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A HOUSING-DECISION FRAMEWORK: DEVELOPMENT AND APPLICATION

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ABSTRACT

This paper explains the theoretical bases and procedures used in developing and testing a housing-decision framework. The framework presented 1) assumes that consumer choice among housing alternatives is a function of available knowledge and predictability of intertemporal or future impact of a decision, and 2) requires the rating of six socio-economic and production factors on three conditions of choice resulting in an 18-cell matrix for assessing a housing-decision score (HDS). Four alternative housing types (active solar, passive solar, retrofitted and earth-sheltered) are evaluated using the housing-decision framework. Application of the framework results in the following HDS ranking: retrofitted 1, passive solar 2, active solar 3, and earth sheltered 4. Results of this procedure are then compared to three measures of consumer acceptance of the four alternatives from 1,804 respondents in the S-141 Southern region housing project, "Housing for Low- and Moderate- Income Families." For each of the three measures, consumer preferences for the four housing alternatives are consistent with consumer preference ranking from the application of the housing-decision framework.

During the past two decades, major modifications abound in conditions external to the family that affect housing choices available to consumers. Consumers often lack adequate knowledge of both the alternatives and the impact that some alternatives have.

The purpose of this paper is to identify the theoretical bases and procedures used in developing a housing-decision framework and in using the framework to understand consumer preferences for four housing alternatives. The framework developed relies heavily upon existing theory as well as on an accumulated body of knowledge related to the production and distribution of four energy-efficient alternative housing systems; retrofitted, passive solar, active solar

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and earth sheltered.

THEORETICAL FRAMEWORK

Literature on decision process, choice selection, and socio-economic and production aspects of housing provides the theoretical basis for the housing-decision framework.

Decision Process

According to Brim, Glass, David, Lavin and Goodman (1962) and Engel, Blackwell and Kollatt (1973), there are eight stages in the decision process. These include: 1) identifying or recognizing the problem, 2) determining information readily available, 3) obtaining additional necessary information, 4) defining possible solutions or actions, 5) evaluating such solutions, 6) selecting a strategy for performance, 7) performing an action, and 8) subsequent learning and revising based on the outcome.

The importance of the decision process in understanding consumer acceptance of housing alternatives is supported by the diffusion-of-innovation literature (Rogers, 1972; Rogers, 1983; Rogers and Shoemaker, 1971; and Solo and Rogers, 1972). A widely accepted concept is that the adoption of an innovation is the final stage in a multistage process in which a conscious decision is made to use an innovation on a continuing basis. This concept assumes that adopters either consciously or unconsciously move through five stages (awareness, interest, evaluation, trial and adoption) in a multistaged adoption process. Definitions of these five stages in the adoption process parallel steps four through eight in the decision process.

The consideration of innovations is often the result of steps one and two in the decision process. The decision to consider energy-efficient housing alternatives may be encouraged by discontent with the energy situation and knowledge of the availability of energy-efficient housing alternatives. In essence, movement through the adoption process for an innovation is movement through the decision process once a problem has been recognized and some knowledge of potential choices exists.

Knowledge of alternatives and the quality of information available to consumers is an important aspect of the decision process as well as the adoption of innovations process. The quality of information available to consumers is most important in the early stages of the adoption process according to Klonglan and Coward (1970). Their discussion of "symbolic adoption" vs. "use adoption" suggests that "symbolic adoption" or "symbolic rejection" refers to acceptance or rejection of the "idea" of the innovation and occurs following the evaluation stage in the adoption process. They discuss the importance of knowledge and information to the evaluation stage. In this scheme "use adoption" or "use rejection" refers to the acceptance or rejection of the "use" of innovation. On the basis of the concepts presented by Klonglan and Coward (1970), the movement from awareness to symbolic adoption of a housing innovation is controlled by the consumer, whereas movement from symbolic adoption to use adoption is supported, in part, by factors and conditions of the housing production, finance and distribution systems. Therefore, consumer knowledge and information is of great value to the demand side of the adoption process. Factors outside the consumers' sphere of influence (factors that may also include knowledge and information of intermediaries in the diffusion scheme) are critical to the supply side.

A basic assumption from the diffusion literature is that, as people move through the various stages in the adoption process, they are more likely to adopt the innovation. Because the adoption framework closely parallels the steps in the decision process, and because knowledge and information flow are important aspects in the adoption process, availability and quality of information could constrain or facilitate the decision process. According to Weber and McCray (1984),

> "Confusion exists regarding the benefits of various energy saving methods and the availability of alternative energy sources. Additionally, the reliability of available information has been questioned" (p. 1).

Access to dependable information on alternative sources of energy may reduce the deliberation time involved in the adoption of energy-efficient housing systems. Information available to the general public is sometimes deceptive and does not always focus on the conservation process. Analysis of cost-effectiveness data for various alternative energy systems is often unavailable. Consequently, potential users are often uncertain about problems and benefits of various systems as well as behavioral changes that might be involved in the adoption of the system. Even the knowledge level of decision makers who are involved in the production and distribution of housing varies along this dimension (Weber, Williams, and Larson, 1981).

Without accurate and reliable information, consumers may avoid the acceptance of a new idea or product. Based on the concepts from adoption/diffusion and decision-making literature, knowledge and information flow are recognized as important elements for inclusion in the housing-decision framework.

Economic Theories of Choice.

Economists generally discuss "choice" within the framework of modern utility theory. A basic element in utility theory is that the "utility and subjective probabilities assigned by a subject to a set of risky alternatives can be measured simultaneously and independently" (Howard, 1963, p. 80). In this sense, Dolan (1977) defines utility as "the pleasure, satisfaction, and need fulfillment that we get from the consumption of material goods and services" (p. 78).The element of risk refers to the quality and quantity of information that is available for each alternative.

Green and Wind (1973) discuss three basic choice situations: certainty, risk and uncertainty. In conditions of certainty, the decision-maker has complete knowledge of the outcome of each alternative. Lancaster (1976) suggests that under conditions of certainty, utility can be replaced with the concept of preference. In choosing among alternatives, consumers with perfect knowledge simply choose the alternatives they prefer. Choice in risky situations requires the consumer to choose among alternatives under conditions of imperfect knowledge. The consumer may know some probable consequences or expected outcomes, but the full impact of the decision is not known. In conditions of uncertainty, the individual cannot assign objective probabilities to the consequences of selecting one alternative from another (Green and Wind, 1973). According to Burns (1980), this factor (consideration of the future impact of a choice) is particularly relevant to energy decisions.

Because few consumers possess perfect knowledge of all factors related to production, supply and utilization of alternative housing, it appears useful to identify factors that pose risk and uncertainty for consumers. Uncertainty provides the second aspect of the framework.

Socio-Economic and Production Factors

The availability and utilization of housing is affected by numerous socio-economic and production factors. Because alternative housing imposes specific requirements that extend the magnitude of these factors, the impact of the factors on various housing types must be considered independently. Figure 1 identifies important dimensions of several socio-economic and production factors related to housing decisions in general and alternative housing decisions in particular.

DEVELOPMENT OF A HOUSING-DECISION FRAMEWORK

Defining the relationship between the three concepts presented above suggests a plausible theoretical framework for understanding consumer acceptance of housing. Included are 1) knowledge and information of consumers and housing intermediaries regarding alternative choices, 2) the degree of certainty affixed to intertemporal results of alternative choices, and 3) the identification of specific factors important to the housing decision. The interrelationship of these concepts, the housing-decision framework, can be summarized as follows: Choice among housing alternatives can be predicted on the basis of available knowledge of various socio-economic and production aspects of housing.

Assumptions of the housing-decision framework are 1) individual decision-makers differ in their possession of knowledge about various energy-efficient housing alternatives, 2) movement through the decision process is characterized by increased assimilation of available knowledge, and 3) the quality and quantity of information available to consumers about socio-economic and production factors associated with an alternative are the crucial ingredients in distinguishing choice under conditions of certainty, risk, and uncertainty.

The framework includes the knowledge level of housing consumers and housing intermediaries. The consumer's knowledge is assumed to predict the demand side of the market equation, and the intermediary's knowledge is assumed to predict the supply side.

Figure 1. Socio-Economic and Production Dimensions Related to Housing Decisions

GENERAL	EARTH-SHELTERED HOUSING	SOLAR
Economic		
Income - access to credit (Brown, 1978) Price - Quality (King and Summers, 1967; Brown, 1978) Net resale value (King and Summers, 1967; Brown, 1978) Dependable income(Wedin and Nygren, 1979) Overall costs and energy expenditures (Davis and Schubert, 1970) Uncertain estimation of value (Davis and Schubert, 1974)	Energy saving potential (Case and Warsco, 1981; Bligh, 1976; Fairhurst, 1976; Korell, 1979) Potential for increased construction costs(Weber and McCray,1984;Sterling, Aiken, Carmody, 1980) Lack of comparable prototypes (Sterling, et al., 1980) Uncertain resale value (Bligh, 1976; Scott,1980, Korell, 1979; Weber and McCray, 1984) Differing mortgage provisions (Bligh, 1976; Scott,1980, Korell, 1979; Weber and McCray, 1984) Market comparables and appraisals (Korell, 1979) Tax factors and insurance (Sterling, 1979).	Energy saving potential(Case & Warsco,1981) high initial cost, low operating costs and low environmental costs, (Bezdek and Maycock,1976).
Socio-cultural		
Compatability with values values and past experiences (Rogers and Shoemaker,1971; Combs and Madden,1983) Self-identity (Hayward, 1977) Social networks (Hayward, 1977) Childhood home (Hayward, 1977).	Social acceptability (Scott, 1980; Bligh, 1976).	Energy conscious life-style (Rogers & Shoemaker,1971 Innovative attitude (Case & Warsco,1981).
Lifestyle		
Activities, interest and consumption patterns (Wedin and Nygren, 1979) Concepts of comfort (Case and Warsco, 1981) Family characteristics (Dillman, Tremblay, and Dillman, 1977)	Energy behavior (Case and Warsco, 1981) Lack of prototypes (Weber and McCray, 1984).	Energy behavior(Case & Warsco,1981)Privacy violation (Case & (Case & Warsco, 1981) Comfort adjustments Case & Warsco, 1981;Hamrin, 1978;Lorriman, 1976; and Dillman et al., 1977).

(Figure 1 continued)

Aesthetics		
Consistency with design norms (McKown, 1975) Visual perceptions (Stoeckeler, 1980; Hanna and Lindamood, 1981) Style and appearance (Custom/Luxury Market,1982)	Depart from aesthetic norms (Sterling, 1979; McCray, Tremblay and Navin, 1985)	Considerations of aesthetic norms (Marylander Marketing Research Ind.,1976; Towles, 1978; Leonard-Barton, 1978; Wilson,1979)
Policy		
Knowledge of building Technology (Bezdek and Maycock, 1976) Restrictive zoning ordinances (Bezdek and Maycock, 1976) Interface with electric utilities (Bezdek and Maycock, 1976) Restrictive codes and ordinances (McCray, Baird, Weber and Day, 1984).	Prescriptive building codes (Labs, 1979; Impson and Impson, 1984; Perkins, 1980) Code officials (Bezdek and Maycock, 1976 Zoning codes (Labs, 1979; McCray, Baird, Weber and Day, 1984).	Solar air rights(Bezdek & Maycock,1976) 1976, Support national energy goals(Anderson & Michal,1987) Building Codes,(McCray, et al,1984)
Technical		
Fluctuation and instability in construction industry (Field and Rivkin, 1975) Size and orientation of firms (Field and Rivkin, 1975). Inexperienced labor market (Wilson, 1979).	Complicated design features (Impson and Impson, 1984) Lack of knowledge(Impson and Impson, 1984) Lack of standardization construction techniques and prototype designs Lane, 1979) Shortage of experienced architects & contractors and quality control during construction,(Boyer, 1980)	Variety of approaches (Anderson and Michal,1978) Difficulty in analyzing,predicting and evalu evaluating thermal performance(Anderson and Michal, 1978).

Although the present concern is with housing choice, and specifically choice among four energy-efficient housing alternatives, the framework presented is supported by Mann and Neff (1961) who state:

> "An individual's reaction to a change appears to be related directly to the clarity of his perception of the meaning of the change and his evaluation of the effect that the change will have on him as an individual with certain aspirations and expectations" (p.68).

The housing-decision framework is presented graphically in Figure 2. As presented, the framework requires the assignment of weights to each alternative on the basis of condition of choice related to knowledge of each socio-economic and production factor.

Figure 2. Housing-Decision Framework

Socio-economic and production factors	Conditions of choice related to knowledge Certainty Weight = 3	Risk Weight = 2	Uncertainty Weight = 1
Economic			
Socio-cultural			
Life-style			
Aesthetics			
Policy			
Technical			

DEFINITIONS

Conditions of choice:

Certainty - Complete knowledge of the outcome of the choice is available and the future impact is known.

Risk - Some information regarding outcome of the choice is available but future impact is somewhat unknown.

Uncertainty - No information or contradictory information is available and the future impact is not known

Socio-economic and production factors:

Economic - Economic factors related to housing decisions refer to initial and continuing costs of occupancy. Knowledge required to aid decision-making includes initial capital outlay, life-cycle and maintenance costs, resale value, potential available financing and approximate pay-back period.

Socio-cultural - Socio-cultural factors refer to the nature and meaning of space and how people use that space. Included are perceptions of crowding, density and privacy, preferences and evaluation of environments and effects of the environment on people.

Lifestyle - Lifestyle factors related to housing decisions refer to expectations for comfort and convenience. People's biological, psychological, and cultural peculiarities combine in defining acceptable comfort levels.

Aesthetic - Aesthetic factors include preferences for interior and exterior appearance. In this evaluation, design quality is not as important in the decision process as are consumers' likes and dislikes as well as general norms for appearance.

Policy - Policy factors affecting housing decisions include legal and regulatory considerations such as unresolved issues affecting air and sun rights, and building, zoning and other codes and ordinances.

Technical - Technical factors refer to the engineering and design aspects of a housing system or subsystem. Availability of materials, supplies and craftsmen, as well as adequate performance data, are important in the decision process.

In assigning weights, each alternative is entered in a cell corresponding to the assigned condition of choice for each socio-economic and/or production factor.

Mathematically, the housing-decision framework can be represented by the following formula:

$$\text{Housing Decision Score (HDS)} = \sum_{i=1}^{6} \sum_{j=1}^{3} C_{ij}$$

where C_{ij} is the cell value of the ith row and jth column.

For each row, two Cij values will be equal to zero and the third will have a value corresponding to the condition of choice checked. The formula is used in obtaining a housing-decision score (HDS) for each alternative. As the HDS increases, more information is available to consumers, thus enabling them to make sound decisions.

APPLICATION OF THE HOUSING-DECISION FRAMEWORK

On the basis of accumulated information about the four energy-efficient housing alternatives under consideration, each alternative is assigned a condition of choice weight for the six socio-economic and production factors. The four energy-efficient housing alternatives are defined as follows:

Retrofitted/Energy Improved Housing Unit - The addition of materials and devices to an existing structure for the purpose of increasing energy efficiency.

Passive Solar House - A housing unit that relies on natural gravity or convection currents to transfer solar energy to the living space. Site orientation and design features of the structure are important in determining the quality and quantity of solar radiation that enters the structure.

Active Solar House - A housing unit with accompanying mechanical devices designed to collect solar energy and transfer this energy into interior use. The active solar system commonly includes solar collection panels, a storage medium, and a set of automatic controls that regulate both energy collection and delivery between the storage medium and the living space.

Earth-Sheltered/Underground House - A housing unit that has 50 percent or more of the exterior shell covered by earth. The covering provides increased energy efficiency by reducing air infiltration and creating a thermal mass.

Assignment of each alternative to various cells within the framework was based on the quality and quantity of knowledge/information (about that alternative) available for each socio-economic and production factor. Figure 3 shows the results of this procedure.

Application of the mathematical framework to the cell assignments in Figure 3 provides the following Housing Decision Score for each alternative: Retrofitted (RTF) = 16, Passive Solar (PS) = 10, Active Solar (AS) = 9 and Earth-sheltered (ESH) = 6. For example, if one notes the conditions of choice indicated for PS in Figure 3, then the C_{ij} values in the HDS formula have the following values: $C_{13} = 1$, $C_{22} = 2$, $C_{33} = 1$, $C_{41} = 3$, $C_{52} = 2$, and $C_{63} = 1$ and all other $C_{ij} = 0$. Hence the total HDS for PS is equal to 10.

Comparison Of Housing-Decision Scores To Consumer Preference Data

Following the application of the housing-decision framework to the four alternatives under consideration, the housing-decision scores are compared to consumer preference data from the S-141 Southern region housing project, "Housing for Low- and Moderate- Income Families." The S-141 sample consists of 1,804 U. S. nonfarm households residing in 28 non-SMSA counties in seven Southern states. Households in each county are randomly selected from the 1980 property tax roll for the respective county. Any occupied housing unit on the selected property is included in the sample regardless of tenure status. Over-sampling of 2 1/2 times or more the number of household surveys needed in each county provides an alternate sample list to allow for ineligible households, nonresidential properties, unoccupied housing units, and refusals. A detailed description of the sampling plan and the procedures for data collection are presented by the S-141 Technical Committee (1983).

Figure 3. Application of Housing-Decision Framework to Four Energy-Efficient Housing Alternatives.

Socio-economic and production factors	Conditions of choice related to knowledge Certainty Weight = 3	 Risk Weight = 2	 Uncertainty Weight = 1
Economic	None Perfect knowledge of all economic aspects does not exist for any alternative. C_{ij}	RTF Information is gen erally available regarding financing and initial cost outlay. C_{ij}	AS,PS,ESH Basic information is lacking or uncertain for all economic aspects associated with these three alternatives. C_{ij}
Socio-cultural	RTF Since retrofitting is the application of energy features to an existing house, consumers have prior knowledge of these factors. C_{ij}	AS, PS The similarity of these alternatives to conventional in design and layout provides a basis on which consumers can predict socio-cultural congruence. C_{ij}	ESH The nontraditional envions of ESH negate available knowledge of the intertemporal social and psychological results of hability. C_{ij}
Lifestyle	RTF By definition of RIF this alternative provides comfort and convenience consistent with conventional housing. C_{ij}	AS Level of comfort and convenience as of AS is dependent on the quality of the solar system installed and the utilization of the required back-up system. C_{ij}	PS, ESH Level of comfort and convenience of these alternatives is determined by the interaction of site selection, soil condition and other factors peculiar to a single unit. Since each unit reacts differently, lifestyle factors cannot be predicted. C_{ij}

(Figure 3 continued)

Aesthetic	RTF, PS Similarity to aes thetic norms for housing allows consumers to choose on the basis of likes and/or dislikes. C_{ij}	AS Specific design requirements for roof slope and application of solar panel depart from aesthetic norms. C_{ij}	ESH Design requirements depart from aesthetic norms. Such norms must be suppressed in favor of other socio-economic and production factors. The degree to which consumers are willing to do this is unknown. C_{ij}
Policy	RTF Bv definition, policy issues affecting RIF are the same as for conventional. Consequently, knowledge is available. C_{ij}	PS Unresolved issues affecting air and solar access result in imperfect knowledge of the intertemporal impact. C_{ij}	ESH Air and solar access are the major policy issues resulting in imperfect knowledge of intertemporal results of AS and ESH. Additionally building codes may impede construction of AS, while Building and Zoning ordinances may impede construction of ESH. C_{ij}
Technical	None Complete knowledge of all technical aspects is lacking for all alternatives	RTF Some technical information is available, however knowledge of optimum application of interacting energy features is not known.	AS, PS, ESH Some technical information is available. However, knowledge of optimum application of interacting energy features is not known and information

(Figure 3 continued)

			regarding design and construction aspects of the systems is often contradictory.
	C_{ij}	C_{ij}	C_{ij}

RTF=Retrofitted PS=Passive Solar AS=Active Solar
ESH=Earth Sheltered

Consumer perceptions of conventional and alternative housing types were studied. The housing types were introduced to the respondents via a "show and tell" workbook that included lay definitions and four black and white photographs and/or diagrams of each housing type.

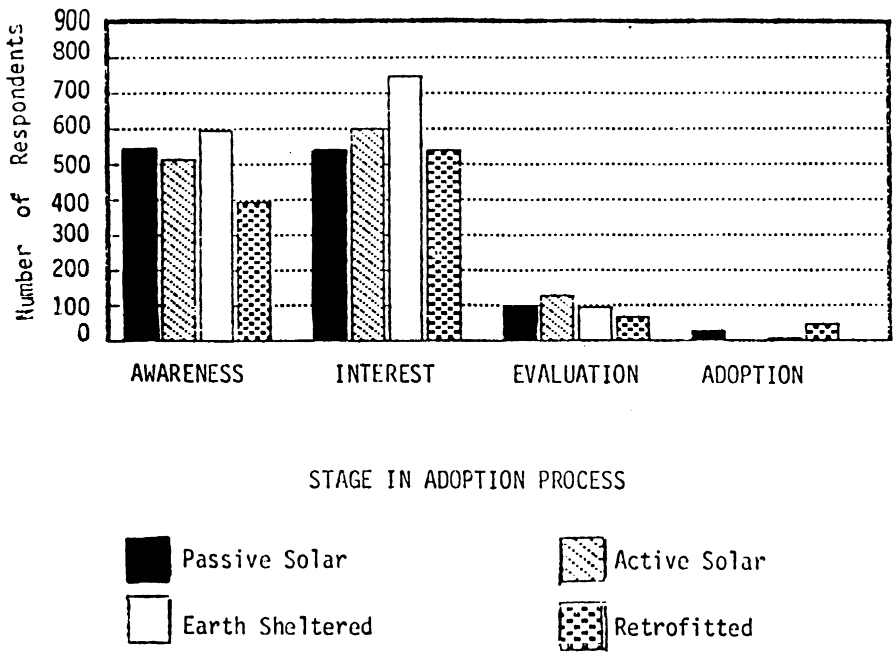
The three measures of consumer perceptions studied are: "Knowledge of alternative housing types," "willingness to consider" and "house ranks." For the knowledge variable, a knowledge index was developed based on research findings by Rogers and Shoemaker (1971) that describe the process by which individuals become aware of an innovation and subsequently move through intermediate stages of interest, evaluation and trial to adoption or rejection of the innovation.

Respondents were asked to respond to five bipolar variables relating to knowledge of each housing type. Each bipolar variable represented a single stage in the adoption process from "never heard of" to "lived in." A numerical value from 0 to 7 was assigned each positive response as follows: no response/never heard of unaware--0, heard about only (awareness)--1, heard and read about (interest)--2, read about or seen only (interest)--3, heard about and seen or read about and seen (interest)--4, sought information about (interest)--5, attempted evaluation (evaluation)--6, and lived in (trial or adoption)--7.

Figure 4 presents the stage in adoption of each alternative for the 1,804 respondents. These data show that respondents are knowledgeable of the alternatives, with the largest number of respondents in the interest stage for each alternative. Although less than fifty respondents were in the trial/adoption stage for any alternative, the distribution of trial/adopters for the four alternatives directly parallels the hierarchy of HDS for the four alternatives (retrofitted, passive solar, active solar and earth sheltered).

The second variable, "Willingness to consider," was based on responses to the question, "If you were moving into a new or different home, would you consider the alternative under question?" A Likert-type scale ranging from "definitely would consider" (1) to "definitely would not consider" (5) was used to assign numerical value to the "willingness to consider" measure.

Figure 4. Stage in Adoption of Alternative Housing



The mean and standard deviations for the 1,804 respondents on the willingness-to-consider variable suggests that respondents are generally more willing to consider the retrofitted, passive solar and active solar alternatives (means are 2.41, 2.62 and 2.77 respectively), but are less willing to consider the earth-sheltered alternative (mean is 3.49). Again, the ordering of the names on this measure of consumer perceptions parallels the HDS hierarchy.

Table 1. Willingness to Consider Alternative Housing Types

Housing Type	Mean*	Standard Deviation
Retrofitted	2.41	1.21
Passive Solar	2.62	1.25
Active Solar	2.77	1.29
Earth Sheltered	3.49	1.49

*Based on Likert-Scale responses from 1 (definitely would consider) to 5 (definitely would not consider).

The final consumer perception variable, "house ranks," is measured by asking respondents to rank each housing type in the order of preference from 1 to 7 (1 represented the home liked best and 7 the home liked least). The apartment/multifamily, conventional and manufactured/mobile housing types examined in the survey are included in the ranking making the 1-to-7 range. However, since they are not included in the energy-efficient alternatives under consideration, their means are not presented. Table 2 presents the mean rankings and standard deviation of the four alternatives. Observation of the means in Table 2 also shows that consumer preferences for alternative housing types parallel the respondents' willingness to consider the four alternatives as well as the HDS resulting from the application of the housing-decision framework.

DISCUSSION AND CONCLUSIONS

The long-term economic and social-psychological impact of housing decisions is unquestioned, yet numerous factors affect consumers' ability to choose among various housing alternatives. Given the limitations in the existing housing-decision knowledge base, an attempt is made to develop a housing-decision framework that can be used in comparing various housing alternatives. In the current effort, the framework is applied only to energy-efficient alternatives, yet its potential application to other housing decisions is promising.

The specific components of the housing-decision framework are quality and quantity of information, degree of certainty/uncertainty

Table 2. House Ranks of Alternative Housing Types

Housing Type	Mean*	Standard Deviation*
Retrofitted	3.3	1.44
Passive Solar	3.7	1.45
Active Solar	3.9	1.60
Earth Sheltered	5.1	2.04

* Based on 1,804 responses ranking indicated alternative housing type among 7 choices.

of choice, and socio-economic and production factors related to housing. The quality and quantity of information regarding socio-economic and production factors aid consumers in affixing degree of certainty to the intertemporal impact of a particular housing choice. In this sense, the housing-decision framework is a knowledge-based instrument developed on the assumption that consumers are more likely to choose alternatives on the basis of knowledge and predictability of future implications.

Although consumers actually make housing decisions, available knowledge to housing intermediaries (builders, suppliers, lenders, code officials, appraisers, etc.) affects choices available to consumers. In fact, economic, policy and technical issues could be classified as supply-side factors since they directly affect the production and distribution of housing.

In line with this reasoning, four alternative housing types (active solar, passive solar, retrofitted and earth-sheltered) are evaluated using the housing-decision framework. The framework requires the rating of six socio-economic and production factors (economic, socio-cultural, life-style, aesthetic, policy and technical) on three conditions of choice (choice under certainty, choice under risk and choice under uncertainty) resulting in an 19-cell matrix for assessing a housing-decision score (HDS) for the various alternatives. The resulting scores are retrofitted (16), passive solar (10), active solar ((9) and earth sheltered (6). The higher HDS indicates that a greater quality and quantity of information about the alternative is available.

Consumer preference data for the four alternatives from 1,804 respondents of the S-141 Southern Region Housing Project are compared to the results of the housing-decision framework. The consumer data includes three measures of consumer perceptions: knowledge/stage in adoption process, willingness to consider each alternative and preferential ranking of the alternatives. In all instances, consumer response to the alternatives is ordered in the same hierarchy as the housing-decision scores. Consumers are more knowledgeable of and preferred alternatives in this order:

retrofitted, passive solar, active solar and earth sheltered. If the housing-decision framework is accurate, lack of information forces decisions supporting the retrofitting of conventional housing as opposed to the adoption of other innovations.

This effort in developing a housing-decision framework provides a foundation for exploring multiple factors that influence housing decisions. There are two limitations in this exploratory effort. First, the framework as currently constructed assumes that all six socio-economic and production factors are equally important to all consumers. This may or may not be true. Research that measures the relative importance of the factors is needed. Second, the framework is applied only to consumer choice among four energy-efficient housing alternatives. The application of the framework to other housing decisions is necessary in assessing its worth. A potential problem in applying the framework to other housing decisions relates to identifying potential socio-economic and production factors associated with choice among the possible alternatives. The factors in the current framework are included on the basis of a literature review. This same type of inquiry would be necessary if the framework were to be applied to choices among other alternatives. Nonetheless, the concept of assessing the interrelationship of degree of certainty surrounding the knowledge of important factors in the housing-decision process appears appropriate.

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