

Understanding diffusion of technology in rural entrepreneurship operations:

A three year longitudinal study

William L. Smith

Emporia State University

BAE Dept, Campus Box 4058

1200 Commercial

Emporia, KS 66801

620-341-5729

[smithwil@emporia.edu](mailto:smithwil@emporia.edu)

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### Abstract

This paper presents partial results of a three year study of technology diffusion in the tourism hospitality sector, in three states, specifically in bed and breakfast operations (B&Bs). Email and web site issues in B&B businesses over the three years are examined in light of the technology diffusion literature with a focus on service management practice. Implications are discussed both for future research and for management practice.

### **Introduction**

This paper will report partial survey results which focus on two specific issues within a larger study. These issues are the adoption rate of email as a communications device and use of a commercial provider for creation and maintenance of web sites. Each of these is shown to follow the diffusion of innovations theory of adoption.

The first section below provides an overview of relevant aspects of the diffusion of innovations theory of adoption. This is followed by a discussion of the Bed and Breakfast industry as it appears in mid-America. The survey methodology is presented in the next section. Then the relevant results of the longitudinal study are presented and discussed. This is followed by discussion of the implications for service management in this segment of the industry.

## The diffusion of innovations theory of adoption overview

The diffusion of innovations theory has a long history [cf.1, 2], dating from before 1960, but growing in interest and application since that date. Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. In recent years, the diffusion of innovations theory has been studied as it relates to new technology implementations, such as online shopping, online banking, online investing and electronic payment for Internet services [3], for example. These, of course, are just the latest in a stream of innovations that have distinguished the western market economy [4]. Innovation occurs through strategic scanning, innovation processes and management, and knowledge management in organization where learning is a competitive strategy [5, 6, 7, 8, 9]. Heijs [10], further, has shown that firms that do not innovate at a high level fall into a vicious circle where their lack of innovation causes them to fall behind, and, “catching up” becomes nearly impossible. This is consistent with a study of ATM technology adoption where rate of adoption predicted firm success [11]. Knowledge management combined with innovation-technology fit has also been shown to reduce product development cycle time, for instance, as well [12].

The diffusion of innovation model has allowed researchers to investigate how new innovations spread among groups of people. Research has shown that several variables may be used to define the adoption process: economic advantage, effectiveness, observability, trialability, complexity, compatibility, reliability, application, communality, and radicalness [13]. Organizational social pressures have been found to be the most significant discriminators of adopters and non-adopters of Internet websites [14]. Raymond [15] found that strategic web site implementation was determined by the

firms' marketing strategy in terms of distribution and communication, the organizational context (type of ownership, nature of the business) and the perceived advantages and technology attributes.

Diffusion is a kind of social change, defined as the process by which alteration occurs in the structure and function of a social system. When new ideas and technology innovations are invented, then diffused and either adopted or rejected, this leads to certain consequences, where social change occurs. This is the context within which diffusion will be considered in this paper.

The diffusion of innovation process is defined by four elements: 1) An innovation, 2) the communication process utilized through certain channels, 3) the time element, and 4) the members of the social system affected [1].

The innovation is an idea, practice or object that is perceived as new by the members of the social system under study. The perceived newness of the idea for the individual member of the social system determines his or her reaction to it. If the idea seem new to the individual, it is an innovation (even if it has been used by others, in other social systems, for a long period of time). In the present study, the innovations examined were the use of email as a communications/marketing device and the use of an outside provider of Internet web site creation and maintenance.

The communications channels in the industry under study are the normal word-of-mouth, print media, annual conference presentations, and mass media processes.

Customer communications and marketing strategies and tactics are regularly presented at association conferences and in the mass media. Operators of B&Bs have some unique

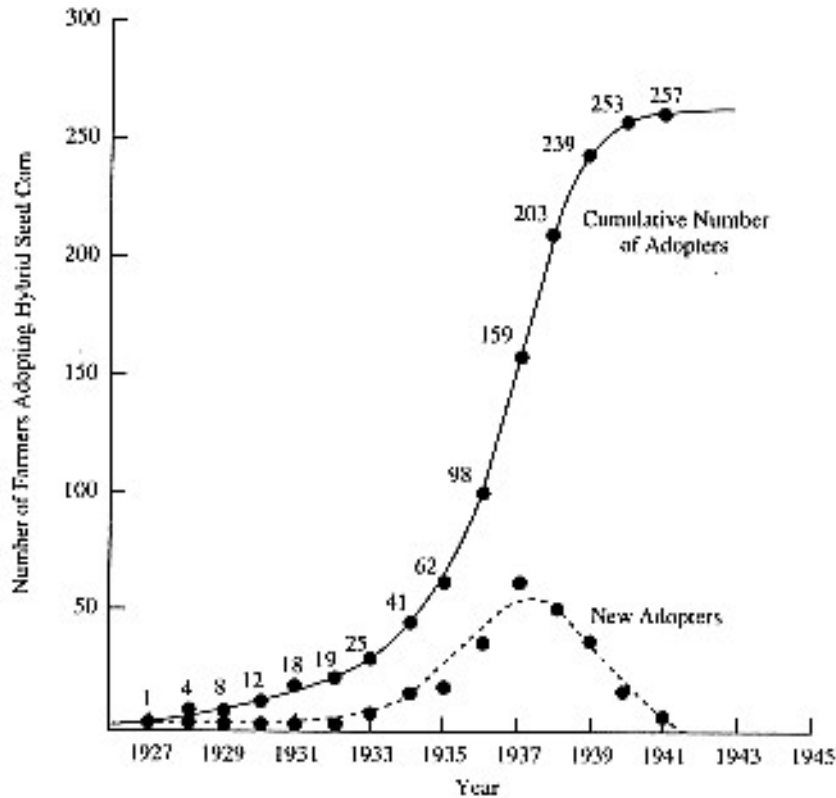
characteristics (to be discussed later), but overall, are fairly representative of the general population.

The time element is a critical factor in the diffusion of innovation theory and is why a longitudinal study was employed here. The adoption process occurs over a number of years. The present study examines a three year segment of that adoption process for the B&B industry located in three mid-America states.

The members of the social system involved include: 1) the operators of the B&Bs, 2) the customers (both actual and potential) of the B&Bs, and 3) the general public. The present study focuses on the operators of the B&Bs but the implications extend to the other members of the social system.

The time element of the diffusion process allows us to classify adopter categories and to draw diffusion curves. The adoption of an innovation usually follows a normal, bell-shaped curve when plotted over time on a frequency basis. If the cumulative number of adopters is plotted, the result is an S-shaped curve. Figure 1 shows these curves for a classic diffusion study.

**Figure 1:** The Number of New Adopters Each Year, and the Cumulative Number of Adopters, of Hybrid Seed Corn in Two Iowa Communities [1, p. 258], based on [16], cited in [1].



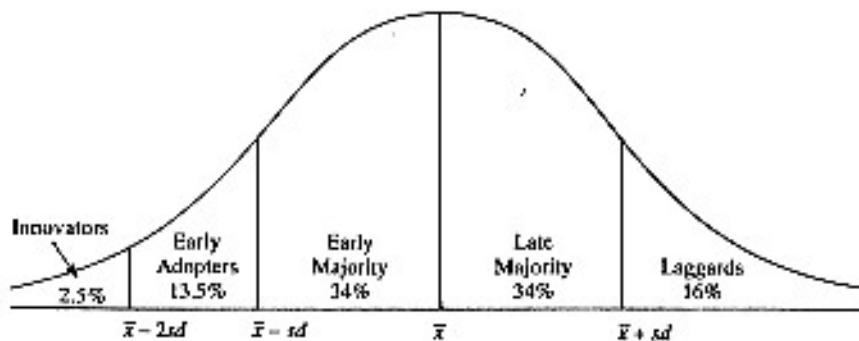
The cumulative number of adopters of hybrid seed corn approaches an S-shaped curve over time, while the frequency distribution of the number of mean adopters per year approaches a normal, bell-shaped curve.  
 Source: Based on Byer and Cross (1943).

We can expect a normal adopter distribution for an innovation because of the cumulatively increasing influences upon an individual decision-maker to adopt or reject an innovation, as a result of the activation of peer networks, for instance, about the innovation in a system. Adoption of a new idea comes from information exchange in interpersonal networks within the given social system. If the first adopter of the innovation discusses it with two other members of the system, and each of these two

adopt the idea and pass along their success to two more members, the resulting distribution follows a binomial expansion that results in the normal shape when plotted [1].

Over the years of study of the diffusion of innovations model, a standard set of adopter categories has been identified. The categories relate to standard deviations from the norm of the normal bell curve. The five categories are labeled: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. These are, then, the partitions of the innovativeness dimension, a continuous function. Early Majority and Late Majority are defined as one standard deviation on either side of the norm, each representing 34% of the members. Early Adopters are defined as one standard deviation prior to the Early Majority, or 13.5% of members. The 2.5% prior to the Early Majority (beyond two standard deviations on the left tail of the distribution) are the Innovators, those who get the whole process started. Finally, the Laggards make up the right tail of the normal distribution, that 16% beyond one standard deviation from the norm. Figure 2 illustrates this graphically.

**Figure 2:** Adopter Categorization on the Basis of Innovativeness [1, p.262].



“Venturesomeness is almost an obsession with innovators [1, p. 263].” The following discussion of adopter categories is taken from the discussion of Rogers [1].

The Innovator must also be willing to accept an occasion setback, and they often use this to start a new innovation built on the previous one.

Early Adopters, on the other hand, are more a part of the social system, and are generally those in a position of respect. The Early Adopter knows that to continue to be the object of respect, they must be discrete in their selection of innovations to adopt. The Early Adopter decreases uncertainty about a new idea by adopting it, and then conveying a subjective evaluation of the innovation to their peers through interpersonal networks.

The Early Majority adopt new ideas just before the average member of the social system. They interact frequently with their peers, but seldom hold positions of opinion leadership in the system (such as the Early Adopters do). The Early Majority are an important link in the diffusion process, of course, because they spread the news of the success they perceive to an ever wider audience. They follow with deliberate willingness in adopting innovations, but seldom lead. The period of time they take to reach their adoption decision is also longer than that of the Innovator and Early Adopter, of course.

The Late Majority is skeptical when it comes to adopting new ideas. Adoption may be both an economic necessity for the Late Majority as well as the result of increasing network pressures from peers. The weight of the system’s norms must definitely favor an innovation before the Late Majority is convinced.

Laggards are the last in a social system to adopt an innovation. “Laggards are the most localite in their outlook of all adopter categories; many are near isolates in the social networks of their system [1, p. 265].” Laggards tend to be suspicious of innovations and

change agents. Their decision process tends to be relatively lengthy, with adoption and use lagging far behind awareness-knowledge of a new idea. Resistance to innovation on the part of laggards may be entirely rational from the laggard's viewpoint, as their resources are limited and they must be certain that a new idea will not fail before they can adopt.

### **The Bed and Breakfast Industry in mid-America**

The Bed and Breakfast industry, built on a long European history, really began to grow in the United States in the 1960s. There are now more than 20,000 B&Bs, up from about 2,000 in 1979 [17].

Descriptive definitions continue to evolve as the B&B industry grows. The American Bed and Breakfast Association has suggested these categories: B&B Homestay; B&B Inn; Country Inn; and Small or Historic Hotels.

The B&B Homestay is defined as a private, owner-occupied residence in which the frequency and volume of B&B visitors are incident to the primary use of the building as a private residence. One to five guest rooms are made available to transient visitors and provide supplemental income for hosts. Breakfast is the only meal served and is included in the charge for the room. {Some of the B& B operation in the current study fall into this category.}

The B&B Inn is a commercially licensed business operated in a building that primarily provides overnight accommodations to the public even though the owner may live on the premises. Guest rooms for a B&B Inn range from a minimum of four to a maximum of 20, although some believe the range is more like 5 to 25 rooms. Breakfast is

the only meal served and is included in the room charge. The business is salable to a new owner. {Most of the B&B operations in the current study fall into this category.}

The Country Inn is a commercially licensed establishment primarily known for its cuisine that is removed from planned, commercial areas and generally accessible for patronage only by automobile. Overnight accommodations are available and a full-service restaurant provides breakfast and dinner to overnight guests and/or the public. The number of guest rooms usually ranges from a minimum of four to a maximum of 20, although a number of Country Inns have more than 20 guest rooms. The business is salable to a new owner. {A few of these are included in the current study.}

Small or historic hotels are also recognized as a part of Bed and Breakfast accommodations. They are frequently thought of as establishments with twenty or more rooms that provide the service and privacy of a hotel in the setting of an inn with some individual attention from a host. The State of Michigan, for example, defines their historic hotels as: "at least fifty years old and associated with events or persons of significance in contributing to the broad patterns of history." Many embody the distinctive characteristics of a type, period, or method of construction in architecture. Most are located in historic districts and all have twenty-one or more rentable rooms. If breakfast is not included in the room price, it cannot be a true Bed and Breakfast. [17]. {A few of these may be included in the current study.}

The Bed and Breakfast industry in the three states under consideration in the present study is relatively small and stable. Each state has a Bed and Breakfast Association with the names of member operations are published on-line at an Internet web site. These were the source of the names and addresses for the present three year

study. Over the three years, in Kansas, the numbers were 113, 115, and 115, for 2001, 2002 and 2003, respectively. The comparable numbers for Oklahoma were 48, 48, and 38. For Arkansas, they were 101, 118, and 83.

Owner characteristics of Bed and Breakfast operations across the three-state survey are shown in Table 1. Note that women are the leading owner/decision-makers for this industry. An age distribution for the principal decision-maker for each respondent operation is given in Table 2. The average age of B&B operators is well above that of the general population, of course. Each of these demographic sets appears to be a normal distributions for the industry.

**Table 1: Owner characteristics**

Owner characteristics of Bed and Breakfast operations across the three states (for those replying and answering these questions for the third year of the survey) were as follows:

- Owned by a couple, about equal involvement – 36%
- Owned by a couple, male takes lead – 8%
- Owned by couple, female takes lead – 38 %
- Owned and operated by an individual – female – 16%
- Owned and operated by an individual – male – 2 %

**Table 2: Age distribution**

Age distribution for the principal decision-maker was as follows:  
Under 25 – none

25-34 – 2 %

35-44 – 6%

45-54 – 33 %

55-64 – 49%

Over 65 – 10%

### **About the Survey**

The survey results reported here are extracted from a four state email survey conducted quarterly over a three year period with additional questions asked on the original survey and on a follow-up survey each year. The other results are being reported elsewhere. The source of the contacts for the survey each year is the membership list of the state B&B association in each state posted on the Internet at the time of the beginning of each annual survey. The posted information was printed off as a master list and individual email messages were sent to each B&B, with a follow-up message to those not responding approximately two weeks after the original message. Each message stated clearly in the opening paragraph that this was an entirely voluntary survey being conducted for academic research purposes only and that the individual responses would remain anonymous.

The context of each survey was described as targeted to B&Bs as family business enterprises and questions were being asked about their use of new technology such as email, the Internet and web sites. Follow-up questions related to service industry management issues of interest to small businesses.

## Survey Results

Two sets of results are being reported in this paper. The first set “falls out” from the methodology employed for the survey: the number of B&B operations that have (and don’t have!) an available email address for the consuming public to use to contact them. The second set of results is the response to a question about the creation and maintenance of their individual business web sites.

In the first year of the survey (2001), it was found that, for example, in Kansas, only 82 of the 113 business operations (72.6) even had a working email address that could be used by the general public. The Oklahoma sample was found to be only 26 of 48 (54.2%), and that of Arkansas to be 75 of 101 (74.3%). The first concern of the researcher, of course, was that this reduced the sample size for the survey considerably. Anecdotally, the problem seemed to be that some B&Bs were located in rural areas where email service providers were simply not available and/or the B&B operators simply did not want to be bothered with “new-fangled” equipment – their guests wanted to get away from such things, anyway.

The question was laid aside as other data were analyzed until the second year of the survey came around (2002). The results barely changes: KS: 84 of 115 (73.0%); OK: 26 of 48 (54.2%); AR: 82 of 118 (69.5%). Internet service providers were becoming very wide spread, even in rural areas, yet the percentage of users barely increased (actually decreased in AR).

As the current year (2003) numbers were calculated, it was becoming clear that this was very likely a diffusion of technology issue. For 2003: KS: 103 of 115 (89.6%); OK: 25 of 38 (65.8%); AR: 64 of 83 (77.1%).

Table 3 summarizes the percentages for the three states combined over the three year period.

**Table 3:** Summary of email availabilities

Year 2001	183 of 262	69.8%
Year 2002	192 of 281	68.3%
Year 2003	192 of 236	81.4%

This pattern appears to be that of the Late Majority Adopters of the diffusion of innovation theory, with the Laggards yet to come. It is imperfect for certain. The sample size is small. The middle year is “out-of-line” but the slow, steady, late adoption pattern is there, it seems from this viewpoint.

The second set of results is a bit more complex. To begin, only sites with email addresses could be surveyed. These were assumed to also have business web sites on the Internet, which turned out to be the case. The question asked can be summarized as: “Who is/was responsible for the creation and ongoing maintenance of your business web site on the Internet?” The responses for the “creation” and the “maintenance” were virtually identical, so they are combined for our analysis here. The responses were in three categories: 1) someone “inside the organization” (that is, not paid separately for this service), 2) a paid “outside” person or firm – a service provider, and 3) an “other” unpaid person (usually a relative, doing it as a favor or gift). Details by state and year are provided in Appendix A. Summary results are shown in Table 4.

**Table 4:** Summarized “Creation/Maintenance” Results

Year	“inside”	“outside” paid	“other”
2001	21.4%	44.0%	34.5%
2002	24.7%	50.2%	25.1%
2003	20.3%	61.4%	18.3%

Trends are clear. Those “inside” stayed about the same. There was a clear movement away from “other” (unpaid) toward “outside” paid service providers being used for this new technology service. Again, it would appear that the diffusion of innovation theory does apply. In this case, the rate of increase for adopting an outside paid contractor is higher: from 44 to 50 to 61 across the three years. This would suggest that this adoption process is crossing the norm on the steep part of the adoption curve, moving from Early Majority to Late Majority Adopters across this three year sample.

### **Implications for Service Management and future research**

The survey data extracted for this paper have shown that the diffusion of innovation theory appears to apply to both the rate of adoption of email addresses by B&B operators in these three states and to their movement toward using paid outside service providers to create and maintain their business Internet web sites.

This three year “slice” of the life cycle of these two technology-related “innovations” provides an insight into the diffusion of innovation theory in action in this industry in the three states included in the survey. What more should we know, or attempt to learn, about these phenomena?

The results certainly beg the researcher to extend the email survey to a fourth and fifth year, perhaps, to determine if the patterns continue, and become clearer, or are not continued. This would provide additional information on both sets of issues.

On the first question, a mail survey, possibly followed by a telephone survey, is planned to determine the specific reasons for non-adoption given by those who do not have email addresses available. These results should have both marketing and management implications for both current B&B operators and for those planning to enter the industry. Marketing theory would suggest those non-adopters are losing significant chunks of potential customers and revenue by failing to adopt a communications medium now in wide use. What might their reasoning be? What is the portion of these operators that still do not physically have access to such a service? Are access costs prohibitive, even if they exist? What is the attitude of these B&B operators? Do they plan to change and adopt? When? Why?

Behavioral issues lie behind the diffusion of innovation theory and have implications for B&B and other small business tourism industry participants. Failure to be an early adopter may be indicative of other behavioral issues characteristics of ownership which should be examined by those interested in the growth and expansion of this industry. B&B operators are generally considered to be a collegial group, serving a clientele with above average education and income. They must be well aware of alleged benefits of the new technologies, yet they have chosen not to adopt. They are Laggards, according to the diffusion of innovation theory. Recall the extended definition of Laggards: "Resistance to innovations on the part of laggards may be *entirely rational* from the laggard's viewpoint, as their resources are limited and they must be *certain that*

*a new idea will not fail* before they can adopt. The laggard's precarious economic position forces the individual to be *extremely cautious* in adopting innovations (emphasis added) [1, pp.265-6].”

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**Appendix A: “Create/Maintenance” Data presented by State by Year(percentages)**

<b>KS: Year</b>	<b>“inside”</b>	<b>“outside” paid</b>	<b>“other”</b>
2001	17.1	51.4	31.4
2002	30.5	47.8	21.7
2003	15.6	53.2	31.2

<b>OK: Year</b>	<b>“inside”</b>	<b>“outside” paid</b>	<b>“other”</b>
2001	25.0	25.0	50.0
2002	8.3	50.0	41.7
2003	16.7	66.6	16.7

<b>AR: Year</b>	<b>“inside”</b>	<b>“outside” paid</b>	<b>“other”</b>
2001	22.2	55.6	22.2
2001	35.3	52.9	11.8
2003	28.6	64.3	7.1