Running Head: ELECTRONIC COMMUNICATION

The Effectiveness/Relevance of Electronic Communication In American Small Business: The HVAC Industry

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Table of Contents

Tables

Figures

Introduction

The importance of unimpaired communication grows almost daily along the American landscape. With this growth the use of electronic communication has reached critical mass in the United States. Critical Mass is "the point at which a certain minimum number of users has adopted so that the rate of adoption of a new communication technology suddenly takes off" (Rogers, 1995, p. 183). It is safe to say that, with e-communications, critical mass has been reached.. In essence, e-mail and the Internet are here to stay. Because of the nature of electronic communication, persons have staggering amounts of information available to them via several different media. As might be expected, critical mass has a downside: "the greater ease of communication across physical and social distance provided by interactive communication systems may lead to problems of information overload" (p. 182). Therefore, accurate and concise communication is an absolute necessity when messaging contains an element of significance. As Foy points out, "more than ever, people need high-quality, timely information that is easy to obtain" (p.23). Nowhere is communication of greater concern than in the business community.

Businesses, just to exist in the changing market place, have had to make communication a priority. As Young and Post (1993) found in bench marking leading companies, "communication is viewed as a critical management process" (p. 40). Businesses and corporations are bound to the profit motive as reason for existence and, therefore, must maintain profitability:

> The corporation is forced by competitive pressures to use knowledge technology, information, people, and organizations to achieve

> strategic competitive advantages of one kind or another. It can do so by employing or embodying technology in its essential design, development, or production processes; in its distribution, marketing, or sales systems; or its communications, coordination and decision-making processes, which are essential for them to operate. (Estabrooks, 1995, p. 12)

One of the most important and difficult communication processes for a business or corporation is that of communication change.

Change has become a reality in the business sphere. Change and profitability go hand in hand in today's climate of competition. "Competition, competition, competition has been the strongest economic factor for change in corporations" (Goodman, 1996, p. 2). There exist several ways in which a business can undergo change and maximize economic profitability. Goodman puts it this way: "ventures, partnerships, reorganizations, mergers, acquisitions, buyouts, re-engineering, downsizing, right sizing-these are more than buzzwords, they are the codes for a workplace in tremendous upheaval" (p. 2). Without question, new technologies are forcing businesses to re-engineer their thought processes regarding how they communicate. Re-engineering of a businesses communication paradigm remains a difficult task at best. This study seeks to address some questions regarding a select industry, their usage of technology, and gauge the effectiveness of technology while perhaps enlightening the reader to some of the marvels we can expect in the not, too, distant future.

Small Business

All businesses are exposed to the current volatile dynamics of a vastly changing and increasingly global world. No derivation of the business structure feels this more

than small businesses. As Haynes (1998) puts it, “today’s small businesses face an increasingly unstable marketplace rife with change” (p. 229). Because of this uncertainty, prudent business owners should prepare themselves for the technological moves that the entire business community is making. This would most certainly involve a vast amount of planning and strategy to encompass all aspects of their organization. As communicated more succinctly by Barrier, “wise small-business people aim for long-term relationships that benefit both buyer and seller” (1997, p.12). At the heart of making wise business decisions are communication and communications technology. Without buyers there are no sellers and no economy. At this juncture of our economic evolution, small businesses are a vital cog in the machinery that is the United States infrastructure. By examining the importance of small business to the nation, the relationship between business and communication, and the tools of communication most widely used, we can begin to see the paramount importance of, as well as the communication habits of, the ‘Moms & Pops’ of the world.

Small business plays a major role in the economy of the United States. According to Haynes (1998) almost all of the employers in the U.S. are small businesses: “small and mid-sized businesses comprise more than 99% of all U.S. employers” (p. 229). This statement, prima fascia, provides irrefutable evidence of the extreme importance of small businesses. Ihator (1998) echoes this sentiment in that “small businesses are very important for the viability of the national economy . . . and employ almost 60% of the country’s private work force” (p. 28). President Clinton (1995) provides the most compelling evidence of the importance of small business to the U.S.: “at the heart of our free enterprise system are the nation’s 21.5 million small business. They are the engine

of our economy, keeping America competitive in domestic and global markets" (p. 729). There remains no doubt as to the necessity of small business to the nation's economy, and of the necessity of effective communication to small businesses.

Since communication is paramount to business, it is therefore paramount to the national economy. Because of this, communication should be a fundamental aspect of all business segments. However, in the case of small business, that is not always the case. As Anderson (1995) explains,

> Communication is seldom seen as a core issue in small business, unless the business is itself advertising or public relations consulting. Communication is more commonly regarded as a luxury, until the consequences of that assumption 'gone wrong' are faced. (p. 28)

The implications here are quite disturbing. As will be shown in a subsequent section, small businesses, similar to large businesses, need to communicate with myriad persons and organizations to remain effective and profitable. However, as Anderson (1995) notes, "Large organizations have the advantage of more resources and multiple business segments that keep the organization healthy" (p. 28). This means that small businesses face a tougher challenge to achieve maximum communication effectiveness. Electronic communication has eased many of these challenges and made small business more competitive with larger organizations for market share.

Electronic communication plays an ever-increasing role in the viability of small businesses. The Internet and/or the World Wide Web provide a vast array of electronic communication tools for the small business. "The most popular use of on-line services – both for business and individual computer users - - is on-line communications, primarily

the ability to send and receive messages" (Resnick, 1994, p. 66). On-line services have paved the way for small businesses to be more competitive. As Shafer (1995) states: "E-mail, networks, and easy – to – access databases are enabling small business to play ball with the big guys" (p. 92). Instant electronic information and instant electronic messaging for virtually no cost is one of the primary tools enabling a more competitive marketplace. E-mail, especially, has carved a unique niche within the business world, emerging "as the primary means of business communication, surpassing faxes, voicemail and even the phone" (Michaels, 1999, p. 30). However, the use of the cellular phone and wireless technology has also had quite an impact on small business. In fact " . . . small businesses now account for 22 percent of the cellular-phone market of 26 million subscribers" (Weaver, 1996, p. 44). While this figure is a bit dated, it gives a good example as to the saturation and usage of electronic communication in the small business setting. Whatever electronic communication tool employed, e-mail, voice mail, cell phones, the fact remains that small businesses have, by necessity, been forced to adopt these technologies.

As a nation, we could not and cannot survive without small businesses. Their existence is necessary for the vitality of the nation and the nation's economy. While communication as a function of business is extremely important, small business has lagged behind in using communication as a profit generating tool. The advent of electronic communication in all its current forms has provided the vehicle for small businesses to compete better and be more efficient. The question remains, have they, in fact, adopted electronic communication and to what degree? This study uses the HVAC

industry as its backdrop. A discussion of that industry comprises the bulk of the next section.

The HVAC Industry

The HVAC industry is both a dynamic and a crucial industry to the United States. This industry provides the differentiation in our dwellings between livable domiciles and structural boxes. HVAC stands for Heating, Ventilating & Air Conditioning. Specifically, HVAC builds, sells, installs, and services appliances that heat, cool, humidify, de-humidify, and filter the air we breathe, in our homes and businesses. This specific industry was chosen because of the closeness of the author to many of the persons in the trade due to professional business relationships. Moreover, the author is an owner of a small business that performs work as a sub-contractor for HVAC professionals. Through this experience, the author has noticed and been subject to communication deficiencies within the industry that do not bode well. A brief look at the importance and function of the industry, how the industry is organized and which specific geographic region is targeted for this study provide a necessary backdrop for the understanding of the predictions and actual results of the research.

Most individuals take the HVAC industry and the appliances available for granted. However, without trained professionals working in the industry and the availability of quality products, our lives would most certainly be much different than they are today. Imagine a home without heat in the winter. Peoples' lives are saved and enhanced every year because the heating systems in their house keep them from freezing and the cooling systems keeping them from overheating. Many persons still spend grueling days and nights through the dog days of summer without adequate cooling.

There are products available that are 95%+ efficient, which provide an enormous benefit to the environment and to the consumer as a cost benefit. These products heat and humidify the air during hot months and cool and de-humidify the air during cold months. There are products that filter the air, removing even the smallest of particles and effectively killing microbes, bacteria and viruses in the living space. Persons suffering with asthma, emphysema, and other respiratory conditions can breathe easier in their own homes and businesses because of properly installed appliances. This is the importance of the HVAC industry.

There are a few unique layers to the industry that are worth mentioning. An HVAC business can focus on industrial, commercial, or residential. Industrial accounts are those that are involved in the process of manufacturing or fabrication and are generally housed in large warehouses or factories. Commercial accounts comprise the widest spectrum. Basically, anything that is affiliated with a business, agency, or service can be classified as commercial. Residential refers to single family dwellings or duplexes. To demonstrate the organizational structure of the industry, let us trace a furnace from inception to installation. An OEM or Original Equipment Manufacturer produces a furnace by assembling the units with parts they make themselves or contract to have made for them. After assembly the unit is shipped to a distribution center, more commonly known simply as distributor. An HVAC contractor purchases the units from the distributor and then resells the unit to the end-user who requires installation. (See table 1). Keep in mind also the communication dynamics necessary to get the units from OEM to end-user. Working backwards, lets trace the chain of events necessary for the communication of the need to the fulfillment process. The consumer requires a new unit

for a new structure or to replace a faulty old unit. The consumer must first secure the services of a contractor. The contractor then relays the need to the distributor who sends it on to the OEM. The communication process mimics the economic process because the flow of the communication from consumer to OEM is also the flow of money from the consumer ultimately to the OEM. This process is currently performed via telephones, or at best, faxes; this will not always be the case, as will be shown in subsequent sections.

For the purposes of this research there is a specific area targeted for selection. The industry is, of course, the HVAC industry, a considerable proportion of which is made up almost entirely of small businesses. Although there is a consolidation movement afoot in the industry, currently it has not reached the demographic territory selected for study. Southwestern Pennsylvania is targeted for the research, specifically, all contractors in the zip codes 15001 through 15999. This is a unique area from which to launch a study of the HVAC industry. There are over 250 HVAC contractors within the 15-zip area. This is an enormous number of contractors. A summation of an interview with Robert Matviko (1999), owner of Automatic Heating & Air Conditioning, Inc., provides some insight into why there is such a saturation of contractors in this area: Automatic has been in business for 25 years in Arnold, PA, which is just to the NE of the city of Pittsburgh. They are a full service heating and cooling firm specializing in custom sheet metal ductwork. In Matviko's opinion there are myriad persons involved in the HVAC industry in SW PA. There are two main reasons why there are so many heating and cooling contractors in the area. First, when the mills closed in the 80s, many displaced workers started HVAC businesses from scratch with little or no training. Second, the terrain almost necessitates that there be many contractors. With all of the

rivers and hills, it takes twice as long to get around here than if you were in an area that is considerably more flat. A contractor's service territory is 30 to 45 minutes from their place of business and in this area that can only be a few miles. Matvico feels that the demographic ratio of contractors per capita is not necessarily positive for the region. Although competition keeps any industry healthy, there are just too many unqualified persons performing substandard work without the knowledge of the consumer. The sheer numbers of contractors in the area make SW PA perfect for a study of this type.

The HVAC industry is necessary for the enormous accommodations that are provided to the average citizen. The comfort aspects are only exceeded by the life saving benefits. This, in and of itself, provides substantiation for researching the industry, but there are other reasons as well. There is a great communication dynamic that flows through the industry beginning with the consumer all the way up to the manufacturer. Furthermore, the self-contained geographical space and plethora of contractors in the SW PA seem ideal for conducting research on communication in small business. Lastly, due to the emergence of new technologies that are drastically affecting how we communicate, research needs to be conducted to gauge the extent, as well as the effectiveness, of communication technologies in the industry.

New Technologies

New technologies have been arriving constantly for the past few years. From the expansion of the Internet to personal communication systems to palm pilot organizers, businesses are faced with the overwhelming task of keeping up with new technology in

order to remain competitive. Hickens (1999) provides some insight into the importance of communication technology for local small businesses:

> Most people think of electronic commerce as a way for big businesses to reach across state and even national boundaries. But many Internet users are also looking for local products or services. Indeed, the Internet can be an effective communications tool for local and regional businesses. The Internet is also a great way for a business to reach out to its neighbors. A lot of people surf the Web just to figure out where to go to dinner or the movies. (p. 5)

What remains certain is that the influx of new technology is not over and more adaptation is right around the corner. In the introduction to the research section of this paper, the term 'critical mass' was introduced and defined. In this section critical mass will be broadened in the sense of "pervasive technology." Next shall ensue a discussion of the types of technologies that can be expected in the not too distant future and the implications for the HVAC industry, especially the small business entrepreneur.

Pervasive Technology

As with anything new, there are bound to be vocabulary that was heretofore unknown. One of the main new terms is "pervasive technology." This term is not even in the dictionaries yet. Pervasive technology is a clearer and more defined term than critical mass. Kevin Coleman (2000), CPCM, and chief strategist for Netscape, defines pervasive technology thusly:

> Pervasive technology is any technology that meets one or more of the following criteria: will be accepted and used by more than 20% of the

> population in North America, causes an organizational impact of more than 25%, has a fan out of at least 10 fold – drives other technological advances. There currently exist many types of pervasive technology, the Netscape Browser being a single example. Emerging pervasive technology would be XML and iWap.[1] XML and iWap are in production now but will become mainstream in 2 to 3 years. It is expected that XML will become mandatory and there are standards committees addressing that issue currently.

Coleman's pervasive technology explanation has expanded the meaning of critical mass. However, a question remains as to how pervasive technology plays into the current research. An answer was provided at a strategy meeting that the author attended, given by Jerry Nath, Senior Account Executive, for Sun Microsystems and Robert Marzullo, Senior Account Manager, for Sun/Netscape Alliance (1999).

According to Nath and Marzullo, inside of the home, pervasive technology will forge a relationship between homeowner and appliance. Cupboards will no longer just hold dry goods; rather, 'smart shelves' that employ scan devices to interface with microchips that will soon be on all food labels, will automatically inventory groceries and make a shopping list every week. Add a 'smart refrigerator' to the equation and appliances will tell consumers when the milk is too old or the vegetables no longer fresh and print a total list as to favorite items that are missing from the shelves. Add a modem or wireless technology through the Internet and the refrigerator will automatically place a shopping order and the on-line distribution centers will automatically ship the items to the consumer's doorstep. This is technology that exists now but is not in place, except in

Bill Gates' house, due to current cost and the fact that the general population is just not ready.

As far as pervasive technology is concerned, and combined with the examples above, it is not hard to imagine a 'smart furnace' or 'smart central air conditioning system'. A smart piece of equipment would monitor itself and its components. Once a deviation in performance was detected, the system would automatically notify the service/installation contractor and the homeowner to make them aware of the potential problem; all before the unit actually malfunctions. The contractor's system would scan for the necessary part and order one from the distributor. The distributor's system would then, in turn, notify the OEM that they need a replacement. In Figure 1 (See Figure 1) we see that the consumer initiates the contact, mainly by phone. The lines of communication are in opposite proportion to the flow of the equipment. Thanks to pervasive technology, the equipment becomes the initiator of communication (See Figure 2). This constitutes no less than a new form of 'artificial communication,' with appliances and machines communicating to people instead of people communicating through appliances and machines.

With such new technologies already developed and just waiting for the population to become technologically mature, it is easy to see why small businesses need to be ahead of the curve and poised to react when the time is right. That is the goal of this research: to determine the extent of the use of current electronic communication by HVAC contractors to assess how they will fare in the future. Before we discuss the methodology for assessing their readiness, we need to discuss the current literature relevant to our research.

Literature Review

Although electronic communication, specifically e-mail, intranets, and the World Wide Web, are fairly recent advances, already there exists a plethora of research on media, makes, and channels. In order to stay within the scope of this research, literature was chosen that specifically addresses the goals of this paper. First, a discussion of research impacts and adoption of communication technology will ensue. Next, the location of this study within the scholarly framework will be discussed, followed by relevant studies. Research exists that addresses electronic communication within the corporation. What is missing, however, is any published research that addresses a specific industry in relation to electronic communication and technological advances. Communication scholars, as will be shown, have done some preliminary research over the past few years to provide some chronologically associated surveys that lend themselves well as precursors to this work.

Impacts

In order for any research to be viable, its relevance must first be established according to certain parameters. One secure method for determining viability remains the impact or possible impact of the subject matter. While there exists little room for debate on the fact that there will be impacts from new technology in general, and electronic communication specifically, what are not so solid are the ramifications themselves. Perugini (1996) established an impact scenario beginning with adoption of technology and ending with areas of possible impact that serve as grounding relevance for this paper. Adoption remains so very critical to this research due to the aforementioned pervasive technology that is quickly appearing on the scene.

According to Perugini (1996), before any technology can have any impact at all, it must first go through an acceptance phase where enough users accept it fully to give it longevity. Small business owners must make certain that a new technology or communication is actually utilized by all members of the company or the benefits become irrelevant. Perugini maps the adoption cycle of technology through the stages: "innovators, early adopters, early majority, late majority, and finally, laggards" (P. 8, See Figure 3). Once a technology reaches the "early majority stage the chances for the survivability of it are fairly high. There are steps that a business can take to ensure the acceptance and usage of a new technology: '1) visibility, 2) a good conceptual model, 3) good mappings, and 4) feedback" (Perugini, 1996, p. 8). An easy adoption scenario for a small business is the fact that employees have to use the new equipment and software as a condition of employment[2]. However, usage and adoption are clearly differing concepts. Adoption will lend itself towards effectiveness when dealing with electronic communication.

According to Perugini (1996), if adoption of technology is assumed then the possible impacts can start to be weighed: "plain and simple, any technology adopted . . . will have 'inherent and identifiable social, political, and environmental consequences'" (p.9). The application of this statement to a business environment is not a difficult assimilation. Some of the possible impacts/consequences include value issues, privacy issues, security issues, productivity issues, and moral issues.

Because the depth of impacts has not been extensively studied, the only goal for this paper in discussing impacts and issues is to demonstrate the breadth of possible ramifications. A business that moves into an electronic communicative medium runs the

risk of non-adoption that could result in lost productivity, loss of morale, and even suspicion on the part of the employees. Businesses must be wary of the possible impacts on their choice of communicative media. In fact, Brimm and Murdock (1998) claim that "the actual channel used in communication has been shown to be significant" (p. 169). For this reason, business owners must be sure that their workforce is properly trained and be positive that the preferred channel of communication is the right application for their purposes.

Definition of Business Communication

Technology is increasingly changing the scope of how organizations function, communicate, and perform their operations. El-Shinnawy and Markus (1998) have evaluated the communication in organizations and concluded that "new communication technology is changing how we work" (p. 242). Further emphasis is provided from Goodman (1996) that "new media technologies-the tools of communication-continue to have a profound impact on corporate communication" (p. 26). Because of this, organizations are prime locations for communication research: "because organizations are more clearly finite than broad society, they present a potentially useful laboratory like setting for communication research" (Bastien, 1992, p. 405). Research by Shelby (1993) succinctly positions business communication within the communication strata.

Business communication occupies a specific and well-defined locale within the communication discipline. If structured hierarchal organizational communication would occupy the top rung, with business communication located directly underneath and other sub-disciplines overlapping and interacting further down. Shelby's model (1993) is one of overlapping functions with linkages circling other sub-areas as well (See Figure 4).

The model presented provides a visual representation of where business communication is found in the academic strata. Shelby's design provides a much more enhanced style than a straight or rigid concept due to the overlapping and exclusionary aspects. However, the model does not represent the concerns of small business, which is contained in the model but is inherently unique unto itself. This paper attempts to correct this deficiency by proposing an addition to the Shelby model that places small business within the boundaries of business and touches the other facets of organizational communication[4] (See Figure 5). For the purpose of this research, the Shelby model presents a discernable location for our work within the communication realm.

Relevant Studies

Many surveys that currently exist look at small businesses in relation to electronic communication usage and preference. While these studies are not industry specific, they do provide valuable data as to the trends in usage. In this section, various studies will be reviewed in chronological order of publication date beginning with the earlier studies. The research will be provided in the same format as it was published. Some of the studies mentioned are not scientific surveys but appear to be merely polling data. However, since the data is in published form it will be accepted in so far as trend evaluation is considered.

The first acceptable research regarding electronic communication and small businesses was published in 1995. Any study prior to 1995, the author felt, was too old to provide any usable information. The collected data reveal that small businesses are not at the forefront of technology adoption:

> Small businesses lag behind when it comes to online communications, says a report by the National Federation of Independent Business, in Washington, D.C. Of 4,600 members surveyed (typically businesses employing five persons and reporting gross sales of about $250,00), 41% have modems; 16% have more than one modem and only 5% have fax machines. (Editor a, 1995, p. 10)

What is interesting about this survey is that the modes of electronic communication we are considering, Internet, e-mail, etc., are not even included in the survey; however, the figures on modern usage suggest how far behind small businesses find themselves in adopting electronic communication systems.

The next survey, conducted by Holzinger (1995), provides more useful information regarding targeted media than the previous survey. This work is an excellent comparison and contrast to the previous one because it surveys business as a whole without targeting a specific segment during the same year. It does not, however, ask the same questions, so some reader extrapolation is necessary:

Business's Plans for Using Communications Technology

Type of Technology	Companies Now using It	Companies Planning to use it by 2000
Electronic Mail	39%	81%
Employee Interactive Education and Training	32%	75%
CD-ROM Access to Publications	28%	77%
Videoconferencing	15%	57%
Electronic Marketing	10%	44% ‘

(P. 47).

While the types of technologies listed in this study are far more advanced than the technologies listed in the previous survey, they nevertheless provide valuable insight. The low percentage (41%) of modern usage would predict the low percentage (39%) of electronic mail usage. This just further emphasizes the point that small businesses typically are far behind the rest of the business community.

The next survey, published in 1996, was actually conducted in 1995. The research directly targets small businesses and technology that are relevant to the technologies discussed in this work:

> According to a June 1995 Gallup survey of 300 small-business owners, 46% claim to be "cyberphobic," [sic] or intimidated by the information superhighway. Of the 48% of business owners surveyed who have desktops or laptops with modems, only one in 10 uses E-mail to connect with customers, and only one in 11 uses the Internet to do so.
>
> . . . The survey, which addressed companies with 20 or fewer employees and was sponsored by MCI, found that the telephone still trumps the computer, with 98% of respondents relying on it. Despite rising postage costs and a bad delivery rap, the U.S. mail runs a close second at 90%. And while 65% of respondents send faxes to customers, only 58% rely on overnight-delivery services (Hise, 1996, p. 1c)

In contrast to the first study that said only 5% of the companies ($\geq$5 employees) had fax machines, this study shows that 65% ($\geq$20 employees) have fax machines. This clearly suggests that the fewer employees, the farther behind in electronic communication the business is.

The next study, from late 1996, shows the desire of small businesses to adopt new technologies. This was a poll released in *Nation's Business* in which respondents voluntarily participated in an advertised poll. Because of the methodology, the results cannot be considered scientific; there is no control over who responds. Nevertheless, these results can provide some insight into why small businesses lag behind in adoption. The current study will borrow some of the questions used in this survey.

Questions And Answers

Which technologies do you currently use in your business? (Note all that apply.)

Cellular phone	78%
E-mail	54%
Toll-free number for customer support	53%
On-line services or the Internet	27%
Videoconferencing	2%

Which technologies do you plan to add in the next twelve months? (Note all that apply.)

Cellular phone	13%
E-mail	31%
Toll-free number for customer service	17%
On-line services or the Internet	46%
Videoconferencing	12%

What usually is your main reason for adopting a new technology?

To provide new services	26%
To reduce costs	19%
To increase employees' productivity	19%
To improve service to customers	36%

What usually is the primary factor that dissuades you from adopting a new technology?

Complexity	29%
Cost	51%
Fear of obsolescence	4%

Privacy and security concerns	7%
Need for more information	9%

Which of the following services or products do you believe can provide adequate privacy protection and information security? (Note all that apply.)

The public telephone network	32%
On-line services	12%
The Internet	9%
Private company networks	36%
Encryption software	49%

Are new laws needed to protect individual privacy and provide security of information transmitted electronically?

Yes	66%
No	34%

Are new laws needed to protect copyrighted material and other intellectual property transmitted electronically?

Yes	63%
No	37%

(September Poll, 1996, p. 84).

Although the reliability of this study is questionable, if we assume even a large amount of error, the data are still useful. One item in particular is that over half of the participants do not utilize more technology due to the cost factor against the perceived benefits. As a general rule, small businesses do not have much in the way of disposable income; a true statement more so for the HVAC industry. In fact, it is the author's experience that, at certain times of the year, contractors can have difficulties meeting payroll. Another interesting item from this poll is the percentages who want more laws. This is in stark contrast to the interview earlier in this paper by the industry partner who said that government should stay out of the way and let the industry work itself out. The next bit of research jumps to 1998.

A side article in the *Christian Science Monitor* stipulates that "small business leaders found marketing and technology were the areas in which they felt their companies needed the most improvement" (Editor b, 1998, p. 2). This certainly echoes the statistics we have seen up to this point. The following brief survey, reported in the same article, shows how the adoption of electronic communication has grown since the first and second studies presented previously. These figures represent the percentages of companies polled who use the media.

Fax machines	95%
Specialized software applications	73%
Internet	63%
Electronic mail	62%
Voice mail	58%
World Wide Web site	37%

(p. 2).

A comparison of the Holzinger (1995) study to this one shows that business has made gains in usage of electronic mail, from 39% to 62%, but not as much usage as had been predicted (81%). Moreover, this study does not specifically target small business. Studies of this type validate the research of this paper that will focus on a specific industry to map trends in electronic communication usage. The last survey to be discussed remains the most valid and statistically relevant thus far.

Haynes, Becherer and Helms (1998) conducted an in-depth study of small businesses related to Internet usage. This study might well be used as benchmark. Published in 1998, the researchers were looking for a correlation between business size and Internet applications. The researchers surveyed 1,507 businesses and received 316 responses. The businesses were categorized into three groups: large, mid-sized, and small. Surprisingly, there was not much statistical difference among the three groups and

the percentages of electronic communication usage (See Table 1). This could possibly mean that the playing field is being leveled. Again, however, there are no industry specific studies.

Hypotheses and Research Questions

Certain predictions are obvious from the previous sections. This study will test the validity of the following hypotheses:

H1 Among the targeted HVAC businesses, the size of the business will not be a factor in technology adoption.

As shown in table 1. from Haynes et.al (1998), the size of the business was not a determining factor in the technology they utilized.

H2 A. The HVAC industry falls short of business in general regarding the usage of computer based electronic communication..

Falls short will refer to a drop of 25% from the predictions of the Holzinger (1995) study which predicted 81% of business will use electronic communication by 2000. If >60% of the contractors do not use some form of computer based electronic communication then H2A will be supported.

B. The HVAC industry will not be prepared for pervasive technologies.

H2B will be supported if and only if H2A is supported.

The questions below represent areas the research does not address but which could have a significant impact on adoption rates:

Q1 Do older HVAC businesses have lower technological adoption rates than newer businesses.

Q2 Do HVAC contractors trust accuracy of electronic communication.

Q3 Do HVAC contractors prefer traditional communication media to electronic media.

Significance of Research

The significance of the study is that it will further the electronic communication research relevant to the discipline of organizational/business communication while enhancing the information known about the HVAC industry, the S. W. Pennsylvania region, and small business. Anyone interested in researching business communication or electronic communication would also find the study relevant to his or her field of inquiry. Industry specific research regarding the adoption or acceptance of electronic communication is virtually nonexistent. Those involved in the HVAC industry would find the information invaluable. The target market, small HVAC contractors, would benefit enormously from the information. Distributors and OEMs need to know the status of those who sell and install their equipment in relation to preparedness for new technologies. Marketing persons could employ the information in demographic product analysis. Furthermore, any agency or body interested in small business relationships would also find the research useful. Lastly, the local development authorities as well as regional economic development managers need to possess data such as this to know how to properly allocate funds.

Methodology

The methodology for this study employs elements from the *Nation's Business* (1996) study and the Haynes, Becherer and Helms (1998) research. Although the questions are similar, the format of the research and the control make this research more accountable. So that geographic factors can be eliminated, a single zip code prefix was chosen for the survey. HVAC contractors whose businesses are in the 15001 to 15999 zip code range will receive the survey. The 15 zips are in South Western Pennsylvania. The Air Conditioning Contractors of America Western Pennsylvania Chapter provided the names and addresses. Membership in ACCA is not required for participation in the study. The only criterion is that the business be a locally owned HVAC contractor. There are 221 contractors who fall into this segment. They received a survey by mail in the summer of 2000 (See Table 3) and a return envelope with an anonymous return address to the California University of Pennsylvania. The results of the first section of the survey provide percentages of contractors utilizing electronic communication in ratio to number of employees and age of business in order to validate/invalidate H1, H2 and provide an answer to Q1. The results of the second section of the survey were entered into a statistical program to calculate mean and standard deviation in order to ascertain Q2 & Q3. The final results are tabulated and discussed in the subsequent sections.

Results

The surveys provided some very interesting results. Of the 221 surveys sent out, 109 were returned or 49%. Four of the returns were not usable leaving 105 usable responses. The respondents were divided into the categories of age of business and size of business. For the purpose of this study the following classifications were utilized in order to provide a basis for data analysis: a small business employed up to 5 employees, mid sized up to 10, and large 11 or more employees; a young business was less than 15 years old, middle aged business 16 to 29 years old, and old business 30 years in existence or more. Most of the business respondents fell into the 'small' category, but the age of the businesses was fairly constant across the sample (See Table 2).

H1 was not supported. The size of the business was indeed a factor in whether or not technology was adopted (See Table 4). The larger and mid-sized businesses were utilizing technology much more often than the small businesses. In some cases the difference was as much as 30%.

H2A was supported. Less than 60% of the HVAC businesses utilized computer based electronic communication. The usage rates are shown in the following table:

Fax Machines	84.7%
Voice Mail	48.5%
E-Mail	50.4%
Internet Access	44.7 %
Pagers	56.1%
Computer	81.9%
Cell Phone	84.7%
Company Internet Site	20.0%
Company Intranet	3.8%

This table can be compared to the Holzinger (1995) study, the Hise (1996) study and the 1998 (Editor b) study showing that business in general was ahead of the HVAC industry

a few years ago and remains ahead currently. H2B, therefore, was also supported; the HVAC industry will not be ready for pervasive technology.

One area of relevance completely ignored in the available research was any information regarding the age of the industry or businesses being investigated. Q1 seeks the answer regarding age being a determining factor for technological adoption in HVAC businesses. Age was not a factor in relation to the usage of technology (See Table 5). The differences in adoption in relation to the age of the business were not statistically significant.

The Likert Scale answers provide the necessary insight into Q2 and Q3 as well as the attitudinal profiles of the persons in this particular industry (See Table 6). In answer to Q2, the business owners appear to trust electronic communication in so far as the mean shows a value of 3.4762. As to the preference of communication media, Q3, they preferred print over electronic with mean scores of 3.5 to 2.7670.

The amount of apathy from the contractors, as demonstrated by the mean averages in the Likert Scale results, provides some interesting insight into their feelings regarding electronic communication. The two areas that seemed to generate some stronger emotions were that they do not trust the security of electronic communication and they feel strongly that legislation is necessary to police electronic communication. The other questions from the survey yielded means mostly in the three range, which suggests that they are mostly neutral towards these issues. A possible explanation for this is that this industry is not prepared for the technology on the horizon and are therefore not aware that they should be concerned about these issues.

Implications

The importance of communication, especially that of electronic communication, grows almost daily as the business climate races to keep up with changing technologies. Competition for an expanding, technology driven consumer is reaching critical mass in the business world. Small businesses need an attitude of imperativeness to remain viable and solvent in the technology world. The HVAC industry is no exception. With pervasive technologies looming on the horizon, waiting for consumers to catch up with technology, the small business owners need to be prepared for the eventualities that are nearer than they expect. The research presented here provides compelling evidence that not only are the businesses in this industry and demographic not prepared, but also that they are apathetic. This research lends itself towards a broader look at this industry or another micro examination of a different industry. What remains now as an obstacle to electronic communication and technology based research are timing limitations and the exponential growth of the associated industries.

Also of note towards further research mentioned for the first time in the material presented here is the notion of artificial communication defined as communication generated by an artificial intelligence and received by another artificial intelligence or a person and the ramifications thereof.

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Figures

Figure 1: Business Communication Interaction

This is the business model that is currently in place today in the HVAC industry. The red line represents the flow of communication that is initiated by the consumer and ends at the OEM. The blue line represents the flow of equipment and/or parts (See Author Note 3).

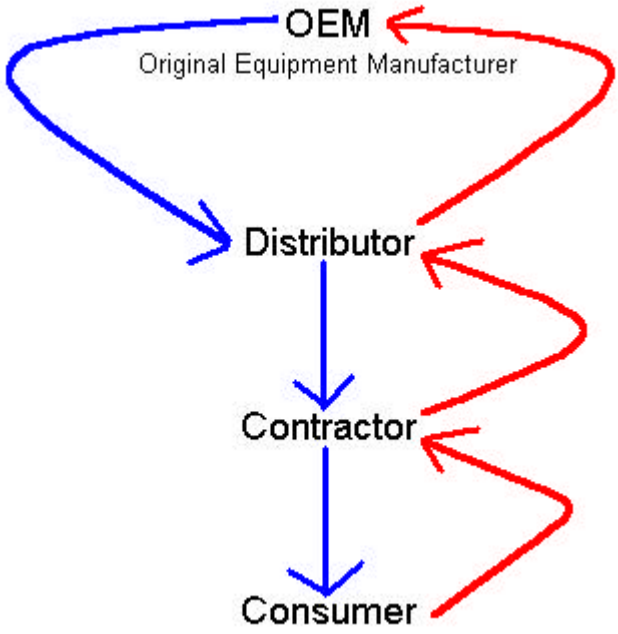


Figure 2: Pervasive Technology Business Communication Technology

This figure illustrates a business model for the future. In this model the red again signifies the lines of communication, but the communication is initiated through artificial means via the appliance itself or the computer networked to the appliance. Although it is difficult to represent visually, this model is much faster since the communications are automatic and electronic instead of manual.

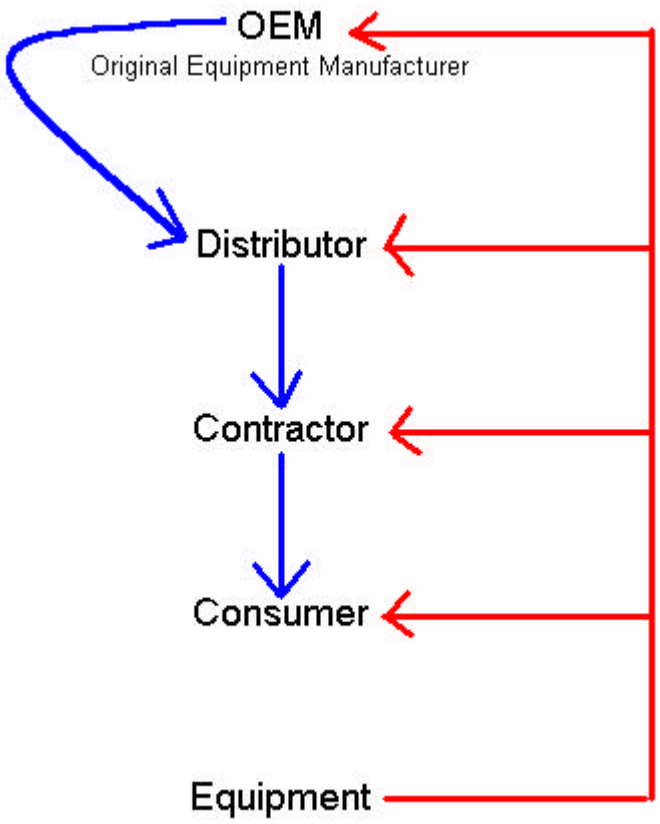


Figure 3: Perugini's (1996) Model of the Adoption Cycle of Technoolgy

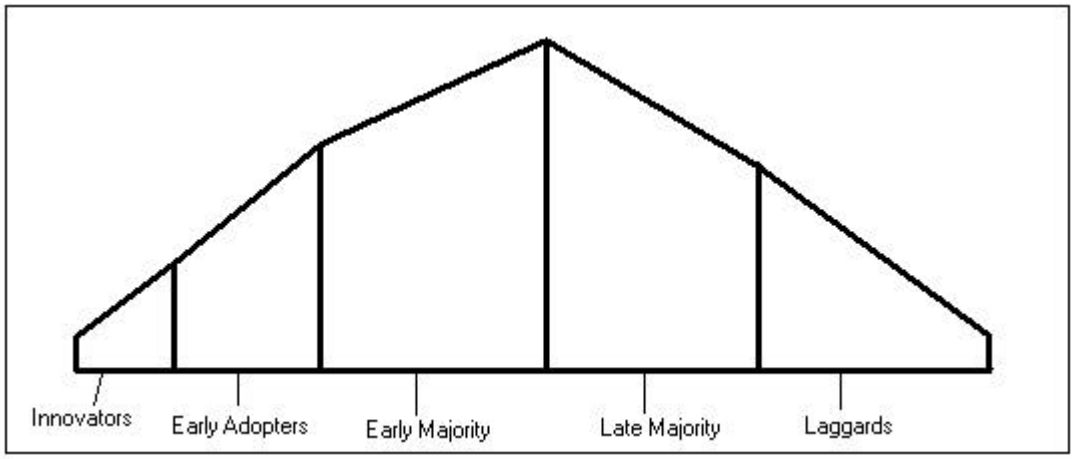


Figure 4: Shelby's (1993) Model of Hierarchical Organizational Communication

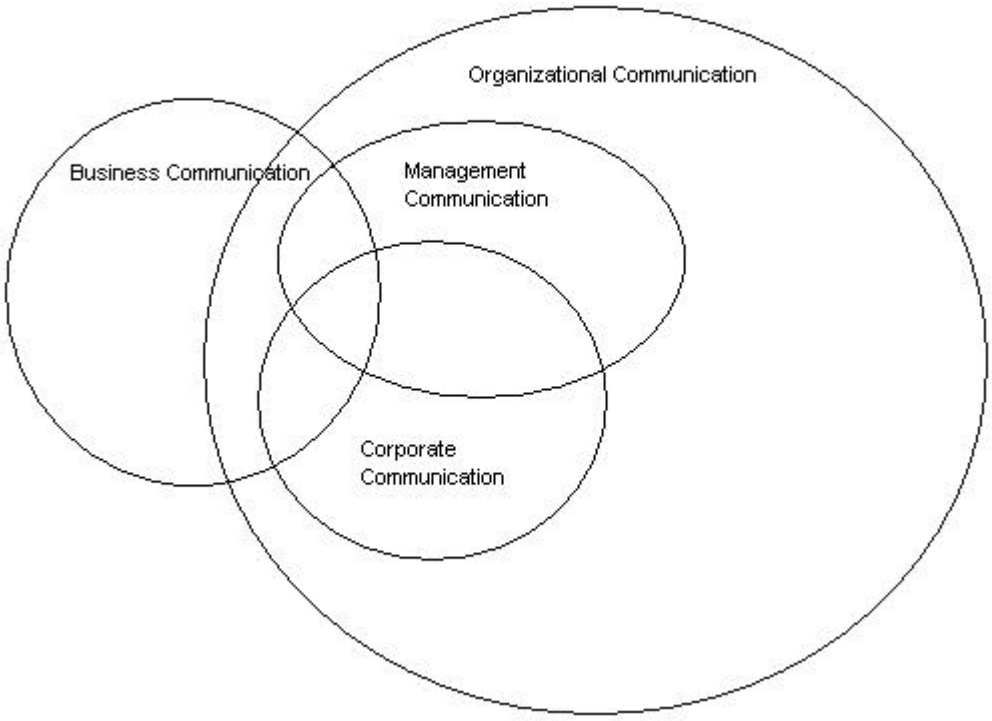


Figure 5: Author's Revised Model of Shelby (1993).

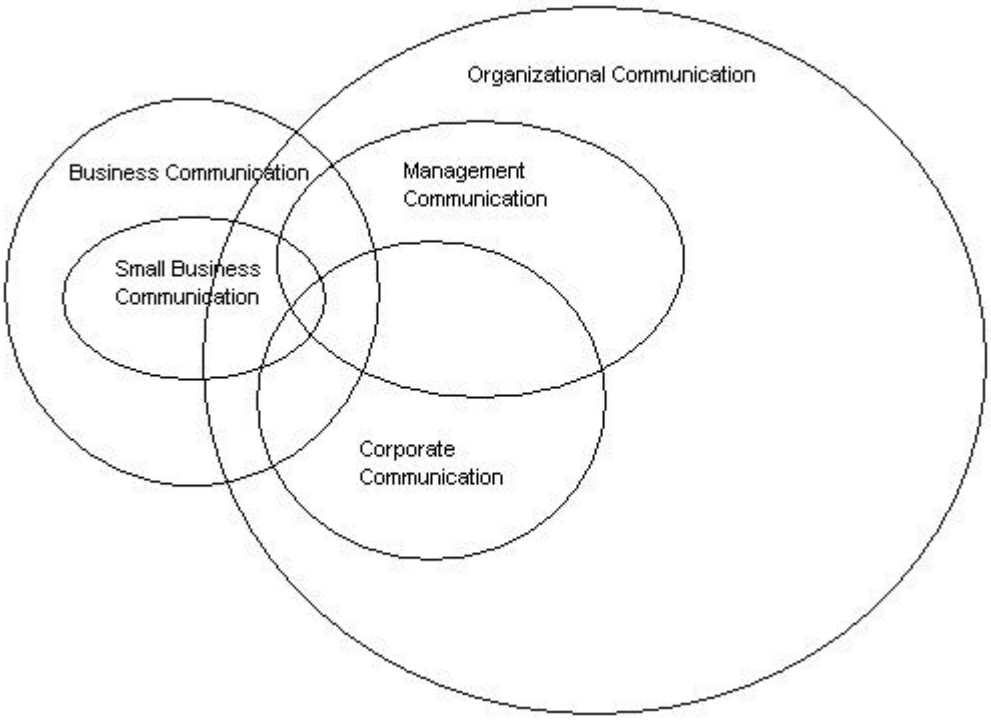
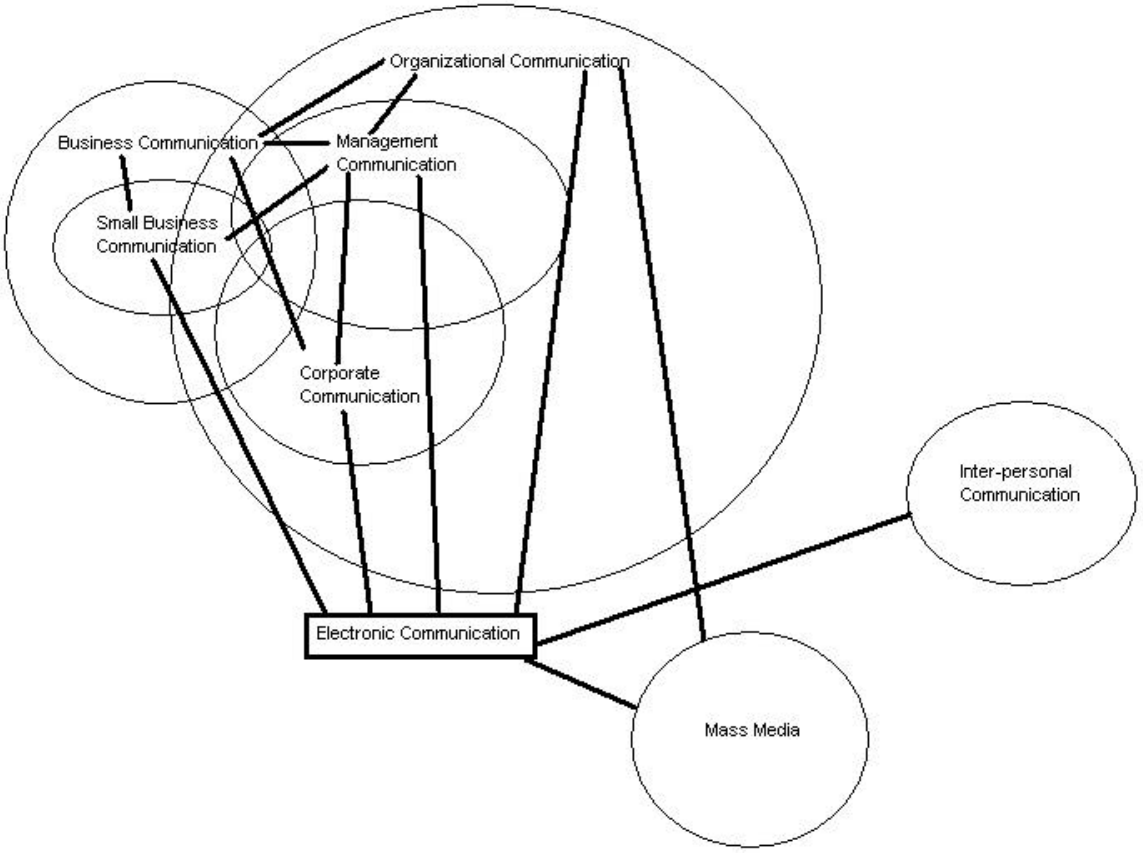


Figure 6: Author's Revised Model of Shelby (1993) incorporating electronic communication (See Author Note 4).



Tables

Table 1: Haynes, Becherer, and Helms (1998) Research Results

Internet Usage	Large Business	Mid-sized Business	Small Business	X2	Significance Level
Have Internet Access	56.1	58.7	54.8	0.323	0.851
See Internet benefit to their business	85.1	85.7	76.2	3.955	0.138
Use Internet for market/industry analysis	35.6	31.4	36.2	.0619	0.734
Use Internet to Research Competition	39.1	29.5	39.0	2.691	0.260
Use Internet for e-mail	50.6	45.7	56.2	2.309	0.315
Have business home page	49.4	34.6	52.4	7.864	0.020
Use Internet to evaluate suppliers	13.8	16.2	17.1	0.417	0.821

Table 2.

Number of Employees * Years in Business Cross tabulation (r=105)

		Years in Business			Total
		1-15	16-29	30 +	
Number of Employees	1-5	33	23	20	76
	6-10	5	8	6	19
	11 +	2	2	6	10
Total		40	33	32	105

Table 3.

This is a school project surveying small businesses paid for by a student. Please take a moment to fill it out and return it in the postage paid envelope. It is entirely anonymous. Do not identify yourself or your business on the survey. Thank you for participating.

Number of Employees _____ Years in Business _____

Circle all that apply

I currently use for my business:

fax machines	voice mail	e-mail	Internet	pagers
Computers	Cell phones	Company Internet Site	Company Intranet	

Circle the best response

Please answer the following questions by circling the best response using the following ratings:

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

01. I trust the security of the Internet	1	2	3	4	5
02. I trust the security of e-mail	1	2	3	4	5
03. I trust the accuracy of electronic communication*	1	2	3	4	5
04. I trust the accuracy of printed communication**	1	2	3	4	5
05. The introduction of electronic communication has increased my profitability	1	2	3	4	5
06. The introduction of electronic communication has increased my productivity	1	2	3	4	5
07. I prefer electronic communication over printed communication	1	2	3	4	5
08. I prefer printed communication over electronic communication	1	2	3	4	5
09. New laws are needed to protect individual privacy and provide security of information transmitted electronically	1	2	3	4	5
10. New laws are needed to protect copyrighted material and other intellectual property transmitted electronically	1	2	3	4	5

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* electronic communication refers to fax machines, e-mail, cell phones, voice mail, pagers, or anything transacted over a modem.

** printed communication refers to things received by mail, letters, written or printed memos etc.

Table 4. Survey Results by size

	Large 11 +	Mid-Size 6-10	Small 1-5	X2	Significance Level
Fax Machines	100	100	78.9	7.203	0.027
Voice Mail	70	36.8	48.6	2.885	0.236
E-Mail	70	63.1	44.7	3.749	0.153
Internet Access	70	63.1	36.8	7.105	0.029
Pagers	60	57.8	55.2	0.108	0.947
Computers	100	89.4	77.6	3.88	0.144
Cell Phones	100	100	78.9	7.203	0.027
Company Internet Site	60	42.1	9.2	21.332	0
Company Intranet	0	15.7	1.3	9.127	0.01

Table 5. Survey Results by Age of Business

	Old 30+	Middle 16-29	Young 1-15	X2	Significance Level
Fax Machines	81.2	96.9	77.5	5.746	0.057
Voice Mail	37.5	57.5	50	2.674	0.263
E-Mail	46.8	54.5	50	0.388	0.824
Internet Access	40.6	42.4	50	0.738	0.691
Pagers	56.2	66.6	47.5	2.699	0.259
Computers	81.2	84.8	80	0.3	0.861
Cell Phones	84.3	93.9	77.5	3.789	0.15
Company Internet Site	18.7	21.2	20	0.062	0.97
Company Intranet	0	6	5	1.878	0.391

Table 6. Results of Likert Scale Survey

	N	Mean	Std. Deviation	Std. Error Mean
Trust security of Internet	103	2.5631	1.1855	0.1168
Trust security of e-mail	103	2.6796	1.2144	0.1197
Trust accuracy of electronic communication	105	3.4762	1.0478	0.1023
Trust accuracy of printed communication	105	3.9619	0.9896	9.66E-02
Electronic communication has increased my profitability	102	3.1667	1.2355	0.1223
Electronic communication has increased my productivity	102	3.4314	1.2309	0.1219
Prefer electronic communication over printed	103	2.767	1.1132	0.1097
Prefer printed communication over electronic	104	3.5	0.9754	9.57E-02
New laws are needed for privacy	104	4.2404	1.0192	9.99E-02
New laws are needed to protect copyrighted material	103	4.0194	1.1201	0.1104

Author's notes

1. The author is by no means a computer expert and had to search the Internet for explanations as to the exact nature of what Coleman was discussing. XML stands for Extensible Markup Language, which is the successor to HTML or Hypertext Transfer Markup Language. These are the computer languages which make the Internet possible. For more on XML see www.w3.org/XML/. iWAP stands for Internet Wireless Application Protocols. This is rather self-explanatory. For more on iWAP see www.iwap.com/iw/.

2. The following is an anecdotal adoption scenario related to the author by a medium to large HVAC contractor the author encountered during hands on research for this project. The contractor had gone through the steps necessary to research wireless options for his technicians to communicate with them in a more effective manner than just paging them and waiting for a return call. One of his older technicians was averse to the adoption scenario of utilizing the new wireless technology. After much cajoling by the owner proved to no avail, he resorted to a different type argument. His tech. told him, 'I don't need a cell phone, I have a pager that I have used for years with no trouble'. 'May I please see the pager,' the owner said. The tech handed him the pager and he immediately threw it against a block wall thereby shattering it into many small pieces and said, 'Now you don't have a pager so you need the cell phone'.

3. While this model works for most of the industry, it is not all inclusive. For example there is a movement in the industry towards consolidation. Lenox has become their own distributors and in some parts of the country they are also the contractor. This would narrow the model to an interaction only between the consumer and the OEM. Time will tell if this catches on and if it is a benefit to the consumers.

4. In this work there remains great attention to electronic communication as a sub-function of communication as a whole. If electronic communication were to be mapped into the Shelby model, perhaps it would look like the model presented here (See Figure 6). Since electronic communication can be considered its own sub-discipline and is generated and/or received by an electronic apparatus, the lines of demarcation would be straight lines rather than concentric overlapping circles and would interface with most facets within the communication discipline.