptable, accessible, and safe. Behar (1991) defined universal design as the "four A's", necessary components to incorporate into the designed (this case residential) environment. These components were accessible, adaptable, affordable, and aesthetic. Wilkoff and Abed (1994) defined universal design with three basic characteristics: it was safe, more functional, and more convenient for everyone, not just those with disabilities. They described universal design as not adding new elements into the designed environment but redesigning existing ones to enhance and broaden their funtionality. Steinfeld (1994) described universal design as designing for a broad range of people, not just those with disabilities. He felt ease of use by all and strong aesthetic qualities (mass appeal) were important for successful universal design. The four principles he put forth to assure this goal were: wide range of anthropometric fit, minimal energy expenditure, clarifying the environment, and using a systems approach, one that was easily adjusted to meet the needs of any person. Null and Cherry (1996) put forth four principles or characteristics essential for creating universal design. These were accessible, adaptive, supportive and safe-oriented. Wilde (in Holmes, 1997) suggested using the word "universal" as an acronym for the features to be considered when selecting products: Useable, Neutral, Inclusive, Visible, Elegant, Redundant, Simple, Adaptive, and Logical.

The seven universal design principles developed by Connell et al. in Story, Mueller, and Mace (1998, pp. 34-35) in the mid-1990s went beyond a simple definition. They named specific characteristics of universal design and universally designed objects and spaces. These seven principles are:

1. Equitable Use: The design is useful and marketable to people with diverse abilities.
2. Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.
3. Simple and Intuitive Use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
5. Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.
6. Low Physical Effort: The design can be used efficiently and comfortably and with a minimum of fatigue.

7. Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

These principles assist designers in three ways: 1) evaluation of designs (features and products) to determine how universally usable they are; 2) creation of new designs that are more universally usable; and 3) education of designers and consumers.

In literature explaining the Universal Design Facility established at Kansas State University, universal design was described as accessible, adjustable, adaptable, attractive, and affordable. They further defined it as being usable by people of all ages, sizes, and abilities, and would accommodate common age-related changes (Kansas State University, 1999).

Housing Professionals Universal Design Awareness and Use

Previous research has shown that most housing design, construction, and remodeling professionals were aware of the concept of universal design (Blanco, 1994). She found a smaller number of these professionals, however, had expressed interest in it, with fewer evaluating, even less trying, and only a very small number adopting it as a regular part of their designs. This has been particularly true in the home building industry for single-family dwellings, where government policy has not yet encroached on codes or requirements of this nature. Belser and Weber (1995) found that there was a reluctance on the part of home builders to break from traditional building practices, which focused on spaces designed for use by the young, fit, adult male who will never grow old (or be disabled). Home builders, in the past, have not seen the house environment as a part of an individual's support system responding to changing needs, and seldom recommend that changes in existing standards be made (Hiatt, 1988). Ways need to be found to change these attitudes and practices in response to the projected growing need of a more diverse population with widely varying abilities. Housing design and building professionals (including housing contractors) could facilitate this by introducing and incorporating into their designs the long-standing, but underutilized practices, features, and products that respond to the users' age-related changes and optimize independence and safety for all throughout the lifespan (Guetzko & White, 1991).

The role of the professional designer, builder, and/or housing contractors in universal design adoption has received modest research attention. Most home builders, contractors, and designers seem to understand that the environment has an effect on the user, yet few give it much consideration when designing and/or building single-family housing (Gabb, Lodl, & Combs, 1991). Reizenstein (1975) found that most of the designers surveyed were aware of environment and behavior research and believed that behavior was influenced by environment. He found, however, that few designers had ever used such research findings in their work. Reasons he found for not incorporating such findings were that the findings were not readily available, they were written in 'jargon-like' language, and the implications or applications for design were not immediately obvious.

Several explanations for the reluctance of professionals to pay attention to the values and needs of occupants were identified by Sommer (1974). He suggested that rather than trying to accommodate the varied needs of different users, it was easier and less costly for builders and designers to assume that everyone had similar needs and tastes. Many home builders and contractors are often supplier oriented, more interested in persuading users to accept the designs and/or products that they want to supply or are readily available to them than search out new ones (Gabb et al., 1991). Habits and values for all individuals are slow to change, and the use of conventional building practices and products is certainly no exception. Most home builders build according to tradition-based building paradigms, are very resistant to change, and are often unwilling to part from those traditions long enough to find alternative (often better) ways of doing things (Belser & Weber, 1995).

Guetzko and White (1991) found that the kitchen designers they surveyed had a high level of knowledge about specialized kitchen design for older persons, although design to meet these needs was limited to an individual or custom-design basis and was not routinely used. They also found an apparent gap between the awareness of special needs and the knowledge of special products and designs that meet these needs. Their findings also suggested that there still exists the stigma of designing for special populations, such as the aging or disabled, rather than designing for the good of the whole population throughout the lifespan. They found that few of these designers were willing to change.

One Virginia builder, an advocate of designing for the older (and also the disabled) population, found that it took extra effort, time, and patience to locate the products required for universal design, which often were not available locally

(McLeister, 1996). Another barrier mentioned was cost. The National Association of Home Builders (NAHB) indicates that the cost of these special design features and products (for universal design) in new construction is about 1.5 to 2% more than traditional products, but often as much as 20 - 25 % more in remodels (McLeister, 1990). Respondents to the Belser and Weber (1995) survey felt that universal design features and products added about 6 to 10 % to housing construction costs. A standard universal design package was developed and included universal design as standard features for a 1,600 square foot home plan which added about $1,500 to the cost of the home (Bradford, 1997). An Illinois developer found that the cost did not have to increase for universally designed or barrier-free projects with careful planning and budgeting, and the space could look no different than any other (Hooper, 1991). Both manufacturers and retailers are slowly beginning to see this market potential. Universal design products are increasing in variety and number, becoming more affordable and readily available with better design and a wide range of colors (NAHB Research Center, 1998; Oreskovich, 1997).

Belser and Weber (1995) focused on the attitudes and knowledge of aging by home builders and that relationship to housing design for independent living. They found that builders were reluctant to break from traditional building practices, especially those who had worked in the building industry the longest. This group also tended to be less aware of accessible products and features, as well as have a more negative attitude of aging. Their findings suggest that the home building industry (architecture and interior design as well) would benefit by actively pursuing builders (and other housing professionals) with educational programs about aging and accessibility. The same could be said for information and programs about universal design. The information is readily available, yet few seem to seek or use it. Trade publications of the home building industry, such as Builder and Professional Builder, regularly feature articles about home design for the aging population and universal design for the whole population (e.g. Johnson, 1994; Lowe, 1995; McLeister, 1989, 1992, 1996, 1999).

Consumer/User Universal Design Awareness and Use

On the other side, consumers are often resistant to change or new ideas in housing, such as universal design, even if they know it will be beneficial to them. Consumers would rather “make do” or “manage” (adapt) than consider a change or something new (adopt), particularly if it is perceived to be special, institutional, or different in appearance. This is especially true if changes or products are associated with aging or disability (Filion et al., 1992). Mannion (1992) found in her study of mature Kansas residents that with the exception of wall ovens, these homeowners were not ready to accept selected universal design features that could facilitate aging in place. Other resistance comes from the fear that such changes may detract from the aesthetic beauty of their home, render it more institutional, less attractive or less desirable, or decrease its anticipated resale value. For older and disabled persons, the potential high cost and fear of being taken advantage of by less than ethical contractors were additional barriers mentioned (Frampton, 1997). Planning a home environment deserves closer attention than it has previously received. Good, safe design (universal design) improves life at any age and can be used by anyone regardless of level of size, ability, or disability (Landa, 1991; Tevis, 1997).

The attitudes of housing users and consumers toward universal design are mixed. There is still a stigma attached to any "special" type of design, be it for the older population or the disabled, anything that is not considered to be "normal." Perhaps marketing strategies for universal design features and products need to be changed to emphasize convenience, economy of space, and affordability, rather than "assistive qualities " (Mannion, 1992). Overall, society has been very protective of the older and disabled population and has promoted helplessness rather than encouraging independence (Gunn, 1988). Along with this, early attempts at universal design were generally based on medical models of barrier-free or accessible design. They were considered to be unsightly and frequently had the look of institutions or hospitals (Jacobs, 1958). Consumers were concerned about spoiling the aesthetics of their housing unit and lowering the resale or market value of their home with such modifications (Gilderbloom & Markham, 1996). Many builders and developers who opted for accessible features in their housing units found that they were unable to rent or sell them as many of the features looked cold and institutional, as well as different (Hooper, 1991). Gilderbloom and Markham (1996) found there was a strong denial on the part of most people that they were aging and would require a more supportive, user friendly environment. They would rather make-do or adapt their behavior than succumb to the fact that they were growing older and needed to make changes. Sohn (1997) found that older adults generally do not feel they need special environmental considerations in their home and adapt with behavior rather than physical changes. Hence, they have little reason to become aware of or consider universal design features. A majority of the population ignored and avoided planning for future change; they very much lived in the present (Filion, et al., 1992). They also found that a majority of older respondents who currently lived independently resisted change and were reluctant to adapt their environment to their decreasing levels of physical capacity. If that environment were more supportive (i.e. universally designed), adaptation would occur gradually and probably more easily. There is an occasional exception. In 1983, an Iowa couple built their retirement home with aging and physical changes in mind (i.e. universal design). They incorporated many universal design features, yet it was attractive, convenient, with a look very much like other homes (Tevis, 1997). According to Gunn (1988), most consumers do not realize that they could live in the same house relatively easily for 20 years or more with some thoughtful planning ahead of time.

With the variety of media available, educating and promoting design throughout the lifespan and the increased interest on the part of the public, more people are aware of the universal design features and products available to them (Johnston, 1997a, 1997b). Many consumers have found, however, that they have to be very insistent in order to get them implemented, or go through a list of several designers, contractors, or builders before they find one who will accommodate them and their desires (for universal design) (Tevis, 1997).

Barriers to Use of Universal Design

Research is limited in the areas of why the design professionals have not incorporated universal design solutions in their work, or if the public (particularly the older consumer) wanted it. Studies were found dealing with housing design professionals, two surveying home builders (Belser & Weber, 1995; Blanco, 1994)), another kitchen designers (Guetzko & White, 1991). None were found about architects or interior designers, other professionals who do a significant amount of residential home building and design (including remodeling design). One study was found on user input in housing design and surveyed the general population across the lifespan (Gabb, et al., 1991). The latter concluded that low maintenance, energy efficiency, and attractive interiors were essential in housing across all stages of the family life cycle. No specific conclusions were drawn about the actual design of that space, other than it be flexible to change with changing needs, implying (but not specifically stating) a type of universal design. In all of these studies, the results indicated that there was an awareness of universal design by a majority of those surveyed, yet few implemented it. The primary reason given was that the traditional or usual way of doing things was not only easier for the housing professional, but also more acceptable to the consumer. Why is this? More studies need to be done of not only the various home design and construction professional groups, but also of the users to determine why adoption is not occurring and what it would take for that to occur.

Another gap in the literature was found in the area of universal product/material designed for use in the home. Universally designed products were mentioned generally as being unattractive and institutional-looking, as well as expensive. In recent years the design as well as color options have improved, as has the number of products, availability, and cost. One only needs to look at the plethora of articles and advertisements in consumer shelter and trade publications (Anders, 1997; Herbst, 1997; Oreskovich, 1997). The NAHB Research Center (1998) annually publishes and offers for no charge, both in print, and on their internet web site, a directory of accessible building products for the building professional that is also available to consumers. Perhaps the term, "accessible," rather than universal denotes "special," hindering the acceptance, adoption, or even use of the publication by either housing professionals or consumers.

Another obstacle mentioned was the lack of local availability, which involved extra time, effort, and cost to obtain universally designed products (McLeister, 1996). Even knowledge or information about such products was limited, both by the professionals and the consumer (Guetzko & White, 1991; Null, 1988). Why is this? What can be done to increase awareness and availability?

Universal Design Standards

The research in the area of design standards or requirements for universal design in residential spaces was occurring during the 1990s, with varying guidelines and publications put forth. Since these guidelines usually exceeded the existing minimum code standards, they were not requirements, just suggestions, and varied widely. Contractors and builders have reported that it was not cost effective to exceed minimum standards (Frain & Carr, 1996). Others, working under the Fair Housing Regulations, have ignored the requirements, partly because of not knowing which regulations or (building) codes to follow (Lurz, 1997). The National Association of Home Builders (NAHB) reported that home builders and contractors were more apt to read and be knowledgeable about building codes than read and know the regulations in the Federal Register (McLeister, 1998). This made it confusing not only for the professionals concerned with the design and construction of such spaces, but also for the consumer who would ultimately benefit from the improved designs. This lack of specific, consistent universal design guidelines and/or code requirements for single-family housing probably has contributed to the lack of adoption on the part of professional and consumer alike to create safer, more manageable physical environments (Holden, 1990).

Adoption of Universal Design Standards

As of 1999, no specific set of suggestions for codes or standards for single-family residences that incorporate universal design have been made, based on the recommendations that have previously been put forth. Belser and Weber (1995) found that homebuilder respondents (no indication of number was given) in their sample considered it a viable idea. An attempt was made in the early 1990s to add universal design amendments to the building codes, but were rejected by the code bodies (Code bodies nix [sic] universal design amendments, 1992). In the late 1990s, there was a on-going attempt to incorporate the three existing building codes in the

United States into one code for the entire country (Dale, 1997). Whether or not universal design standards for single-family residential structures will be incorporated remains to be seen. The U.S. DHUD has reviewed the proposed International Building Code to see how universal design guidelines or standards might be included (McLeister, 1999). This is an ongoing challenge for all housing design and construction professionals. Until the universal design recommendations become code (required), existing standards, which are not adequate, will continue to be used, unless consumers demand them or professionals willingly promote them. Likewise, the consumer, both young and old, needs to realize that universal design guidelines can enhance the livability of homes for everyone, not just for the disabled and older population, are aesthetically pleasing, and do not diminish the resale value of their home (Hunt, 1991; Jones, 1995). Ultimately, if universal design standards were adopted as a part of the building code, the option of staying in one's own home as long as possible would be greatly increased. That home would better support and accommodate changes and care needs over the lifespan, including the declines due to aging and/or disability (Brent, Phillips, Brent, Gupta, & Degges, 1991).

Focus of this Study

Using the Rogers' (1995) innovation-decision process as a framework, this study focuses on the current level of awareness and use of universal design features and products in single-family housing by Oregon housing contractors. In addition, barriers and incentives to use will be identified. With the impending adoption of the International Building Code in 2000 that will include single-family residential standards, opinions on viability of including universal design as a part of the building code will also be sought. Finally, the influence of specified demographic as well as other perceived characteristics on universal design awareness and use will be explored.

CHAPTER 3

METHODS

This study sought Oregon housing contractors' awareness and use of specified universal design features in single-family residential construction. In the methods chapter, the design of the study, instrument development, the sample and its selection, data collection, management, and analysis procedures are discussed.

Design of Instrument and Study

A written, self-administered, mail, survey questionnaire (Appendix A) was developed by the researcher and used to gather data to meet the research objectives of this study. The Dillman Total Design Method (Dillman, 1978) was used as the basis for the design of the survey instrument, as well the administration of it. Most of the data collected were quantitative in nature, which allowed for statistical analysis and interpretation. This included descriptive/demographic data, forced choice questions related to information about each of the universal design standards, including awareness of, use of, and added cost to implement, barriers and incentives to use, and the viability of adopting such standards for single-family housing. Several open-ended questions were also included to allow for responses that might not have been considered otherwise.

The list of universal design standards was developed by the researcher, compiled from the literature review in the field of universal design (ANSI, 1986; Belser & Weber, 1995; Blanco, 1994; Bradford, 1997; Casto & Day, 1977; De

Merchant & Beamish, 1995; Jones, 1995; Parr, 1994; Simon, 1987; Sit, 1992; White, 1992). Criteria for selection and inclusion of universal design features by the researcher included:

- Frequency and consistency of item, based on the literature review,
- Item considered to be beneficial to widest range of users, regardless of size, age, ability, or disability,
- Item satisfied a majority of the seven universal design principles criteria as established by the Center for Universal Design (Story, et at., 1998), and
- Item considered appropriate for single-family housing construction.

A panel of several experts in the field of universal design reviewed the survey questionnaire for validity issues, as well as clarity and format, before it was administered. The survey was pilot tested with a pre-selected group of housing professionals as a further check for clarity, format, and validity. The recommendations of these professionals were incorporated into the final survey that was administered. The design of the study as well as the survey questionnaire were approved by the Institutional Review Board for the Protection of Human Subjects of the Oregon State University Research Office (Appendix B).

Sample

The sample was taken from the Oregon Construction Contractors' Board. The computerized list of registered construction contractors was purchased by the researcher from the office of the administrator, located in Salem, Oregon. This allowed for the sample to be drawn from the list of all registered construction contractors in the state of Oregon. To become a registered contractor in the state of Oregon and obtain a license number, one must pass an examination, become bonded, as well as periodically complete continuing education units. A random sample was drawn from those who indicated single-family residential construction as a primary focus of their business. Because contractors could list up to three categories of specialization, with single-family residential only construction being one of them, the likelihood of non-qualifiers being selected for inclusion in this study was a risk.

The population of Oregon construction contractors who indicated that one of their foci of business as single family houses was 6806. There were 294 who were disqualified because either their listed address was not in the state of Oregon, or there was no county code indicated for their address. The remaining 6512 (N) eligible participants were divided into metropolitan and nonmetropolitan populations, based on county code, using the established criteria of metropolitan statistical areas put forth by the Office of Management and Budget based on Census Bureau data (U.S. Bureau of the Census, 1999) (Appendix C). Because the majority of the population of Oregon is concentrated in the western portions of the state, geographically, these criteria were used to help the researcher obtain as random a sample as possible from the entire state. Based on this information, there were nine counties placed in the metropolitan category: Clackamas, Columbia, Jackson, Lane, Marion, Multnomah, Polk, Washington, and Yamhill. The remaining 27 counties in the state were placed in the nonmetropolitan category. This allowed the researcher to sort the list into the two groups, metropolitan and nonmetropolitan, using the county code column with Microsoft Excel 97. The total metropolitan population was 4256, the nonmetropolitan population 2256. From each of these populations a random sample of 250 was drawn, using the random numbers function of Microsoft Excel 97, for a total sample of 500 participants for the study (Walkenbach, 1996). To control for non-random sample error, the nonmetropolitan sample was over-sampled. Each survey was given a code number so that those respondents who promptly returned the questionnaire would not receive a second survey and letter. The metropolitan surveys were coded from 1001 to 1250, the nonmetropolitan 2001 to 2250. The only other purpose attached to that number was its use for identification in data entry to apply weights for desired inferential analyses.

Data Collection

Dillman's (1978) Total Design Method was used as a guide for the data collection. This procedure involved sending a cover letter (Appendix D) along with the survey form. This letter explained the purpose of the study and that participation was voluntary. Using the mail merge function of Microsoft Word 97 (Weverka, 1996), the letters were printed and addressed individually, as were the envelopes. Each letter was signed separately by the researchers using blue ink. The survey and letter were sent by first class mail, with each envelope stamped individually. A stamped, self-addressed return envelope was included to return the completed questionnaire. Each of these envelopes was stamped individually as well and addressed with labels prepared with the label function of Microsoft Word 97 (Weverka, 1996). A reminder postcard (Appendix E) was sent to all participants two weeks after the initial mailing of the survey. These, too, were individually stamped and addressed with clear labels, using the address label function of Microsoft Word 97 (Weverka, 1996). A follow-up letter (Appendix F) with another survey and stamped, self-addressed return envelope was sent after four weeks to those who had not responded to either the initial survey or reminder postcard mailings, using the same procedure and methods as the initial mailing. These mailings were at slightly greater intervals than those recommended by Dillman (1978) (one week and two weeks, respectively). This was due to increased delays generally being experienced in mail delivery during the time of this study. A summary of the results was sent to each of the respondents who requested that information at the completion of the study.

Data Management

The data were provided by the self-administered written surveys returned during the spring of 1999 by 164 Oregon housing contractors specializing in single-family residential construction. Of the 500 surveys mailed, there were a total of 208 returned responses (metropolitan, 99, 48% overall; nonmetropolitan, 109, 52% overall), for an overall response rate of 41.6%. Of these, 164 (metropolitan, 74, 45% overall; nonmetropolitan, 90, 55% overall) were usable, for a usable response rate of 32.8%. Of the non-qualifiers, 5 (1%) were returned undeliverable by the postal service (metropolitan, 3; nonmetropolitan, 2). The 39 (7.8%) remaining non-qualifiers disqualified themselves as non-applicable, retired, or did not complete the survey form. Of these 39, 22 were metropolitan, 17 nonmetropolitan.

Data from the surveys were coded and entered into the SPSS Base 9.0 (SPSS, 1999) statistical program by the researcher for computer analysis. Variables were created for each question and parts of questions as required on the survey form. Each entered case was identified by its survey number, 1001 – 1250 for metropolitan, 2001 – 2250 for nonmetropolitan.

Forced Choice Questions

For each of the universal design features (Question 1), from A through Z, responses were coded as follows: Awareness of feature from "1," very aware, to "4," unaware; use of feature from "1, " very often, to "4," never; added cost of feature "1," yes there is added cost, or "0," no added cost, with "9" used for missing values. New variables were created for each of these categories, awareness, use, and added cost of universal design, consisting of the mean score for each respondent in each of those categories. Responses to Question 2, percentage universal design features would add to the cost, were entered as the written numerical value, two-digits, with "999" used for no response. For Questions 3, 5, 10, 11, and demographic questions 13, 14, 15, 16, 17, 18, 20, 21, 22, and 23, responses were coded with the actual number of the response in the question, between "1," "3," "4," "5," or "6," as appropriate, with "9" used for missing values. The responses to Question 6, the actual number of clients requesting universal design was entered (two-digit number), with "99" being used for missing values. Responses to Question 7, A through E, were coded from "1," strongly agree, to "4," strongly disagree, with "9" used for missing values. The responses to the gender question (Question 12) were coded "0," male, "1," female, with "9" as the missing value. Responses to Question 19, parts 1 through 5, were coded with the numerical value of the number of houses designed or built in the square footage range listed, with "999" for missing values.

Open Ended Questions

The responses to the open ended questions, 4, 8, 9, and 24, were organized by the researcher into categories using a Microsoft Excel 97 (Walkenbach, 1996) spreadsheet. This allowed the responses to Questions 8 (barriers to use) and 9 (incentives to use) to be categorized and coded for statistical analysis. For Question 8, barriers to use, the following numerical codes were assigned: "1," added cost; "2," no demand, lack of request; "3," unaware or not available; "4," appearance; "5," site or lot restrictions; "6," client preferences or selects designs; and "7" for other. The codes for Question 9, incentives to encourage universal design use, were as follows: "1," client request; "2," comparable cost; "3," education, awareness, more information; "4," government grants, such as tax incentives, breaks, credits, or rebates; "5," easier access to and availability of products and plans; "6," becomes code, required; and "7," other. Missing values for each of these questions were coded with "9." To facilitate statistical analysis, these two questions were each recoded again into a new variable, to note if a barrier or incentive to use of universal design was indicated. These were coded as "1," barrier indicated, "0," no barrier indicated, and "1," incentive indicated, "0," no incentive indicated. The responses to Questions 4 and 24 were listed but not coded for statistical analysis and are reported in the results chapter and appendix.

Weighting Data

Data were weighted for use in inferential statistical analysis to more accurately represent the populations surveyed. This accounted for some of the variations in the value of N in these statistical analyses. The following weights were assigned, 1.31 for metropolitan, and .69 for nonmetropolitan contractors, using the survey code number for identification. Weights were computed, based on the number of contractors in each group as a percentage of the total number of contractors in the state. Computations to determine the weights are shown in Appendix G.

Analysis Procedures

The data analyses included descriptive statistics and frequency distributions of the sample using unweighted data. Inferential statistics were computed using weighted data to respond to the research questions and to test the null hypotheses. The significance level was set at $p < .05$. Tables prepared to summarize the data are shown in Chapter 4.

Research Questions

For research question 1, what level of awareness and use do housing contractors have of universal design features for single-family housing construction, descriptive and rank order means were obtained for each of the 29 universal design features, as well as the mean average for all 29 features. Paired sample t-tests were used to determine if there were any significant differences between the awareness and use of each feature as well as for the mean average of all the features. Also listed were other features that respondents mentioned as universal design. These include other names or terms heard or used by housing contractors to describe the concept of universal design, and how often they had discussed universal design with clients, as well as how many times clients had requested universal design in the past year.

For research question 2, what are the barriers, if any, to the adoption and use of universal design features in residential construction by housing contractors and are there incentives that would encourage their use of universal design, descriptions and frequency counts using unweighted data were used.

For research question 3, what is the position of housing contractors on the viability of universal design standards becoming a part of the residential building code, frequency distributions using weighted dated were used.

Null Hypotheses

For Null Hypothesis 1, there is no significant difference between awareness and use of universal design features by single-family housing contractors, paired sample t-tests to compare means using weighted data were used for analysis. These included t-tests for each of the 29 universal design features listed, as well as for the total mean score for awareness and use. The 29 universal design features awareness and use mean scores were also ranked in order from most aware/use to least aware/use to allow for mean comparisons.

For Null Hypothesis 2, there is no association between universal design awareness and use of universal design in single-family housing construction and demographic characteristics of housing contractors: Gender, age, level of education, occupational title, and years in business, Pearson correlations and multiple regression were used with weighted data.

For Null Hypothesis 3, there is no association between universal design use and added cost to implement universal design features in single-family housing construction by housing contractors, a paired sample t-test with weighted data was used.

For Null Hypothesis 4, there is no association between identified barriers to use and the use of universal design in single-family housing construction by housing contractors, a paired sample t-test was used with weighted data.

For Null Hypothesis 5, there is no association between the viability of and the opinion about mandated use of universal design standards as part of the building code for single-family housing by housing contractors, the Kendall's Tau test with weighted data was used.

For Null Hypothesis 6, there is no association between current voluntary use of universal design and housing contractors' perceptions of each of the following characteristics of universal design: a) similar appearance, b) similar cost, c) ready availability, d) information readily available, and e) current use of universal design features and products by other home building professionals in the state/area, the MANOVA multivariate test with weighted data was used.

CHAPTER 4

RESULTS

The purpose was to find out the awareness and use of universal design features and products in single-family residential home construction by Oregon housing contractors. This chapter includes a description of the sample as well as research questions and hypotheses testing results.

Description of the Sample

The sample for this study was nearly evenly divided between metropolitan and nonmetropolitan respondents, 74 metropolitan (45%) and 90 nonmetropolitan (55%). A majority of the respondents were male, over 93%. The ages ranged from under 30 to over 60, with over 70% of the respondents being between the ages of 41 and 60. Most were general contractors and had some education beyond high school, at least some technical, trade school or college training. The majority had been in the home construction business between 11 and 30 years and in small firms with fewer than 5 employees, including themselves. Single family house construction constituted over half of the business of most of the respondents, with the majority involved in the building of custom homes. Locations of the majority of housing units built were split, with most being in small cities. The metropolitan housing contractors had built most of their units in the cities and suburbs, while a majority of the nonmetropolitan contractors units were built in the small cities, towns and rural areas. The average age range of clients was between the ages of 41 and 50, over

50%, with another 20% each being between the ages of 31 and 40 and 51 and 60. Of those responding, 23% indicated membership in a professional organization, with most of those being members of the National Association of Home Builders (NAHB). Table 2 details the descriptive statistics of the respondents.

Table 2

Sample Description

	Metropolitan (N = 74) (%)	Nonmetropolitan (N = 90) (%)	Total (N = 164) (100%)
Gender			
Male	40.8	52.5	93.3
Female	2.5	1.2	3.7
No response	1.8	1.2	3.0
Age			
30 and under	1.8	0.6	2.4
31-40	11.0	6.7	17.7
41-50	16.5	26.2	42.7
51-60	12.8	18.3	31.1
Over 60	3.0	2.5	5.5
No response	0.0	0.6	0.6
Occupation Title			
General contractor	34.8	43.9	78.7
Housing designer	1.2	3.7	4.9
Sub-contractor	3.0	3.7	6.7
Other	5.4	3.7	9.1
No response	0.6	0.0	0.6
Level of Education			
High school grad	7.9	6.7	14.6
Technical, trade, Some college	15.9	25.0	40.9
Comm. college deg.	5.5	10.4	15.9
Bachelor's degree	12.8	11.0	23.8

Table 2, Continued

Graduate degree	2.4	1.8	4.2
No response	0.6	0.0	0.6
Years designing/building houses			
0-10 years	10.4	9.7	20.1
11-20 years	16.5	14.6	31.1
21-30 years	15.2	25.0	40.2
Over 30 years	2.4	5.5	7.9
No response	0.6	0.0	0.6
Number of employees			
0-5	38.4	50.0	88.4
6-10	4.3	3.7	8.0
11-15	1.2	0.6	1.8
16-20	0.0	0.0	0.0
21 and over	1.2	0.6	1.8
Percentage of work single-family houses			
0-25 %	6.1	7.9	14.0
26-50 %	2.4	3.1	5.5
51-75 %	6.1	14.6	20.7
76-100 %	30.5	29.3	59.8
Percentage spec homes			
0-25%	11.0	19.4	30.4
26-50%	4.3	3.7	8.0
51-75%	4.9	1.8	6.7
76-100%	9.8	6.1	15.9
No response	15.2	23.8	39.0
Percentage custom homes			
0-25%	17.1	15.2	32.3
26-50%	5.5	7.9	13.4
51-75%	3.0	11.0	14.0
76-100%	7.9	11.0	18.9
No response	11.6	9.8	21.4
Percentage of business other			
0-25%	9.1	13.4	22.5
26-50%	0.0	5.5	5.5
51-75%	4.9	9.1	14.0

Table 2, Continued

76-100%	10.4	6.7	17.1
No response	20.7	20.2	40.9
Location of most houses			
Metro/central city	13.4	0.6	14.0
Suburb of metro	15.2	1.9	17.1
Small city	8.5	26.3	34.8
Small town	5.5	11.6	17.1
Rural area	1.2	13.4	14.6
No response	1.2	1.2	2.4
Age range of clients			
30 and under	0.6	0.0	0.6
31-40	13.4	6.1	19.5
41-50	21.3	27.5	48.8
51-60	5.5	14.0	19.5
Over 60	1.2	4.3	5.5
No response	3.0	3.0	6.0
Professional affiliations			
NAHB	11.0	7.3	18.3
NARI	1.8	0.0	1.8
Other	1.8	1.2	3.0
No response/none indicated	85.4	91.5	76.9

Note. Unweighted data.

Research Questions

The results to the research questions follow.

1. What level of awareness and use do housing contractors have of universal design features for single-family housing construction?

The results of the paired sample t-test of the means using weighted data of the total 29 universal design features specified found that the Oregon housing contractors surveyed have a greater awareness ($M = 1.97$, $SD = .57$) than use of these features (M = 2.34, SD = .47), t = -9.67(157), p = .00. Their awareness level, overall, was slightly greater than "aware" (2); their use level between some use, or "often" (2) and not much use (3). Those sampled were most aware of:

- switches by each entrance to rooms and halls (M = 1.17),
- switches and controls 36" to 48" above finished floor (M = 1.40),
- single story, no steps between areas (M = 1.44),
- 36" wide doorways (M = 1.58), and
- lever door handles (M = 1.64).

These respondents were least aware of:

- tub/shower control offset from center (M = 2.76),
- wall support and provision for adjustable and/or varied height counters and removable lower cabinets in kitchen (M = 2.79), and
- provision for dishwasher and clothes dryer to be raised 12" to 15" above floor (M = 3.04).

The universal design features used most often by those sampled were:

- switches by each entrance to rooms and halls (M = 1.19);
- switches and controls 36" to 48" above finished floor (M = 1.37);
- 5' by 5' clear turn space in living area (M = 1.82); and
- receptacle for at least 2 bulbs in vital places (baths, exits) (M = 2.00).

The features used least often were:

- tub/shower control offset from center (M = 3.31);

- wall support and provision for adjustable and/or varied height counters and removable lower cabinets in kitchen ((M = 3.38); and
- provision for dishwasher and clothes dryer to be raised 12" to 15" above floor (M = 3.50).

Table 3 shows the order of awareness of all the universal design features listed in the survey from greatest to least. Table 4 shows the order of use from most to least of the universal design features listed in this study.

Table 3

Awareness of Universal Design Features from Most to Least Aware

Design Feature	M	SD	N
Switches by each entrance to rooms and hall	1.17	.45	158
Switches and controls 36" – 48" above floor	1.40	.72	158
Single story, no steps between areas	1.44	.72	158
36" wide doorways	1.58	.85	159
Lever handles on doors	1.64	.87	158
Multi-story, space for eating, sleeping, laundry, and bathing on ground level	1.73	.93	150
Lever handled water faucets	1.74	.89	156
Reinforced wall support, tub, shower, toilet for grab bar installation	1.76	1.00	158
Rocker or touch switches	1.80	.89	157
One entrance at ground level, no steps	1.82	.87	159
5'x5' clear space in kitchen	1.82	1.01	152
Thresholds flush or no higher than ½"	1.83	.99	159
5'x5' clear space in living area	1.83	1.00	152
Adjustable/handheld shower	1.87	.97	156
5'x5' clear space in one bedroom	1.89	1.02	147
Halls minimum 42" wide	1.90	.92	159
Light in or in front of each closet	1.90	1.05	157
5'x5' clear space in one bathroom	1.93	1.04	149
Adjustable shelves and clothes rods in closets and other storage	2.01	1.06	158

Table 3, Continued

Thermostatic or anti-scald faucets	2.03	1.13	158
Receptacle for at least 2 bulbs in vital places (baths, exits)	2.06	1.10	156
Outlets 18" minimum above finished floor	2.09	1.13	158
Dense, low pile carpet (<.50")	2.18	1.00	156
Non-skid, non-glare surfaces and floors	2.27	1.04	156
Clear access space 30"x48" in front of switches and controls	2.40	1.11	158
Use of contrast, such as color, to indicate change in surface levels	2.45	1.12	156
Tub/shower control offset from center	2.76	1.13	154
Wall support and provision for adjustable and/or varied height counters and removable lower cabinets in kitchen	2.79	1.15	156
Provision for dishwasher and clothes dryer to be raised 12" to 15" above floor	3.04	1.15	155

Note. Weighted data.

Table 4

Use of Universal Design Features from Most to Least Often

Design Feature	M	SD	N*
Switches by each entrance to rooms and halls	1.19	.53	155
Switches and controls 36" to 48" above floor	1.39	.82	156
5'x5' clear space in living area	1.82	1.04	146
Receptacle for at least 2 bulbs in vital places (baths, exits)	2.00	1.04	155
Light in or in front of each closet	2.02	1.02	156
5'x5' clear space in one bedroom	2.06	1.06	144
36" wide doorways	2.07	.99	156
Multi-story, space for eating, sleeping, laundry and bathing on ground level	2.08	1.02	146
Single story, no steps between areas	2.12	.97	154
Lever handled water faucets	2.13	.93	154
5'x5' clear space in kitchen	2.15	1.02	145
Thresholds flush or no higher than ½"	2.16	1.06	152
Halls minimum 42" wide	2.21	.95	152
Lever handles on doors	2.23	.90	154

Table 4, Continued

Thermostatic or anti-scald faucets	2.26	1.22	156
Outlets 18" minimum above finished floor	2.28	1.25	157
Rocker or touch switches	2.28	.96	155
Reinforced wall support, tub, shower, and toilet for grab bars to be installed	2.30	1.02	157
Adjustable shelves and clothes rods in closets and other storage	2.38	1.01	157
Clear access space 30"x48" in front of switches and controls	2.40	1.01	154
Dense, low pile carpet (<.50")	2.50	.91	154
5'x5' clear space in one bathroom	2.52	.91	145
One entrance at ground level, no steps	2.59	.88	154
Non-skid, non-glare surfaces and floors	2.67	.96	155
Adjustable/handheld shower	2.76	.98	154
Use of contrast, such as color, to indicate change in surface levels	2.96	.98	156
Tub/shower control offset from center	3.31	.92	153
Wall support and provision for adjustable and/or varied height counters and removable lower cabinets in kitchen	3.38	.92	154
Provision for dishwasher and clothes dryer to be raised 12" to 15" above floor	3.50	.88	153

Note. Weighted data.

Respondents had the opportunity to list any other feature(s) that they felt were also universal design but were not included in the survey instrument. Forty separate items were mentioned. The features most often named by these respondents were:

- showers with wheelchair access, no threshold (8 responses),
- ramps (6 responses), and
- lowered height windows (5 responses).

The remaining responses were each mentioned once or twice. These are listed in Appendix H.

Also related to the awareness and use of universal design by housing contractors is the use of or familiarity with other terms or phrases that refer to the concept of universal design. Respondents were asked to list any other terms they had heard used or used themselves to refer to this concept. Two responses were mentioned most often. Handicap accessible (or closely related variations of this term) was mentioned most often, 34 times, with ADA or ADA compliant second, with 15 responses. There were 14 other terms identified, each with three or fewer responses. One respondent indicated that the term, universal design, was not used in his/her area at all. The remaining responses are listed in Appendix I.

Respondents were also asked how often they had discussed universal design with clients as well as the number of clients in the last year that had requested the use of universal design for single-family housing. Nearly 60% of those surveyed indicated that they had seldom or never discussed universal design with clients; about 25% indicated they had often, with just over 15% indicating that they had very often. Table 5 shows the breakdown of these responses. As for the number of requests for universal design by clients in the past year, over half (55%) indicated that they had had no requests for universal design in the past year. About 20% had had one or two requests from clients, while the remainder (25%) had from 3 to 20 requests. The breakdown of these responses is shown on Table 6.

Table 5

How Often Discuss Universal Design with Client

	Frequency (N = 159)	Percent
Never	33	20.5 %
Seldom	60	37.9
Often	40	25.3
Very Often	24	15.1

Note. Unweighted data.

Table 6

Number of Clients Requesting Universal Design in the Last Year

Number of Clients	Frequency (N = 159)	Percent
0	87	54.6%
1	19	12.2
2	15	9.7
3-5	19	12.2
6-10	10	6.0
11-20	4	2.0
Missing/No Response	5	3.3

Note. Unweighted data.

2. What are the barriers, if any, to the adoption and use of universal design features in residential construction by housing contractors? Are there incentives that would encourage their use of universal design?

The respondents listed several barriers to the adoption and use of universal design features and products. The most often stated was the additional cost, with lack of request or no demand second. Other prominent responses mentioned were lack of awareness, lack of availability, appearance, and site or lot restrictions. Table 7 includes a list of barriers mentioned by respondents. Respondents could list up to three barriers. The number of responses ranged from none to three. The other responses are listed in Appendix J.

Table 7

Barriers to Universal Design Use

Barrier	Frequency (N = 265)	Percentage of Responses
Added cost	81	30.6 %
Lack of request, no demand	79	29.9
Site, lot restrictions	21	7.9
Client preferences, design	21	7.9
Unaware, not available	20	7.5
Appearance	16	6.0
Other reasons	27	10.2

Note. Unweighted data.

Several incentives to encourage use of universal design were mentioned by survey respondents. The most frequently mentioned response was to have the cost be comparable to the cost of regular or current building products and construction. Also mentioned frequently were client request and more awareness and information as well as education about universal design products and features. Table 8 includes a list of the incentives mentioned by respondents. There was space on the survey form for respondents to list up to three incentives. Responses of those surveyed ranged from none to three. The other responses are listed in Appendix K.

Table 8

Incentives to Universal Design Use

Incentive	Frequency (N = 236)	Percent
Client request	61	25.8 %
Comparable cost	58	24.6
Education, awareness, more information	25	10.6
Government grants, tax incentives, breaks, credits, rebates	19	8.1
Becomes code, required	14	5.9
Easier access to and availability of products And plans	12	5.1
Other reasons	47	19.9

Note. Unweighted data.

3. What is the position of housing contractors on the viability of universal design standards becoming a part of the residential building code?

Over 60% of the housing contractors surveyed felt that universal design standards for single-family housing were a somewhat viable idea, with the remaining split between very viable and not at all viable. As for universal design standards becoming a part of the building code, over 60% disagreed or strongly disagreed, with nearly 28% agreeing or strongly agreeing, just over 11% had no opinion or did not respond. Table 9 shows the breakdown of the sample.

Table 9

Viability of Universal Design Standards for Single-Family Homes and Becoming Part of the Building Code

Viability	Frequency (N = 159)	Percent
Very viable	30	18.6 %
Somewhat viable	98	61.7
Not at all viable	27	17.2
No response	4	2.5

Part of the Building Code	Frequency (N = 159)	Percent
Strongly agree	7	4.2 %
Agree	37	23.4
No opinion	18	11.4
Disagree	46	29.1
Strongly disagree	49	31.0
No response	1	0.9

Note. Weighted data.

Null Hypothesis Testing

The following are the results of the null hypotheses testing.

Ho1: There is no significant difference between awareness and use of universal design features by single-family housing contractors.

Paired sample t-tests were used to determine if there was a significant difference, between the awareness and use of each of the 29 universal design features as well as between the mean values for awareness and use of the total group of universal design features. For this analysis, the value of alpha was adjusted to account for the multiple tests being run simultaneously. This was achieved by dividing the desired .05 alpha by the number of tests run (29), thus, changing the value of p to < .002 in order to be significant at the .05 confidence level. The results of the t-tests using weighted data for each of the 29 universal design features are presented in Table 10. There was a significant difference between the level of awareness and the use of 21 of the listed design features. There was not a significant difference between the level of awareness and use for 8 of the listed features:

- 5'x 5' turn space in living area;
- 5'x 5' turn space in bedroom;
- switches by each entrance to rooms and hall;
- receptacle for at least 2 light bulbs in vital places;
- light in or in front of each closet;
- switches and controls 36" to 48" above finished floor;
- outlets 18" minimum above finished floor; and
- clear access space of 30" x 48" in front of switches and controls.

Between the overall level of awareness and use of all the universal design features listed, the difference was significant ($\underline{M} = -.37$, $\underline{SD} = .47$, $\underline{t} = -9.67(157)$, $\underline{p} = .000$).

Table 10

Paired-Sample t-tests: Universal Design Features Awareness and Use

Universal Design Feature	M	SD	t	df	Sig
Single story, no steps between areas	-.68	.88	-9.46	152	.000*
5'x5' clear space in living room	.02	.90	.28	143	.779

Table10, Continued

5'x5' clear space in one bedroom	-.14	.94	-1.72	139	.088
5'x5' clear space in kitchen	-.29	.99	-3.51	141	.001*
5'x5' clear space in one bathroom	-.60	1.04	-6.84	139	.000*
Multi-story: space for eating, sleeping, laundry, and bathing on ground level	-.34	.79	-5.15	144	.000*
36" wide doorways	-.49	.97	-6.36	155	.000*
Lever handles on doors	-.60	.96	-7.76	153	.000*
Thresholds flush or no higher than ½"	-.32	.90	-4.36	151	.000*
Halls minimum 42" wide	-.29	.87	-4.18	151	.000*
One entrance at ground level, no steps	-.76	.91	-10.30	153	.000*
Non-skid, non-glare surfaces and floors	-.40	.93	-5.32	154	.000*
Dense, low pile carpet (<.50")	-.32	.93	-4.30	153	.000*
Use contrast, such as color, to indicate change in surface levels	-.50	.89	-7.08	155	.000*
Lever handled water faucets	-.38	.93	-5.00	153	.000*
Thermostatic or anti-scald faucets	-.24	.82	-3.59	155	.000*
Switches by each entrance to rooms and halls	-.01	.53	-0.23	154	.817
Receptacle for at least 2 bulbs in vital places (baths, exits)	.07	.78	1.17	154	.266
Light in or in front of each closet	-.12	.77	-1.89	155	.061
Rocker or touch switches	-.47	.95	-6.14	154	.000*
Switches and controls 36" to 48" above finished floor	.01	.69	0.17	155	.867
Outlets 18" min. above finished floor	-.19	.95	-2.43	156	.016
Clear access space 30"x48" in front of switches and controls	-.01	.92	-0.10	153	.923
Adjustable shelves and clothes rods in closets and other storage	-.36	.93	-4.78	156	.000*
Reinforced wall support around tub, shower, and toilet for grab bars to be installed	-.53	1.02	-6.57	156	.000*
Adjustable/handheld shower	-.89	1.01	-10.98	153	.000*
Tub/shower control offset from center	-.55	.90	-7.51	151	.000*
Wall support and provision for adjustable and/or varied height counters and removable lower cabinets in kitchen	-.59	1.06	-6.94	153	.000*
Provision for dishwasher and clothes dryer to be raised 12" to 15" above floor	-.46	.96	-5.95	152	.000*

Note. Weighted data.
*$p < .002$.

Ho2: There is no association between universal design awareness and use of universal design in single-family housing construction and demographic characteristics of housing contractors: Gender, age, level of education, occupational title, and years in business.

Multiple regression and Pearson correlations using weighted data were run for selected demographic characteristics of housing contractors: Gender, age, level of education, occupational title, and years in business, first with universal design awareness and then with universal design use. None of the predictors, gender, age, level of education, occupational title, and years in business was a significant predictor for either universal design awareness, F (5, 151) = .98, MS = .31, p = .44, or universal design use, F (5, 151) = 1.62, MS = .31, p = .16. There was a significant positive correlation, however, between universal design awareness and use (r = .59, p = .00). The more one was aware of universal design, the more they were apt to use it. There was a significant negative correlation between universal design use and years designing/building houses (r = -.19, p = .02), the longer one had been building houses, the less apt one was to use universal design. Table 11 shows the results of the multiple regression analyses, Table 12 the correlation results.

Table 11

Multiple Regression Results: Universal Design Awareness and Selected Characteristics - Gender, Age, Level of Education, Occupation Title, and Years in Business; Universal Design Use and Selected Characteristics - Gender, Age, Level of Education, Occupation Title, and Years in Business

Universal Design Awareness:

Characteristic	B	SE	Beta	t	Sig.
(Constant)	2.39	.22		10.84	.00
Gender	.04	.23	.01	.17	.87
Age	-.04	.06	-.07	-.76	.45
Occup. Title	-.03	.05	-.05	-.58	.56
Educ. Level	-.02	.04	-.03	-.39	.70
Years in Bus.	-.08	.06	-.12	-1.30	.20

Universal Design Use:

Characteristic	B	SE	Beta	t	Sig.
(Constant)	2.70	.17		15.90	.00
Gender	.21	.18	.10	1.18	.24
Age	-.07	.05	-.15	-1.56	.12
Occup. Title	.00	.04	.00	.04	.97
Educ. Level	-.02	.03	-.05	-.60	.55
Years in Bus.	-.04	.05	-.08	-.89	.37

Note. Weighted data.

Table 12

Correlations: Universal Design Awareness, Universal Design Use, Gender, Age, Occupation Title, Level of Education, Years in Business

Characteristic	Gender	Age	Occup. Title	Educ. Level	Years in Businesss	U D Awareness	U D Use
Gender	1.00	.79	.004	.08	-.08	.01	.08
		.33	.96	.32	.33	.87	.31

Table 12, Continued

Age	1.00	-.02 .80	.13 .10	.47** .00	-.13 .11	-.13 .11
Occup. Title		1.00	.19* .02	-.13 .12	-.02 .79	.06 .49
Educ. Level			1.00	.07 .38	-.05 .55	-.07 .42
Years in Bus.				1.00	-.15 .06	-.20* .02
UD Awareness					1.00	.59** .00
U D Use						1.00

Note. Weighted data.
* $p < .05$. ** $p < .01$

Ho3: There is no association between universal design use and added cost to implement universal design features in single-family housing construction by housing contractors.

The paired sample t-test, using weighted data, between universal design use ($M = 2.34$, $SD = .47$) and whether or not there was added cost to implement universal design features ($M = .55$, $SD = .18$) indicated that there was a significant difference between them ($M = 1.79$, $SD = .47$, $t = 47.32$ (157), $p = .00$). The more there was indicated an added cost to implement, the less the use of universal design occurred. Most respondents felt that using universal design features and products added anywhere between 5 and 20% to the cost of construction, with 5 and 10% being the most often named individual responses, 22 and 24 respectively. The range of responses, however, was broad, from no added cost (0 %) to adding 100 % to the cost. Table 13 shows these results. Nearly all the respondents (95.4 %), however, indicated that it was most cost effective to incorporate universal design with initial construction, rather than later, such as during remodeling construction (Table 14).

Table 13

Percent Universal Design Adds to the Cost of Construction

Percent added to cost (%)	Frequency Count (N = 159)	Percent of Total (%)
0 – 5	48	30.2
6 – 10	38	23.9
11 – 15	25	15.7
16 – 20	16	10.1
21 – 30	10	6.3
31 – 100	3	1.9
No response	19	11.9

Note. Weighted data.

Table 14

When Cost Effective to Incorporate Universal Design

Stage of Construction	Frequency Count (N = 159)	Percent(%)
Initial Construction	152	95.4
Remodel Construction	1	0.8
Anytime	3	2.1
No response	3	1.6

Note. Weighted data.

Ho4: There is no association between identified barriers to use and the use of universal design in single-family housing construction by housing contractors.

In the paired sample t-test using weighted data between whether or not there was an identified barrier to universal design use (M = .77, SD = .42), and the voluntary use of universal design (M = 2.34, SD = .47), a significant difference was found (M = 1.57, SD = .55, $t = 35.71(157)$, $p = .00$). If a barrier was identified, one was less likely to use universal design features or products. The barriers cited most often were additional cost and no request or demand for universal design. Other barriers are listed on Table 7 and in Appendix I.

Ho5: There is no association between the viability of and the opinion about mandated use of universal design standards as part of the building code for single-family housing by housing contractors.

In the Kendall's tau test between the viability of and the mandated use universal design as part of the building code, the results of the cross tabulation between the two variables using weighted data are shown in Table 15. The value for Kendall's tau-b is .37, SE = .07, $p = .00$. The respondents differed significantly between the viability of and opinions concerning the mandated use of universal design standards. While respondents were apt to say that a set of universal design standards was a viable idea, they were also apt to disagree or strongly disagree with them becoming mandated as part of the building code.

Table 15

Cross Tabulation: Viability of Universal Design Standards for Single-Family Housing and Incorporating Universal Design Standards as a Part of the Building Code

		Opinion about mandated use as part of building code					
		Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	Total
	Very viable	7	11	1	7	4	30
Viability	Somewhat viable	0	24	16	30	2	97
	Not at all viable	0	3	0	7	17	27
	Total	7	38	17	44	48	154

Note. Weighted data.

Ho6: There is no association between current voluntary use of universal design and housing contractors' perceptions of each of the following characteristics of universal design: a) similar appearance, b) similar cost, c) ready availability, d) information readily available, and e) current use of universal design features and products by other home building professionals in the state/area.

The MANOVA test of multivariate analysis using weighted data was run with the housing contractors perceptions about the characteristics, appearance, cost, availability, information and use by other home building professionals and their current voluntary use of universal design. The Wilks' Lambda value for the model was significant, equaling .010, with $F = 1.34$, $p = .003$. Upon further analysis of the model, the results were significant for only one of the perceived characteristics, cost to implement is similar to current design. There is an association between current voluntary use of universal design and housing contractors' perception of the characteristic of universal design, b) similar cost. One was more apt to use universal design features or products voluntarily if they felt that the cost was similar to that of other building products or features. For the other four characteristics, a) similar appearance, c) ready availability, d) information readily available, and e) current use of universal design features and projects by other home building professionals in the state/area, there appears to be no association between the housing contractors' perceptions about each of them and their current voluntary use of universal design. The results are shown in Table 16 and 17.

Table 16

Opinions on Selected Universal Design Characteristics

Characteristic	Strongly Agree	Agree	Disagree	Strongly Disagree	Total
Similar appearance	23	84	40	7	154
Similar cost	7	39	68	42	156
Ready availability	45	56	43	9	153
Information available	37	49	49	20	155
Others using it	6	24	74	39	143

Note. Weighted data.

Table 17

Voluntary Universal Design Use and Selected Characteristics MANOVA Results

Universal Design Use and Similar Appearance	F (76) = 1.40, p = .079
Universal Design Use and Similar Cost	F (76) = 1.51, p = .041*
Universal Design Use and Availability	F (76) = 1.21, p = .212
Universal Design Use and Information Available	F (76) = 1.07, p = .386
Universal Design Use and Others Using It	F (76) = 1.28, p = .149

Note. Weighted data.

* $p < .05$

CHAPTER 5

DISCUSSION

Major findings associated with the sample, research questions, and null hypotheses are discussed, using the theoretical framework that guided this study. Following this discussion, the study's limitations and suggestions for future research, as well as implications of the study's findings are presented.

Sample

The sample for this study was fairly evenly divided between metropolitan and nonmetropolitan respondents (45% and 55% respectively), which was desired by the researcher. The fact that there were slightly more respondents from the nonmetropolitan group was unexpected. This group was over-sampled only to insure adequate representation because of the disparity in size between the two populations within the state of Oregon. Weighting the data for the inferential statistical analyses compensated for this. Other characteristics of the sample, such as gender (predominantly male), age range (41-60), some education beyond high school, in business between 11 and 30 years, working in a firm with fewer than 5 employees, and building mostly single-family custom homes were not expected. Overall the location of most of the houses built was nearly evenly distributed among the different areas. The location of houses for the metropolitan housing contractors was predominantly in the metro/central city or suburb of metro area; the location of houses for the nonmetropolitan builders was primarily in small cities, small towns, and rural areas. This, too, was expected. As for the age range of clients, the metropolitan housing contractors tended to have more of the younger clients (31-50), while the nonmetropolitan housing contractors had a predominantly older clientele (41-60). This could be due to an influx of retirement or pre-retirement housing away from major metropolitan areas. The one characteristic of the sample that was of interest and surprise, and worth pursuing in future research was the response to professional affiliations. Only 15% of the metropolitan and less than 10% of the nonmetropolitan respondents indicated membership in a professional organization, barely 25% of the total sampled. Apparently there is a large group of housing contractors that does not feel the need to belong to a professional organization. While this probably allowed for obtaining a more random sample for this study, it is an issue for the various professional organizations and worthy of further investigation. Are there significant differences (and what are they) between those who are members of professional organizations and those who are not? Of no surprise, however, was the fact that about three-fourths of the 25% who had membership indicated membership in the National Association of Home Builders (NAHB) with National Association of the Remodeling Industry (NARI) a distant second. The remainder indicated membership in a variety of other smaller, less well-known organizations, some of which were Canadian. Previous research with home contracting and building professionals related to universal design used NAHB membership lists to draw their samples. There was the assumption on the part of the researcher that it had a larger membership base, or that it's members would be more apt to respond (Belser & Weber, 1995; Blanco, 1994).

Research Questions

Using Rogers' (1995) Innovation-Decision Process as a framework for this study assists in determining where Oregon housing contractors are in the awareness and use of universal design. The results of this study found that those Oregon housing contractors surveyed were aware (mean between "aware" and "very aware") of universal design features and products, but their use was not as high (mean between "often" and "not much use"). These results were not unexpected and support the findings of previous research (Belser & Weber, 1995). They could also be attributed to the fact that the codes and requirements of both the ADA legislation for commercial spaces and the Fair Housing Guidelines for multi-family housing have been in effect for nearly 10 years. A portion of the survey respondents also do other than single-family housing construction, so would very likely be aware of these requirements. It is interesting to note that only two of most aware features were also two of the most used (switches by each entrance to rooms and halls and switches and controls 36" to 48" above finished floor). Each of these features, however, is currently within existing building code requirements. On the other hand, the universal design features respondents were least aware of were also the same features that were indicated as the least used. These features are tub/shower control offset from center; wall support and provision for adjustable and/or varied height counters and removable lower cabinets in kitchen; and provision for dishwasher and clothes dryer to be raised 12" to 15" above floor. These three features are very specific in nature as well as not being as widely known as the others mentioned. In the Rogers' (1995) continuum, most of the housing contractors surveyed would be at the Knowledge stage, with Persuasion (barriers removed and incentives to use) still needed to form a decision to use (adopt) or not.

Related to this, respondents were able to list any other features or products that they felt were also universal design but had not been included on the survey. This elicited 40 separate responses. Showers with no threshold, ramps, and lowered height windows were mentioned most often. These were not included in the list by the researcher for several reasons. Showers with no threshold were considered by the researcher to be more of specialized, accessible feature, rather than universal design, as were many of the other features mentioned (Appendix H). Having one entrance at ground level, no steps, could preclude the need for requiring a ramp, as well as being less stigmatizing or obvious as "special." There could still be one entrance with a step or two and would not require or imply that each entrance have a ramp for access. A lowered height for windows would depend on the room involved and would be a difficult guideline or standard to establish as it would vary from room to room. It was considered by the researcher to be too restrictive a requirement to be included in this study.

Also a part of the issue of awareness and use of universal design is the term people use to refer to it. Respondents had the opportunity to list other terms or phrases they had heard used or used themselves to refer to this concept. Not surprisingly, handicap accessible (and several closely related variations of this term) and ADA or ADA compliant were the most often mentioned terms, 34 and 15 responses respectively. These terms both have a history of use in the design/build community that is difficult to change or remove. Accessible or handicap accessible housing implies special features or adaptation to meet a specific need. The requirements would be different, depending on the disability, as they are not universal. The term ADA is being incorrectly applied to single-family housing, as the ADA requirements are only for commercial, public spaces, and not individual single-family residences. This incorrect application and use of terminology could be contributing to the lack of use of universal design by housing contractors (and others). The terms other than universal design seem to imply special, as well as rigid requirements and code or other governmental regulations, rather than normal, for use by all.

The responses to the questions about how often they (housing contractors) discussed universal design with clients as well as the number of clients they had had in the past year request universal design were consistent. In both instances, over half (60%) had either seldom or never discussed it with clients as well as not having any requests from clients for universal design. It is encouraging, however, to note that over one-third (40%) had discussed it often or very often, and that just under half (45%) had had at least one request for universal design from a client. This could be either an indication of more awareness that could eventually lead to gradual acceptance, use, and adoption of universal design in the future, or equating it with accessible design or ADA applications for public spaces.

Following with the Rogers' (1995) Model, barriers and incentives to use are important considerations in the decision process of adopting an innovation. Previous research has found this to be true, not only with universal design, but also with other innovations in housing, such as alternative building methods and materials or heating systems (Blanco, 1994; Combs, Parkhurst, & Madden, 1987; McCray & Weber, 1981).

Not surprising, the most often mentioned barriers to universal design use were added cost and lack of request or demand by clients, 81 and 79 responses respectively. This was also true for other building related innovations. Most housing contractors neither want to spend additional money (and time) if they don't have to nor build something if there is no request or demand for it by clients (Belser & Weber, 1995; NAHB, 1990). Other barriers mentioned were site/lot restrictions, client design preferences, lack of knowledge, awareness or availability of features and products, and appearance. Again, these were not unexpected comments as they have been mentioned in prior research (Belser & Weber, 1995). Overcoming these barriers will be necessary in order for universal design to become more widely used.

As for incentives that would encourage the use of universal design, not surprisingly, client request and comparable cost again topped the list, 61 and 58 responses, respectively. Education, awareness, and more information about universal design were also mentioned as incentives to use by 25 respondents. An incentive that was not on the list of barriers, was the category of government grants, tax incentives, tax-breaks, credits or rebates for use of universal design (19 responses). Clearly these housing contractors want some financial or other economic benefit from using universal design, as became the case with solar and other alternative heating and housing systems. Also serving as an incentive would be that universal design requirements become just that, required or part of the building code (12 responses), along with easier access to and availability of universal design products and plans. This has been a continual problem, as reported in previous research (Belser & Weber, 1995).

When it came to the opinions about and agreement on the viability of universal design standards becoming a part of the building code by housing contractors, the responses varied. While nearly 80% of the respondents felt that universal design standards as a part of the building code was a somewhat or very viable idea, more than 17% overall felt that it was not at all a viable idea, which supports previous findings (Blanco, 1994). This positive response to viability as becoming part of the building code could be in anticipation of the adoption of the International Building Code in the year 2000 that will have residential standards. It could also be the influence of both the Fair Housing Acts requirements for multi-family housing and the ADA requirements for public spaces that have been in effect for awhile, trickling down, so to speak, to the single-family housing market. When it comes to whether or not they agree that these standards should become part of the building code, however, just over 60% disagreed or strongly disagreed. Again these findings support those in previous studies (Belser & Weber, 1995). The home building industry has historically resisted the implementation and addition of codes and regulations. It was interesting to note that just over 27% of these respondents overall agreed or strongly agreed that standards such as these should become part of the building code. The changing demographics (i.e. aging population) of the market, however, could account for some of that, as well as the influence of education, either formal or through professional and trade associations, as well as the influence of the ADA and Fair Housing Acts legislation.

Null Hypothesis Testing

Following are the significant findings from the testing of the null hypotheses.

Ho1 (There is no significant difference between awareness and use of universal design features by single-family housing contractors)) was only partially supported by this research, using paired sample t-tests. For 8 of the 29 features listed,

- 5'x 5' turn space in living area,
- 5'x 5' turn space in bedroom,
- switches by each entrance to rooms and hall,
- receptacle for at least 2 light bulbs in vital places,
- light in or in front of each closet,
- switches and controls 36" to 48" above finished floor,
- outlets 18" minimum above finished floor; and
- clear access space of 30" x 48" in front of switches and controls,

there were no significant differences between the awareness and use by these respondents. For the remaining 21 features, as well as for the overall awareness and use, there were significant differences between awareness and use for these respondents, which again supported previous research (Blanco, 1994). It was interesting to note that the awareness and use of at least some universal design features are getting closer together, hopefully at the aware/often level, rather than at the unaware/never level. All of the most aware and used features, except outlets 18" minimum above finished floor and clear access space of 30" x 48" were in the top 10 of both the awareness and use rank orders, which is encouraging. At the very least those housing contractors surveyed are generally aware of universal design even though they may not be using it.

Ho2 (There is no association between universal design awareness and use of universal design in single-family housing construction and demographic characteristics of housing contractors: Gender, age, level of education, occupation title, and years in business) was supported by these findings. None of the selected demographic characteristics, gender, age, level of education, occupation title, and years in business was a predictor for either universal design awareness or use of universal design. This is different than previous findings, which found age and years in business predictors of less awareness and use of universal design when designing for the aging population (Belser & Weber, 1995). This could well be due to the influence of the ADA and Fair Housing Acts legislation, as well as an increase in public as well as professional awareness through education and exposure. Not to be forgotten is the increase in the aging population and their influence slowly beginning to be felt in the single-family housing industry.

Ho3 (There is no association between universal design use and added cost to implement universal design features in single family housing construction by housing contractors) was not supported by these findings. There is an association between the use of universal design and whether or not there was an added cost to implement it. The more there was an indication of an additional cost to implement, the less the use of universal design. This supports the findings of previous research (Blanco, 1994). When it comes to how much universal design products and features added to the cost of construction, the opinions of the respondents varied widely, from no added cost to adding 100% to the cost. The majority of respondents (80%), however, felt that universal design added between 5 and 20 % to the cost, with 5 and 10% being the most often named responses. These responses are in line with previous findings (Belser & Weber, 1995), however, they are higher than the 1.5 to 2% mentioned by the NAHB. Inflation over the years could well account for part of the increase cited, as well as considering the differences in additional cost between new and remodel construction (often as much as 20 to 25%) (McLeister, 1990). Whatever the additional cost, it was overwhelmingly considered to be less when incorporating universal design at the initial construction stage, rather than at the remodeling stage, by over 95% respondents overall. This, too, supports previous findings (Belser & Weber, 1995).

Ho4 (There is no association between identified barriers to use and the use of universal design in single-family housing construction by housing contractors) was not supported by these findings. There is an association between identified barriers to use and the use of universal design. Results from the paired sample t-tests found that if a barrier was identified, then one was less likely to use universal design features or products. Again, this supports the findings of previous research (Blanco, 1994). Barriers hinder the decision to adopt an innovation. Identifying the barriers is important as well as finding ways to remove them (with incentives) so adoption can eventually occur. Likewise, once incentives have been identified, they need to be pursued to encourage adoption. This was the case in previous housing research related to alternative housing systems and energy sources (McCray & Weber, 1981).

Ho5 (There is no association between the viability of and the mandated use of universal design standards as part of the building code for single-family housing by housing contractors) was supported by these findings. There is not an association between the viability of and the mandated use of universal design standards as part of the building code for single-family housing by housing contractors. The respondents in this study differed significantly. While respondents were more apt to say that a set of universal design standards was a viable idea, they were also very apt to disagree or strongly disagree about them becoming a mandated part of the building code. This also supports previous findings (Belser & Weber, 1995; Blanco, 1994). As mentioned previously, the building industry has historically resisted the attempts to add codes and regulations, so this instance would be no exception.

Those, however, who indicated it was viable or very viable may well see such standards as inevitable, given the passage of the ADA and Fair Housing Acts regulations, and that it is only a matter of time before they apply to single-family housing as well.

Ho6 (There is no association between current voluntary use of universal design and housing contractors' perceptions of each of the following characteristics of universal design: similar appearance, similar cost, ready availability, information readily available, and current use of universal design features and products by other home building professionals in the state or area) was partially supported. While the Wilks' Lambda value for the multivariate MANOVA model with all five of the perceived characteristics was significant (an association), the results within the model were significant for only one of them, similar cost. In light of other findings in this study, this is a reasonable result. One would be more likely to use universal design features or products voluntarily if they felt that the cost was similar to that of other (or regular) building products and features. Likewise, one would be less apt to use universal design products or features if they felt the cost was different (more). As for the other four characteristics, similar appearance, ready availability, information readily available, and current use by other home building professionals in the state/area, the null hypothesis is supported, there is no association between perceptions about each of these and the current voluntary use of universal design. These respondents seemed to vary in their opinions about these perceived characteristics, so no conclusions could be drawn. While each of the perceived characteristics could be considered a barrier to use, cost appears to have the most influence on those surveyed at the time of this study.

Limitations and Suggestions for Future Research

Attempts were made to control the number of limitations associated with this study, which may have influenced the results. These are summarized below and provide a basis for suggestions for future research.

First, the nature of the sample as well as the source of the sample had a number of problems. The sample consisted of contractors registered with the Oregon Construction Contractors' Board. This included all contractors, regardless of specialty, registered in the state. While there were categories and codes to help delineate and more closely define single-family housing contractors, it was only one of three categories that a contractor could register for, so the chances of non-qualification were high. An advantage to this method was that a sample could be drawn from all registered housing contractors and was more representative of the state. This probably also contributed to both the lack of response by many who were sent the survey as well as the return of some of the questionnaires either blank or with a note of explanation as to why it was not completed. The useable response rate was nearly 33%, lower, than what was desired (50%), but within acceptable limits, as over 40% of the surveys were returned. Members of the home building industry historically do not have a high response rate for mail surveys. Also, the time of year as well as the economic conditions at the time that the survey administered may have contributed. The economy was good, and there was a lot of home and other building activity throughout the year, leaving less time to fill out a survey questionnaire. Spring, when this survey was administered, is a busy time for housing contractors, both for building and completing income tax returns. During the winter, when home building is generally slower, would probably be a better time and hopefully elicit a higher response rate than was achieved. The reminders, however, did bring in more surveys than anticipated, so were worthwhile (One respondent did include a note to that effect).

Second, the use of the mail survey as a means of obtaining information had its own inherent problems. One was relying on respondents to take the time and effort to complete the survey in its entirety and return it. Every effort was made to make the survey instrument clear and understandable for respondents and as short as possible. This is difficult when one is not physically there to answer questions. A possible result was the return of partial and incomplete surveys, accounting for some of the variation in the total number of responses to some of the questions. Administering a survey at a gathering or meeting of housing contractors would probably be a more efficient and productive means of obtaining data, although it would probably not provide as random a sample. It would be difficult and not necessarily random to pre-select who would attend such a meeting. As the topic of universal design could be considered sensitive, even controversial with some housing contractors, some may have chosen to ignore it altogether or answered the questions the way they thought they should be or how the researcher wanted, rather than how they actually felt or believed. The researcher has no control over this.

Third, and related to the nature and accuracy of the survey instrument, is the possible misunderstanding or not knowing the definition or meaning of terms used. A broad definition of universal design was included at the beginning of the survey instrument, but whether or not the respondents read and followed it is difficult to say. This may have been the case with some respondents, when asked if there were other terms they had heard or used for universal design. This misunderstanding or misinterpretation of the various concepts and terms (accessible, adaptable, handicap, ADA) may have influenced survey responses. Likewise, care and effort was taken in the construction of the instrument to as accurately as possible measure awareness and use of universal design features and products. A review of similar and related survey instruments was used in the development of the survey instrument for this study. There was also a review by experts in the field and pilot testing with housing contracting professionals. Again, different interpretations or misunderstandings could well occur that might not if completed when a researcher was present.

Fourth, a few problems with data entry and analysis were encountered that need to be mentioned. While the survey instrument was constructed with data entry and analysis in mind, not all respondents followed directions, occasionally marking more responses than asked for. This presented problems when entering data for analysis, requiring some judgment calls and accounting for some of the missing values. Care was taken to enter data as accurately as possible and was verified before analysis began. Quantifying and grouping similar responses together also have their inherent problems, including increasing the likelihood of error. Again, care was taken to do this as accurately as possible.

There are several suggestions for future study, based on this research. Comparisons could be made between metropolitan and nonmetropolitan housing contractors. While the categories were delineated for sampling purposes only for this study, the differences, if any, would be interesting and could be important to note, especially for areas or states with similar population distribution. Likewise, comparisons between members of a professional building organization(s) and those who do not belong could also be made to determine if there are any differences. Previous studies have used samples drawn from professional organizations, the NAHB (Belser & Weber, 1995; Blanco, 1994) and the National Kitchen and Bath Association (NKBA) (Guetzko & White, 1991). Are there differences between those who belong to such organizations and those who do not? This project was only concerned with housing contractors, but there are other design professionals that could be surveyed, architects, interior designers, residential real estate professionals, educators of housing and design professionals, product designers, as well as consumers. The spheres of activity and influence of the above were mentioned by the housing contractors in this study as barriers to use of universal design. The role that each of the above has in the house planning and selection process is certainly worthy of investigation.

Implications of Findings

This study was an investigation into the awareness and use of universal design by housing contractors in Oregon. The results of this study found that these housing contractors differed significantly between their awareness and use of universal design. They were more aware of universal design features and concepts, but did not use them as often. Such findings are important to educators of these and other housing design professionals, as well as the manufacturers of universally designed products. Education about these features and products, as well as availability and examples of existing applications, need to be pursued and expanded, becoming an integral part of the curriculum.

Several barriers and incentives to adoption and use were identified, with cost and client request, as well as information and availability being mentioned most often. The advantages of universal design for everyone need to be promoted, an opportunity for educators. As acceptance, use, and demand for universal design products increase and becomes more widespread, costs should become more competitive with products currently in use. Again, there is opportunity for manufacturers, developers, builders, and educators to inform and educate not only housing and design professionals, but consumers as well. The cooperative effort of building model homes and disseminating house plans that are universally designed would help accomplish this. Universal design concepts were some of the features highlighted in the Blueprint 2000 house presented in a widely circulated consumer publication (Nolan & Bloom, 1999). More of this needs to be done. Also, educating professionals and consumers alike about the differences between universal design, handicap accessible design, and ADA is essential and a challenge for both educators and professional organizations. Government at all levels and other policy makers have an opportunity to encourage universal design use through providing incentives, such as tax credits or other grants for single-family housing that incorporates these features. They also need to understand the long term and far-reaching implications and advantages of having a universally designed home in terms of the impending increase in size of the aging population. The AARP has taken steps in this direction with their Home Modification Program (AARP, 1996), however, more needs to be done. As for viability of universal design standards becoming part of the residential building code, those surveyed felt that it was viable, but did not necessarily agree. Code and building officials need to understand this when dealing with code and policy changes.

The advantages and benefits of universal design to all in single-family housing will hopefully be the factors that lead towards the removal of barriers and the eventual adoption of universal design. This would be not only as a part of the building code, but acceptance and use by single-family housing contractors, other housing design related professionals, and consumers.

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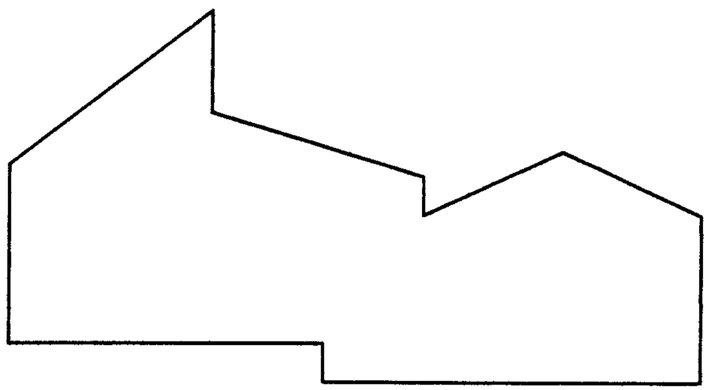
APPENDICES

APPENDIX A

SURVEY INSTRUMENT



Universal Design and Single-Family Housing

Please Return to:
Dr. Jeanette Brandt / Ms. Nancy Wolford
Department of Apparel, Interiors, Housing and Merchandising
224 Milam Hall
Oregon State University
Corvallis, OR 97331-5101

OPINIONS, AWARENESS AND USE OF UNIVERSAL DESIGN FEATURES IN SINGLE-FAMILY HOUSING

UNIVERSAL DESIGN -- attractive spaces, features and products that are functional for most people throughout their lifespan, regardless of ability or disability.

Q1. This question is intended to measure your awareness, use and cost of features that people often want in their homes. *Please circle one response from 1 (very aware) to 4 (unaware) for the "awareness" section. Please circle one response from 1 (very often) to 4 (never) for the "use" section. Please circle one response from 1 (yes, there is added cost), 2 (no added cost) in the "cost" section.*

UNIVERSAL DESIGN FEATURE	AWARENESS OF FEATURE				USE OF FEATURE				ADDED COST OF FEATURE	
	VERY AWARE			UN AWARE	VERY OFTEN			NEVER	YES	NO
A. Single story, no steps between areas	1	2	3	4	1	2	3	4	1	2
B. 5′x 5′ clear turn space in major activity areas										
1 living area	1	2	3	4	1	2	3	4	1	2
2 one bedroom	1	2	3	4	1	2	3	4	1	2
3 kitchen	1	2	3	4	1	2	3	4	1	2
4 one bathroom	1	2	3	4	1	2	3	4	1	2
C. New/existing multi-story: space for eating, sleeping, laundry, and bathing on ground level	1	2	3	4	1	2	3	4	1	2
D. 36″ wide doorways	1	2	3	4	1	2	3	4	1	2
E. Lever handles on doors	1	2	3	4	1	2	3	4	1	2
F. Thresholds flush or no higher than 1/2″	1	2	3	4	1	2	3	4	1	2
G. Halls minimum 42″ wide	1	2	3	4	1	2	3	4	1	2
H. One entrance at ground level, no steps	1	2	3	4	1	2	3	4	1	2

UNIVERSAL DESIGN FEATURE	AWARENESS OF FEATURE				USE OF FEATURE				ADDED COST OF FEATURE	
	VERY AWARE			UN AWARE	VERY OFTEN			NEVER	YES	NO
I. Non-skid, non-glare surfaces and floors	1	2	3	4	1	2	3	4	1	2
J. Dense, low pile carpet (<.50")	1	2	3	4	1	2	3	4	1	2
K. Use contrast, such as color, to indicate change in surface levels	1	2	3	4	1	2	3	4	1	2
L. Lever handled water faucets	1	2	3	4	1	2	3	4	1	2
M. Thermostatic or anti-scald faucets	1	2	3	4	1	2	3	4	1	2
N. Switches by each entrance to rooms and halls	1	2	3	4	1	2	3	4	1	2
O. Receptacle for at least 2 bulbs in vital places (baths,exits)	1	2	3	4	1	2	3	4	1	2
P. Light in or in front of each closet	1	2	3	4	1	2	3	4	1	2
Q. Rocker or touch switches	1	2	3	4	1	2	3	4	1	2
R. Switches and controls 36" to 48" above finished floor	1	2	3	4	1	2	3	4	1	2
S. Outlets 18" min. above finished floor	1	2	3	4	1	2	3	4	1	2
T. Clear access space 30"x48" in front of switches and controls	1	2	3	4	1	2	3	4	1	2
U. Adjustable shelves and clothes rods in closets and other storage	1	2	3	4	1	2	3	4	1	2
V. Reinforced wall support around tub, shower and toilet for grab bars to be installed	1	2	3	4	1	2	3	4	1	2

UNIVERSAL DESIGN FEATURE	AWARENESS OF FEATURE				USE OF FEATURE				ADDED COST OF FEATURE	
	VERY AWARE			UN AWARE	VERY OFTEN			NEVER	YES	NO
W. Adjustable/handheld shower	1	2	3	4	1	2	3	4	1	2
X. Tub/shower control offset from center	1	2	3	4	1	2	3	4	1	2
Y. Wall support and provision for adjustable and/or varied height counters and removable lower cabinets in kitchen	1	2	3	4	1	2	3	4	1	2
Z. Provision for dishwasher and clothes dryer to be raised 12" to 15" above floor	1	2	3	4	1	2	3	4	1	2

Q2. If all of the above universal design features were incorporated in the design and construction of a new single-family dwelling, what do you think would be the total impact on the cost (percentage) of the average single-family dwelling that you build/design? *(Please write in percentage amount. If none, write "none.")* ____________________

Q3. In your opinion, when is it most cost efficient to incorporate universal design in a residence? *(Please circle one)*

1 INITIAL CONSTRUCTION
2 REMODEL CONSTRUCTION
3 ANYTIME

Q4. Are you aware of any other universal design features that we have not listed above? If so, please list in the space provided here.

Q5. How often do you discuss universal design features and products for single-family housing with a client? *(Please circle one)*

1 VERY OFTEN
2 OFTEN
3 SELDOM
4 NEVER

Q6. How many clients during the last year asked about or requested universal design features and/or products for their single-family dwelling construction or remodeling project? *(Please indicate number in space below. If none, write zero.)*

____

Q7. For the following statements about universal design features and products in single-family dwelling construction, to what degree do you agree or disagree with each one? *Please circle one response from 1 (strongly agree) to 4 (strongly disagree).*

	STRONGLY AGREE			STRONGLY DISAGREE
A. The appearance of universal design features and products is similar to that of other building features and products.	1	2	3	4
B. The cost to implement universal design in residential construction is about the same as current design.	1	2	3	4
C. Universally designed products are readily available to me.	1	2	3	4
D. Information about universally designed features and products is readily available to me.	1	2	3	4
E. Other home building professionals in my state/area have adopted and are using universal design in their single-family construction.	1	2	3	4

Please complete the following by briefly responding to the question or circling the appropriate number.

Q8. If you do not choose to use universal design features or products in your single family housing construction, what are up to 3 reasons why you make that decision? *(Please list in the spaces below)*

1 ______________________________
2 ______________________________
3 ______________________________

Q9. Please name up to 3 incentives that would encourage you to include (or include more) universal design features and products in your single-family dwelling construction projects. *(Please list in the spaces below)*

1 ______________________________
2 ______________________________
3 ______________________________

Q10. In general, to what extent do you consider universal design standards for a typical single-family dwelling a viable idea? *(Please circle one)*

1 VERY VIABLE 2 SOMEWHAT VIABLE 3 NOT AT ALL VIABLE

Q11. In general, to what extent do you agree that universal design standards, such as those presented in this survey, should become part of the building code? *(Please circle the number)*

1 STRONGLY AGREE
2 AGREE
3 NO OPINION
4 DISAGREE
5 STRONGLY DISAGREE

YOU AND YOUR COMPANY

This section asks basic background information about you. *(Please circle the appropriate number and/or briefly respond to the question asked. All information given is held confidential. There will be no identifying names or numbers to identify you with your form.)*

Q12. 1 MALE 2 FEMALE

Q13. Your Age:

1 UNDER 30 2 31-40 3 41-50 4 51-60 5 OVER 60

Q14. What is your occupational title? *(Please circle one)*

1 GENERAL CONTRACTOR
2 HOUSING DESIGNER
3 SUB-CONTRACTOR
4 OTHER, PLEASE SPECIFY ____________________

Q15. Your level of education: *(Please circle one)*

1 LESS THAN 12 YEARS
2 HIGH SCHOOL GRADUATE OR EQUIVALENT
3 SOME TECHNICAL, TRADE SCHOOL OR COLLEGE BEYOND HIGH SCHOOL
4 COMMUNITY (TW0-YEAR) COLLEGE DEGREE OR CERTIFICATE
5 COLLEGE OR UNIVERSITY DEGREE (BACHELOR'S)
6 GRADUATE OR PROFESSIONAL DEGREE (MASTER'S OR DOCTORAL)

Q16. How long have you been building/designing houses? *(Please circle one)*

1 0-10 YEARS 2 11-20 YEARS 3 21-30 YEARS 4 OVER 30 YEARS

Q17. How many people do you employ, in addition to yourself? *(Please circle one)*

1 0 - 5 2 6 - 10 3 11 - 15 4 16 - 20 5 21 and over

Q18. What percentage of your work is single-family dwellings? *(Please circle one)*

1 0-25% 2 26-50% 3 51-75% 4 76-100%

Please feel free to add comments that might help in our future efforts to understand how home builders feel about universal design.

This is the end of the survey. Thank you for your help!!!
Please return in the postage paid envelope provided.

If you have any questions please call or e-mail:

Nancy Wolford, Doctoral Candidate
16171 Jasmine Way
Los Gatos, CA 95030
408/356-2465
e-mail: NLWolford@aol.com

or

Jeanette Brandt, Associate Professor
AIHM Department, 224 Milam Hall
Oregon State University
Corvallis, OR 97331
541/737-0994
e-mail: brandtje@orst.edu

If you would like a summary of the results, please print your name and address on the back of the return envelope (NOT on this questionnaire). We will see that you get it.

APPENDIX B

HUMAN SUBJECTS APPROVAL LETTER

RESEARCH OFFICE

OREGON STATE UNIVERSITY

312 Kerr Administration
Corvallis, Oregon
97331-2140

541-737-0670
FAX: 541-737-3093
INTERNET
mary.nunn@orst.edu

February 1, 1999

Principal Investigator:

The following project has been approved for exemption under the guidelines of Oregon State University's Committee for the Protection of Human Subjects and the U.S. Department of Health and Human Services:

Principal Investigator(s):	Jeanette Brandt
Student's Name (if any):	Nancy Wolford
Department:	AIHM
Source of Funding:	
Project Title:	Universal Design Standards for Single-Family Dwellings
Comments:	

This approval is valid for one year from the date of this letter. A copy of this information will be provided to the Committee for the Protection of Human Subjects. If questions arise, you may be contacted further.

Sincerely,

Mary E. Nunn

Mary E. Nunn
Director of Sponsored Programs

cc: CPHS Chair

APPENDIX C

METROPOLITAN AREA INFORMATION
(U.S. Bureau of the Census, 1999)

1. About Metropolitan Areas:

The United States Office of Management and Budget (OMB) defines metropolitan areas (MAs) according to published standards that are applied to Census Bureau data. The general concept of an MA is that of a core area containing a large population nucleus, together with adjacent communities having a high degree of economic and social integration with that core. Currently defined MAs are based on application of 1990 standards to 1990 decennial census data and to subsequent Census Bureau population estimates and special census data. Current MA definitions were announced by OMB effective June 30, 1998.

MAs include metropolitan statistical areas (MSAs), consolidated metropolitan statistical areas (CMSAs), and primary metropolitan statistical areas (PMSAs).

Defining MSAs, CMSAs, and PMSAs:

Current standards for each MSA include at least:

- one city with 50,000 or more inhabitants, or
- a Census Bureau-defined urbanized area (of at least 50,000 inhabitants) and a total metropolitan population of at least 100,000.

Under the standards, the county (or counties) that contains the largest city becomes the "central county" (counties) along with any adjacent counties that have at least 50% of their population in the urbanized area surrounding the largest city. Additional "outlying counties" are included in the MSA if they meet specified requirements of commuting to central counties and other selected requirements of metropolitan character (such as population density and percent urban).

An area that meets these requirements for recognition as an MSA and also has a population of one million or more may be recognized as a CMSA if:

- separate component areas can be identified within the entire area by meeting statistical criteria specified in the standards, and
- local opinion indicates there is support for the component areas.

If recognized, the component areas are designated PMSAs, and the entire area becomes a CMSA. PMSAs, like the CMSAs that contain them, are composed of entire counties (except in New England). If no PMSAs are recognized, the entire area is designated as an MSA.

2. Metropolitan Areas and Components, 1998:

(Metropolitan areas defined by Office of Management and Budget, 6/30/98)

Source: U.S. Census Bureau
Revised date: 11/3/98

MSA = Metropolitan Statistical Area
CMSA = Consolidated Metropolitan Statistical Area
PMSA = Primary Metropolitan Statistical Area

Metropolitan Area and Components:

MSA	Eugene-Springfield, OR		
		Lane County	
MSA	Medford-Ashland, OR		
		Jackson County	
CMSA	Portland-Salem, OR-WA		
	PMSA	Portland-Vancouver, OR-WA	
			Clackamas County, OR
			Columbia County, OR
			Multnomah County, OR
			Washington County, OR
			Yamhill County, OR
			Clark County, WA
	PMSA	Salem, OR	
			Marion County
			Polk County

APPENDIX D

COVER LETTER

DEPARTMENT OF APPAREL, INTERIORS,
HOUSING AND MERCHANDISING

OREGON STATE UNIVERSITY
224 Milam Hall · Corvallis, Oregon 97331-5101
Telephone 541-737-3796
Fax 541-737-0993

March 12, 1999

«FIRSTNAME» «LASTNAME»
«ADDRESS»
«CITY» «STATE» «ZIP»-«ZIPPLUS»

Dear «FIRSTNAME» «LASTNAME»:

We are writing to you as part of an effort to understand the opinions, awareness and use of universal design in single-family residential construction by Oregon home builders. The universal design concept includes design that is useable by most people, regardless of age or ability. The question is, which of these features are being used in housing construction today?

You are part of a state-wide study of the role of single-family home builders in the awareness and use of universal design. Your name was selected through a scientific sampling process from the list of contractors who specialize in single family housing construction which was provided by the Oregon Construction Contractors Board. For the results of our study to truly represent the opinions and experiences of home builders, it is important that you complete and return the enclosed questionnaire.

You may be assured of complete confidentiality. You will see an identification number on the front of the questionnaire. This is so your name can be checked off the mailing list when it is returned. Your name will not be placed on the questionnaire or associated with any of the information you provide. Please return the questionnaire in the enclosed stamped envelope as soon as possible.

We believe it is important that results of this study be brought to the attention of interested people including those concerned with establishing residential housing design standards and codes. If you would like a summary (it's free), please print "send results" along with your name and address on the back of the return envelope. Please do not place this information on the questionnaire itself.

Dr. Brandt or Ms. Wolford would be happy to answer any questions you may have about this study. Please write, call, or e-mail Dr. Brandt at (541) 737-0994 during business hours; e-mail for Dr. Brandt is brandtje@orst.edu; e-mail for Ms. Wolford is NLWolford@aol.com.

Thank you for your help with this important effort.

Sincerely,

Nancy Wolford
Graduate Student

Jeanette Brandt, Ph. D.
Associate Professor

APPENDIX E

FOLLOW-UP POST CARD

March 26, 1999

Two weeks ago a questionnaire seeking your opinions about universally designed housing was mailed to you. You and other Oregon home builders selected at random for this study represent the state-of-the-art in building single-family housing.

If you have already completed and returned the survey, please accept my sincere thanks. If not, please do so today. Because it has been sent to a small, but representative sample, it is very important that your response be included in the results.

If by some chance you did not receive the questionnaire, or it has been misplaced, please call Dr. Jeanette Brandt at 541-737-0994 and another will be sent to you.

Sincerely,

Nancy Wolford,
Doctoral Degree Candidate in Housing, Oregon State University

APPENDIX F

FOLLOW-UP LETTER

DEPARTMENT OF APPAREL, INTERIORS,
HOUSING AND MERCHANDISING

OREGON STATE UNIVERSITY
224 Milam Hall · Corvallis, Oregon 97331-5101
Telephone 541·737·3796
Fax 541·737·0993

April 26, 1999

«FIRSTNAME» «LASTNAME»
«ADDRESS»
«CITY» «STATE» «ZIP»-«ZIPPLUS»

Dear «FIRSTNAME» «LASTNAME»:

About six weeks ago we wrote seeking your participation in a study about your opinions and experiences building single-family houses with universal design features. As of today we have not yet received your completed questionnaire.

We are writing to you again because your opinions are very important to the success of this study. You are one of a small number being asked to help. For our results to truly represent single-family home builders and contractors in Oregon, it is essential that each person return the questionnaire.

In the event that your questionnaire has been misplaced, a replacement copy is enclosed. Please return it within the next week in the enclosed stamped envelope. All responses will be confidential.

If you have any questions regarding this research, please feel free to contact Dr. Brandt at (541) 737-0994 during business hours, or Ms. Wolford at (408) 356-2465.

Your help is greatly appreciated.

Sincerely,

Nancy Wolford
Graduate Student

Jeanette Brandt, Ph. D.
Associate Professor

APPENDIX G

COMPUTING WEIGHTS FOR DATA ANALYSIS

The weights for the data for inferential statistics were computed as follows:

Population of housing contractors: 6512

Metropolitan contractors = 4256/6512 = 65.4%/.500 = 1.31 (weight)

Nonmetropolitan contractors = 2256/6512 = 34.6%/.500 = .69 (weight)

APPENDIX H

OTHER UNIVERSAL DESIGN FEATURES (QUESTION 4)

Other Universal Design Feature	Number of Responses
Handicap toilets	2
Pull down seats in tub/shower	2
Sinks without cabinets underneath	2
Cutting boards in kitchen for wheelchair workspace	2
Exterior areas partially covered	2
Solar orientation of house/passive solar	2
Remote control draperies and windows	2
Remote door controls	2
Windows with tempered glass	2
Drains in floors of bath, mud room	1
Elevated toilets	1
GFI outlets	1
Outside faucets	1
Angled hallways, no 90-degree turns	1
Disposal access	1
Even ventilation	1
More drawers for kitchen cabinets	1
Use of natural lighting	1
Incorporated heating system	1
Multiple exterior exits	1
Personal elevators	1
Emergency door access	1
Alarm system	1
Insulation	1
Raised spigots in tub and shower	1
Storage on main floor	1
Lower front door peep hole	1
Separate tub/shower	1
No hallways	1
Efficient kitchen layout	1
Easy access from automobile	1
Skylights	1
Ridge vents	1
Telephone jacks in all rooms	1
Lighted switches	1
Voice activated controls	1
Electric, smart house	1

Note. Unweighted data.

APPENDIX I

OTHER TERM(S) FOR UNIVERSAL DESIGN (QUESTION 24)

Term	Number of Responses
Wheelchair friendly/house	3
User friendly	2
Common sense	2
Custom design	2
Standard safety features	2
Specialty friendly	1
Physically challenged needs	1
Unihomes	1
Standards	1
Code	1
Senior friendly	1
Tract homes	1
California Title 24	1
Alterable	1

Note. Unweighted data.

APPENDIX J

OTHER BARRIERS TO UNIVERSAL DESIGN USE (QUESTION 8)

Barrier	Number of Responses
Marketing/marketability, hard to sell/resell	9
Building codes	6
Impractical	4
Requires extra time	3
Small minority benefit	2
Experience of what works	1
Doesn't match what is existing	1
Speculative building	1
Total	27

Note. Unweighted data.

APPENDIX K

OTHER INCENTIVES TO ENCOURAGE USE OF UNIVERSAL DESIGN (QUESTION 9)

Incentive	Number of Responses
Easier to sell, appeal to a larger market	7
Public acceptance	6
Architect/designer recommendation to client	6
Decrease extra time/labor involved	6
Usage by other builders	2
Safety advantages	2
Customer satisfaction	2
Manufacturers help sell products/idea of universal design	2
Ease of use	2
Benefits to buyer	1
Universal design showroom	1
Competition	1
Feeling good about quality construction	1
Feasibility	1
Help with advertising	1
Easy to build	1
The right thing to do	1
Environment	1
Compliance to quality workmanship	1
Test market incentives	1
Discount from building department	1
Total	47

Note. Unweighted data.