

An empirical analysis of an innovative application for an underutilized resource: Small-diameter roundwood in recreational buildings

Randall Cantrell*

Dorothy Paun*

Susan LeVan-Green*

Abstract

Builders were surveyed to explore perceptions regarding small-diameter roundwood (SDR). The study empirically tests a model of builders' attitudes and opinions about using SDR as a building material in recreational buildings. Findings suggest that, of the 130 builders surveyed, most are likely to use SDR in recreational buildings when it meets the following criteria: 1) a pleasing aesthetic that blends in with the environment; 2) easy and convenient to work with; 3) readily available and long lasting; and 4) when they are empowered to make SDR purchase decisions. Additionally, builders are segmented into propensity-to-innovate groups, and marketing strategies are discussed. Ready Builders should be given SDR information through technical reports or building or purchasing trade journals. Interested Builders should be targeted through SDR salespeople, who receive in-depth SDR sales training. Cautious Builders can be reached through selling complete solutions for SDR recreational buildings, such as a bundled product that offers all needed features, functions, and technical support, as well as an attractive price. The importance of this research is that it enhances our understanding of what augments or detracts from the decision to use SDR in recreational buildings and as such may offer entrepreneurs insights into profitable SDR opportunities.

It is widely believed that the supply of small-diameter roundwood (SDR) will continue to exceed demand due to government policy and regulations, forest ownership and management practices, and environmental and political considerations. LeVan-Green and Livingston (2001) report that where dense stands of SDR exist, fire and disease manifest. To foster forest health and reduce fire, several researchers (Paun and Jackson 2000, LeVan-Green and Livingston 2001, Paun and Wright 2001) suggest proactive forest management focused on extracting SDR. Unfortunately, it has been reported that SDR is perceived as having marginal value regarding quality and costs (Smith and Briggs 1986,

Barbour et al. 1995). We view these perceptions as "misconceptions" and suggest that both technical and marketing advances can contribute to a better understanding of SDR's many benefits. To investigate technical issues, the Forest Products Laboratory (FPL) conducts ongoing SDR research (<http://www.fpl.fs.fed.us/tmu/>

[small-diameter.htm](http://www.fpl.fs.fed.us/tmu/small-diameter.htm)) and provides the technical expertise needed for innovative SDR-based building applications. For example, two information kiosks were built and installed at the 2002 Olympics to demonstrate the effective use of SDR for roof trusses and vertical supports. Also, successful technology transfers of new SDR

The authors are, respectively, Former PhD Candidate (now a Market Analyst, NAHB Research Center Upper Merion, MD) and Associate Professor, Univ. of Washington, Box 352100, Seattle, WA 98195; and Program Manager, USDA Forest Serv., Forest Prod. Lab., One Gifford Pinchot Dr., Madison, WI 53726. This research was supported by the USDA Forest Service State & Private Forestry Technology Marketing Unit at the Forest Products Laboratory. This paper was received for publication in February 2003. Article No. 9624.

*Forest Products Society Member.

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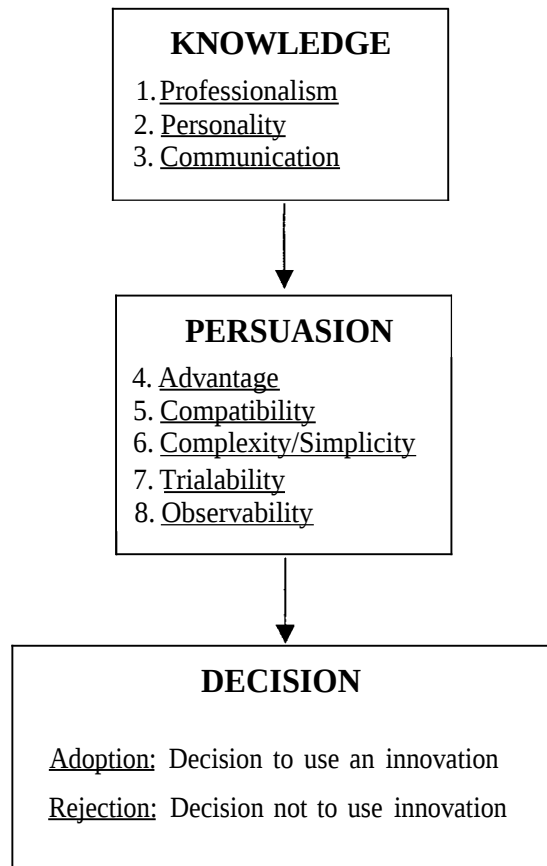


Figure 1. – Rogers' model for describing stages in the innovation diffusion process.

building technologies have been realized in several rural communities, including the La Madera Forest Products Association in New Mexico, builders of SDR-based sheds and farm structures, and a Navajo community in Arizona that builds SDR-based Hogan structures.

Marketing information gaps must be closed if engineers, architects, builders, and others are to become aware of and insist on SDR as a building material. Wolfe (2000) believes that a lack of information inhibits SDR's use in structural applications and he stresses the need for improved marketing communications. He contends that educating targeted markets (builders) about SDR's building applications will increase demand. Stem (2001) has said that SDR as a building material will not be marketed successfully until appropriate uses are understood. Paun and Wright (2001) stated that sellers of SDR need a marketing orientation (e.g., Jaworski and Kohli 1993) or a "we sell what is needed by our customers" philosophy. The reluctance of buyers to purchase SDR suggests that it is an "unsought" good, so sellers must actively pursue buyers, show buyers

how SDR can satisfy their building needs, and establish long-term business relationships to keep lines of communication and learning open (Paun 1997).

Research objectives

Many stakeholders, including government, corporate, and private timberland owners, are concerned about how to best manage SDR, and that entails increasing SDR's perceived value among potential buyers. While SDR is not a new building material, its structural use constitutes an engineering innovation. The objective of this research is to conduct an empirical test, based on Rogers' (1995) innovation diffusion model, of building professionals' attitudes, opinions, and perceptions regarding the use of SDR as a building material in recreational structures. The importance of this research is that it will enhance our understanding of what augments or detracts from the SDR adoption and use process.

Model and hypotheses

In 1962, Rogers defined diffusion as the dissemination of a new product or idea from its source of invention to users, and innovation as the degree to

which a user adopts an innovation earlier than others (Rogers 1995). Rogers' theory suggests that buyers move through five stages in the innovation decision process: knowledge (understanding the innovation), persuasion (developing a favorable attitude toward the innovation), decision (adopting the innovation), implementation (using the innovation), and confirmation (reinforcing the adoption decision). Because SDR-based recreational buildings occupy the introduction stage of their product life cycle, Rogers' model is a useful framework for strategizing how to best assist buyers in the SDR adoption process. This study tests the predictive ability of Rogers' first three stages: knowledge, persuasion, and decision (Fig. 1).

The knowledge phase, occurring while the potential adopter becomes informed about the innovation, consists of three personal characteristics: socioeconomic status (renamed Professionalism for this publication), Personality, and Communication. Professionalism refers to workplace characteristics such as level of training or education, having a job with more status, and being empowered to make decisions. According to Rogers, Personality is having empathy for others, possessing a more favorable attitude toward education, and being motivated by achievement. Communication refers to being a part of a highly interconnected social system, networking outside one's social system, and exposure to mass media communication channels.

The persuasion phase, which happens while the potential adopter is forming a favorable or unfavorable attitude, consists of five perceived characteristics of the innovation: Advantage, Compatibility, Complexity, Trialability, and Observability. Advantage refers to the degree that an innovation is perceived as being superior to previous innovations; as Advantage increases, so does the adoption rate. Compatibility refers to the degree that an innovation is perceived to match the values and experiences of the adopter; when similar, faster adoption occurs. Complexity is the difficulty of understanding and using the innovation. Adoption increases when an innovation is relatively easy to use, so in this study we refer to this stage as Simplicity to underscore the importance of ease of use. Trialability is the degree of access that adopters have to experiment or rent an innovation, which

Table 1. — Hypotheses and Cronbach's (alpha) reliability measures.

Hypothesis	Determinants of SDR adoption	Variable label	Hypothesized relationship	Alpha
H ₁	Professional status of builder	PRO	Positive	.61
H ₂	Personality of builder	PERSON	Positive	.41
H ₃	Communication of builder	COM	Positive	.79
H ₄	Advantage of innovation	ADV	Positive	.64
H ₅	Innovation compatibility	COMPAT	Positive	.34
H ₆	Simplicity of innovation	SIMPLE	Positive	.84
H ₇	Trialability of innovation	TRIAL	Positive	.62
H ₈	Observability of innovation	OBSERVE	Positive	.80

serves to reduce uncertainty and increase the adoption rate. Observability means having the results of the innovation be visible and discernible to others; this is positively correlated with an innovation's adoption rate.

Lastly, the decision phase involves activities that lead to a choice between adoption (decision to use the innovation) or rejection (decision not to use the innovation). In sum, **Table 1** presents hypotheses for predicting when the likelihood increases for adopting SDR. As will be discussed shortly, hypotheses with alpha values greater than .60 possess sufficient reliability for testing their respective influence on increasing adoption (Nunnally 1967).

Methods

Sample

SDR is well suited for aesthetic and structural use in recreational buildings, so the sample was comprised of government building professionals who are involved in construction materials selection and design processes for recreational buildings. Architects and building designers represented both federal (USDA Forest Service, National Park Service, Bureau of Land Management) and state organizations (Departments of Parks and Transportation).

Questionnaire

Measures development. — A four page questionnaire was designed, primarily using a seven-point Likert-like scale, to determine to what degree builders would consider using SDR as a recreational building material. The questionnaire underwent extensive pre-testing, for clarity and comprehensiveness, by building professionals and academics. A first set of questions examined factors associated with innovation and adoption or acceptance of SDR as a building material. Respondents were asked the degree to which certain factors

(appearance, value) would impact their acceptance of using SDR in recreational buildings, ranging from "no impact" to "high impact." A second set of questions asked respondents their opinions on attributes associated with innovative builders. Respondents were asked to what degree they associated certain attributes (motivated by achievement, willingness to accept new ideas) with innovative designers, ranging from "not very important" to "most important." Another question asked respondents about their likelihood of using SDR. Lastly, demographic and other background information on the respondents was gathered (building experiences, years of employment, geographic region).

Measures of reliability for the independent variables. —Using Varimax rotation, principal component factor analysis was conducted on 27 items from the questionnaire, which represented Rogers' 8 constructs. To assess construct reliability, the factors were tested using Cronbach's alpha (Lattin et al. 2003). As **Table 1** shows, the exploratory factor analysis and associated Cronbach alphas generated six constructs with an alpha greater than .60, thus acceptable as predictors of adoption (Nunnally 1967).

Professionalism ($\alpha = .61$) deals with builders' knowledge and empowerment. Builders more likely to adopt SDR in recreational buildings tend to be more knowledgeable about SDR, authorized to make building materials purchasing decisions, members of professional organizations, and motivated by achievement. Rogers (1995) reported that Personality was difficult to measure, and we found this to be the case with an alpha of .41. This may be attributable to lack of construct clarity. For example, Rogers said that a component of Personality was achievement motivation, yet we found that achievement loaded on Professionalism.

The third hypothesis, Communication ($\alpha = .79$), was measured by asking about partnering opportunities and supportive government policies and funding. Builders will have a higher propensity to use SDR as a building material in recreational buildings to the degree that federal seed funding or other forms of partnering are available. Advantage (.64) measures the superiority of SDR as a building material. The acceptance of SDR in recreational buildings will increase if SDR use results in superior recreational building designs that require low maintenance. Compatibility, with an alpha of .34, received the least support for reliability. It is thought that this construct was poorly operationalized in asking only about the compatibility of building designs and contractors.

The sixth hypothesis, Simplicity ($\alpha = .84$), measures the ease of understanding and working with SDR. Builders will be inclined to adopt SDR as a building material if they see SDR demonstration buildings like the FPL 2002 Olympic kiosks, are familiar with SDR as a building material, associate SDR with ease of construction, know that SDR joinery connections are reliable, perceive that SDR represents good construction value, expect that there will be continued SDR design improvements, and believe that SDR is a "green" building material. Trialability ($\alpha = .62$) was measured when asking about trying or using SDR. SDR will be used increasingly in recreational buildings to the degree that SDR is readily available as a building material, has a long service life, and when a builder is environmentally inclined and open to new ideas. Observability ($\alpha = .80$) measures the appearance or feel of a recreational building that is constructed from SDR. SDR adoption as a building material will be enhanced if the resultant recreational building is seen as blending in with the environment, having a traditional ap-

Table 2.— Experience with recreational buildings.

Respondents	n	Experience
Forest service	50	More
State parks	41	More
Control group	39	Some or less
National Parks Service	21	Some
Dept. of Transportation	12	Less
Bureau of Land Management	6	Some
Total	130	

pearance, and possessing a pleasing aesthetic.

Measures of organization and experience. — The sample consists of building professionals from five federal and state government organizations. Because respondents varied in their involvement (more, some, less) with designing and building recreational buildings, three groups emerged. That is, the majority of respondents from the Forest Service and State Parks played an integral role in all stages of constructing recreational buildings. However, respondents from the National Parks Service, Department of Transportation, and Bureau of Land Management had little or no role in the construction process. These three organizations were grouped as a control because, as a less-involved group, their responses were anticipated to vary from those of the other two more involved groups (Forest Service and State Parks). This labeling essentially was designed as a means of capturing additional variation between groups. **Table 2** reports these groups, which form the basis for dummy variables that will be discussed shortly.

Dependent variable. — Rogers believed that people vary in their innovativeness, and he proposed five adopter groups. Innovators (2.5% of the people) are venturesome, will try new ideas, and are not risk averse. Early Adopters (13.5%) are opinion leaders who adopt early but carefully so as to not jeopardize

the respect they have earned from peers. The Early Majority (34%) adopt earlier than the majority but are rarely opinion leaders. The Late Majority (34%) are skeptical and adopt only after the majority has tried it. Laggards (16%) are traditional, uncomfortable with change, and adopt only when it becomes a tradition itself.

Respondents were asked this open-ended question: “How likely are you to consider using SDR?” We have taken the liberty of renaming Rogers’ five adopter categories to reflect the applied nature of this research: Ready to Adopt SDR (Innovator), Interested in Adopting SDR (Early Adopters), Cautious About Adopting SDR (Early Majority), Hesitant About Adopting SDR (Late Majority), and Doubtful About Adopting SDR (Laggards). Our five adopter groups were not defined by Rogers’ percentiles but rather on the content of responses. Ready respondents said they were “very likely” to use SDR, and were assigned for data analysis a 100 percent likelihood of adopting. Interested respondents gave a favorable but less definitive response of “likely” to use SDR, and were assigned a 75 percent likelihood of adopting. Cautious respondents were affirmative about using SDR but followed with a qualifier (“I may use SDR, if performance data are available..”), and were assigned a 50 percent likelihood of adopting. Hesitant respondents first

qualified their affirmative response (“If there is more information on SDR’s structural properties, then I may use SDR”), and were assigned a 25 percent likelihood of adopting. Doubtful respondents commented negatively (“not very likely” to use SDR), and were assigned a 0 percent likelihood of adopting. In sum, adoption probabilities range from 0 to 1.

Study findings

Response rates

There were 390 questionnaires mailed, and 130 responses were received for an effective response rate of 33.3 percent. Individual agency response rates were: Forest Service (32.5%), National Parks Service (26.3%), Bureau of Land Management (42.9%), State Parks (82.0%), and Department of Transportation (13.0%). No late-response bias was detected after an analysis using the Armstrong and Overton (1977) method.

Demographics

Respondents said that their experiences with recreational buildings included designing (86%), building (70%), general contracting (68%), and remodeling (68%). They have worked for their current employer, on average, for 19 years. This suggests that respondents have considerable work experience as well as employee loyalty. All regions in the United States were represented: Intermountain (26%), Southeast (19%), West Coast (17%), Midwest (17%), Northeast (15%), and Southwest (6%).

Adoption of SDR in recreational buildings

Respondents’ attitudes about using SDR in recreational buildings are reported in **Table 3**. As mentioned earlier, the adoption propensities associated with each adopter category differ markedly between this study and Rogers’ study. His Innovators are hypothesized

Table 3. — Respondents’ varying propensities to use SDR in recreational buildings.

Organization	Ready adopter segment	Interested adopter segment	Cautious adopter segment	Hesitant adopter segment	Doubtful adopter segment	Organization ^a
----- (%) -----						
Bureau of Land Management	50	25	0	25	0	75
National Parks Service	33	28	22	6	11	66
Forest Service	31	21	17	19	12	60
State Parks	23	13	28	18	18	51
Dept. of Transportation	17	25	8	42	8	50
Overall sample percent	28	20	20	19	13	58

^aNumber of respondents per adopter segment multiplied times its likelihood of adopting SDR.

Table 4. — Factor intercorrelations (based on factors derived from exploratory factor analysis).^a

	H ₁	H ₂	H ₃	H ₄	H ₅	H ₆	H ₇	H ₈	D ₁	I ₁
H ₁ PRO	1.00									
H ₂ PERSON	-.002	1.00								
H ₃ COM	.016	-.017	1.00							
H ₄ ADV	-.002	-.007	-.014	1.00						
H ₅ COMPAT	.003	.015	.035	.013	1.00					
H ₆ SIMPLE	-.012	.001	.034	0.00	-.002	1.00				
H ₇ TRIAL	-.005	0.00	.016	0.00	-.001	-.009	1.00			
H ₈ OBSERVE	-.003	-0.04	-.002	-.003	0.07	-.004	-.002	1.00		
D SP	.029	.019	-.097	.025	.001	.150	-.051	.117	1.00	
I FS*SIMPLE	-.013	.072	-.096	.032	-.056	.462	.301	-.028	.046	1.00

^a Boldface indicates a correlation significant at the 0.01 level (2-tail); D = dummy; SP = State Parks; I = interaction; FS = Forest Service.

to be 2.5 percent of the population while our Ready to Adopt group is 28 percent; his Early Adopters are 13.5 percent while our Interested group is 20 percent; his Early Majority group is expected to be 34 percent and our Cautious group is 20 percent; his Late Majority group is 34 percent while our Hesitant group is 19 percent; and his Laggards are 16 percent while our Doubtful group is 13 percent. This suggests that the respondents are much more likely to adopt or use SDR in recreational buildings than we expected, or as would be predicted by Rogers' innovation theory, which is encouraging news for sellers of SDR.

A comparison among the organizations provides interesting insights, mainly the difference between federal and state government builders. Organization percentages are the number of respondents per adopter segment multiplied by its likelihood of adopting SDR. The Bureau of Land Management respondents reported the most interest (75%) in adopting SDR in recreational buildings; however, it should be acknowledged that this group had only six respondents (only 5% of the sample). National Parks Service respondents rank second, 66 percent indicated that they would use SDR, while 60 percent of the Forest Service respondents said they would use SDR in recreational buildings. Both state government respondents, State Parks (51%) and Department of Transportation (50%), indicated less interest in SDR. Also, Forest Service, National Parks Service, and Bureau of Land Management respondents can be characterized as having more Ready Builders than any other type; whereas the majority of State Parks builders are Cautious and Depart-

ment of Transportation builders are Hesitant.

Overall sample percents, which will be discussed under cluster study findings, are the percent of the respondents associated with each adopter segment. For example, 28 percent of the sample is ready to use SDR and belongs to the Ready Adopter Segment. The overall sample percentage suggests that respondents have a 58 percent propensity to adopt SDR.

Multiple regression analysis

To test the hypotheses of influences on SDR adoption, multiple regression was used. Additional variables were created to explore less intuitive associations, including dummy variables representing three building professionals groups (Table 2) and interaction terms consisting of dummy variables that were multiplicatively combined with the hypotheses (main effects).

Stepwise regression was used and the multi-item scales were subjected to exploratory factor analysis, thereby minimizing any possible instability of the beta coefficients caused by multicollinearity. Table 4 summarizes the factor intercorrelations among the independent variables, dummy variable, and interaction term. The interaction term (I₁) FS*SIMPLE is significantly correlated, as expected, with the related Simplicity construct (H₆) and (H₇) Trialability. While these intercorrelations indicate some redundancy in these constructs' measures, the reduced power arising from multicollinearity is not viewed as sufficient to be a validity threat.

Table 5 reports multiple regression results using all adoption constructs in a stepwise elimination. The stepwise estimated regression equation below ex-

plains 17.8 percent of the variance in the likelihood to adopt SDR, an amount significantly greater than zero ($r^2 = .178$; $F_{6,104} = 2.219$; $p < .005$).

$$\text{ADOPT} = .622 + .082\text{OBSERVE} + .081\text{SIMPLE} + .064\text{PRO} + .061\text{TRIAL} - .148\text{D} - .152\text{I}$$

where:

OBSERVE = observability of an innovation

SIMPLE = simplicity of an innovation

PRO = professionalism of a builder

TRIAL = trialability of an innovation

D = dummy variable representing State Parks

I = interaction term between Forest Service and Simplicity

Main effects. — Of the eight possible main effects representing Rogers' adoption hypotheses, two (Personality and Compatibility) did not meet reliability criteria ($\alpha > .60$). Of the remaining six (Table 5), four main effects are significant and positively related to the adoption of SDR: (H₈) Observability, (H₆) Simplicity, (H₇) Trialability, and (H₁) Professionalism.

Dummy variable effects. — Inclusion of the three grouping variables revealed a fifth significant finding, that State Parks builders seem to be less willing to use SDR in recreational buildings. When all other variables are held constant, there is a negative effect on adoption rates by State Parks builders who work directly with recreational buildings ($b = -.148$, $p < .038$). A reason for this may be that state recreational building professionals may not be as in-

Table 5. — Multiple regression results for adopting SDR (using stepwise elimination).^a

Hypothesis	Determinants of adoption	Variable label	Stepwise <i>p</i> -value
H ₁	Professionalism of builder	PRO	.048
H ₂	Personality of builder	PERSON	Not supported
H ₃	Communication of builder	COM	Not supported
H ₄	Advantage of innovation	ADV	Not supported
H ₅	Innovation compatibility	COMPAT	Not supported
H ₆	Simplicity of innovation	SIMPLE	.030
H ₇	Trialability of innovation	TRIAL	.075
H ₈	Observability of innovation	OBSERVE	.013
D	State Parks	SP	.038
I	Forest Service* Simplicity	FS*SIMPLE	.072

^aD = dummy; SP = State parks; I = interaction; FS = Forest Service.

Determinants of adoption	Ready builders	Interested builders	Cautious builders	Hesitant builders	Doubtful builders
Professionalism	0.43	0.17	0.46	-0.25	-0.22
Simplicity	0.35	0.00	-0.14	-0.25	-0.12
Trialability	-0.17	-0.22	-0.33	0.00	1.4
Observability	-0.13	-0.17	-0.18	-0.13	0.00
Sample average	28%	20%	20%	19%	13%

formed about the latest SDR research as their federal counterparts.

Interaction term effects. — By multiplicatively combining the categorical variables with the main effects, an interaction term indicated a negative relationship between Simplicity and Forest Service builders. Said another way, while Simplicity is positively correlated with SDR adoption, it seems to not have the same positive effect on Forest Service employees as compared to Bureau of Land Management, National Parks Service, State Parks, and Department of Transportation respondents. While this interaction term was marginally significant ($p < .072$), including it in the regression model increased r^2 from .135 to .178, a 32 percent increase. The resulting p values for the other three main effects in the model decreased when the interaction term was included, creating a much better fit.

In sum, the multiple regression results support the following hypotheses, which are based on Rogers' (1995) model. These findings suggest that builders are most likely to use SDR in recreational buildings when:

- SDR has a pleasing aesthetic that blends in with the environment (OBSERVE);

- builders believe that SDR is fairly easy and convenient to work with (SIMPLE);

- builders are empowered to make purchase decisions and enjoy professional status (PRO);

- SDR is readily available and is a long-lasting building material (TRIAL);

- builders have extensive building experience and are employed by branches of the federal government.

Cluster analysis

Cluster analysis was employed to explore the characteristics or SDR preferences associated with each of the five builder adopter groups (Ready, Interested, Cautious, Hesitant, and Doubtful) in terms of the four main effects. Having a deeper understanding of builders' preferences permits us to offer managerial insights to sellers of SDR who want to grow market potential.

Cluster values for the five builder adopter groups are presented in **Table 6**. For ease of comparison and elimination of possible bias, standardized values were used (Hair et al. 1998). Based on factor scores, these values have a mean of zero and a standard deviation of one. Positive values are above average, negative values are below average, and the

magnitude is the number of standard deviations the original value is from the mean. For example, Interested Builders are above average in their preferences for Professionalism, average for Simplicity, and below average in their preferences for Trialability and Observability.

Segment I: Ready Builders (28%). — For SDR sellers, Ready Builders are an attractive segment to target because they will be the first to use SDR in recreational buildings. In general, they are quick to understand and apply new technical knowledge, willing to take risks, less traditional, not afraid of an occasional setback, and less price sensitive (Rogers 1995, Best 2000).

Ready Builders are above average on Professionalism and Simplicity and below average on Observability and Trialability. They most value Professionalism and will go to great lengths to gain the knowledge needed for understanding and applying technical building information (joinery connection specifications, grading standards, building codes). Ready Builders subscribe to journals and other publications and are empowered to make purchasing decisions. This group, which is less dependent on what others think than most people, relies on scientific evidence and technical information, rather than sales-

people or other users, and often search for information on the Internet, read articles in technical publications, or look for informative ads in trade journals (Perreault and McCarthy 2002). Strategically, this group can be reached through technical reports or advertising in building or purchasing trade journals. SDR sellers should continue to invest in researching and communicating SDR technological advances.

Ready Builders prefer Simplicity and like variety and dislike complicated procedures, which may inhibit variety-seeking behavior. Recall that this group tends to learn through reading rather than talking with others, so less SDR complexity produces fewer barriers to use. They want access to continued SDR design improvements, good joinery connection reliability information, easy construction methods, natural or "green" building materials (i.e., symbol for Simplicity), all means by which to decrease complexity.

Ready Builders are below average on Observability and Trialability. This seems intuitive as Ready Builders are not risk averse. Observability means the results of the innovation are clearly visible and communicated while Trialability is being able to experiment with the innovation; both are a means to reduce uncertainty, an attribute of less importance to this segment.

Segment 2: Interested Builders (20%). — Opinion leaders respected by their peers, Interested Builders will adopt SDR fairly early. Of all the adopter segments, this has the most contact with salespeople (Perreault and McCarthy 2002). Consulting with salespeople helps Interested Builders to decide how to best use SDR, reducing the risk of failure that could jeopardize their opinion leader status. Once they have successfully used SDR in recreational buildings, they will enthusiastically tell others that it is a superior building material. Sellers of SDR must focus on attracting, satisfying, and retaining Interested Builders as their acceptance is critical to all following adopter segments. Given the important role played by salespeople, SDR sellers should consider developing sales partnerships that provide in-depth training, sales leads, and cooperative advertising.

Interested Builders are above average on Professionalism, average on Simplicity, and below average on Observability

and Trialability. In most ways, Ready Builders and Interested Builders share preferences, the exception being that Interested Builders do not report needing SDR to be simple to use. This suggests more flexibility and a willingness to deal with some degree of complexity in using SDR in recreational buildings. This may be due to their different learning approaches: Ready Builders prefer to learn by reading versus the preference of Interested Builders for personal contact. The salesperson interface means that information gathering and the learning process can be adapted and customized, so Interested Builders may be willing to accept more complexity because they know challenging issues will be resolved with the salesperson's assistance.

Segment 3: Cautious Builders (20%). — This segment looks to Interested Builders for opinions and guidance. They will use SDR in recreational buildings only after much deliberation and proof of success by others. Sellers should facilitate communication (e.g., Web page) with Interested Builder opinion leaders who have had success in using SDR. Cautious Builders are less willing to put up with less-than-complete solutions, so a bundled SDR recreational building product could be offered that includes all necessary features, functions, and technical support for a foolproof experience. A double benefit may arise if the bundled product offers savings to these price-sensitive builders. Cautious Builders rely on contact with mass media and communications so sales promotion tools can be used effectively by SDR sellers who rely on opinion leaders and mass media (e.g., coupons, rebates, samples, contests).

Ready, Interested, and Cautious Builders, the three earliest adopter segments, have similar preferences. The difference for Cautious Builders is that they are below average on Simplicity while Ready Builders are above average and Interested Builders are average. This means that Cautious Builders do not mind if SDR use in recreational buildings is complex. Note that Cautious Builders will adopt SDR only after having received positive feedback and guidance from Interested Builders, who they trust and respect as opinion leaders. Cautious Builders may not need an *a priori* guarantee that SDR will be simple to use because they think Interested

Builders will reduce perceived complexity through their experienced, positive word-of-mouth advice. Also, Cautious Builders are slow and deliberate in their adoption decision making, thus giving them more time to explore and mitigate complexities.

Segment 4: Hesitant Builders (19%). — This group will be skeptical about using SDR in recreational buildings. They make very little use of marketing information provided by salespeople and sales promotion tools, and, in fact, may begin using SDR only after being pressured by peers (Perreault and McCarthy 2002). Hesitant Builders are the only segment that is not above average on any dimension, and they are average on Trialability and below average on Observability, Professionalism, and Simplicity.

Segment 5: Doubtful Builders (13%). — This segment is suspicious, very traditional, risk averse, and uncomfortable with change. They may never use SDR or will use it only after it becomes a tradition in recreational buildings. Doubtful Builders are the only segment above average in Trialability; they are average on Observability and below average on Simplicity and Professionalism. Trialability refers to being able to use SDR, which this risk-averse segment may believe will do more to reduce their uncertainty than Professionalism, Simplicity, or Observability. Their preference for Trialability may be suggesting that they prefer seeing widespread trial or use before they make the adoption decision.

Concluding discussion of findings

SDR is not widely used as a building material in recreational buildings, so this research was undertaken to explore the relationship between builder and building attributes, factors, and preferences and their potential impact on the propensity to adopt or use SDR. This study reports that specific factors appear to increase interest in and use of SDR in recreational buildings. The findings offer marketing segmentation strategies premised on builders' membership in propensity-to-innovate groups. It is hoped that these insights will stimulate entrepreneurial interest in developing SDR-based small businesses and rural economic development projects aimed at expanding SDR's market potential. Sellers of SDR who want to grow mar-

ket potential should strive to target and attract:

- Ready Builders by providing continually updated SDR information published in technical reports and building and purchasing trade journals;
- Ready Builders by reducing the perceived or real complexity of SDR building applications; this can be done through making available, on a regular basis, information on improvements in building design, joinery connections, and construction methods;
- Ready Builders by positioning unprocessed SDR as a green building material;
- Interested Builders by developing partnerships with SDR salespeople who Interested Builders rely on; this might involve providing in-depth SDR sales training, sales leads, and cooperative SDR advertising;
- Interested Builders who are very satisfied customers due to the efforts of the SDR seller; this segment contains respected opinion leaders who offer frequent word-of-mouth recommendations, the most credible form of promotion and absolutely free;

- Cautious Builders by selling complete solutions for SDR recreational buildings; a bundled product could be offered that includes all needed features, functions, and technical support; a double benefit would occur if the bundled product offered a savings to these price-sensitive builders;
- Cautious Builders who rely on opinion leaders and mass media; sellers should facilitate communication (e.g., Web page) with Interested Builder opinion leaders who have had success in using SDR in recreational buildings; various sales promotion tools can also be used, like coupons, rebates, samples, contests, etc.

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