The Nature of Lead Users and Measurement of Leading Edge Status

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Abstract

"Lead users" are defined as being at the leading edge of markets, and as having a high incentive to innovate. Empirical research has shown the value of lead user need and solution data to new product development processes. However, the nature of the lead user construct itself has not been studied to date. In this paper we fill this significant gap by proposing and evaluating a continuous analog to the lead user construct, which we call leading edge status (LES). We establish the validity and reliability of LES and examine the characteristics of users having high levels of this variable. We also offer a first exploration of how LES is related to traditional measures in diffusion theory such as innate innovativeness and time of adoption. We find a strong relationship and explain how users with high LES can offer a contribution to both predicting and accelerating early product adoption.

Key words: lead users, adoption, innovation.

1.0: Introduction and Overview

Lead users display two characteristics with respect to a given novel product or service: (1) they face needs that will be general in a marketplace--but face them months or years before the bulk of that marketplace encounters them and, (2) they are positioned to benefit significantly by obtaining a solution to those needs. It has also been argued that lead users were more likely than other users to innovate when the product or service they needed was not yet available in the marketplace (von Hippel 1986). This proposition has since been documented in several empirical studies (e.g., Urban and von Hippel 1988, Morrison et al 2000, Franke and Shah 2001).

The three variables used by von Hippel, being "ahead of the market," "level of expected benefit" and "level of innovation," can in principle be treated as continuous variables. However, empirical research conducted on lead users to date has only segmented user samples into dichotomous lead user vs. non-lead user clusters (e.g., Urban and von Hippel 1988, Herstatt and von Hippel 1992). Thus, the actual nature of the construct – binary or continuous – has not yet been explored.

To enable a finer and more flexible definition of lead users, we introduce the construct of Leading Edge Status (LES), a continuous variable. We define LES to be "the ***degree*** to which organizations use and apply technology innovations in new and different ways to solve problems faced by the organization, and the ***degree*** to which they perceive the benefits of new products earlier than the rest of the marketplace". We define lead users to be those organizations exhibiting high levels of LES. If the distribution of LES proves to be bipolar then the assumption of a dichotomous classification of the population, as previously used in the literature, will be a good one. If it is unimodal then any classification into two discrete groups will tend to be somewhat arbitrary and throw away useful information.

In addition, the correlation of the three variables throughout user populations has not been previously explored. To the extent that these elements are perfectly correlated throughout the population we have a single-faceted construct. To the extent that they are not, we would have some organizations which are primarily classified as leading edge because of their early novel applications of technology, while others would fall into that category primarily due to their early recognition of needs. That is, there is no guarantee that these two elements of the lead user definition are indeed correlated and that we have a single construct.

In this paper we explore the continuous analog to the lead user construct, LES, and test it's validity and reliability in a sample of innovating and non-innovating users of information technology drawn from the population of Australian libraries. We find that LES is indeed distributed in a continuous, unimodal manner in our sample of innovating and non-innovating users. We also find that the three component variables in LES, being ahead of the trend, having high levels of need, and actual development of innovations, are indeed highly correlated throughout our sample.

Urban and von Hippel (1988) suggested that lead users, in addition to their role as innovators, might serve as opinion leaders to speed the diffusion of new commercial products that are related to their needs. That is, lead users may play an important role in the diffusion of many innovations. However, there has as yet been no empirical work linking the idea of lead users to the diffusion paradigm. We begin this work by exploring the relationship of LES to two other constructs that have been used to address the diffusion of innovation: the innate innovativeness of adopters (Midgley and Dowling 1978), and the characteristics of adopters as a function of time of adoption (Rogers 1962, 1995). We find that LES is strongly related to these other measures of innovation adoption, and that the lead user measure is

in some ways complementary to the other two - providing additional information that they do not provide.

In section 2 of this paper we provide a review of relevant literature. In section 3 we discuss our empirical sample and methods. In section 4 we report our findings on the nature of the lead user construct and LES. In section 5 we report our findings on the relationship between LES and variables traditionally used in diffusion studies. In section 6 we discuss the implications of our findings for an expanded use of the lead user construct in both innovation-related and diffusion-related applications in the marketing research field.

2.0: Literature Review

Research on lead users emerged from research into sources of innovation. It was first found that users rather than manufacturers are often the initial developers of what later become commercially significant new products and processes (Enos 1962, Knight 1963, Freeman 1968, Shaw 1985, von Hippel 1988, Shah 1999). Next, it was found that innovation by users tended to be concentrated among "lead users" of those products and processes (von Hippel 1986, Urban and von Hippel 1988, Morrison, Roberts and von Hippel 2000, Shah 1999, Luthje 2000). That is, users who experienced needs for a given innovation earlier than the majority of the target market (von Hippel 1986).)

Research on innovation-related incentives and capabilities provides a theoretical basis for the empirical observation of innovation by users, and innovation by lead users as well. From the perspective of innovation as an economically motivated activity (Mansfield 1968), those users expecting significantly higher economic or personal benefit from developing an innovation – one of the two characteristics of lead users – have a higher incentive and are more likely to innovate. Also, given that lead users experience needs in advance of the bulk of a target market, the nature, risks, and eventual size of that target market are often not clear to manufacturers. This lack of clarity can reduce manufacturers' incentives to innovate, and increase the likelihood that lead users will be the first to develop their own innovative solutions for leading-edge needs – including those that later prove to represent mainstream market demand.

To this point, empirical research on the relationship among the two characteristics of lead users and their likelihood of innovating has involved only observations that the three variables just mentioned do strongly cluster. Thus, Urban and von Hippel (1988) studied the characteristics of a sample of 136 users of PC-CAD, a type of software used in the design of printed circuit boards. They found that 24% of these users had innovated by either modifying commercial software or developing their own PC-CAD software. A two-cluster solution explained 24% of the variation in their data. One cluster contained 28% of the respondents. The members of this cluster clearly displayed all the characteristics postulated for lead users. They were significantly ahead of users in the second cluster with respect to technical trends in that field. They also had higher needs, as shown by their significantly higher level of dissatisfaction with commercially-available PC-CAD systems. In addition, many more respondents in the lead user cluster reported building their own PC-CAD system (87% versus only 1% in the non-lead cluster). Franke and Shah (2001) studied the innovating behavior of 197 members of four sports communities. They found that almost one third of the respondents had innovated, with one in seven innovations considered to be a completely new product by their innovator. They compared the innovators in their sample with the non-innovators on a number of characteristics and found that the

innovators displayed the characteristics of lead users in that they received high benefit from innovating and were ahead of the trend. On each of these items the innovators were significantly different from the non-innovators.

Empirical lead user studies, such as those just reviewed, tend to also find that lead users are early adopters of new products and services. Thus, Urban and von Hippel (1988) found that users in their lead user cluster adopted technologies an average of 7 years before users in their non-lead user cluster. Similarly, Franke and Shah (2001) find that innovating users – who tend to be lead users – are significantly more in agreement ($p<.01$) with the statement that: "I have benefited significantly by the early adoption and use of new products." These studies simply use this finding as additional support for the finding that lead users are "ahead of the field" relative to non-lead users. To us, however, this finding suggested that it would be useful to explore the relationship of the lead users to other measures of early adoption of innovation.

In this regard, Urban and von Hippel (1988) have suggested that lead users can fulfill an important function after the launch of new products as opinion leaders, fueling the diffusion process. However, there has as yet been no empirical research on this possibility. Also, Gatignon & Robertson (1985, p863) argue that: "The key to diffusion of technological innovation may be in building the consumer knowledge and experience base for that type of technology". If so, lead users, as early experiencers of new technologies may be an important part of the diffusion process. Foxall (1989) supports this idea, arguing that for discontinuous innovations, lead users are crucial in providing detailed implementation experience to later adopters and play a valuable function in supporting the communication network. Morrison et al (2000) report a significant overlap of organizations that are lead users and opinion leaders. Trondsen (1996) claims that early adoption makes lead users particularly valuable in increasing the effectiveness of database marketing and magnifying the innovating supplier's pioneering advantage.

We explore the relationship of the lead user construct to two other important constructs in differentiating between the adoption patterns of users: Rogers' (1995) time of adoption and Midgley and Dowling's (1978) innate innovativeness. Rogers (1995, and in earlier editions of his book going back to 1962) defines *innovators* as those individuals or units of adoption possessing a high level of innovativeness, where innovativeness is the "degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of the social system". Rogers (1995) proposes a unimodal distribution of the population along the adoption time dimension, and there is strong empirical evidence that the distribution of adoption times is bell-shaped rather than bimodal (see Mahajan, Muller and Bass 1993 for a review of models and fits).

While Rogers' innovativeness (time of adoption) measures a behavior, Midgley and Dowling's (1978) innate innovativeness measures an inherent characteristic or trait of a population member. They define innate innovativeness as an inherent desire to experiment with the novel rather than a situational response: the extent to which consumers make the adoption decision independently of the communicated experience of others.

3.0: Method and Sample

3.1 The LES Construct Defined

von Hippel's definition of lead user, the discrete precursor to our leading edge status, is defined on the basis of two elements; the recognition of benefits from an innovation early in the process and the potential for accruing large benefits (von Hippel 1978 p796). In addition, he argues that users with those characteristics will tend to innovate in order to solve their needs (ibid, p. 798). Thus, lead users are defined to have two distinguishing features and hypothesized to possess a third, the generation of new applications and solutions. To date there has been no empirical study to test the validity of this construct. Clearly, it is an empirical question as to whether these three elements move together and form part of the same construct. Confirmatory factor analysis (CFA) provides an excellent technique with which to test this assertion. CFA tests whether hypothesized variables all load on the same factor, leading to an internally consistent construct. See Hair et al (1998) for a detailed description of the approach.

To operationalize LES four types of measure may be used; the two elements of von Hippel's definition ("benefits recognized early" and "high benefits expected"), his method of identifying lead users (applications generation), and direct elicitation of the construct from respondents (both self reports and from third parties). These four groups of variables allow us to examine the internal consistency of the two components of von Hippel's definition and the method that he proposes to use to identify it. If LES does represent a single, valid construct we can contrast it to related constructs and test the hypothesis that lead users form a discrete group identifiable by their score on the resultant LES scale. Once we have tested the validity of the construct we can study its distribution and the background characteristics of members with high LES.

3.2 Hypothesized Relationships between LES and Related Constructs

After validating the construct of leading edge status the next challenge is to determine how it relates to traditionally used constructs such as innate innovativeness and time of adoption. The construct of LES is expected to be closely related to the construct of Organization Dispositional Innovativeness (ODI), the analog of Midgley and Dowling's (1978) innate innovativeness in organizations and to Rogers' (1995) behavior measure of Time of Adoption (TOA). Both LES and ODI refer to a cross-category predisposition to innovate. Because LES is more contextually dependent than ODI we expect ODI to be a determinant of LES.

3.3 Experimental Setting

To test the model we needed an industry that exhibited homogeneity of product interest among respondents; heterogeneity with respect to size, adoption rate, market sector and adoption timing; and the capability and motivation for good recall. Based on these requirements, libraries were selected as the organizations to be studied. Technologies in libraries tend to be reasonably homogeneous although the rate of adoption of these technologies is not. There is considerable heterogeneity in the size and type of information used in each library. Finally, because librarians are in the profession of storing, accessing and retrieving information we expect them to have good capability and motivation for recall.

Within each library the primary respondent was the principal librarian or the librarian responsible for information processing technology.

The population consisted of 13,000 libraries employing almost 20,000 people. Of these approximately 10,000 were school libraries, the majority staffed only part-time. The survey questionnaire was sent to 747 libraries, comprising all identified libraries with five or more professional staff (i.e. a census of large libraries), and to a stratified sample of the remaining small and medium libraries (stratified by library type: Business, Public, Government, Academic, and Tertiary). Within each type of library, the final sample was selected by systematic sampling from available lists. The response rate of 62% (n = 463 organizations) showed no obvious bias, with all types and sizes of libraries being well represented in relation to their sampling proportion. The libraries in the final sample account for 56.5% of people employed by libraries in the population and 50% of the total library spend.

The empirical testing of the model involved a cross-sectional survey of organizations within one industry. Restricting the study to one industry may restrict the generalizability of the results, but as the goal of this research is not primarily external validity, but rather to understand the internal validity of the concept of lead users, it is necessary to trade off generalizability for a more in-depth study of construct elements (Calder, Phillips & Tybout 1981).

Multi-item scales were used to measure LES and Organizational Dispositional Innovativeness (ODI). Sufficient redundancy was also built into the measurement to provide estimates of convergent validity. The behavioral variable Time of Adoption (TOA) was measured for four innovations: Online Public Access Catalogues, Online Database Systems, Searchable Compact Disk Databases, and Electronic Data Interchange. We also suggest the use of and test a more general measure of innovative behavior, the actual number of innovations adopted by an organization.

3.4 Measures Used to Calibrate LES and Related Variables

Multi-item measures of LES were developed based on previous lead user literature. Table 1 contains details of the measures used.

Insert Table 1 about here

The eight measures of the elements of LES in Table 1 enable us to examine the construct validity of the concept. To relate it to the traditional constructs of adoption traits and behavior we also need measures of these variables. The adoption trait, ODI, is measured by six items, reflecting the Midgley and Dowling (1978) definition of dispositional innovativeness. Confirmatory factor analysis techniques are used to estimate the measurement model using maximum-likelihood in AMOS. The ODI construct has a Cronbach alpha of 0.80 and construct reliability of 0.71. Behavior is measured in two ways, firstly by Rogers "time of adoption" and secondly by the "number of innovations adopted". This second behavior measure captures a more general innovative behavior by the organization, with the more innovative organizations expected to have adopted a greater number of recent innovations. A list of these variables is included in Table 2.

Insert Table 2 about here

4.0: Findings on the Nature of the Lead User Construct and LES

The analysis has two objectives. These are to:

(1) Test and refine the construct. To clarify what LES is and whether its elements hold together, leading to an increased understanding of the appropriateness of the construct and its definition.

(2) Study the distribution of LES.

We address each of these objectives in turn.

4.1 Testing the Construct of Leading Edge Status.

We constructed measures of LES (see Table 1) in accordance with current lead user literature and our definition of the continuous analog. Initially we need to see how reliable these measures are in representing the LES construct.

The reliability of the construct as measured by Coefficient Alpha is $\alpha = 0$ .83 with 430 observations (where the unit of analysis is the organization). Given this high level of reliability we estimate the LES measurement model using confirmatory factor analysis (using the software package AMOS) to test the unidimensionality of the LES construct. There are no offending estimates and all the parameter estimates are highly significant (see Table 3). The composite reliability measure is 0.78, providing support for the reliability of the Leading Edge Status measurement model. Given these results the measurement model for the Leading Edge Status construct was regarded as highly reliable. The fact that von Hippel's two definitions of lead user and the third he advances to identify them do form part of the same construct, at least in this application, is an important finding.

Insert Table 3 about here

(2) Distribution of LES

As discussed earlier, the assumption and use of a dichotomous distribution of lead users in the population, as suggested in the literature, has not been empirically tested. By examining the distribution of the continuous analog, LES from the measurement model in Table 3 we can examine that assumption. Figure 3 provides the distribution of LES which demonstrates that it is a unimodal construct, leading to the recommendation that a lead user dichotomy should not be used as it is not a good representation of the population mix and its use throws away useful information.

This distribution of LES is consistent with Rogers' (1995) assertion of the bell-shaped distribution of the related construct, Time of Adoption (TOA) and the diffusion of innovation literature on the time trajectory of the population adopting an innovation. Because we know of no research which has studied the empirical distribution of Midgley and Dowling's (1978) innate innovativeness construct in the adopting population, in Figure 1 we also show the distributions of ODI and TOA. All are bell-shaped, leading to an interesting conclusion. The diffusion of innovation literature suggests that S-shaped diffusion patterns occur (leading to bell-shaped distributions of time of adoption) as a result of an increasing contagion effect followed by the limiting influence of saturation. These results suggest that it is not just the nature of communications that is causing a bell-shaped curve but also the distribution of

population heterogeneity with respect to propensity to adopt innovations (ODI and LES). This is consistent with the view of the diffusion process advanced by Russell (1980) and Horsky (1990).

Insert Figure 1 about here

5.0: The relationship between LES and traditional diffusion study constructs

The analysis has the following objectives. To:

(1) Test the hypothesized relationship between LES and traditional diffusion study constructs. To learn how LES fits in with previously developed constructs, clarifying the role lead users might play in the adoption of new technology.

(2) Contrast LES to other measures of innovativeness. To compare and contrast the characteristics of "lead users" (i.e. those with high LES) with the characteristics of "innovators" and "early adopters".

We address each of these objectives in turn.

5.1 The relation of LES to other measures of innovativeness

To examine how LES fits with the adoption literature it is useful to make a direct comparison of LES to the traditional definitions of innovativeness: innate innovativeness (ODI) and time of adoption (TOA). We also compare LES with the more general behavior measure "number of innovations adopted". Pairwise correlations between the constructs, illustrated in Table 4, are all highly significant ($p = 0.000$). It is not surprising given we are estimating across respondents where there are many extraneous sources of variation (e.g. people use scales differently) that ρ is much smaller than one. We can see from the correlations ($r_{(LES, ODI)}$, $r_{(LES, TOA)}$ and $r_{(LES, no. innov adopted)}$) that LES is more closely related to the trait (ODI) than to the behavior (TOA and Number Innovations Adopted).

Insert Table 4 about here

We test the hypothesized relationship that the more contextually dependent construct, LES, is a mediator between the trait measure Organization Dispositional Innovativeness (ODI) and behavior. We test two sets of models, one using Rogers behavior measure Time of Adoption (TOA) and the second using the more general behavior measure "number innovations adopted". As per Barron and Kenny (1986) we run a series of regression models to test whether LES is a mediating variable between ODI and TOA. The results of the regression analyses are summarized in Table 5.

Insert Table 5 about here

To establish that LES mediates the relationship between the trait ODI and adoption behavior, the path in Model 1 should be significant, the path in Model 2 should be significant, and the path from the mediator to the dependent variable in Model 3 should be significant. Each of these requirements is satisfied. Ideally, and for the complete mediation, the coefficient of ODI in Model 3 should be zero. This requirement is satisfied with TOA as the dependent. With the number of innovations as the

dependent the magnitude of the coefficient is also markedly reduced compared with Model 2 (although it remains significant). LES can thus be said to substantially mediate the relationship between ODI and adoption behavior. Hence, even after controlling for the organization's innate innovativeness, LES still captures a significant amount of the variation in adoption times.

5.2 *Contrasting LES to other measures of innovativeness*

Having examined the interrelation of these three constructs we proceed to investigate how each is related to other characteristics of the organization. These results are presented in Table 6. All pairwise correlations are significant. While Table 4 illustrated that there is substantial overlap between the three constructs, Table 6 shows that there are also considerable differences between them. High LES organizations are generally larger in size than organizations with high ODI or those that adopt early. This is consistent with the opportunity to reap greater benefits. The level of respondent knowledge about specific innovations is more highly correlated with the contextual LES measure and behavior TOA than with the trait ODI. Organizations with high ODI and high LES are more likely to perform better and have a wider range of services than libraries of a similar type and size, to enjoy a higher level of autonomy in new technology decisions, and have higher levels of financial resources than organizations with just early Time of Adoption. Respondents were asked to name organizations they communicated with on a regular basis as well as those they might approach for information about technological innovations. We find in our sample that lead users are more likely to be sought out for information on both general and specific innovation matters. This is an important finding highlighting the potential role of lead users in seeding the diffusion process.

Insert Table 6 about here

6.0: Discussion

In this research we have validated the lead user construct. The correlation between early benefits expected and large benefits was 0.295 (highly significant with $p = 0.000$ and reasonably large considering the other sources of variation between respondents). All four measures of applications innovativeness were consistent with the lead user construct, suggesting high construct validity between the construct and the measures von Hippel earlier proposed for its identification.

We addressed the previously held assumption that lead users were dichotomous by examining the empirical distribution of Leading Edge Status (LES), the continuous analog of lead user. LES was found to have a unimodal distribution making any dissection of it arbitrary and meaning that talking of lead users/others throws away valuable information. Thus, for this population at least, the continuous variable LES appears to be a more useful and more informative measure, particularly when trying to understand the continuous behavioral variable, time of adoption (TOA) in terms of the continuous trait, innate innovativeness (ODI).

We have also related lead users to other constructs in the adoption of innovations literature. Our data supported the hypothesized role of LES as an intermediate construct mediating the link between the trait, ODI, and adoption behavior. LES adds significantly in explaining organizations' times of adoption, even after accounting for their dispositional innovativeness. Finally, it is more highly correlated with the majority of respondents background characteristics than either ODI or TOA suggesting that it may be more easily identified by these surrogates than other measures of innovativeness.

Our findings suggest expanded use of the lead user construct in both innovation-related and diffusion-related applications in the marketing research field. Lead users, being "advanced" relative to an adopting population, can be harnessed for forecasting purposes and to generate new products based on their advanced application status. We also explore and suggest the value of the role they play in the contagion process (assisting others in the adoption process). This is a function of their early adoption of new products for which they are lead users, combined with their importance as communication sources.

Further research will clearly be useful to test the results of this study in a number of different industries. Although there seems little reason why our results would not carry over to other adopting populations, their external validity needs to be established. Also, we have looked solely at the role of leading edge status in the adoption decisions of individual's own organizations. It would be valuable to now relate this to their role in the adoption decisions of others, as well as relate it to the level of innovation that they undertake internally.

In conclusion, the study of lead users is attracting increasing attention because of their value as early adopters, sources of new product ideas, market research potential, and their role in fueling the diffusion process. In this paper, we have attempted to consolidate the measurement basis on which the lead user concept is founded and relate it to other approaches studying differences between adoption behavior in the population.

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TABLE 1: Measures of Leading Edge Status Construct: Cronbach Alpha = 0.83

Scale Item	Item Wording	Scale	Alpha if Item Deleted
Benefits Recognized Early	We are usually ahead of other libraries in recognizing and planning new solutions to problems.	5 point scale: 1 = definitely false 5 = definitely true	0.81
High Level of Benefits Expected	This library can benefit significantly by the early adoption and use of technological innovations.	5 point scale: 1 = definitely false 5 = definitely true	0.85
Perceived LES			
(a) By Self	How *leading edge* is the library you work in? (Definition of lead user given)	7 point scale: 1 = not *lead user* 7 = highly *lead user*	0.80
(b) By Others	A count of how often library is mentioned by others as being a *lead user*.	integer variable	0.84
Applications Innovativeness	We often find that we are suggesting new applications to equipment developers.	5 point scale: 1 = strongly agree 5 = strongly disagree	0.80
	We have been used as a test site for prototype versions of new equipment.	ditto	0.81
	We have close relationships with technology suppliers.	ditto	0.81
	We are regarded as having pioneered some applications of technology.	ditto	0.79

TABLE 2: List of Items Used to Calibrate Constructs Related to Leading Edge Status

Organization Dispositional Innovativeness (ODI) *(Cronbach alpha = 0.80)* *(Construct Reliability = 0.71)*	**Adoption Behavior measures**
Library is innovative Library takes advantage of opportunities Library is willing to experiment Library is risk taking Advisable to wait before adopting Reliance on others' opinions	**(1) Time of Adoption (TOA)** Rogers adoption categories **(2) Number of Innovations Adopted** (integer value between 0 and 4)

TABLE 3: Confirmatory Factor Analysis Results for the LES Construct

Item	Unstd ML Estimates	Std ML Estimates	t
Benefits Recognized Early	0.504	0.669	14.40
High Benefits Expected	0.200	0.272	5.41
Perceived LES (self)	1.000	0.802	
Perceived LES (by others)	0.265	0.380	7.79
Applications innovativeness:			
- New applications suggested	0.656	0.737	16.00
- Test site for prototypes	0.683	0.667	14.23
- Close supplier relations	0.548	0.632	13.37
- New applications pioneered	0.820	0.791	17.45
NFI = 0.98 CFI = 0.99			
RMSEA = 0.10			
Composite Reliability = 0.78			

TABLE 4: Leading Edge Status and Innovativeness Pairwise Correlations

	(trait)	(need level)	(behavior)	
Pairwise correlations	ODI	LES	TOA	Number Innovations Adopted
ODI	1.000	0.579	0.211	0.386
LES		1.000	0.393	0.527
TOA			1.000	0.463

Note: All coefficients significant at p = .000

TABLE 5: Results of the Mediating Effect of LES

	Dependent variable		
SET 1 (behavior measure = TOA)	**Model 1: LES Std coeff (t)**	**Model 2: TOA Std coeff (t)**	**Model 3: TOA Std coeff (t)**
ODI	0.58 (14.49)	0.21 (4.09)	-0.03 (-0.42)
LES			0.39 (6.41)
Adj R^2	0.33	0.04	0.14
F sig.	0.00	0.00	0.00
SET 2 (behavior measure = # innovations adopted)	**Model 1: LES Std coeff (t)**	**Model 2: # adopted Std coeff (t)**	**Model 3: # adopted Std coeff (t)**
ODI	0.58 (14.49)	0.39 (8.66)	0.13 (2.56)
LES			0.45 (8.79)
Adj R^2	0.33	0.15	0.28
F sig	0.00	0.00	0.00

TABLE 6: Characteristics of Lead users and Innovators

Pairwise correlations	ODI	LES	TOA
Number of Employees (size)	.211[a].	.469[a]	.298[a]
Budget Expenditure (size)	.144[a]	.368[a]	.354[a]
Level of respondent knowledge	.243[a]	.332[a]	.385[a]
Comparative performance of organization	.322[a]	.354[a]	.150[a]
Extent of services	.364[a]	.402[a]	.257[a]
Level of autonomy in new technological decisions	.350[a]	.346[a]	.258[a]
Comparative level of financial resources	.236[a]	.229[a]	.122[b]
General communication links (mentions by others)	.193[a]	.358[a]	.309[a]
Sought out for technological innovation information (mentions by others)	.211[a]	.409[a]	.381[a]

NOTE: [a] Coefficients significant at p = .01 [b] Coefficients significant at p = .05

FIGURE 1: Distribution of Leading Edge Status (LES), Organization Dispositional Innovativeness (ODI) and Time of Adoption (TOA).